https://www.sworldjournal.com/index.php/swj/article/view/swj32-01-029
DOI: 10.30888/2663-5712.2025-32-01-029

UDC 004.8:519.8

OVERVIEW OF FUNDAMENTAL MACHINE LEARNING ALGORITHMS AND THEIR APPLICATIONS

ОГЛЯД ФУНДАМЕНТАЛЬНИХ АЛГОРИТМІВ МАШИННОГО НАВЧАННЯ ТА ЇХ ЗАСТОСУВАННЯ

Kiselyov O. V. / Кісельов О.В.
Founder of the Company "Blind Tech"
ORCID: 0009-0005-5256-5251
Alfred Nobel University,
Dnipro, 18 Sicheslavska Naberezhna St., 49000

Abstract. *The article is aimed at substantiating the need to create a comprehensive educational resource for students and young professionals that systematizes knowledge about fundamental machine learning algorithms (linear regression, decision trees, basic neural networks, clustering algorithms, ensemble methods) and their practical application in healthcare and finance. The resource is designed to combine theoretical foundations with practical skills, helping to effectively choose algorithms for solving real-world problems by analyzing their advantages, disadvantages, and use cases.*

The article proposes a structured approach to systematizing knowledge about fundamental machine learning algorithms, focusing on their accessibility for beginners. The novelty lies in the creation of a universal educational framework that integrates theoretical aspects, practical examples, and analysis of the strengths and weaknesses of algorithms adapted to the needs of healthcare and finance. Particular attention is paid to simplifying complex concepts through intuitive tools (scikit-learn, TensorFlow, AutoML) and increasing the interpretability of models, through the development of "white boxes" for neural networks, which promotes trust in critical areas.

The analysis demonstrates that linear regression is effective for simple predictive tasks (e.g., diabetes risk assessment or creditworthiness) due to its simplicity and interpretability but is limited by linear dependencies. Decision trees provide intuitive classification (e.g., diabetes diagnosis or credit decision automation) and outlier resistance but are prone to overfitting. Basic neural networks model complex nonlinear dependencies (MRI image analysis, fraud detection), achieving up to 90% accuracy, but require significant resources. Clustering algorithms (k-means) are effective for data segmentation (grouping patients, customers) but are sensitive to initialization. Ensemble methods (Random Forest) increase accuracy up to 92% in medical and financial tasks but are less interpretable. Comparison with traditional methods shows the advantages of machine learning algorithms: diagnostic accuracy of 85-92%, transaction processing speed of 0.1-0.3 seconds, cost reduction of up to $20-30 per hour.

Fundamental machine learning algorithms are universal tools for healthcare and finance due to their efficiency and accessibility. Understanding their advantages and limitations allows optimizing the choice of methods for specific tasks. The development of intuitive libraries (scikit-learn, TensorFlow), automated setup (AutoML), and adaptive algorithms (Evolving Machine Learning) are reducing barriers for beginners. Further research should focus on improving the interpretability of models, optimizing for limited data, and expanding educational resources to build digital competencies.

Keywords: *linear regression, decision trees, neural networks, forecasting models, automated learning.*

Problem statement.

The current state of information technology development is characterized by a rapidly growing need for specialists who can effectively apply machine learning (ML) algorithms in practice, in particular in such critical industries as healthcare and finance. This demand is driven by the rapid development of artificial intelligence technologies that are transforming traditional approaches to data processing, process automation, and decision-making. At the same time, there is a significant gap between the theoretical knowledge that students and young professionals acquire during their studies and their ability to apply this knowledge to solve real-world problems. This gap is especially noticeable when choosing the optimal algorithm for a particular problem, as the lack of a systematic understanding of the strengths and weaknesses of methods such as linear regression, decision trees, neural networks, clustering algorithms, or ensemble methods leads to inefficient solution design, which reduces the accuracy and practical value of the developed models.

Machine learning and deep learning (DL) have become key technologies that allow solving complex problems through the integration of AI-based solutions. Nevertheless, the complexity of choosing among basic algorithms such as linear regression for simple prediction tasks, decision trees for classification tasks, neural networks for nonlinear modeling, clustering algorithms for analyzing completely unsupervised data, and ensemble methods for improving accuracy is a huge obstacle for beginners. For example, linear regression is easy to understand but limited to linear relationships, while neural networks allow for modeling complex nonlinear relationships but require significant computing resources and careful tuning. Most training resources either focus on complex mathematical theory that may be incomprehensible to beginners or provide a superficial overview of the tools without providing the necessary connection between theoretical foundations and their practical application in real-world scenarios. This problem is exacerbated by the lack of structured educational materials that would systematize knowledge about fundamental algorithms, their advantages, disadvantages, and specific scenarios of use in healthcare and finance. Such a lack of materials hinders the development of practical skills among students and young professionals necessary for the effective selection and implementation of algorithms in their professional activities.

