IRSTI 14.35.07
UDC 378.1
https://doi.org/10.52269/KGTD2532176

INFLUENCE OF ARTIFICIAL NEURAL NETWORKS ON EDUCATION

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This article discusses the impact of artificial intelligence and neural networks on the educational environment. The main focus is on the role of artificial neural networks in the modern educational system and suggests using them as tools that can be effectively integrated into curricula without compromising the quality of knowledge gained. The article also provides examples of neural networks that can be useful in the educational process and are already available for use. The resistance and anxiety factors associated with the use of neural networks in education was addressed, as well as the benefits of use thereof. Software services and platforms for using neural networks in education are mentioned. A survey was conducted and the results of using neural networks by students in completing scientific papers and assignments in the educational environment were analyzed. Within digitization process, it was found that the neural network can be considered as a useful educational tool, since it is able to read a wide range of texts and information on the Internet, including educational resources. It is important to keep in mind, that they can be used to solve specific problems, monitor the use of neural networks in education and teach students to critically evaluate the information obtained.

Key words: *neural network, education, neural networks in education, artificial intelligence, leaners.*

БІЛІМ БЕРУДЕ НЕЙРОНДЫҚ ЖЕЛІЛЕРДІҢ ӘСЕРІ

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Бұл мақалада жасанды интеллект пен нейрондық желілердің білім беру ортасына әсері жан-жақты қарастырылады. Негізгі назар қазіргі білім беру жүйесіндегі нейрондық желілердің рөліне аударылып, оларды алған білім сапасына нұқсан келтірместен оқу бағдарламаларына тиімді кіріктіре алатын заманауи құралдар ретінде пайдалану ұсынылады. Білім беруде нейрондық желілерді қолдануға байланысты қарсылық пен алаңдаушылық факторлары және оны пайдаланудың артықшылықтары туралы мәселе қозғалған. Білім беруде нейрондық желілерді қолдануға арналған бағдарламалық жасақтамалар мен онлайн платформалардың қызметі айтылған. Білім беру ортасында білім алушылардың ғылыми жұмыстар мен тапсырмалар орындау кезінде нейрондық желілерді қаншалықты қолдануына сауалнама жүргізілген және оның қорытындысы талданған. Цифрландыру аясында нейрондық желіні білім берудің пайдалы және тиімді құралы ретінде қарастыруға болатыны, өйткені бұл нейрондық желі Интернет желісіндегі көптеген мәтіндер мен ақпараттарды, соның ішінде білім беру ресурстары арқылы автоматты түрде оқып, өңдей алатыны айтылған. Оларды белгілі бір мәселелерді шешу үшін қолдануға болатындығын есте ұстау керек. Білім беру саласында нейрондық желінің қолданылуын бақылап, білім алушыларға алынған ақпаратты сыни тұрғыдан және жауапкершілікпен қолдануға үйрету қажет.

Түйінді сөздер: *нейрондық желі, білім беру, білім берудегі нейрондық желілер, жасанды интеллект, білім алушылар.*

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В этой статье рассматривается влияние искусственного интеллекта и нейронных сетей на образовательную среду. Основное внимание акцентируется на роли нейронных сетей в современной образовательной системе и предлагается использовать их в качестве инструментов, которые можно эффективно интегрировать в учебные программы без ущерба для качества полученных знаний. Также статья приводит примеры нейросетей, которые могут быть полезными в образовательном процессе и уже доступны для использования. Был затронут вопрос о факторах сопротивления и беспокойства, связанных с использованием нейронных сетей в образовании, а также о преимуществах использования. Упоминаются услуги программного обеспечения и платформ для использования нейронных сетей в образовании. Был проведен опрос и проанализированы итоги использования нейронных сетей обучающимися при выполнении научных работ и заданий в образовательной среде. В рамках оцифровки было отмечено, что нейронную сеть можно рассматривать как полезный образовательный инструмент, поскольку эта нейронная сеть считывает широкий спектр текстов и информации в Интернете, включая образовательные ресурсы. Важно помнить, что их можно использовать для решения определенных проблем. Необходимо контролировать использование нейронной сети в образовании и обучать учащихся критическому использованию полученной информации.

