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Application of Artificial Intelligence Technologies in Teaching Computer Mathematical Systems Science

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Abstract: This article discusses the use of artificial intelligence (AI) technologies in teaching computer mathematical systems. The effectiveness of AI-based modeling and simulation technologies in the educational process is analyzed. The possibilities of increasing the interactivity, visualization and quality of the educational process using artificial intelligence tools are also considered. It is argued that the integration of AI technologies with computer mathematical systems such as Mathematica, MATLAB, Maple, GeoGebra and Desmos significantly increases the effectiveness of education.

Keywords: Artificial intelligence, computer-based mathematical systems, modeling, simulation, neural networks, visualization, digital learning, algorithms.

Introduction: The modern education system is increasingly integrated with digital technologies. Artificial intelligence (AI) technologies play a special role in this process. AI tools facilitate the mastery of complex mathematical concepts through modeling, visualization, and simulation in teaching computer-based mathematical systems.

The literature notes that the educational process organized on the basis of SI serves to develop students' practical skills, as well as increase their ability to think independently and analyze [1–2].

METHOD

1. The importance of artificial intelligence technologies in education

Artificial intelligence technologies create the following opportunities in the educational process:

Adaptive learning is an adaptive learning model based on artificial intelligence technologies that allows for the formation of a personal learning trajectory, taking into account the individual educational needs, level of knowledge, dynamics of mastery, and cognitive characteristics of each student . As a result, the educational process is individualized and learning efficiency is increased [3].

The analytical approach is an approach based on artificial intelligence technologies and methods of analyzing educational data, which allows for a comprehensive analysis of students' level of mastery, knowledge gaps, and the dynamics of educational activity. As a result of this approach, individual recommendations are developed for each student, increasing the effectiveness of the educational process [4].

Automated assessment is an assessment system based on artificial intelligence and data mining methods that allows for rapid and objective assessment of students' knowledge, skills, and competencies in real time. This approach reduces subjectivity in the assessment process and increases the accuracy and reliability of learning outcomes [5].

These opportunities serve to improve the quality of the educational process, improve the level of knowledge acquisition of students, and significantly raise the efficiency of teaching to a higher level.

2. Use of SI in computer mathematical systems

Computer mathematical systems (Mathematica,

MATLAB, Maple, GeoGebra, Desmos) integrated with artificial intelligence provide the following capabilities:

Mathematical modeling allows for the representation and analysis of complex calculations and functional relationships in the form of a simplified model [6];

Simulation processes are an approach based on virtual modeling of real systems and processes in a computer environment, which allows for in-depth analysis of their dynamic behavior and scientifically based forecasting of possible outcomes under conditions of changes in various parameters [7].

Problem solving is an approach based on the integration of artificial intelligence and computer-aided mathematical systems, which allows solving algebraic and geometric problems quickly, accurately, and reliably using automated algorithms. This process not only increases computational efficiency, but also simplifies the analysis of complex mathematical problems [8].

Visualization is the process of representing mathematical and statistical data in a clear and understandable way through graphs, diagrams, and animations [17].

Interactive mathematical software tools such as GeoGebra and Desmos develop students' mathematical imagination based on modern visualization capabilities, help to deeply analyze functional relationships, and significantly facilitate the intuitive and visual understanding of complex mathematical functions [18].

3. SI-based modeling and simulation technologies

Artificial intelligence-based modeling is carried out based on the following methods:

Neural networks are one of the advanced approaches to artificial intelligence, which, based on the principles of biological neural systems, allows for processing large amounts of data, identifying hidden patterns, and predicting complex processes with high accuracy [9].

Genetic algorithms are an artificial intelligence method based on the principles of evolutionary processes (selection, crossover, and mutation) that allows for efficient finding of global or near-optimal solutions to complex optimization problems [10].

Machine Learning is an advanced area of artificial intelligence that enables intelligent analysis by identifying hidden patterns in large amounts of data, training models, and automating decision-making processes [11].

Simulation technologies, on the other hand, build practical skills in students by imitating real processes.

4. Ways to introduce SI technologies into the educational process

The integration of SI technologies into education is carried out in the following areas:

1. The development of special training courses is a pedagogical and methodological process aimed at teaching the theoretical and practical foundations of artificial intelligence technologies, involving the development of competency-based training modules and their integration into the educational process, which serves to form in-depth knowledge and practical skills in AI among students.

2. Creating virtual laboratories is a pedagogical process aimed at creating a digital interactive learning environment that allows working with artificial intelligence algorithms, modeling, testing, and practical analysis of them, which serves to develop students' practical competencies.

3. The use of software tools is a pedagogical process aimed at developing students' algorithmic thinking, forming mathematical modeling skills, and strengthening practical competencies by integrating modern computing, modeling, and programming systems such as MATLAB, Python, and Mathematica into the educational process.