Analysis of recent research and publications.

Modern scientific publications indicate the active development of the methodology for applying fundamental machine learning algorithms in various fields. Razzaq K. and Shah M. [1] emphasize the critical importance of understanding machine and deep learning paradigms for a logical analysis of their applicability and effectiveness in healthcare, finance, agriculture, manufacturing, and transportation, emphasizing the need for a systematic approach to the study of these technologies. In the healthcare sector, Wan S., Wan F. and Dai X. [9] demonstrate the high efficiency of traditional methods, such as linear regression and decision trees, in the early diagnosis of cardiovascular diseases, where the correct parameter setting, such as regularization to reduce overfitting, provides prediction accuracy of up to 85-90%. Mohsen S. [10] extends the scope by showing how basic neural networks, in particular multilayer perceptrons with three layers, can be adapted to diagnose Alzheimer's disease, given the complexity of nonlinear relationships in medical data such as MRI images. Sadr, H., Nazari, M., Khodaverdian, Z., Farzan, R., Yousefzadeh-Chabok, S., Ashoobi, M. T., Hemmati, H., Hendi, A., Ashraf, A., Pedram, M. M, Hasannejad-Bibalan M. and Yamaghani M. R. [3] confirm the effectiveness of fundamental algorithms in the diagnosis of Parkinson's disease, using a combination of decision trees and ensemble methods to process complex medical data such as biomarkers and clinical indicators.

The financial industry is actively implementing machine learning algorithms to solve credit scoring, fraud detection, and market trend forecasting problems. Razzaq K. and Shah M. [1] note that understanding the advantages and disadvantages of each algorithm, such as the speed of linear regression or the accuracy of neural networks, is key to effective financial decision design, although specific studies of financial applications in the references provided are limited. Chen J., Zhou X., Yao J. and Tang S.-K. [4] investigate the use of supervised learning methods, such as logistic regression and decision trees, to predict student performance, which is of indirect relevance to educational initiatives in the field of machine learning, in particular, for the creation of adaptive learning systems. Jiménez-Macías E. et al. [4] analyze student interaction with learning materials, demonstrating the availability of fundamental algorithms such as k-means for clustering data on student behavior.

The engineering industry is also actively integrating machine learning. Khatir S. et al. [5] show revolutionary changes in monitoring the condition of structures such as bridges or buildings through the use of ML and DL, where ensemble methods provide prediction accuracy of up to 90%. John T. and Akeem S. [5] demonstrate the practical use of algorithms to predict the bearing capacity of pile foundations using decision trees to analyze geotechnical data. Montejano Leija A. B., Ruiz Beltrán E., Orozco Mora J. L. and Valdés Valadez J. O. [2] confirm the effectiveness of algorithms in diagnosing faults in production systems, which has parallels with medical and financial problems where high interpretability is required. Sapkal K. G. and Kadam A. B. [6] apply clustering algorithms to analyze soil data in agriculture, which can be adapted to customer segmentation in finance, creating personalized banking products. Liang, J., Miao, H., Li, K., Tan, J., Wang, X., Luo, R. and Jiang, Y. [7] investigate multi-agent learning, which has potential for complex financial systems, such as real-time forecasting of market trends. Hao L. [8] emphasizes the role of machine learning in improving the performance of autonomous vehicles, which can be used in medical technologies, for example, to automate diagnostic systems. Zhyvko Z. and Petrukha N. [11] emphasize the formation of digital competencies, which facilitates the development of machine learning tools for beginners through intuitive libraries such as scikit-learn or TensorFlow and the automation of configuration processes.

Thus, the analysis of modern research confirms that fundamental machine learning algorithms are universal tools that find application in various industries, from healthcare to finance. Their accessibility and efficiency depend on the understanding of their strengths and weaknesses, as well as on the right choice of algorithm depending on the specifics of the task. This emphasizes the need for structured educational resources that would help beginners to systematize knowledge and develop practical skills for the effective use of these technologies.

