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APPLICATION OF MACHINE LEARNING METHODS IN THE MODERN EDUCATION SYSTEM

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Abstract: In the modern world, the educational system is facing a number of challenges, including the need to personalize learning, increase its effectiveness and optimize management processes. Machine learning provides unique tools capable of addressing these challenges by automating and adapting educational processes. This makes the study of the application of machine learning methods in education relevant and important for the development of modern educational systems.

Research methodology. The research is based on the analysis of various machine learning methods, such as supervised, unsupervised, reinforcement learning and semi-guided learning, and their applications in the educational field. The methodology includes the study of scientific literature, case studies, as well as the analysis of practical examples of the use of these methods in real educational contexts. Special attention is paid to the comparison of traditional educational methods with innovative approaches based on machine learning. The results of the study show that machine learning can significantly improve the personalization of learning, allowing systems to adapt to the individual educational needs of students. Supervised learning demonstrates success in automating assessments and personalizing content, while unsupervised learning is effective in grouping students according to learning needs. Reinforcement learning finds applications in creating adaptive learning environments, and semi-guided learning helps with incomplete data. There has also been a significant improvement in the administrative aspects of educational process management.

Conclusions: The use of machine learning in education opens up new opportunities for creating more flexible and effective learning environments. Machine learning methods can not only improve the quality of learning, but also significantly optimize educational processes at all levels. The article emphasizes the importance of training specialized personnel capable of integrating these technologies into educational processes. It is necessary to pay attention to the ethical aspects of data use and ensure that the knowledge of machine learning specialists is constantly updated to maintain the relevance and effectiveness of educational methods.

Keywords: Machine learning, educational technologies, adaptive learning, classification algorithms, neural networks, data analysis in education

Introduction:

In the modern world, various scientific disciplines, including biology, economics and sociology, face the need to process huge amounts of data. These data are often poorly structured and contain errors, which makes it difficult to classify them using traditional mathematical methods. In this regard, machine learning methods that automate the classification process are gaining popularity. These methods work on the principle of learning by examples: the program, using already known data, adjusts coefficients that subsequently help classify new data.

The basis of modern machine learning methods is the Theory of statistical learning, developed by Vladimir Vapnik in the late 1960s[11].This theory offers a mathematical approach to the analysis and creation of learning algorithms, including concepts such as the Vapnik-Chervonenkis dimension (EP dimension) and the principle of structural risk minimization (CPM)[2]. These tools help you choose the optimal complexity of the model and manage the learning process to minimize errors.

Among the popular machine learning methods are neural networks, support vector machines (SVM) and the k-means method. Each of these methods takes into account its own mood, since it is the result of the work of both neurons and neural networks, or venom, and the parameters of working with SVM, which can be traced to the results obtained as a result of specific processing[3].

Cross-qualification is often used when choosing and configuring machine learning algorithms. This method allows you to test the model with different settings and choose the most effective configuration. An important aspect when working with machine learning is also the conversion of input data into vectors suitable for classification, which often requires creativity and experimentation.

The development of machine learning requires not only knowledge in the field of computer science, but also an understanding of a specific subject area, which makes the process of developing algorithms quite complex and expensive. This highlights the need to create user-friendly packages for data processing that would be available to specialists who do not have deep knowledge of programming. This will allow a wider range of researchers to use advanced data analysis methods to solve specific problems in various fields of science.

The main part: Machine learning, which is an important section of artificial intelligence, is aimed at creating algorithms and programs capable of independent learning and adaptation when new data is received. This area is actively developing as a separate field of scientific research and practical development, differing from traditional data analysis in that machine learning algorithms not only process data for human understanding, but also use it to automatically identify patterns and adapt their behavior[8].
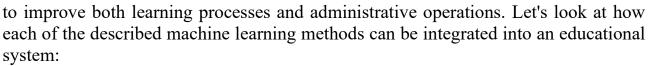
Historically, machine learning began to take shape as an offshoot of artificial intelligence, with a primary focus on teaching machines how to use data for self-learning. In the early years of AI, scientists tried various approaches, including symbolic methods and the first versions of neural networks, which then represented simple models for processing statistical data. Over time, machine learning began to move away from the symbolic and strict logical rules-based methods adopted in AI, moving to methods based on statistical analysis and probabilistic models.

The practical application of machine learning covers many areas, from spam filters and optical character recognition systems to search engines and recommendation services. A feature of machine learning is the use of large amounts of data to determine the best algorithm capable of generating the desired results depending on the volume, quality and characteristics of the data.