4. Creating interactive platforms is a pedagogical and technological process aimed at developing a digital learning environment that allows for real-time organization of the learning process, monitoring, analysis, and feedback of learning activities, which serves to increase the effectiveness of education.

CONCLUSION

The use of artificial intelligence technologies in teaching computer-based mathematical systems is of great importance in modernizing the educational process and increasing its efficiency. The results of the study show that flexible teaching, analytical approach and automated assessment systems based on AI allow taking into account the individual needs of students, determining their level of mastery, and improving the quality of education.

Also, the integration of SI technologies with computer mathematical systems (Mathematica, MATLAB, Maple, GeoGebra, and Desmos) serves to more effectively organize the processes of mathematical modeling, simulation, complex problem solving, and visualization. This helps students to gain a deeper understanding of abstract mathematical concepts and develop practical skills.

The research demonstrated that the SI methods considered during the study, such as neural networks, genetic algorithms, and machine learning, are important tools for analyzing and forecasting complex processes. Their application in the educational process develops students' algorithmic thinking and forms scientific and research competencies.

In general, the widespread introduction of SI technologies into the educational process significantly improves the quality of teaching computer-based mathematical systems, individualizes education, and serves to form a modern digital learning environment.

REFERENCES

1. Turanovich, SM (2022). Status and analysis of teaching information technology in students on the basis of computer simulation models. Asian Journal of Research in Social Sciences and Humanities, 12(4), 13-19.
2. Lutfullaev, MH, & Shodmonkulov, MT Methods Of Teaching The Subject "Information Technologies" Based On Computer Simulation Models. Journal of Multidisciplinary Engineering Science and Technology (JMEST) ISSN, 2458-9403.
3. Turanovich, SM, Ugli, DII, Ugli, MMM, & Mamarasulovich, MK (2021). THEORETICAL BASIS OF APPLICATION OF COMPUTER IMITATION MODELS IN TEACHING TYPES OF COMPUTER GRAPHICS. Galaxy International Journal of Interdisciplinary Research, 9(7), 10-13.
4. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
5. Turanovich, SM (2021). TECHNOLOGIES OF USING COMPUTER IMITATION MODELS IN EDUCATION. In Archive of Conferences (pp. 95-99).
6. Shodmonkulov, MT (2022). Application of the discipline of "information technologies in education" as a teaching tool based on modern electronic information and educational resources in the process of digitization. Physics, Mathematics and Informatics. Scientific Journal.
7. Otamuratov, OT, & Shodmonqulov, MT (2017). DEVELOPMENT OF DISTANCE EDUCATION IN CENTRAL ASIAN COUNTRIES. Internauka , (6-2), 45-47.
8. Shodmonkulov, MT (2023). Formation and Development Factors in the Digital Education Process. American Journal of Engineering, Mechanics and Architecture (2993-2637), 1(8), 94-96.
9. Schmidhuber, J. (2015). "Deep Learning in Neural Networks: An Overview." Neural Networks, 61, 85-117.
10. Rumelhart, DE, Hinton, GE, & Williams, RJ (1986). "Learning representations by back-propagating errors." Nature, 323(6088), 533-536.
11. LeCun, Y., Bengio, Y., & Hinton, G. (2015). "Deep learning." Nature, 521(7553), 436-444.
12. Usmonovna, SN (2023). FORMATION OF DESIGN SKILLS IN CIVIL ENGINEERS USING THE INTEGRATION OF APPLICABLE SOFTWARE TOOLS. Science and innovation, 2(Special Issue 10), 206-209.
13. Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2018). Foundations of Machine Learning. MIT Press.
14. Murphy, KP (2012). Machine Learning: A Probabilistic Perspective. MIT Press.
15. Shodmonkulov MT Studying computer graphics topics through simulation teaching method// Scientific and methodological journal of Physics, Mathematics and Informatics. –Tashkent, 2021. No. 3 –P. 90-98.
16. ChorshanbiyevCh.I. Theoretical foundations of the use of simulation models in education based on the integration of information technologies// Scientific and methodological journal of Physics, Mathematics and Informatics. –Tashkent, 2023. No. 5–P. 135-140. (13.00.00 No. 2)
17. Chorshanbiyev Ch.I. Visualization of mathematical concepts using innovative technologies// Scientific and Theoretical Journal of Scientific Information of Tashkent State Pedagogical University. –Tashkent,

2024. No. 10 –B 30-37.

18. Chorshanbiyev Ch.I. Study of the integration of software tools and their adaptation to educational processes.// COLLECTION of materials of the Republican scientific and practical conference on the topic "DIGITAL TECHNOLOGIES IN SUSTAINABLE DEVELOPMENT OF THE ECONOMY: PROBLEMS, INNOVATION AND SOLUTIONS" Samarkand April 18-19, 2024 pp. 372-376.

19. Kholjigitov DX Software and methodological support for the development of students' competencies in working with mathematical systems . VOCATIONAL EDUCATION scientific-methodical, practical, educational magazine 2025, Issue 10