The purpose of the article is to justify the need to create a comprehensive educational resource that will provide students and young professionals with a concise, beginner-friendly synthesis of basic machine learning algorithms such as linear regression, decision trees, basic neural networks, clustering algorithms, and ensemble methods, with an emphasis on building a link between theoretical knowledge and its practical application in key industries, including healthcare and finance. The article systematizes knowledge about these algorithms, analyzes their strengths and weaknesses in detail, and provides specific examples of their use to develop practical skills for effective selection of algorithms in professional activities.

Summary of the main material.

Linear regression is a simple supervised learning algorithm that assumes a linear relationship between the input variables and the target variable. Its advantage is that it is easy to implement and interpret, and thus explaining the impact of each variable on the outcome is easy, making it ideal for beginners [1]. Linear regression is fast to learn and predict, computational requirements are low, and in the case of regularization, such as L1 (Lasso) or L2 (Ridge), it is not prone to overfitting and can be applied to small data sets. It also allows for statistical analysis of the significance of variables in terms of p-value, which is useful when investigating influencing factors [9]. As an example, linear regression in medicine allows to estimate the impact of glucose or blood pressure on the probability of diabetes, giving doctors certain coefficients of influence. Despite its drawbacks, the algorithm can only estimate linear dependencies, is vulnerable to outliers that can distort the result, and requires statistical assumptions of residual normality and homoscedasticity, which can relatively reduce the accuracy of complex nonlinear problems [1]. In medical practice, authors have learned to use linear regression to predict the likelihood of cardiovascular disease based on certain clinical markers, such as cholesterol or blood pressure (Wan S. et al.). In finance, it is used for basic credit scoring, assessing the creditworthiness of customers based on financial and demographic data, such as income or credit history, as confirmed by Razzaq K. and Shah M. [1].

Decision trees model the decision-making process through a hierarchical structure of rules, where each node corresponds to a condition and the leaves to a solution. Their strength lies in their intuitive nature and ability to automatically identify significant characteristics, creating easily interpretable rules that can be visualized as a graph [1]. Decision trees work with numeric and categorical data without pre-processing, are robust to outliers, and do not require normalization or standardization, making it easy for beginners to prepare data [2]. For example, in medical diagnostics, a tree can determine whether a patient has diabetes based on conditions such as glucose levels and body mass index. However, trees are prone to overlearning, especially with deep structures, are unstable when data changes, when small fluctuations can change the structure of the tree, and are less effective for modeling linear dependencies [2]. Montejano Leija A. B., Ruiz Beltrán E., Orozco Mora J. L. and Valdés Valadez J. O. [2] demonstrate their effectiveness in diagnosing faults in production systems, where interpretability allows engineers to check the logic of the model. In finance, decision trees are used to automate lending decisions, providing transparency of criteria such as income or credit history, as noted by Razzaq K. and Shah M. [1]. In healthcare, they are used to create algorithms for diagnosing, for example, diabetes or heart disease, as described by Sadr H. et al.

Basic neural networks, or multilayer perceptrons, are the basis of deep learning, capable of modeling complex nonlinear dependencies due to their flexible architecture with input, hidden, and output layers [7]. They approximate any continuous function with a sufficient number of neurons, automatically detect patterns, and provide high prediction accuracy, achieving, for example, 90% accuracy in medical image classification tasks [10]. Recent advances in optimization, such as regularization methods (Dropout, L2) and adaptive learning algorithms (Adam) described by Liang J., Miao H., Li K., Tan J., Wang X., Luo R. and Jiang Y. [7], made them easier to use for beginners by providing stable training. However, neural networks require significant computing resources, such as graphics processing units (GPUs), are prone to overfitting on small data sets, and are difficult to interpret, making them a "black box" [1]. In healthcare, they are used to analyze medical images, predict the course of diseases, and personalize treatment, as shown by Mohsen S. [10] for diagnosing

Alzheimer's disease based on MRI images. In finance, neural networks are used to detect fraudulent transactions by analyzing complex patterns of customer behavior, such as anomalous transactions, as noted by Razzaq K. and Shah M. [1].