***Ключевые слова:** нейронная сеть, образование, нейронные сети в образовании, искусственный интеллект, обучающиеся.*

Introduction. Modern education is in continuous development, with neural networks emerging as a key factor shaping its future. While this technology is widely embraced in other fields, it faces some skepticism and resistance in education. Nevertheless, the potential of neural networks to enhance learning and elevate the quality of educational programs is undeniable. This article explores the transformative impact of neural networks on education and the distinct opportunities they offer.

Artificial neural networks are a form of data processing system designed to imitate the cerebration of the human brain and its learning processes. They are extensively employed by researchers to tackle a range of challenges, including optimization, classification, pattern recognition, associative memory, and observation [1]. A review of the literature reveals that education, like numerous other areas of society and human endeavor, has been profoundly influenced by technological progress. One of such advancements is the integration of artificial intelligence into education [2-4]. Artificial intelligence, in this context, is the ability of machines to perform tasks that typically require human intelligence, such as decision-making, problem-solving, and language understanding. A deep understanding of these terms is critical, as their use shapes educational policies, research focus, and implementation strategies.

Initially, neural networks were primarily utilized for analyzing large datasets and addressing classification and clustering challenges. However, as technology has advanced and computing devices have become more powerful, neural networks have emerged as a promising tool in learning processes [5].

Integrating neural networks into teaching enables the application of innovative information processing methods. This approach allows for the utilization of not only textual but also graphic, auditory, and video information as educational materials [6]. Furthermore, it facilitates the creation of personalized learning programs, enables the analysis of individual student challenges, and allows for the development of specialized tasks tailored to address those challenges.

Utilizing neural networks in education offers numerous advantages, notably in optimizing the personalization of learning. Neural network technologies address the challenge of individualizing learning, a crucial aspect of modern education. This approach enables the creation of individualized training programs for each student, considering factors such as their current knowledge level, learning pace, professional interests, etc.

While several questions regarding the development and impact of neural networks in education remain pertinent, they have yet to be fully explored.

The search for answers to the questions posed is the **goal** of our research.

The **objectives** of the research are:

– To identify the current stage of neural network development in education;

– To analyze the influence of neural networks on educational advancement;

– To assess students' readiness to engage with neural network technology.

Materials and methods. The study focuses on predicting education using neural networks in educational processes, employing both theoretical and empirical methods to derive its findings. The research methodology encompasses analysis, generalization, and surveys.

Resistance and anxiety related to the adoption of neural networks in education are attributed to several factors (Figure 1):

Figure 1 – Resistance and anxiety factors related to the use of neural networks in education

Neural networks should not be seen as a replacement for educators; instead, they should serve as tools that enhance and support their work. Educators and learners remain essential in the educational process, providing interpersonal interaction, motivation, and personalized support. Neural networks can be valuable for data collection and analysis, as well as offering individualized recommendations. Therefore, the use of neural networks in education does not diminish the role of educators; rather, it makes them more effective in meeting the individual needs of learners and aiding in their adaptation. Furthermore, neural networks should not deprive students of the opportunity to demonstrate their knowledge and skills. Their purpose in education is not to automate student work but to enhance accessibility and improve educational outcomes.

Some individuals express concerns about potential leaks of personal information, suggesting that the use of neural networks may compromise the privacy of students and educators.

Now, let's examine the benefits of integrating neural networks into education (Figure 2).

Figure 2 – Benefits of using neural networks in education

Neural networks enable the consideration of individual student needs and characteristics. They can automatically adapt curricula and materials, offering personalized tasks and recommendations to enhance learning efficiency and achieve better results. Additionally, neural networks facilitate the creation of interactive and innovative teaching materials that capture student interest and promote self-directed learning. These innovative teaching methods stimulate interest, foster creative thinking, and inspire students to develop new ideas for individual projects and works. Moreover, neural networks help automate and enhance the assessment process by enabling students to objectively evaluate their knowledge and skills. They can analyze data, identify errors, and highlight areas needing further attention, thereby assisting students in improving their performance. Ultimately, the use of neural networks can enhance the accessibility of knowledge for various categories of students [7].

Below are examples illustrating the application of neural networks in education (Figure 3).