The training focuses on the ethical aspects of using machine learning, including issues of privacy, data bias, and the impact of automation on labor and society. The importance of continuous learning and self-education in the context of rapidly changing technologies is also emphasized.

Machine learning educational programs are offered both at traditional universities and on online platforms, making them accessible to a wide range of applicants around the world. This contributes to the wider dissemination of knowledge and competencies in this important and influential field.

Machine learning techniques can be very useful in the educational field, helping

to improve both learning processes and administrative operations. Let's look at how each of the described machine learning methods can be integrated into an educational system:

1. Supervised learning includes personalized learning and assessment automation, which implies that Algorithms can analyze a student's past performance and provide materials that optimally match their level of knowledge and learning pace.

Machine learning systems can automate assessment processes, especially in tasks with well-defined answers, such as mathematics or physics, which reduces the burden on teachers and increases the objectivity of assessments.

2. Unsupervised learning includes clustering of students and analysis of educational resources. That is, algorithms can group students by types of learning interaction or academic performance without predefined categories, which helps to develop targeted educational programs. And also, the study of large volumes of educational content to identify the most effective methods and materials[10].

3. Reinforcement learning consists of adaptive learning and educational game development[6].

The use of interactive learning platforms, where the system adapts and optimizes the learning process depending on the student's actions, for example, choosing tasks of increased complexity when the previous ones are successfully completed.

Creating educational games where AI adapts to the user's abilities, providing a gradual increase in complexity and maintaining student motivation.

4. Semi-guided learning involves the processing of incomplete data and the development of courses. In educational research, it is often necessary to deal with incomplete data on students or schools. Algorithms can help fill in these gaps by improving the quality of the analysis.

Analysis of available educational data to create more complete and in-depth educational programs that contribute to a deeper understanding of subjects.

Conclusions

Today, special attention is being paid to training specialists to work with machine learning in education. The training of specialists who can apply machine learning in the educational field requires a specific approach. It is necessary to take into account the requirements of interdisciplinary training. Specialists should have knowledge not only in the field of machine learning, but also in the pedagogy and psychology of learning.

The training should be aimed at the introduction of practical skills. It is important that the training includes real projects related to educational data, for example, the development of adaptive learning systems or the analysis of the effectiveness of educational programs.

It is necessary to take into account both ethical and legal aspects. Education in the field of data ethics and protection of students' privacy when using information systems.

List of used literature

1. Aivazyan, S.A., Enyukov, I.S. & Meshalkin, L.D., 1983. Applied Statistics: fundamentals of modeling and Primary Data Processing. Moscow: Finance and statistics.

2. Cherkassky, V. & Ma, Y., 2003. 'Comparison of Model Selection for Regression', Neural Computation, vol. 15, no. 7, pp. 1691-1714.

3. Cherkassky Vladimir, Yunqian Ma. Practical selection of SVM parameters and noise estimation for SVM regression // Neural Networks, 2004. № 17. P. 113-126.

4. Flah, P., 2015. Machine learning. Moscow: DMK Press.

5. Hastie, T., Tibshirani, R. & Friedman, J., 2001. *The elements of statistical learning: Data mining, inference and prediction*. New York: Springer-Verlag.

6. Horata, P., Chiewchanwattana, S. & Sunat, K., 2013. 'Robust extreme learning machine', Neurocomputing, no. 102, pp. 31-44.

7. Liu, X., Gao, C. & Li, P., 2012. 'A comparative analysis of support vector machines and extreme learning machines', *Neural Networks*, no. 33, pp. 58–66.

8. Platt, J.C., 1998. 'Sequential Minimal Optimization: A Fast Algorithm for Training Support Vector Machines'. [online] Available at: <http://research.microsoft.com/apps/pubs/default.aspx?id=69644> [Accessed 20 August 2014].

9. Scheinberg, K., 2006. 'An Efficient Implementation of an Active Set Method for SVMs', *he Journal of Machine Learning Research, no. 7, pp. 2237-2257.

10. Shao, X., Cherkassky, V. & Li, W., 2000. 'Measuring the VC-Dimension Using Optimized Experimental Design', Neural Computation, vol. 12, no. 8, pp. 1969-1986

11. Vapnik, V.N., Levin, E. & Le Cun, Y., 1994. 'Measuring the VC-dimension of a learning machine', Neural Computation, vol. 6, no. 5, pp. 851-876.