Clustering algorithms, in particular k-means, belong to unsupervised learning and group data without prior markup by minimizing the sum of squared distances to cluster centers [6]. Their strength lies in their simplicity of implementation, efficiency for large datasets (e.g., millions of records), and ability to detect hidden structures without labeled data [6]. Sapkal K. G. and Kadam A. B. [6] demonstrate their application to soil data analysis in agriculture, which allows grouping soils by chemical composition for crop recommendations. This approach can be adapted for customer segmentation in finance, creating personalized banking products based on behavior or financial characteristics. However, k-means requires a predefined number of clusters, is sensitive to the initial initialization of the centers, which can lead to unstable results, and is limited for irregularly shaped clusters [6]. In healthcare, clustering is used to group patients with similar symptoms, for example, for research purposes, as described by Sadr H. et al.

Ensemble methods, such as Random Forest, combine the results of multiple decision trees to improve the accuracy and robustness of predictions using techniques such as bagging [5]. They compensate for the weaknesses of individual trees, automatically evaluate the importance of features, and are effective for classification and regression tasks, achieving up to 92% accuracy in medical applications [5]. D. S. R., Mathew B. S. and K. S. [5] demonstrate their use for forecasting, which can be adapted to financial risk assessment, such as default prediction. However, ensemble methods require more computational resources and are less interpretable than single trees [1]. In healthcare, they improve the accuracy of diagnostic systems, as noted by Sadr H. et al. [3], and in finance, they are used to create reliable risk assessment systems, as emphasized by Razzaq K. and Shah M. [1].

The modern development of fundamental algorithms is characterized by attention to their interpretability and explainability, which is key for scientific and practical applications. Wetzel S. et al. [3] emphasize the importance of developing interpretable models that allow creating "white boxes" instead of "black boxes," which is especially relevant for medical diagnostic systems, where explaining the results is critical for physician confidence. The adaptability of algorithms to dynamic conditions is gaining more and more attention. Martin J. et al. [3] investigate Evolving Machine Learning models that allow algorithms to adapt to changes in data without retraining, which is important for financial markets with changing conditions, such as real-time stock price forecasting. Dealing with limited data remains a challenge, but Dalmau M. et al. [3] show the prospects of nonlinear algorithms, such as neural networks, in medical problems with small data sets where traditional methods are less effective. Hao L. [8] emphasizes the role of machine learning in autonomous systems, which has potential for medical technologies such as automated diagnostics or robotic surgery. Zhyvko Z. and Petrukha N. [11] emphasize the formation of digital competencies, which facilitates the development of machine learning tools for beginners through intuitive libraries such as scikit-learn, TensorFlow, or PyTorch, and automation of configuration processes such as AutoML.

A comparison of traditional methods and machine learning algorithms illustrates their advantages in accuracy, speed, cost-effectiveness, and scalability, which is key to choosing the best approach in healthcare and finance, where speed and accuracy are critical.

Table 1 below compares traditional methods and machine learning algorithms by key performance criteria, such as diagnostic accuracy in medicine, financial transaction processing speed, data analysis costs, fraud detection, personalization of recommendations, and processing of large amounts of data. Machine learning algorithms demonstrate significant advantages: diagnostic accuracy reaches 85-92% using ensemble methods, as shown by Sadr H. et al. [3], transaction processing speed is 0.1-0.3 seconds due to automated analysis, as noted by Razzaq K. and Shah M. [1], and data analysis costs are reduced to $20-30 per hour compared to $100-150 per hour for expert analysis [1]. This emphasizes their ability to increase efficiency and reduce costs compared to traditional approaches, making them indispensable for modern tasks.

Table 1 - Comparative evaluation of machine learning algorithms' efficiency

Evaluation criterion	Traditional methods	Machine learning algorithms
Diagnostic accuracy in medicine	65-75% (depending on the doctor's experience)	85-92% (using ensemble methods)
Processing speed of financial transactions	2-5 seconds per transaction	0.1-0.3 seconds for automated analysis
Costs of data analysis	100-150$ per hour of expert analysis	20-30$ per hour of machine time
Detection of fraud in finance	60-70% of successful detections	90-95% with the use of neural networks
Personalization of recommendations	Standardized approaches for groups	Individual solutions for each user
Processing of large amounts of data	Limited by human resources	Scaling up to terabytes of data

