TRANSFORMATION OF MEDICAL EDUCATION IN THE ERA OF ARTIFICIAL INTELLIGENCE

Abstract. The emergence of artificial intelligence (AI) has revolutionized many fields, education is no exception, and since we are entering a new era of learning, the potential of AI to transform education is huge. From personalized learning to efficient administrative tasks, AI is poised to change the way we approach teaching and learning.

One of the most important ways AI will impact education is through personalized learning. By analyzing huge volumes of data, AI can identify patterns and trends in learning styles, strengths and weaknesses of students. This information can be used to develop an individual study plan adapted to the needs of each student. The era of a one-size-fits-all approach to education is over; thanks to AI, teachers can provide individual attention and support to each student to help him reach his full potential.

Another area where AI could have a significant impact is accessibility. For students with disabilities or those facing language barriers, AI-powered tools can help bridge the gap and ensure inclusive education – “Education for All”. For example, AI-based speech recognition and natural language processing can provide real-time translation and transcription, enabling students to learn in their preferred language and in their preferred way of communicating. Similarly, AI can help create adaptive learning materials that meet the needs of differently-abled students, ensuring that no one is left behind.

It is also quite important to remember that AI can play a crucial role in improving undergraduate medical education by making it more interesting and interactive: with the help of virtual assistants and AI-based Chatbot’s, students can get instant answers to their questions, which can contribute to better assimilation of the material. In addition, educational games and simulations with artificial intelligence can provide a more engaging and hands-on learning experience and promote a deeper understanding of complex concepts.
If we look to the future, the potential of artificial intelligence to transform medical education goes beyond the classroom. With the development of distance learning, AI can bridge the gap between students and teachers. By enabling personalized learning experiences, real-time feedback, and improved accessibility, AI can democratize education and ensure access to quality learning opportunities for all, regardless of location or socioeconomic background.

But the implementation of artificial intelligence in medical education is still associated with a number of problems, namely: data privacy issues, ethical considerations, potential loss of human contact in education - all this needs to be solved in the future. Therefore, it is necessary to find a balance between using the advantages of artificial intelligence and preserving the essence of human interaction in the process of "teaching - learning".

Keywords: artificial intelligence, medical education, transformation, educational experience

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ТРАНСФОРМАЦІЯ МЕДИЧНОЇ ОСВІТИ В ЄРУ ШТУЧНОГО ІНТЕЛЕКТУ

Анотація. Поява штучного інтелекту (ШІ) зробила революцію в багатьох галузях, не стала винятком й освіта, а оскільки ми вступаємо в нову еру навчання, то і потенціал ШІ для трансформації освіти є величезним. Від персоналізованого навчання до ефективного виконання адміністративних завдань - ШІ готовий змінити наш підхід до викладання і навчання.

Одним з найважливіших способів впливу ШІ на освіту є персоналізоване навчання. Аналізуючи величезні обсяги даних, ШІ може виявити закономірності і тенденції в стилях навчання, сильних і слабких сторонах студентів. Ця інформація може бути використана для розробки індивідуального навчального плану, пристосованого до потреб кожного студента. Ера універсального підходу до освіти закінчилась; завдяки ШІ викладачі можуть надавати індивідуальну увагу і підтримку кожному студенту, щоб допомогти йому повністю розкрити свій потенціал.
Інша сфера, в якій штучний інтелект може мати значний вплив, - це доступність. Студентам з обмеженими можливостями або тим, хто стикається з мовними бар'єрами, інструменти на основі ІІ можуть допомогти подолати розрив й забезпечити інклюзивність освіти – «доступність освіти для всіх». Наприклад, розпізнавання мовлення та обробка природної мови на основі ІІ можуть забезпечити переклад і трансформацію в реальному часі, що дасть змогу студентам навчатися мовою, якій вони надають перевагу, і способом спілкування, якому вони віддають перевагу. Аналогічно, ІІ може допомогти у створенні адаптивних навчальних матеріалів, які відповідають потребам студентів з різними здібностями, гарантуючи, що ніхто не залишиться без уваги.

Також досить важливо пам'ятати, що ІІ може відігравати вирішальну роль у покращенні додипломної медичної освіти, роблячи його більш цікавим та інтерактивним: за допомогою віртуальних асистентів і чат-ботів на основі ІІ студенти можуть отримувати миттєві відповіді на свої запитання, що може сприяти кращому засвоєнню матеріалу. Крім того, навчальні ігри та симуляції зі штучним інтелектом можуть забезпечити більш захопливий та практичний досвід навчання та сприяти глибшому розумінню складних концепцій.