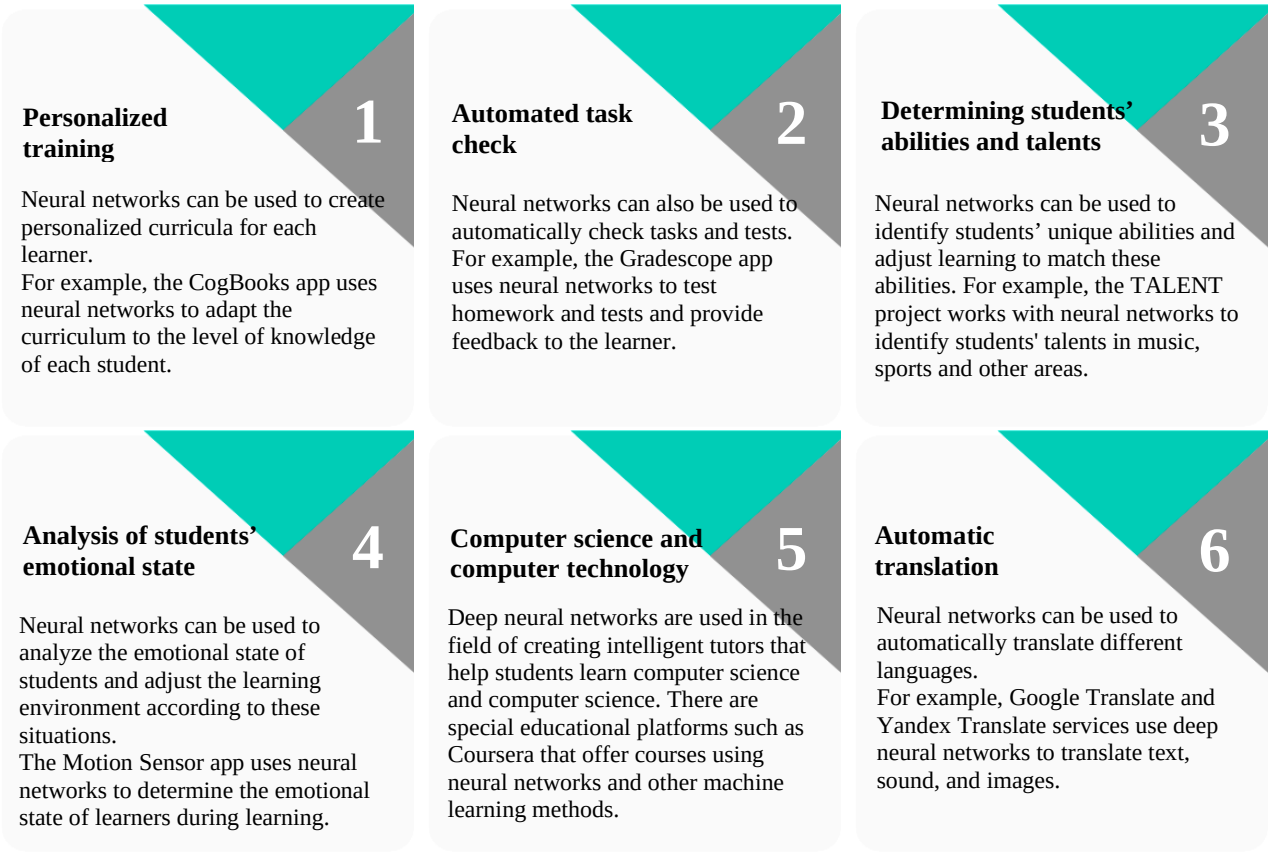

Figure 3 – Examples of neural networks application in education

Software for using neural networks in education may include Python libraries for working with neural networks such as TensorFlow, PyTorch, and Keras. Platforms and services such as Google Colab, Microsoft Azure Machine Learning, and Amazon SageMaker can also be used [8-10].

Results and discussion. The widespread and rapid integration of neural networks across various domains has presented the digital world with several challenges. One such challenge is the difficulty in distinguishing texts generated by neural networks from those authored by humans. In December 2022, OpenAI Corporation launched ChartGPT, a product that quickly gained popularity, surpassing 1 million users within a week of its release. This remarkable popularity can be attributed to its unique capabilities. ChartGPT is trained to respond to sequential questions, generate texts in various formats, counter incorrect inputs, and create artistic images based on user requests [11].