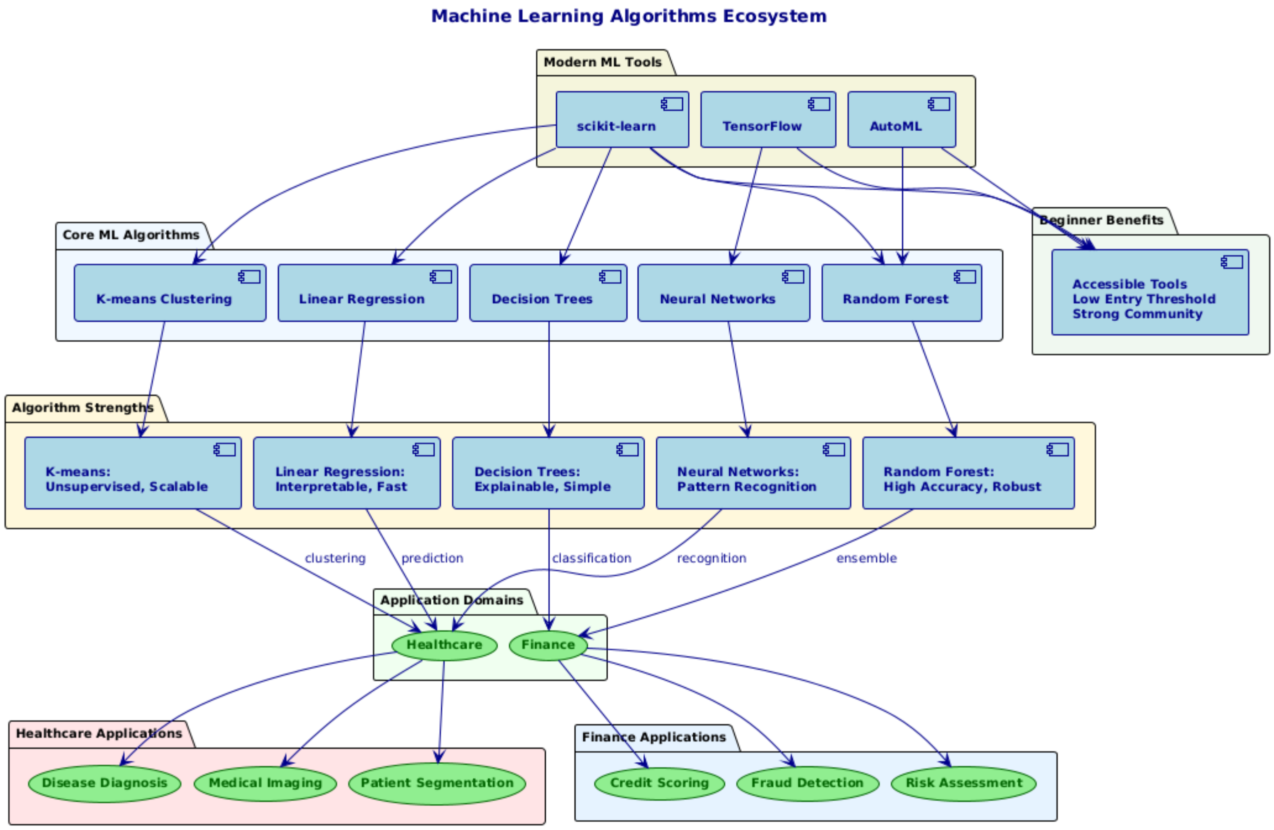

Figure 1 - Ecosystem of fundamental machine learning algorithms

Figure 1 illustrates a comprehensive ecosystem of fundamental machine learning algorithms, including linear regression, decision trees, basic neural networks, clustering algorithms, and ensemble methods, and their applications in healthcare and finance. It shows the relationships between algorithms, their strengths, such as the interpretability of linear regression or the accuracy of ensemble methods, and specific use cases, such as disease diagnosis or credit scoring. The framework also emphasizes how recent advances in machine learning tools, such as intuitive libraries (scikit-learn, TensorFlow), automated tuning (AutoML), and active communities of practice, make it easier for beginners to learn algorithms by providing accessibility, interpretability, and a low entry threshold [7, 11]. This allows students and young professionals to effectively choose the best algorithms for solving real-world problems.

Conclusions.