Якщо зазирнути в майбутнє, то потенціал штучного інтелекту для трансформації медичної освіти виходить за межі аудиторії. З розвитком дистанційного навчання ІІ може подолати розрив між студентами та викладачами. Забезпечуючи персоналізований навчальний досвід, зворотний зв'язок у реальному часі та покращену доступність, ІІ може демократизувати освіту і забезпечити доступ до якісних навчальних можливостей для всіх, незалежно від місця проживання чи соціально-економічного походження.

Але впровадження штучного інтелекту в медичну освіту всього ж таки пов'язане з низкою проблем, а саме: питання конфіденційності даних, етичних міркувань, потенційна втрата людського контакту в навчанні – все це потребує вирішення в майбутньому. Отже необхідно знайти баланс між використанням переваг штучного інтелекту та збереженням суті людської взаємодії в процесі «викладання – навчання».

Ключові слова: штучний інтелект, медична освіта, трансформація, навчальний досвід

**Formulation of the problem.** As the modern health care system changes, of course, medical education will also change. And since doctors spend most of their lives learning, the question arises whether learning is effective. Medical students and doctors are always learning and must apply knowledge in critical situations that require it instant reaction. That is why modern medical education must change to meet the rapid development of technology, the large amount of knowledge.
reality is already developing in medical education, and therefore Artificial Intelligence in medicine [1] is computer programs that simulate the thinking process of a doctor.

These technologies are still expensive [2], and state medical universities experiencing financial difficulties may not have the funds to implement them.

Due to the fact that distance and mixed education [3] prevails in Ukraine at the moment, it is not always possible to conducting training online (in connection with stabilization or emergency power outages), a problem arises diversification and better visualization of educational material for students [4]. Methodically balanced use of artificial intelligence tools and cloud services of open science can be a possible solution to this problem.

**Analysis of recent research and publications.** Different industries use artificial intelligence in different ways (Chen et al. 2020) [5]. Powerful artificial intelligence can perform many different tasks at the same time. He can act like a human doing any complex job.

Recently, the use of AI in the field of medical education has been growing sharply. According to Perrotta & Selwyn (2020) [6], integration was useful for predicting future problems and improving the effectiveness of student learning. According to the findings of Williamson & Eynon (2020) [7], technologies are currently being used to detect plagiarism, maintain the integrity of exams, analyze student performance indicators, etc. Hence, with the support of such tools, student assessment modes become extremely useful.

**A study by Awasthi & Soni, 2023** [8] indicated the following advantages of using artificial intelligence in the education system:

1. AI systems adapt to each student's learning needs and goals according to their strengths and weaknesses.
2. AI systems analyze and observe a student's current learning style and abilities and provide a customized content and support template.
3. Artificial intelligence systems evaluate not only closed answers in the test format, but also descriptive ones.
4. Thanks to artificial intelligence, students feel free to make mistakes, which is an integral part of learning, and then receive real-time feedback to make the necessary corrections.
5. Adaptive learning of students is used at the initial level, and then gradually moves to the next stage, completing the previous one.
6. Artificial intelligence can provide students with access to education according to needs, for example by reading content to a visually impaired student.
7. Artificial intelligence can be dosed and used in preschool education to present interactive games that teach and develop children's basic skills.
8. Can be used to create educational content: Artificial intelligence programs that convert voice to text are widely used.
The aim of the study. The purpose of this study is to study the spread of artificial intelligence in the educational sphere, identification of areas of application of AI to improve the quality of education in higher medical education, analysis of advantages and disadvantages of integration of AI in education.

Presenting main material. Artificial intelligence in medicine is the use of machine learning models to search medical data and extract information that will help improve health and the patient experience. Thanks to recent advances in computer science and informatics, artificial intelligence (AI) is quickly becoming an integral part of modern healthcare. Artificial intelligence algorithms and other AI-based applications are used to support of medical workers in clinical conditions and in current ones studies [9].

To create an effective AI algorithm, computer systems first comes data that is usually structured, which the algorithm recognizes. Once the algorithm has obtained a sufficient number of data points and their labels, the performance is analyzed to ensure accuracy. Based on the test results, the algorithm can be modified, given more data, or deployed to help the human make decisions.

