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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE DEVELOPMENT OF ARMED CONFLICTS

The article examines the impact of artificial intelligence on modern warfare. In the context of rapid technological progress and the increasing dependence of the armed forces on new technologies, artificial intelligence is becoming an important tool in strategic planning and tactical operations. The study covers various aspects of its application, including process automation, processing and analysis of large amounts of data, as well as its impact on real-time decision-making.

The article also considers ethical and legal issues arising from using artificial intelligence in military conflicts, including responsibility for actions taken based on algorithmic decisions. The article ends with conclusions about the future use of artificial intelligence in armed conflicts, as well as recommendations for further research in this area.

Keywords: *artificial intelligence, process automation, data processing, data analysis, algorithmic solutions, armed conflicts, international humanitarian law, ethical norms, cyber operations.*

Statement of the problem. Modern armed conflicts are becoming increasingly complex and multifaceted, and the introduction of new technologies plays a crucial role in this process. Artificial intelligence (AI) is one of the most revolutionary technologies capable of changing approaches to warfare. In the context of russia's war with Ukraine, AI's capabilities in both strategic and tactical planning are evident.

One of the main challenges is the lack of a clear understanding of how AI can affect conflict dynamics. On the one hand, its use can increase the efficiency of operations, improve data analysis and speed up decision-making, but on the other hand, the use of AI also raises serious ethical and legal issues. For example, who is responsible for the actions taken by autonomous systems? How can we guarantee compliance with international humanitarian law when decisions are made by algorithms?

In addition, the war between russia and Ukraine demonstrates how AI can become a factor not only in direct combat actions, but also in cyberspace, where technology is used to wage information wars and manipulate public opinion. This complex interplay between technology and warfare requires in-depth analysis and understanding to adequately respond to the challenges of the use of artificial intelligence in modern conflicts.

Thus, the relevance of studying the impact of AI on the development of armed conflicts is driven by the need to assess both the potential and risks of its use in combat actions, as well as the need to develop recommendations for ethical and legal regulation.

Analysis of recent research and publications. In recent years, the impact of artificial intelligence on armed conflicts has become a subject of active study both in academic circles and in public policy in various countries. The russian-Ukrainian war provides unique opportunities for analyzing the use of AI in the course of combat actions, and many publications cover this issue from different perspectives.

The publication [1] explores the consequences of AI in military affairs. The authors emphasize that AI not only improves the automation of combat systems, but also transforms approaches to strategic planning and tactics. They examine examples of the use of AI in different countries and predict how these changes may affect global security. Paper [2] examines changes in the strategic approach to warfare under the influence of new technologies, including AI, and how the new technological paradigm shapes the concepts of war and strategic planning, focusing on the risks associated with the increasing autonomy of combat systems. The author of [3] analyses how AI is changing traditional methods of warfare. Both positive aspects (increased

efficiency of operations) and negative consequences are considered, including the possibility of new forms of conflict and difficulties in international relations.

The study [4] examines how AI can improve decision-making in the face of uncertainty. Article [5] highlights how big data and AI can change approaches to intelligence and operations planning. Article [6] analyses the use of AI in military structures and its impact on operational efficiency.

Legal and ethical issues related to the use of AI in military operations are discussed in [7]. The article [8] analyses how autonomous systems can comply with international legal norms and how existing legislation should be adapted. Paper [9] explores the ethical dilemmas that arise when AI is used in warfare and offers recommendations for developers.

Article [10] examines how Ukraine is using AI technologies to improve its defense capabilities. The authors analyze the introduction of AI in various aspects of military operations, including intelligence, drone control and cyber defense, emphasizing that the use of these technologies has become an important factor in the confrontation.

Publication [11] focuses on successful examples of AI implementation in the Armed Forces of Ukraine. The article describes in detail specific projects such as the use of AI to analyze data from the frontline and optimize logistics, and discusses the challenges and opportunities associated with adapting new technologies in a conflict environment.