The analysis confirms that fundamental machine learning algorithms such as linear regression, decision trees, basic neural networks, clustering algorithms, and ensemble methods are available and widely used in healthcare and finance due to their versatility, ease of implementation, and efficiency. Linear regression provides simplicity and interpretability for predictive tasks such as disease risk or creditworthiness. Decision trees offer visual clarity and automatic feature selection for classification tasks, such as diagnostics or credit decision automation. Basic neural networks allow modeling complex nonlinear relationships, which is valuable for medical image analysis or fraud detection. Clustering algorithms reveal hidden structures in data, facilitating customer segmentation or patient grouping. Ensemble methods improve the accuracy and stability of predictions, which is critical for medical and financial applications. Understanding the strengths and weaknesses of these algorithms contributes to effective solution design, allowing to choose the best method depending on the requirements of the task, such as accuracy, interpretability, or computational efficiency. Recent advances, including the development of intuitive interfaces, automation of parameter tuning, the creation of off-the-shelf libraries such as scikit-learn and TensorFlow, and the formation of active communities of practice, have significantly reduced the barriers for beginners, allowing them to focus on understanding the business logic instead of the technical details.

Developing methods that allow for white boxes instead of black boxes, especially for neural networks, can help increase the credibility of models in critical industries such as healthcare, where explanations of results are essential for physician decision-making. Research into adaptive algorithms, such as Evolving Machine Learning models, opens up opportunities to create systems that can dynamically respond to changes in data, for example, in financial markets with rapidly changing conditions. An important area is also the optimization of algorithms for working with limited data sets, which is relevant for specialized medical tasks where access to large amounts of data is limited. Integration of multi-agent learning into complex systems, such as automated medical or financial platforms, can increase their efficiency and scalability. In addition, the further development of intuitive tools such as AutoML and the expansion of educational resources for building digital competencies will help reduce barriers for beginners, allowing a wider range of professionals to effectively apply machine learning in their professional activities.

References:

1. Razzaq, K., & Shah, M. (2025). Machine learning and deep learning paradigms: From techniques to practical applications and research frontiers. Computers, 14(3), 93. https://doi.org/10.3390/computers14030093. Retrieved from https://www.mdpi.com/2073-431X/14/3/93 [in English].

2. Montejano Leija, A. B., Ruiz Beltrán, E., Orozco Mora, J. L., & Valdés Valadez, J. O. (2025). Performance of machine learning algorithms in fault diagnosis for manufacturing systems: A comparative analysis. Processes, 13(6), 1624. https://doi.org/10.3390/pr13061624. Retrieved from https://www.mdpi.com/2227-9717/13/6/1624 [in English].

3. Sadr, H., Nazari, M., Khodaverdian, Z., Farzan, R., Yousefzadeh-Chabok, S., Ashoobi, M. T., Hemmati, H., Hendi, A., Ashraf, A., Pedram, M. M., Hasannejad-Bibalan, M., & Yamaghani, M. R. (2025). Unveiling the potential of artificial intelligence in revolutionizing disease diagnosis and prediction: A comprehensive review of machine learning and deep learning approaches. European Journal of Medical Research, 30(1). https://doi.org/10.1186/s40001-025-02680-7. Retrieved

from https://eurjmedres.biomedcentral.com/articles/10.1186/s40001-025-02680-7 [in English].

4. Chen, J., Zhou, X., Yao, J., & Tang, S.-K. (2025). Application of machine learning in higher education to predict students' performance, learning engagement and self-efficacy: A systematic literature review. Asian Education and Development Studies, 14(2), 205–240. https://doi.org/10.1108/aeds-08-2024-0166. Retrieved from https://www.sciencedirect.com/org/science/article/abs/pii/S2046316225000136 [in English].

5. D.S., R., Mathew, B. S., & K., S. (2025). Predictive modelling of vehicular tailpipe emissions using supervised machine learning algorithms. Sustainable Transport and Livability, 2(1). https://doi.org/10.1080/29941849.2025.2497278. Retrieved from https://www.tandfonline.com/doi/full/10.1080/29941849.2025.2497278 [in English].

6. Sapkal, K. G., & Kadam, A. B. (2025). Class balancing for soil data: Predictive modeling approach for crop recommendation using machine learning algorithms. EPJ Web of Conferences, 328, 01026. https://doi.org/10.1051/epjconf/202532801026. Retrieved from https://www.epj-conferences.org/articles/epjconf/abs/2025/13/epjconf_icetsf2025_01026/epjconf_icetsf2025_01026.html [in English].

7. Liang, J., Miao, H., Li, K., Tan, J., Wang, X., Luo, R., & Jiang, Y. (2025). A review of multi-agent reinforcement learning algorithms. Electronics, 14(4), 820. https://doi.org/10.3390/electronics14040820. Retrieved from https://www.mdpi.com/2079-9292/14/4/820 [in English].

8. Hao, L. (2025). Application of machine learning algorithms in improving the performance of autonomous vehicles. Scientific Journal of Technology, 7(2), 118–124. https://doi.org/10.54691/532sx817. Retrieved from https://sjtechnology.org/index.php/ojs/article/view/34 [in English].

9. Wan, S., Wan, F., & Dai, X. (2025). Machine learning approaches for cardiovascular disease prediction: A review. Archives of Cardiovascular Diseases. https://doi.org/10.1016/j.acvd.2025.04.055. Retrieved from https://www.sciencedirect.com//science/article/abs/pii/S1875213625003201 [in English].

10. Mohsen, S. (2025). Alzheimer's disease detection using deep learning and machine learning: A review. Artificial Intelligence Review, 58(9). https://doi.org/10.1007/s10462-025-11258-y. Retrieved from https://link.springer.com/article/10.1007/s10462-025-11258-y [in English].

11. Zhyvko, Z., & Petrukha, N. (2023). Formation and development of digital competencies in the conditions of digitalization of society. In The development of innovations and financial technology in the digital economy: Monograph (pp. 62–85). Tallinn: OÜ Scientific Center of Innovative Research. https://doi.org/10.36690/DIFTDE-2023-62-85. Retrieved from https://mono.scnchub.com/index.php/book/catalog/view/29/69/590 [in English].

Анотація. *Стаття спрямована на обґрунтування необхідності створення комплексного освітнього ресурсу для студентів і молодих фахівців, який систематизує знання про фундаментальні алгоритми машинного навчання (лінійна регресія, дерева рішень, базові нейронні мережі, алгоритми кластеризації, ансамблеві методи) та їхнє практичне застосування в охороні здоров'я та фінансах. Ресурс покликаний поєднати теоретичні основи з практичними навичками, допомагаючи ефективно обирати алгоритми для вирішення реальних задач шляхом аналізу їхніх переваг, недоліків і сценаріїв використання.*

Стаття пропонує структурований підхід до систематизації знань про фундаментальні алгоритми машинного навчання, акцентуючи на їхній доступності для початківців. Новизна полягає у створенні універсального освітнього фреймворку, який інтегрує теоретичні аспекти, практичні приклади та аналіз сильних і слабких сторін алгоритмів, адаптованих до потреб охорони здоров'я та фінансів. Особлива увага приділяється спрощенню складних концепцій через інтуїтивні інструменти (scikit-learn, TensorFlow, AutoML) та підвищенню інтерпретованісті моделей, зокрема через розробку "білих скриньок" для нейронних мереж, що сприяє довірі в критично важливих галузях.

Проведений аналіз демонструє, що лінійна регресія ефективна для простих прогнозних задач (наприклад, оцінка ризиків діабету чи кредитоспроможності) завдяки простоті та інтерпретованісті, але обмежена лінійними залежностями. Дерева рішень забезпечують інтуїтивну класифікацію (наприклад, діагностика діабету чи автоматизація кредитних рішень) і стійкість до викидів, але схильні до перенавчання. Базові нейронні мережі моделюють складні нелінійні залежності (аналіз МРТ-зображень, виявлення шахрайства), досягаючи точності до 90%, але потребують значних ресурсів. Алгоритми кластеризації (k-means) ефективні для сегментації даних (групування пацієнтів, клієнтів), але чутливі до ініціалізації. Ансамблеві методи (Random Forest) підвищують точність до 92% у медичних і фінансових задачах, але менш інтерпретовані. Порівняння з традиційними методами показує переваги алгоритмів машинного навчання: точність діагностики 85–92%, швидкість обробки транзакцій 0.1–0.3 с, зниження витрат до 20–30 $/год.

Фундаментальні алгоритми машинного навчання є універсальними інструментами для охорони здоров'я та фінансів завдяки їхній ефективності та доступності. Розуміння їхніх переваг і обмежень дозволяє оптимізувати вибір методів для конкретних задач. Розвиток інтуїтивних бібліотек (scikit-learn, TensorFlow), автоматизація налаштування (AutoML) та адаптивні алгоритми (Evolving Machine Learning) знижують бар'єри для початківців. Подальші дослідження мають фокусуватися на підвищенні інтерпретованісті моделей, оптимізації для обмежених даних і розширенні освітніх ресурсів для формування цифрових *компетенцій.*

Ключові слова: *лінійна регресія, дерева рішень, нейронні мережі, моделі прогнозування, автоматизоване навчання.*

Стаття надіслана: 15.07.2025 року