UDC: 004.8+007.5 https://doi.org/10.15407/jai2023.03.117

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SOME ASPECTS OF THE APPLICATION OF ARTIFICIAL INTELLIGENCE FOR THE RECOVERY AND DEVELOPMENT OF UKRAINE

Abstract. The relevance of the study lies in the fact that in the current conditions of geopolitical instability and rapid technological advancement, the use of artificial intelligence becomes an integral part of the country's development strategy. These technologies offer new opportunities for enhancing the defense, education, industry, science, medicine, and social welfare sectors. Considering this potential is crucial for implementing effective strategies for the recovery and development of Ukraine amidst modern challenges. Therefore, the aim of the study is a systemic analysis of the possibilities of applying artificial intelligence in key societal areas to identify strategic directions that will contribute to the recovery and further development of Ukraine. In particular, the research encompasses the realms of defense, education, industry, science, medicine, and social sphere. The results of this analysis serve as a basis for developing specific recommendations for the optimal implementation of artificial intelligence technologies in Ukraine, taking into account the specific conditions and needs of the country. The paper proposes concrete strategies and recommendations aimed at the optimal integration of these technologies into Ukrainian practice. Furthermore, the research considers the specific conditions and needs of Ukraine, making it practically applicable. These are important aspects in ensuring the reliability and security of artificial intelligence utilization in Ukraine. Overall, this work opens new horizons for the use of artificial intelligence in modern Ukraine, offering specific ways to improve the defense, education, industry, science, medicine, and social welfare sectors through the effective utilization of these technologies.

Keywords: artificial intelligence technologies, current geopolitical situation, impact on life spheres, military technologies, social programs, infrastructure cybersecurity, individualized learning courses.

Introduction

In the modern world, where technology serves as the engine of progress, the role of artificial intelligence is exceptionally crucial in addressing a range of strategic tasks. One of the most pertinent applications of this technology lies in the recovery and further development of a country, especially in times of conflict.

Ukraine, undergoing a challenging period in its historical development, encounters a series of challenges. However, the exceptional energy and intelligence of our people, combined with cutting-edge technologies, can be the key to success. This article explores certain aspects of employing artificial intelligence for the effective recovery and development of Ukraine. The innovative potential of this advanced technology opens new horizons for overcoming the complex challenges facing our country.

The implementation of artificial intelligence across various spheres of Ukraine's public and economic life allows us not only to respond to current issues, but also to anticipate and develop strategies for the future. This creates unique opportunities for resource management, support of innovation, and the introduction of advanced technologies in various sectors, including defense, technical, industrial, scientific, medical, educational, social, and economic fields.

We will delve into various directions where the application of artificial intelligence has already found its expression and can yield significant results. From resource analysis and optimization to the development of advanced medical technologies and the provision of economic rehabilitation, each aspect plays a vital role in the recovery and development of Ukraine.

Problem Statement

Artificial intelligence in the modern world has become a key technological discipline that transforms various spheres of society and the economy. In the context of current challenges, particularly the war in

Ukraine, the potential of artificial intelligence for the recovery and development of Ukraine takes on special significance. The importance of understanding the capabilities and strategic utilization of this technology is exceptionally high.

Analysis of recent research and publications

In all areas of human activity [1,2], there is a general trend of active implementation of artificial intelligence. This is achieved through advanced technologies and methods that significantly enhance decision-making processes and optimize overall performance.

In the defense sector, where the development of artificial intelligence holds strategic importance for Ukraine [1,2], researchers emphasize the current state and prospects of its implementation for ensuring national security [3]. It is worth noting that some analyses leave room for additional research in this area, particularly in the context of potential military impacts and strategic analysis [3].

In scientific research in the industrial and transportation sectors, particular attention is given to the cognitive approach to modeling the sustainable development of technological systems [4]. Additionally, it is important to consider the significance of regional export policies for the advancement of industrial and transportation sectors [5, 6]. Experts in the field of industry and economics point to the need for enhancing the competitiveness of enterprises [7]. Risk analysis of robotics and the application of artificial intelligence helps companies adapt to new technological challenges [8].

In the field of medicine, the development of methods and software components for disease diagnosis holds paramount importance [9]. Furthermore, the implementation of artificial intelligence in health status analysis significantly impacts the effectiveness of treatment [10, 11]. Regional policies also reflect in the legal aspects of medical practice [6].

In the realm of social services, artificial intelligence opens up new opportunities for improving community services [12, 13]. However, researchers also draw attention to the crucial issue of human rights protection in the context of artificial intelligence and machine learning [14]. This aspect offers opportunities for improving the quality of social programs and influences overall societal development [15].

The purpose and tasks of the research

The goal is to highlight the potential of artificial intelligence technologies as a strategic tool for solving the most important tasks facing Ukraine. Consideration of the aspects of the application of artificial intelligence in various spheres of the country's life will allow to identify promising directons of development and to determine the ways of the most effective use of this technology.

The task of the research: based on the analysis of the potential of artificial intelligence in various spheres of society, in particular in the defense, educational, industrial, scientific, medical and social sectors, to determine the strategic directions of the use of artificial intelligence for the recovery and development of Ukraine in war and post-war conditions and to develop recommendations for optimal implementation of artificial intelligence technologies taking into account the specific requirements and capabilities of Ukraine.

Base part

Given the current situation in Ukraine, where an aggressor war initiated by the Russian Federation is ongoing, the utilization of Artificial Intelligence (AI) can play a critical role in enhancing the country's defense capabilities. Analysis indicates that AI enables the implementation of effective strategies and innovative approaches to ensure national security. An important aspect is the analytics and prediction of military situations, where the use of machine learning algorithms allows for the analysis of large volumes of military-strategic information to predict potential enemy actions and make real-time effective decisions. Additionally, cybersecurity and protection of critical infrastructure are crucial. AI enables the creation of intelligent systems for detecting and deflecting cyber-attacks, which is vital for safeguarding critical assets. Another advantage of using AI lies in the

modernization of military equipment and the implementation of autonomous control systems, significantly increasing the efficiency of combat systems. Border and territory monitoring also becomes more effective through automated systems and the use of drones and satellite surveillance. The application of AI in the military sector extends to the efficiency of logistics, where forecasting systems for equipment and ammunition needs play a significant role. Training military personnel in virtual reality and simulations with AI allows for effective responses to various scenarios. Analysis of large datasets becomes possible through AI, aiding in making informed strategic decisions. Therefore, the utilization of artificial intelligence in Ukraine's defense sector is a necessary step forward in ensuring security and the effectiveness of defense operations in times of war. Additionally, threat forecasting and automated troop management systems based on artificial intelligence enable swift and precise decision-making in military conflicts. Modeling and simulating strategic scenarios provide the opportunity to analyze different courses of action and choose the most effective strategies. Additionally, crisis response systems utilizing AI provide operational and coordination support in emergency situations, including providing swift aid to the affected. Monitoring chemical, biological, radiological, and nuclear threats is another crucial area of AI application, as sensors and monitoring systems allow for the detection of hazardous substances and timely response. The development of cybersecurity against potential cyber-attacks and threats is a critical element in ensuring security in the modern digital world. The modernization of military medical services is also an important aspect, where the use of AI enables fast and accurate diagnosis and treatment of the wounded. Taking into account the above-mentioned aspects, the utilization of artificial intelligence in Ukraine's defense sector is critically important in increasing the efficiency and effectiveness of defense operations. A crucial component of successful AI implementation is continuous monitoring and adaptation of technologies to the evolving needs and requirements of the defense sector.

In the modern educational context, the use of Artificial Intelligence (AI) demonstrates significant potential for transforming the learning process and contributing to the recovery and development of Ukraine in times of war and post-war conditions. One of the key advantages is the ability to develop individualized educational programs tailored to the needs of each student. Learning algorithms adapted to individual characteristics provide students with materials specifically prepared for their needs and pace of learning. The analytical capabilities of artificial intelligence make it an important tool for assessing the progress of each student. AI systems can analyze the work of each student, identifying their strengths and weaknesses. This enables teachers to provide more effective and personalized support. Without time and resource constraints, artificial intelligence can provide individual attention to each student, approaching education on an individual basis and offering recommendations for further development. Thus, the application of artificial intelligence in education facilitates the learning process, making it more efficient and personalized.

Distance education has become an essential component of the educational landscape. The application of artificial intelligence in this field can significantly enhance the quality of distance learning. AI allows for the adaptation of educational material to the individual needs of each student. Algorithms can analyze the speed of material absorption and the level of comprehension to provide additional explanations or tasks, aiding in better understanding of the educational material. AI systems can develop educational scenarios that include interactive tasks and exercises, stimulating active student participation and promoting more effective learning. Artificial intelligence can also analyze the educational achievements of each student, giving teachers the opportunity to timely identify and address each student's weaknesses and improve the overall learning process. Thanks to distance education and the use of artificial intelligence, educational opportunities become accessible to students even in remote regions, where

organizing traditional educational events may be more challenging. AI systems can analyze group needs and optimize educational resources, providing students with the necessary support and materials. Considering this, artificial intelligence contributes to the improvement of education quality and facilitates a more effective understanding of educational material. This combination opens up new opportunities for enhancing the educational process and providing quality education for all students, regardless of their place of residence.

For the recovery and development of Ukraine, it is necessary not only to optimize the current educational system but also actively create and implement new educational content. Higher education plays a crucial role in this context, as high-tech industries, manufacturing, and science require new knowledge and competencies for the development and implementation of advanced technologies. In the modern world, where technologies are rapidly evolving, lifelong learning becomes a necessity. Artificial intelligence can create conditions for continuous human learning, providing personalized materials and teaching methods. One of the key advantages of such an approach is the ability to learn at one's own pace and choose the direction that interests the most. AI systems can analyze the individual needs of each student and recommend educational materials that best suit their interests and needs. Additionally, artificial intelligence can track updates in various fields and recommend additional courses or materials for self-study. This creates unique opportunities for continuous professional development and qualification enhancement. In times of war and post-war conditions, when the situation can change rapidly, continuous knowledge updating becomes critically important. Thus, thanks to artificial intelligence, Ukrainians can maintain a constant intellectual advantage and competitiveness of professionals, which is extremely important in the modern world. Lifelong learning becomes not only a possibility but also a strategically important component of success in the face of constant changes and challenges.

Contemporary conditions in Ukraine demand the immediate implementation of artificial intelligence technologies in industry. To maximize its potential, it is necessary to clearly define the directions and develop specific recommendations for their implementation. This primarily concerns the optimization of production processes. The application of machine learning algorithms allows for the identification of more efficient production methods and cost reduction. Therefore, it is recommended to implement monitoring and analysis systems for production processes in each industry. A crucial step in improving the industrial sector is the development and implementation of automated and robotic systems. Artificial intelligence plays a key role in creating flexible and efficient production lines.

The development of innovative products that meet the requirements of the modern market defines the competitiveness of any industrial sector. In this context, artificial intelligence is an integral tool for creating innovative solutions and technologies. Existing machine learning algorithms allow for the analysis of large volumes of data and the identification of trends in consumer preferences. This provides industry with the ability to respond to rapidly changing demand and produce goods that meet consumer needs. Encouraging research in those areas where the application of artificial intelligence can have a significant impact is important for the development of innovative products. This means providing experts and researchers with opportunities to develop and implement innovative solutions in production. The key aspect is that artificial intelligence enables the production of goods that not only meet current market demands but also adapt to its changes. This creates the opportunity for the industry to be flexible and responsive to the challenges of the modern business environment.

In the current dynamic industrial environment, effective management is a crucial component of successful enterprise operation. The use of artificial intelligence (AI) in the analysis and processing of large data sets opens up new opportunities for enterprises to optimize management decisions.

One of the key advantages of using AI in management is its ability to identify trends and forecast situations based on the analysis of large data sets. Machine learning algorithms applied to this data allow for timely responses to changes in the internal and external environment of the enterprise. For example, they can identify changes in demand for products, analyze market trends, and forecast potential risks. This provides managers with the ability to make informed decisions based on current and reliable information. Using AI systems for decision-making helps reduce risk levels and increase the efficiency of managing industrial enterprises. They automate the data analysis process, reducing the likelihood of errors and facilitating quick responses to changing situations. In particular, AI systems can recommend optimal production strategies, helping to optimize resource utilization and minimize costs. They can analyze the dynamics of supply and demand in the market, helping to determine optimal pricing strategies. In summary, the implementation of AI systems for managing industrial enterprises is a step towards optimizing and enhancing their competitiveness in the modern business environment. The rational use of analytical capabilities of artificial intelligence allows for informed and effective management decisions, which is a key factor for success in modern industrial activities.

The implementation of artificial intelligence in industry opens up numerous opportunities for improving product quality and ensuring the safety of the production process. For example, automated systems are capable of analyzing large volumes of data from the production process in real time. They can detect even the smallest deviations from quality standards and respond to them immediately. This means that low-quality products will not reach the market, ensuring customer satisfaction and trust in the brand. Additionally, artificial intelligence can be programmed to detect potentially dangerous situations in the production process. It analyzes data from sensors and equipment, identifying anomalies and potential hazards. In the event of a hazardous situation, the system can take immediate action to stop the operation of equipment or even an entire production line, preventing potential accidents and injuries to workers. Another important component is data analysis to predict potential risks and threats to the production process. Artificial intelligence can analyze large volumes of data and identify patterns that may indicate potential issues. This allows for preventive measures to avoid potential problems and accidents. Thus, the use of artificial intelligence in industry not only improves product quality but also ensures the safety of the production process. This makes the industry more reliable and competitive, which is critically important in the modern global manufacturing environment.

The use of artificial intelligence in the scientific field provides opportunities to expand the horizons of research and enhance the effectiveness of scientific developments. The analysis and processing of large volumes of data through AI enable the identification of complex relationships and trends, which can significantly facilitate the formulation of new hypotheses. The implementation of AI systems for managing research projects contributes to the optimization of experiments and ensures the most precise and meaningful results. Additionally, in terms of theoretical and methodological approaches, the use of neural network technologies for the analysis of complex scientific data and the prediction of future trends is an important direction. Neural networks allow for the identification of nonlinear relationships and accurate forecasts based on large volumes of information. Another crucial aspect is the application of machine learning algorithms for automating the process of analyzing literary sources and publications. This enables scientists to efficiently select and process the necessary information for their research. Furthermore, the development and implementation of specialized programs and platforms that assist in determining scientific priorities and planning research projects based on the analysis of scientific publications and data about researchers is an important aspect.

However, for the recovery of Ukraine in the conditions of war, the implementation of artificial intelligence in scientific research is an extremely important element of the strategy. This aspect requires thorough consideration, refinement, and delineation of specific

methodological and theoretical approaches. For example, artificial intelligence systems based on the analysis of extensive data can serve as a reliable means of risk prediction and identification of opportunities for the recovery of key sectors, such as infrastructure, energy, and medicine. The use of AI systems for precise resource management and cost optimization in the recovery process is of paramount importance. Neural network technologies can be applied to analyze and predict resource needs, allowing for the rational allocation and minimization of losses. Additionally, the development of algorithms for the efficient use of geospatial data in the recovery of damaged territories and infrastructure is an important direction. The combination of geospatial data analytics with artificial intelligence methods can help accurately determine priority areas for recovery and develop effective recovery strategies.

Therefore, the implementation of artificial intelligence in scientific research for the recovery of Ukraine in the conditions of war and post-war state is a complex yet extremely important task. It requires in-depth analysis and a comprehensive approach to the use of specific methods and technologies. This will allow for the most effective utilization of the potential of artificial intelligence to achieve the strategic goals of the country's recovery.

Given the exceptional importance of the development of the medical field in modern conditions, where the impact of war is keenly felt and significant, special attention should be paid to innovative approaches offered by artificial intelligence systems. These technologies not only modernize the medical sector but also become a key factor in saving lives and improving the quality of medical services in Ukraine.

First and foremost, the implementation of artificial intelligence systems in medical practice ensures a significant increase in the efficiency of diagnosis and treatment. The analysis of large volumes of clinical data and images allows for the timely detection and correct treatment of various pathologies, which is extremely important in times of war and post-war state, where speed and accuracy of response are crucial.

Secondly, artificial intelligence systems enable a transition to personalized treatment. The analysis of genetic and clinical data of each patient allows for the development of unique approaches to therapy and health monitoring. This is particularly important for veterans and servicemen who may require a specific approach to treatment due to the nature of their injuries and the stress of war and post-war conditions.

Additionally, artificial intelligence systems contribute to the advancement of medical science. The analysis of extensive sets of scientific data allows for the discovery of new regularities and the development of advanced methods of diagnosis and treatment. This will not only improve the current state of affairs in the medical field but also lay the foundation for further scientific development.

It is important to emphasize that the implementation of innovative approaches based on artificial intelligence will be a key aspect not only of recovery but also of the further development of the medical sector in Ukraine in the context of war and post-war conditions. The use of artificial intelligence systems (AI) can play a crucial role in overcoming the consequences of war and improving the well-being of people, especially veterans and vulnerable population groups.

Firstly, AI can be used to develop and implement individualized rehabilitation and support programs for veterans. By analyzing medical data and personal characteristics of each veteran, AI systems can develop programs specifically tailored to their needs and capabilities. This allows for effective and personalized support for each veteran in the recovery process.

Secondly, with the help of AI, monitoring and forecasting systems for deteriorations in the health of veterans can be developed. By analyzing clinical data and other medical indicators, AI systems can identify factors that may lead to a deterioration in health and provide timely recommendations to prevent these problems.

Additionally, AI can be used to develop and implement psychological support programs for veterans. By analyzing data on psychological state and individual needs, AI systems can provide personalized

psychological counseling and recommendations to improve the emotional well-being of veterans.

Considering the importance and relevance of these aspects in the context of war and post-war conditions, the implementation of AI in the medical field can significantly facilitate the recovery process and improve the quality of life for veterans and other groups affected by the war.

The use of Artificial Intelligence in the social sphere can have a significant impact on the recovery and development of Ukraine, especially in the context of war. Optimization of social programs is one of the key advantages of AI, where machine learning algorithms help identify the most vulnerable population groups and provide them with effective support. Monitoring and forecasting systems for social issues enable quick responses to social challenges and anticipate their potential development.

Enhancing the efficiency of the healthcare system is another crucial area of AI influence. Implementing AI in the medical field allows for the optimization of processes related to diagnosis, treatment, and patient monitoring. These algorithms assist in accurate diagnosis and provide recommendations to doctors regarding the most effective treatment methods.

The development of e-governance and e-services is important for providing citizens with essential services. AI can be used to develop and improve electronic platforms for delivering public services, increasing the accessibility of social services, and facilitating effective communication with government institutions. Additionally, AI can be applied to create systems for psychological support. The conditions of war and post-war states can lead to psychological traumas and stress among citizens. AI can be utilized to develop virtual psychological counselors and support systems that offer confidential assistance in times of difficulty.

Considering the importance of societal inclusion and the development of civil society in the context of war, AI can be used to create platforms and tools that facilitate citizen interaction, unite them in joint initiatives, and address important social issues. Furthermore, AI can enhance the effectiveness of implementing programs and projects aimed at supporting civil society and developing social initiatives.

In summary, the utilization of AI in the social sphere can significantly facilitate the recovery and development of Ukraine in the midst of war and post-war conditions, providing effective and individualized support to citizens while optimizing resources.

Conclusions

As a result of the analysis of certain aspects of the application of artificial intelligence for the recovery and development of Ukraine, recommendations have been formulated. These recommendations are aimed at ensuring that Ukraine becomes a leader in the use of artificial intelligence technologies and effectively employs them for the recovery and development of the country.

1. In the Defense Sector:

• Development of systems for analyzing military-strategic situations using machine learning algorithms to predict enemy actions and make effective decisions.

• Creation of intelligent systems for detecting and deflecting deviations from standard attack patterns in cyberspace to protect critical infrastructures.

• Implementation of autonomous control and navigation systems based on artificial intelligence for tanks, drones, and other equipment to enhance their productivity and efficiency.

• Development of automated border monitoring systems for early detection of illegal crossings using drones and satellite observation.

• Implementation of a forecasting system for military equipment and ammunition needs to enhance logistical support efficiency.

• Utilization of virtual reality and simulations with elements of artificial intelligence for military training and exercises.

• Creation of systems for analyzing and processing large volumes of data from various sources to make informed strategic decisions.

• Development of systems that analyze geopolitical, economic, and sociocultural factors to forecast potential threats and risks to national security.

• Implementation of artificial intelligence systems to automate decision-making in military command and operational planning.

• Development of computer models for analyzing and testing various strategies in conditions of military conflict.

• Creation of systems for timely response to crisis situations, including providing emergency assistance and coordinating actions in emergencies.

• Use of sensors and monitoring systems for detecting potential hazardous substances and timely response to them.

• Ensuring cybersecurity against potential cyberattacks and threats.

• Implementation of artificial intelligence systems for rapid and accurate diagnosis and treatment of injuries.

• Utilization of facial recognition technology and biometric methods for access control and identification.

2. In the Education Sector:

• Development of an online learning platform with personalized courses.

• Implementation of a personalized education system based on the analysis of educational data.

• Creation of open online resources for learning and self-education.

• Organization of training programs to prepare teachers for the use of AI.

• Development of specialized courses in engineering and future technologies.

3. In the Industrial Sector:

• Implementation of "smart production" systems with monitoring and analysis of production processes.

• Development of automated inventory management and logistical processes.

• Creation of innovative production lines using autonomous robots.

• Implementation of equipment modernization programs to increase productivity and reliability.

• Development of forecasting systems for demand for products using market data analysis.

4. In the Scientific Sector:

• Funding and support for research using AI in various fields.

• Development of big data and computational algorithms for analyzing complex research tasks.

• Creation of infrastructure for data exchange and collaboration between research groups.

• Ensuring access to high-tech laboratories for scientists and researchers.

• Conducting conferences and seminars on the application of AI in science.

5. In the Medical Sector:

• Implementation of electronic medical documentation systems and patient state analysis.

• Development of algorithms to assist in diagnosis and medical decision-making.

• Creation of virtual platforms for consultations and remote communication with doctors.

• Implementation of telemedicine systems to provide medical assistance in remote regions.

• Development of medical devices with elements of artificial intelligence for diagnosis and monitoring.

6. In the Social Sector:

• Use of AI for analyzing social needs and optimizing resource allocation within social programs.

• Development of monitoring and forecasting systems for social issues such as unemployment and poverty.

• Implementation of e-governance systems to improve the provision of public services.

• Development of virtual psychological consultants to provide support to citizens in times of stress and trauma.

Overall, the implementation of artificial intelligence technologies in these sectors will allow Ukraine to achieve leadership in this field and effectively use them for the recovery and development of the country, ensuring its national security and competitiveness in the modern world.

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The article has been sent to the editors 18.09.23.
After processing 25.10.23.
Submitted for printing 30.11.23.