The author [12] analyses the impact of AI on the strategy and tactics of the Armed Forces of Ukraine in the current conflict, noting that Ukraine is actively investing in AI development to improve its tactical mobility and efficiency. The author also considers the impact of international assistance and cooperation in the field of technology on strengthening Ukraine's defense capabilities.

The above studies highlight the importance of further studying the role of AI in modern armed conflicts, as well as the need to develop international standards and norms governing the use of technology, taking into account ethical and legal aspects.

The analysis showed that the role of AI in armed conflicts continues to grow, with new opportunities for intelligence, autonomous operations and cyber warfare emerging. However, new challenges are also emerging related to the ethical and legal aspects of using such technologies.

The purpose of the article is to study the impact of artificial intelligence on modern armed conflicts, to analyze its role in changing military strategy and tactics, and to identify ethical, legal and social challenges in the context of artificial intelligence use.

Summary of the main material. *The role of AI in armed conflicts.* Artificial intelligence is becoming an increasingly important tool in modern warfare, especially in the context of russia's armed aggression against Ukraine. Its use covers several key areas.

Intelligence and data analysis. AI significantly improves intelligence and data analysis capabilities. AI-based systems are able to process and analyze huge amounts of data, including drone and satellite imagery, as well as information from open sources (Open Source Intelligence, OSINT) [13]. This allows the military to receive up-to-date information on enemy movements and assess the situation on the battlefield in real time. As an example, it is the use of drones by Ukrainian forces for reconnaissance operations. Such drones can collect data on the positions of russian troops and transmit it to command centers for analysis using AI.

Autonomous combat systems. Autonomous systems equipped with AI are becoming increasingly common on the battlefield. They are capable of performing various tasks, including monitoring and protecting key facilities, as well as directly participating in combat operations [14]. For example, russia uses Orion unmanned aerial vehicles, which can act independently and make decisions based on data obtained from sensors and AI algorithms.

Autonomous combat systems are capable of performing dangerous tasks without direct human intervention, which reduces the risks for military personnel [15]. However, their use raises ethical questions about the extent to which autonomous systems can make life and death decisions.

Cyber operations. Artificial intelligence also plays a key role in cyber warfare, which has become an important aspect of modern conflict. AI is used to protect information systems and to launch attacks on enemy networks [16]. Ukraine and its allies use AI to create more resilient cybersecurity systems, while russia uses AI to conduct cyberattacks aimed at destabilizing enemy infrastructure.

Studies show that the use of AI in cyber operations allows for faster detection of vulnerabilities and response to threats, which is critical in active combat operations (IEEE Security & Privacy, 2023) [17].

Forecasting and decision-making. The use of AI to predict enemy actions and optimize decision-making is becoming an important element of military planning. AI systems can analyze enemy behaviour and predict their actions based on historical data and the current situation on the battlefield [18]. This allows commanders to develop more effective strategies and tactics.

Changing strategies and tactics. The use of artificial intelligence in armed confrontation not only changes the specific methods of warfare, but also significantly affects the overall strategies used by the armed forces. Let's take a closer look at the main changes.

Rapid response to changes on the battlefield. One of the key advantages of using AI is the ability to quickly analyze and process information. Modern AI systems are able to analyze data from various sources (drones, satellites, ground sensors) and provide commanders with up-to-date information in real time. This allows not only to respond quickly to enemy actions but also to change tactics depending on the situation.

For example, during the war in Ukraine, Ukrainian forces used AI systems to track the movements of russian troops. By detecting new threats, the systems automatically analyzed the data and suggested various options for appropriate actions, such as manoeuvres or the use of artillery. This significantly reduced decision-making time and increased the efficiency of operations.

Optimization of resource allocation. Optimizing logistics and resource allocation becomes a critical task in wartime. The use of AI to analyze data on resource availability, their usage and needs allows commanders to plan operations more efficiently.

