

СЕКЦІЯ: ОСВІТНІ СТРАТЕГІЇ ПІДГОТОВКИ ФАХІВЦІВ ІТ-ГАЛУЗІ

**LEVERAGING MACHINE LEARNING FOR ADAPTIVE LEARNING PATHS
IN VIRTUAL CLASSROOMS**

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The integration of machine learning (ML) into online education has the potential to significantly enhance the effectiveness of traditional learning environments by creating adaptive virtual classrooms. This review paper synthesizes existing literature on the application of various ML techniques to develop personalized learning paths that cater to the unique needs and preferences of individual learners. By analysing diverse learner data, such as performance metrics, engagement levels, and learning styles, ML algorithms can identify strengths and weaknesses, enabling the design of tailored instructional strategies that enhance learner engagement and improve overall academic outcomes.

The main goal of our study is to describe the possibilities of applying mathematical machine learning methods and their possible applications.

Supervised learning is a machine learning method that implies that the algorithm is trained based on a set of examples, and as a result, the built model can classify previously unknown examples [1].

Unsupervised learning – (unlike the previous learning) – in contrast to the previously described method, the model is trained without a set of examples, i.e. without a teacher. In this case the method is used to find patterns and correlations in the data set under study.

Semi supervised learning. The use of this mathematical model involves labelling a small amount of data in an unlabeled array with a large number of observations. One of the areas of application is the automatic mark up of graphic content with the assignment of certain labels to images by the algorithm [3].

Reinforcement learning is one of the three machine learning paradigms. A machine or agent has no prior information about the environment, but it can perform certain actions in the environment. When performing these actions in the environment, the agent learns to make the right decisions based on the analysis of the data received from the environment.

Machine learning algorithms for detecting anomalies in statistical deviations.

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Genetic algorithm is a class of evolutionary search algorithms. This algorithm simulates the process of natural selection, when stronger individuals from a population outlive weaker ones and produce the next generation of individuals.

Uplift modeling method. Uplift modeling contains a set of mathematical methods that allow to predict changes in the behavior of a certain segment of the target audience as a result of any targeted impact

Multi-armed bandit algorithms are one of the types of machine learning methods. The algorithm got its name from the analogy with gambling, where a player stands in front of a number of slot machines (one-armed bandits) and chooses which one to bet on to maximize his winnings [4].

Neural network algorithms for chatbots. One of the main trends in the use of artificial intelligence in the field of online marketing is the development of such software as chatbots, which are used to conduct dialogues with website users.

As a result of the review and analysis of the prospects for the use of machine learning algorithms, it can be concluded that machine learning algorithms are one of the most promising areas of artificial intelligence application in the processing of large data sets in digital economy projects. As a result of the review and research, a positive trend of a significant increase in the number of scientific papers on the successful application of mathematical methods of machine learning in various fields was identified.

The paper discusses various ML methodologies, including predictive modelling, clustering, and reinforcement learning, and their role in constructing adaptive learning systems within online education. Furthermore, it addresses the challenges encountered during implementation, such as data privacy concerns, the potential for model bias, and resource constraints that educational institutions may face when adopting these technologies. Ultimately, this review highlights the significance of adaptive learning systems in fostering effective educational experiences in online environments, emphasizing the need for continued research and development in this rapidly evolving field.

References

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THE IMPACT OF GAMIFICATION ON THE EDUCATIONAL PROCESS

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Every year, the number of educational services that use gamification in their processes is increasing. They are used by schools, colleges, universities, and other educational institutions around the world.

The problems of applying game technologies in education have been studied in the works of S. Kim, K. Song, B. Lockee, J. Burton [1; 2].