In today's education system, significant emphasis is placed on tasks such as scientific articles, term papers, abstracts, theses, and the completion of individual assignments. However, teachers frequently encounter the challenge of students using neural network technologies. In many instances, distinguishing between work produced by artificial intelligence, capable of generating highly unique texts, and that produced by students is problematic or even impossible.

On January 25, 2023, a study was published in the peer-reviewed scientific journal *Finance Research Letters*, revealing that neural networks can generate academic articles of a sufficiently high scientific standard to be accepted by scientific publications. In response, major scientific journals such as Science and Nature prohibited the use of ChatGPT in the composition of scientific articles. They also cautioned scientists about the ethical implications of concealing the use of neural networks.

As part of this study, an online survey was conducted among 3rd- and 4th-year students of the full-time program at the Faculty of Information Technology of our university. A total of 140 students participated in the survey. The purpose of the survey was to determine the extent to which neural networks are used in the learning process and to assess their impact on students.

The following questions were included in the questionnaire:

1. Do you use neural networks? Answer: 1. Yes; 2. No.

2. How often do you use neural networks? Answer: 1. Very often; 2. Often; 3. Sometimes; 4. Very rare; 5. Never.

3. For what purpose do you use neural networks? Answer: 1. To do homework; 2. To create a picture; 3. For fun; 4. For other purposes.

4. Would you use neural network technology when writing a scientific article, term paper, and/or thesis? Answer: 1. Yes; 2. No; 3. I don't know.

5. Do you think neural networks are useful? Answer: 1. Yes, there are benefits; 2. No benefit; 3. It's hard to answer.

6. Do you think neural networks can replace a person? Answer: 1. Yes; 2. No, they can't; 3. Other.

7. Do you think this will negatively affect the quality of the education you receive? Answer: 1. Yes; 2. No; 3. I don't know.

8. Does the use of neural network technologies deprive students of the desire to independently write scientific work? Answer: 1. Yes; 2. No.

9. How much do neural networks help you? Answer: 1. 1b; 2. 2b; 3. 3b; 4. 4b; 5. 5b.

For question 1, 132 students responded «Yes», 8 – «No», that is, it can be seen that 94.3% of students use the neural network as an assistant in everyday life. Obviously, with each passing day, the use of the neural network is becoming closer to 100% (Figure 4).

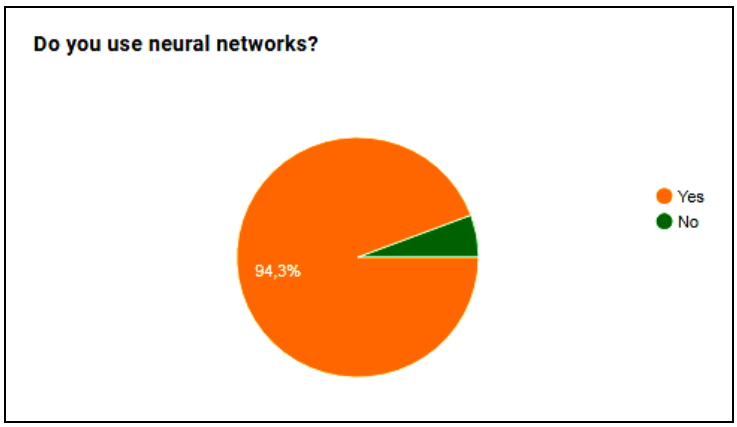

Figure 4 – The result of the first question

For question 2, 8 students responded: «Very often», 56 – «often», 64 – «sometimes», 12 – «Very rarely», 0 – «Never». The answers «very often», «often» and «sometimes» make up 91.4% of the question (Figure 5).

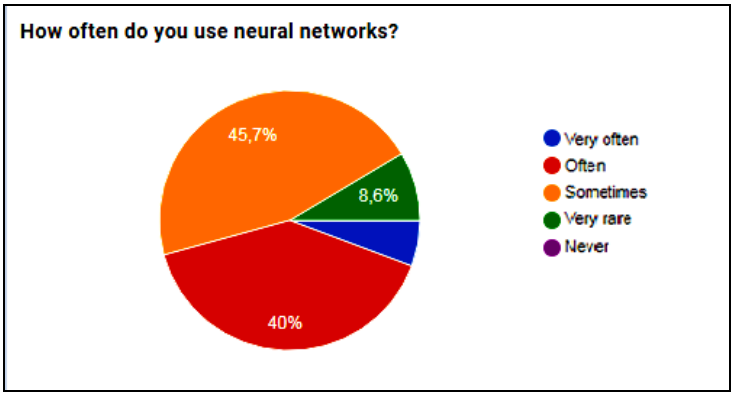

Figure 5 – The result of the second question

For question 3, 88 students answered: «To do homework», 4 – «To create a picture», 4 – «For fun», 44 – «For other purposes». 62.9% of students noted that they use it when doing homework.