Most AI applications in medicine read data of some type, whether numerical, such as heart rate or blood pressure, or image-based, such as MRI or images of biopsy tissue samples, as input. The algorithms are then trained on the data and produce either a probability or a classification. For example, a possible outcome could be the probability of arterial clot formation based on heart rate and blood pressure data, or the designation of a tissue sample as cancerous or non-cancerous [10].

The main characteristic of artificial intelligence is the ability to perform any actions from the point of view of achieving the desired goal, which is established for a specific job intended for artificial intelligence [11]. Artificial intelligence is tuned to achieve different types of goals, which include learning, reasoning, perception, and more.

Artificial intelligence affects the quality of education in medicine, especially in terms of providing different types and methods of online learning. Recently, online classes and online learning processes have become much more fashionable. Medical students may get more opportunities to take online classes because online classes give future doctors more opportunities to learn more components of a single skill. Online learning methods are offered to students in different ways types of high-tech learning methods for better understanding of the topic. Online learning methods are also more accessible for medical students to answer the questions they have, so students do not feel any difficulty while learning the topic or they can easily get their questions answered anytime of the day and anywhere.

Online learning methods also help medical students by providing different types of resources on a particular topic so that they can learn a particular topic better. Students using online classes have the opportunity to attend all classes from home,
which is also a comfort zone for every student. In addition, if a student misses any online class, he can record it and play the video at any other time.

According to the theory of situational learning, the acquisition of cognitive and professional skills of a student (in the future - a doctor) is discussed, since artificial intelligence depends on the development of skills. So, first of all, it is necessary to develop professional skills, because it helps to teach medical students to work better.

According to this theory, artificial intelligence includes various studies of "neuron-like elements" and "evolving multi-dimensional neural-like networks". The artificial intelligence system acts as the brain of the human system from the point of view of solving any problems [12]. This theory was used in our study to justify the usefulness of artificial intelligence in terms of improving the quality of learning. According to the results of the research, based on the study of highly professional peer-reviewed scientific works, the main advantages and disadvantages of the integration of AI in the field of medical education were highlighted. Among the advantages were the following:

1. Artificial intelligence helps to improve the quality of education by developing various software applications for learning. Artificial intelligence helps to present different types of PowerPoint presentations and graphic presentations to provide students with better understandable concepts. Artificial intelligence improves the quality of teaching methods and methods, providing answers to all the questions that students ask at any time of the day, which certainly helps students in their future practical activities.

2. Various factors of artificial intelligence are responsible for the formation of cognitive and formative skills. There are various AI factors that help improve various skills in terms of cognitive and formative skills. Different aspects of quality management of teaching methods are cognitive and formative skills. Cognitive skills help to develop the infrastructure of the education system, and formative skills refer to the skills necessary to form the basis of the education system.

The results of the conducted research can be used to improve future online learning and teaching methods. It is advisable to use artificial intelligence to improve the quality of education in higher education institutions, which, in turn, will help expand the future professional opportunities of students. The results of this research can also be useful in terms of improving various functions of artificial intelligence to make it more useful for improving the quality of teaching methods and teaching techniques of students. The future scope of the use of artificial intelligence for the improvement of learning objects in medical institutions of higher education can be considered an important aspect, since artificial intelligence can make the learning process very easy, understandable and interesting for students. Thanks to this, medical students can easily study the topic and become interested in synchronous studies at the university. The use of artificial intelligence also affects the technique
of conducting lectures and practical classes (seminars), since artificial intelligence can include different types of slides and graphic presentations during training and generate interesting situational tasks.

**Conclusion.** Based on the results of research, it was found that artificial intelligence, which began its existence in the 1950s of the last century, made a significant breakthrough in the field of medicine. AI uses complex machine learning algorithms to process large amounts of data, learn, and then produce a useful result to solve a well-defined problem in the medical system. Once trained, AI systems can free up busy doctors' time by transcribing notes, entering and organizing patient data, personalize treatment, provide remote diagnostics to patients, answer their basic questions and dispatch needed resources. But the most important thing is that such AI systems are accurate, allow to develop medicines, help to carry out operations and can more effectively diagnose a dangerous disease in a patient at an early stage and thereby save a person's life.

In summary, the potential of artificial intelligence to transform education is enormous, and we are only just beginning to scratch the surface of what is possible. As we enter a new era of learning, it's critical to harness the power of artificial intelligence while also being mindful of the challenges it presents. In this way, we can harness the potential of artificial intelligence to create more inclusive, personalized and engaging learning experiences for students around the world, ushering in a new era of truly transformative education.

**Література:**


References: