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ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN WEB ANALYTICS: MODERN APPROACHES AND DEVELOPMENT PROSPECTS

ВИКОРИСТАННЯ ТЕХНОЛОГІЙ ШТУЧНОГО ІНТЕЛЕКТУ У ВЕБАНАЛІТИЦІ: СУЧАСНІ ПІДХОДИ ТА ПЕРСПЕКТИВИ РОЗВИТКУ

Abstract. *The article examines the application of artificial intelligence (AI) technologies in web analytics and their role in improving business management in the digital economy. The study aims to systematize practical approaches to AI integration into analytical processes and identify promising directions for their further development. The main applications of AI in web analytics are classified, including data collection and processing, user segmentation, behavioral and sales forecasting, anomaly detection, personalization, and automated reporting. The advantages of AI implementation are identified, particularly increased analytical efficiency, improved forecasting accuracy, reduced human error, and enhanced data-driven decision-making. Key limitations related to data quality, privacy, information security, and ethical considerations are also highlighted. The study outlines future prospects for AI-driven web analytics, emphasizing the development of AI assistants capable of interpreting metrics, generating insights, and providing recommendations for marketing optimization and managerial decision-making.*

Keywords: *artificial intelligence, web analytics, digital transformation, machine learning, data analytics, personalization, decision support, AI assistants.*

Анотація. Вступ. *У статті досліджено особливості використання технологій штучного інтелекту у вебаналітиці в умовах цифрової трансформації бізнесу. Актуальність теми зумовлена зростанням обсягів даних про поведінку користувачів, ефективність маркетингових кампаній та взаємодію зі споживачами, що потребує вдосконалення підходів до аналізу інформації та підтримки управлінських рішень. Метою дослідження є узагальнення практичних підходів до використання технологій штучного інтелекту у вебаналітиці та визначення перспектив їх подальшого розвитку в бізнес-середовищі.* ***Використані методи.*** *У дослідженні використано методи аналізу та узагальнення наукових публікацій, систематизації, класифікації та логічного узагальнення. Зазначені методи дали змогу визначити основні напрями застосування штучного інтелекту, систематизувати його функції та окреслити ключові переваги та обмеження впровадження в реальних умовах.* ***Результати дослідження.*** *Систематизовано основні напрями використання штучного інтелекту у вебаналітиці: автоматизація збору та обробки даних, сегментація користувачів, прогнозування поведінки та продажів, виявлення аномалій, персоналізація взаємодії та автоматизоване формування звітності. Визначено, що інтеграція AI-технологій сприяє підвищенню ефективності аналітичних процесів, точності прогнозування та обґрунтованості управлінських рішень у сучасних економічних умовах. Виокремлено ключові обмеження їх використання, пов'язані з якістю даних, конфіденційністю, інформаційною безпекою та етичними аспектами. Окреслено перспективи розвитку AI-асистентів для інтерпретації маркетингових показників, формування бізнес-інсайтів і рекомендацій щодо оптимізації маркетингової діяльності.* ***Висновки.*** *Використання штучного інтелекту створює передумови для трансформації вебаналітики від описового аналізу до прогнозування та підтримки управлінських рішень. Подальші дослідження доцільно спрямувати на перевірку запропонованих підходів на реальних маркетингових і фінансових даних та розроблення AI-асистентів для бізнес-аналітики.*

Ключові слова: *штучний інтелект, вебаналітика, цифрова трансформація, машинне навчання, аналітика даних, персоналізація, підтримка прийняття рішень, AI-асистенти.*

Statement of the problem. In recent years web environments have become the main sources of collecting information about user behavior, marketing campaigns and actual results of attracting new customers to the business. The transition of commerce to the online environment has become a response to current market demands related to the digitalization of business processes and the constant growth of data about customers and their actions.

Such changes lead to a conceptual rethinking of business approaches, in which the study of user behavior comes to the fore. Websites, mobile applications and social networks have become the key channels of interaction with consumers. These tools make it possible to see the real desires of users, understand the logic of working with the resource and form a base of hypotheses for further tests.

These conditions have made web analytics a key tool that is gaining increasing importance and also supports management decision-making. With the help of web analytics, it becomes clear how users react to marketing campaigns and a recommendation base is formed for business [8].

Traditional methods of processing statistical information cannot accurately meet business needs due to the rapid growth of information volumes, the speed of its accumulation and processing and the need for prompt decision-making [6].

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The issue of involving artificial intelligence technologies in the field of web analytics becomes relevant. Their advantage lies in the ability to automate data collection, objectively predict user behavior, find anomalies and create targeted recommendations, while forming a basis for prescriptive models to support management decisions.

This situation necessitates the exploration of the possibilities of using artificial intelligence in web analytics to solve business issues.

Analysis of recent research and publications. The potential for the development of artificial intelligence allows us to single it out as a new driving force in the scientific community. Its practical results have led to scientific optimism in solving most issues related to economic activity.

A significant number of scientists, including teams of authors led by Davenport T. [9] and Huang M.-H. [11], have already been able to assess the impact of artificial intelligence and its capabilities. At the same time, special attention is paid to machine and generative models as the most promising areas of AI development.

Another significant vector of implementation of modern research is the search for opportunities to transform individual business milestones and solve local problems. Scientists Hryshko V. [2] and Klius Yu. [3] note that the spread of digitalization generally brings positive changes through the integration of information technologies into business. However, the authors do not sufficiently detail the issues of routine business operations through the use of artificial intelligence.

Authors Basu R., Lim W. M., Kumar A., Kumar S. [8] define web analytics as a field of business understanding. Researchers emphasize that marketing research or business promotion spending should be passed through the prism of an analytical sieve, where a key information base is collected.

A logical step in the development of web analytics is its transition to fully automated systems that will perform the functions of collecting, processing, cleaning information and transforming it into thematic business insights, taking into account best practices and removing irrelevant methods and approaches. Scientists generally predict the use of artificial intelligence in business as a powerful predictive impulse, which will be similar in effect to the spread of the Internet.

The conducted analysis of the literature showed that artificial intelligence has become a key topic for domestic and foreign scientists, forming an environment for testing various ideas and objective conclusions.

Despite the large number of scientific studies on the use of artificial intelligence, the issues of integrated implementation of AI remain insufficiently studied [5].

The authors propose fragmented approaches to using AI in web analytics, focusing on solving local issues, forgetting about complexity and integrity.

Issues related to AI-driven web analytics, which is a new stage in the development of analytical systems in business, remain insufficiently researched in the scientific literature.

The purpose of this article is to summarize practical approaches to the use of artificial intelligence technologies in web analytics and to determine the prospects for their further development in the business environment. The implementation is aimed at increasing the efficiency of data analysis processes, supporting management decisions and developing the concept of data-driven management in the digital economy.

To achieve the set goal, the following tasks are planned:

– to explore the essence of web analytics and its role in the business management system in the context of digital transformation;

– analyze modern artificial intelligence technologies used in analytical activities and systematize the main areas of application of AI technologies;

– summarize the advantages and limitations of using artificial intelligence in data analysis processes;

– to identify promising areas of development of AI -oriented web analytics and possibilities of its use.

Research methods. The methodological basis of the research is the general scientific methods of analysis and synthesis, systematization, classification and logical generalization. The methods of analysis and synthesis were used to process scientific publications dedicated to artificial intelligence technologies, web analytics and data-based business management.

Systematization and classification methods were used to identify the main areas of application of artificial intelligence in web analytics, including data collection and processing, user segmentation, behavior and sales forecasting, anomaly detection, personalization and reporting automation.

The logical generalization method was used to identify key advantages and limitations of implementing artificial intelligence, as well as to identify promising areas for the development of web analytics.

This methodological approach allowed us to integrate specific areas of application into a holistic analytical system and formulate conclusions regarding the potential of technologies in improving analytical processes and supporting management decision-making.

Presentation of the main research material. Web analytics has become a key tool for supporting management decisions in the 21st century. Its development is associated with the concept of data-driven management.

Approaches to using artificial intelligence consist in moving from performing individual routine operations to full-fledged decision-making support through systematization [6].

Figure 1 presents the concept of the functional structure of using artificial intelligence in web analytics.

This structure allows us to consider the use of artificial intelligence as a sequential transformation of data into practical solutions. At each step, artificial intelligence performs specific functions, generates additional value and accumulates it.

Table 1 proposes a classification of areas of use of artificial intelligence in web analytics.

The above classification shows that artificial intelligence technologies are used at different stages of the analytical process. In the initial steps artificial intelligence provides automation of information collection and then goes through stages of expansion to predicting user behavior in and personalization.

A particular advantage of modern artificial intelligence technologies is the ability to perform multiple analytical tasks in parallel, which allows for the creation of integrated analytical systems. The starting data ceases to be just a source of information, but forms the basis for future forecasts.

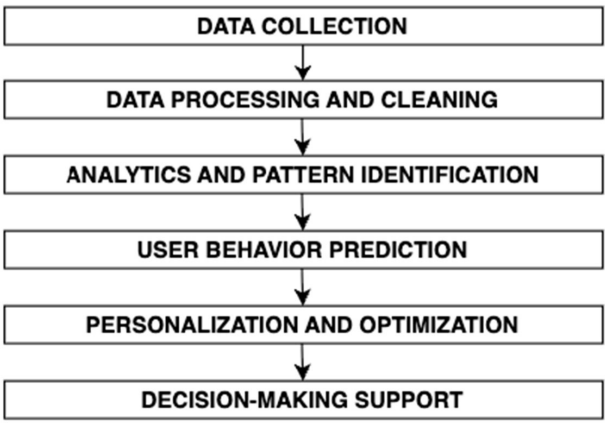


Fig. 1. Functional structure of the use of artificial intelligence in web analytics

Source: compiled by the author

Table 1

Author's classification of areas of use of artificial intelligence technologies in web analytics

Direction of use of AI	Main functions	Practical result
Collection and processing	Data collection and cleaning	Improving data quality
User segmentation	Audience clustering	More precise targeting
Behavior prediction	Predicting user actions	Conversion growth and
Sales forecasting	Evaluating demand and campaign results	Resource optimization
Anomaly detection	Detecting anomalies in data	Improving risk control
Personalization	Formation of individual recommendations	Improving user experience (UX)
Report generation	Generating reports and conclusions	Reduction of analysis time

Source: compiled by the author

The use of artificial intelligence algorithms allows you to assess the probability of conversion, predict the percentage of customer churn and generate personalized recommendations for users, which helps increase the effectiveness of marketing influence [4; 10].

Table 2 lists the key benefits of using artificial intelligence in the context of its impact on the quality of analytics and management efficiency.

The above-mentioned advantages of using artificial intelligence show its potential for increasing the efficiency of the analytical unit of a business.

Despite the significant advantages of using artificial intelligence in web analytics, there are a number of problems and limitations regarding its implementation. The key problem is the quality of the starting information, since modern algorithms cannot provide reliable results in the presence of incomplete or erroneous data.

Another issue is related to data privacy and security, as most digital services for web analytics include restrictions on the distribution and processing of personalized data [1; 7].

A separate point can be made about the ethical aspects of using artificial intelligence.

Figure 2 shows the main challenges and limitations of implementing AI in web analytics.

The key perspective of the development of artificial intelligence in web analytics concerns the use of AI assistants. Such systems will be able to fully replace human labor, automate reporting, interpret indicators and offer options for optimizing marketing strategies. Such a shift forms the basis for the transition from descriptive to predictive analytics. Artificial intelligence solutions will be able to predict the state of events and generate targeted actions to achieve the desired result [9; 11].

Table 2

Key benefits of using AI in web analytics

Advantage	Characteristic	Practical significance
Analysis automation	Automatic data processing	Reduction of analysis time
Scalability	Working with large amounts of data	Improving processing efficiency
Forecasting accuracy	Using machine learning algorithms	Improving the quality of solutions
Reducing the human factor	Minimizing errors and subjectivity	Increasing the objectivity of conclusions
Support for data-driven management	Data-driven solutions	Improving management efficiency
Interaction personalization	Formation of individual recommendations	Increase conversion and loyalty
Anomaly detection	Automatic search for deviations	Risk reduction

Source: compiled by the author

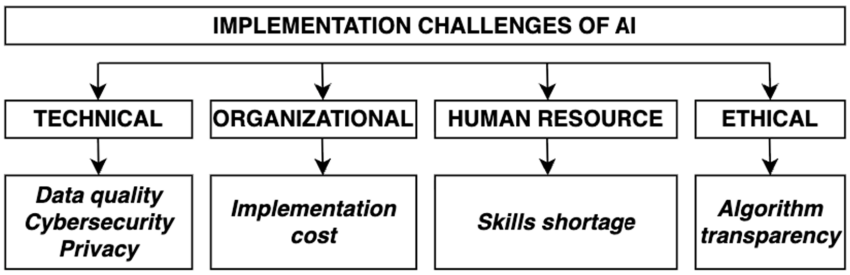


Fig. 2. Key challenges and limitations of implementing AI in web analytics

Source: compiled by the author

Thus, web analytics is rapidly evolving and transforming through the transition to AI-driven analytical systems.

Conclusions. The article summarizes the approaches to using artificial intelligence technologies in analytics and defines their role in the further transformation of analytical systems. The study showed a significant connection between AI technologies and the development of data-driven management, which creates the prerequisites for increasing the efficiency of data analysis and use processes in business.

The use of artificial intelligence in the framework of the study took place at all stages: from automated collection to the formation of management recommendations. The scientific result consists in the systematization of the directions of use of artificial intelligence in the field of analytics and the creation of a conceptual approach to the classification of key stages of the development of the analytical process. The results showed the significant potential of artificial intelligence technologies for increasing the efficiency of the work of a web analyst.

But the implementation of artificial intelligence in web analytics is possible only by overcoming a number of limitations that hinder the effective use of artificial intelligence and require comprehensive consideration.

Future research prospects include case studies on real marketing or financial data. They could show improvements in the web analytics workflow and the development of an AI assistant to support management decisions.

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