For question 4, 60 students responded – «Yes», 48 – «No», 32 – «I don't know». When writing scientific materials, it was noticed that the percentage of students using neural networks is higher.

For question 5, 112 students responded – «Yes, there is a benefit», 28 – «No benefit», 0 – «It's difficult to answer». The version «Yes, there is a benefit» was supported by 80% of students. The neural network provides a large amount of finished material without intermediate tuning, so it would be advisable for learners to analyze, process, correct and only then use those materials before using them.

For question 6, 36 students responded – «Yes», 92 – «No, it is impossible», 12 – «Other».

For question 7, 40 students responded – «Yes», 84 – «No», 16 – «I don't know».

For question 8, 40 students responded – «Yes», 100 –«No» (Figure 6).

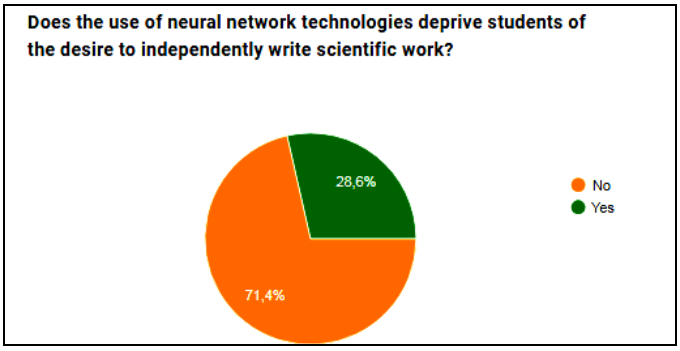

Figure 6 – The result of the eighth question

Learners can learn how to effectively search and analyze information, which is an important skill in the modern world, using neural networks and artificial intelligence. However, these results suggest a dual effect: while the majority of students recognize the utility of neural networks, there is a noticeable portion that remains uncertain about their long-term impact on academic quality. This reflects both opportunities and challenges in adapting education to include AI tools. Students should be guided not only in using these tools but also in understanding their limitations to preserve critical and independent thinking skills.

For question 9, 12 students responded – 1b, 12 – 2b, 48 – 3b, 40 – 4b, 28 – 5b.

Neural networks and artificial intelligence accelerate information retrieval, data analysis, and text compilation, freeing up learners' time for creative thinking and in-depth exploration of their fields. However, there is a potential risk of diminishing a student's individuality and creativity if they rely too heavily on fully automated systems.

Neural networks and artificial intelligence have the potential to greatly enhance the quality of educational materials, making them more accessible and personalized for learners. However, it's important to note that the creation of educational materials necessitates not only the assistance of neural networks but also profound knowledge in the fields of education and pedagogy. Therefore, while neural networks can significantly augment educational processes, they cannot entirely c the role of educators.

Conclusion. The integration of neural networks in education has the potential to significantly enhance training quality, elevate teacher professionalism, and reduce training durations. As technology evolves rapidly, necessitating a deeper learning approach, it becomes imperative to explore novel methods of implementing professional educational programs through neural networks. By embracing the concept of deep learning with neural networks, educational institutions can engage in research endeavors to enhance the educational process and swiftly incorporate neural network-based developments into educational and technical processes across various industries. In the near future, the judicious utilization of neural network technology will facilitate quality education that caters to the individual needs and interests of every student.

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МРНТИ 14.25.09
УДК 371.39
https://doi.org/10.52269/KGTD2532182

ДИАГНОСТИКА УЧЕБНЫХ ДОСТИЖЕНИЙ УЧЕНИКОВ СТАРШИХ КЛАССОВ ПО ПРЕДМЕТУ «ГЕОГРАФИЯ»

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