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BIG DATA ANALYSIS & ANALYTICS IN EFFECTIVE PEDAGOGY

Krasniuk S.O.
senior lecturer
ORCID: 0000-0002-5987-8681
Kyiv National University of Technologies and Design,
Mala Shyianovska Street 2, Kyiv, Ukraine

Abstract. Modern pedagogy strives to adapt to the rapidly changing realities of the digital age. One of the key technologies that contribute to the improvement of the efficiency of educational processes is the analysis and analytics of big data. Big Data is an array of information that is characterized by a large volume, a variety of formats and high processing speed. In the field of education, this data can include students' academic performance, their participation in educational platforms, behavioral data and even biometric indicators.

Big data analysis and analytics open up new horizons in effective pedagogy. They help educational institutions and teachers adapt to the individual needs of students, optimize resources and make informed decisions. However, the successful implementation of these technologies requires overcoming technical, ethical and organizational challenges.

The future of pedagogy lies in the integration of data and technology with a human approach to learning, which will create an educational system that best meets the challenges of the modern world.

Key words: pedagogy, big data, analysis and analytics

Introduction.

Modern educational systems generate huge amounts of data: student performance, attendance, interaction with digital platforms, participation in educational programs, and even biometric indicators [1]. This data, known as Big Data, is an array that requires specialized methods of collection, storage, analysis, and interpretation [2, 3]. The use of Big Data in pedagogy opens up prospects for creating a more effective, personalized, and evidence-based education system. By applying Big Data analytics, educational institutions can make informed decisions, predict learning outcomes, and optimize their processes.

Main part.

Modern pedagogy is undergoing a transformation thanks to digitalization, which is accompanied by a huge amount of data generated by students, teachers and educational platforms. These data include academic performance, behavior, attendance, interaction with electronic resources, test results, and more. Intelligent data analysis (Data Mining) and big data analytics (Big Data Analytics) make it possible to reveal hidden patterns and use them to improve educational processes.

In the context of pedagogy, intellectual data analysis combines the methods of statistics, machine learning, natural language processing, and artificial intelligence. These technologies help make more informed decisions, predict learning outcomes, and personalize educational processes.

The main directions of data analysis in pedagogy:

1. Personalization of education: using data to adapt educational trajectories to the individual needs of students. Example: Systems that analyze students' performance, motivation level, and interests in order to offer personalized learning

recommendations.

2. Prediction of academic results: data analysis for predicting the probability of successful completion of courses or identifying students who are at risk. Example: Using time series and classification algorithms to forecast success based on attendance and activity data.

3. Optimization of educational programs: evaluation of the effectiveness of educational materials and programs based on data on their use and student results. Example: Identifying the least effective teaching methods based on the correlation between student performance and selected teaching methods.

4. Analysis of student involvement: study of student behavior on educational platforms to assess their motivation and involvement. Example: Analysis of clicks, time spent on the platform, and use of educational materials.

5. Management of educational resources: forecasting the need for resources (teachers, classrooms, teaching materials) for optimal planning. Example: Using historical data to forecast the load on educational institutions in different periods.

Technologies and methods of big data analysis:

1. Methods of intellectual data analysis: clustering (for example: grouping students with similar characteristics, for example, knowledge level or learning style); classification (for example: predicting categories such as success (successful/unsuccessful) or involvement (high/low)); associative rules [4] (for example: identifying regularities, for example, connections between attendance and test results).

2. Machine learning and artificial intelligence: a) forecasting algorithms, such as linear regression, decision trees, neural networks; b) the use of deep learning methods for processing complex data (essay texts, video materials).

3. Natural language processing (NLP): analysis of texts, such as reviews, essays, messages in forums, to understand the attitudes of students and evaluate their involvement.

4. Visualization of data: use of Tableau, Power BI, Python (matplotlib, seaborn) tools for visual presentation of analysis results.

5. Tools and platforms: Apache Hadoop, Spark: for processing big data. Cloud technologies (Google Cloud, AWS): for data storage and analysis.

Examples of the use of analytics and big data analytics in pedagogy:

1. Identifying students with a high risk of falling behind (using machine learning algorithms to analyze data on attendance, activity on the platform, grades; forecasting the probability of a drop in performance and proposing corrective measures).

2. Feedback analysis (text data processing using NLP to identify frequent problems reported by students and teachers).

3. Improvement of educational technologies (data analysis of user interaction with educational platforms to improve their functionality and interface).

4. Development of new teaching methods (study of data on the effectiveness of different teaching methods to create hybrid and innovative approaches).

Advantages of big data analysis and analytics in pedagogy:

1. Increasing the effectiveness of training (data analysis helps to optimize educational plans and teaching methods).

2. Individualization of the approach (personalization of training increases the involvement and success of students).

3. Improvement of management (forecasting and optimization of resource use).

4. Reasoned decisions (the use of analytical data allows you to make decisions based on evidence, not assumptions).

Challenges and limitations of analysis and analytics of big data in pedagogy:

1. Ethical issues (confidentiality of data of students, consent to collection and use of data).

2. Technical complexity (processing large volumes of data requires significant computing resources. qualified specialists are required).

3. Data quality (errors or incomplete data may lead to incorrect conclusions).

4. Resistance to changes (not all teachers and institutions are ready to implement big data analytics).

Considering the above, the author emphasizes the importance of acquiring relevant competencies in mathematical modeling within the curricula not only of pedagogical educational specialties, but also for other humanitarian educational programs and plans, which is confirmed in publications [5-9].

Summary and conclusions.

Big data analytics has enormous potential to transform pedagogy. It enables learning to be more personalized, effective, and manageable. However, to successfully implement the technology, it is necessary to address issues of privacy, data quality, and training.

The future of pedagogy is closely linked to big data, which will help to create an adaptive, innovative, and evidence-based education system that can meet the needs of students and society.

Big data mining and analytics have enormous potential to transform pedagogy. They enable learning to be more personalized, informed, and effective. However, to successfully implement it, it is necessary to overcome challenges related to data quality, ethics, and infrastructure.

In the future, data analytics will become an integral part of pedagogy, supporting innovation and creating opportunities to adapt educational processes to the needs of each student.

Discussion.

As a promising direction of his future research, the author puts forward the following debatable thesis: Hybrid methods of data mining and big data analytics open up new perspectives in pedagogy, making educational processes more personalized, efficient and manageable. They allow combining the best aspects of different approaches to solve complex problems related to learning and management.

Modern education is developing in the context of global digitalization, which leads to the accumulation of huge amounts of data related to learning, interaction between students and teachers, as well as the management of educational institutions. Hybrid methods of data mining and big data analytics offer new approaches to processing and interpreting these data, ensuring improved quality of education, personalization of learning and optimization of management processes.

Hybrid methods combine the advantages of different approaches, such as machine

learning, statistical analysis, data mining and artificial intelligence methods [10, 11, 12]. They allow using their synergistic effect to solve complex pedagogical problems, such as predicting academic performance, optimizing educational programs, and individualizing educational trajectories. However, successful implementation of such methods requires a comprehensive approach, including the development of new technologies, training specialists, and the creation of a regulatory framework for data protection. In the future, hybrid methods will become an integral part of modern pedagogy, contributing to its qualitative transformation.

It is this promising direction of the author's future scientific research that will be reflected in future publications.

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