The use of artificial intelligence in logistics processes can reduce costs by 20–30 %. AI can analyze supply routes, identify the most efficient routes and minimize delivery time, which is especially important in the context of active combat actions.

Use of smart warfare tactics. The concept of smart warfare is based on the use of advanced technologies and the integration of various systems to create a single combat network. This means that different elements of military equipment – from drones to ground troops and cyber operations – work in synergy to ensure greater efficiency.

The war between russia and Ukraine provides examples of this integration. For example, the use of drones for reconnaissance and precision strikes in combination with ground forces allows to plan flexible operations and to adapt quickly to the current conditions of combat actions.

Predicting enemy actions. Artificial intelligence also makes it possible to predict enemy actions by analyzing their behaviour based on historical data and current conditions. Machine learning algorithms can detect patterns in the enemy's actions and predict their next steps. This allows commanders to develop strategies and tactics in advance that will help them effectively counter the enemy's actions. For example, forecasting systems can estimate the likelihood of an attack on certain frontline parts and offer commanders options for strengthening positions or redirecting forces to protect the most vulnerable areas.

Reducing the human factor. With the introduction of artificial intelligence, the risk of errors associated with human oversight is reduced. Automated systems monitor data, minimizing the likelihood of wrong decisions, especially during stress and uncertainty. This can significantly improve the accuracy of operations.

However, the question arises regarding the dependence on technology, especially in conditions where system failures can have catastrophic consequences. For example, in 2010–2023, there were several incidents involving the use of automated systems.

In 2017, US troops conducted an air strike on a building in Afghanistan, believing that Taliban combatants were hiding there. However, dozens of civilians were killed in the attack, which showed shortcomings in the target recognition of automated systems.

In Yemen, a drone attack took place in 2018, killing dozens of people, including civilians. The automated systems that controlled the drones failed to accurately identify targets, resulting in significant civilian casualties.

During the conflict in Syria, automated systems used to recognize targets made mistakes in identification. For example, in 2020, Syrian government forces carried out airstrikes using automated systems that hit a medical facility by mistake, believing it to be a rebel base.

During the conflict between Armenia and Azerbaijan in Nagorno-Karabakh, there were cases when automated fire systems mistakenly directed artillery fire at their own positions. The reason was unreliable data received from intelligence systems.

These examples demonstrate that even in modern military conflicts, automated systems can make serious mistakes and, therefore, require careful monitoring and control over their use.

Evolution of command structures. The introduction of artificial intelligence is also having an impact on the command-and-control structure of troops. AI systems can be used to create flatter command structures, where

information flows quickly through all levels, allowing for better data integration and more informed decision-making.

The use of AI in command centres helps to improve coordination between different units and types of troops, which increases the overall effectiveness of operations. AI, for example, can be used to create a single information platform that combines data from different systems and sources, providing a more complete picture of the situation on the battlefield. This allows commanders at all levels to interact and respond to changes more effectively.

Interoperability and compatibility. In modern conflict, an important aspect is the ability of interoperability of different military systems. AI contributes to creating more interoperable technologies that can work together, even if they belong to different countries or military structures. This is especially important for allies – countries of NATO, who can integrate their systems with Ukrainian military technologies.

An example is the use of common standards and data exchange protocols, which allows different AI-based systems to work in a coordinated manner, thus facilitating better coordination and increasing operational readiness.

Unpredictability and adaptability. One of the important factors related to using artificial intelligence in armed conflicts is its ability to learn and adapt. Machine learning algorithms are able to analyze the results of previous operations and improve their strategies and tactics accordingly. This creates an element of unpredictability that can be used in combat actions to disorient the enemy.

For example, if one side uses certain tactics, the AI system can quickly adapt by developing new approaches which may be more effective. This creates a dynamic environment where each side must constantly update its strategies to remain competitive.

Thus, the introduction of artificial intelligence into combat operations is leading to profound changes in the strategies and tactics used by both russia and Ukraine. Rapid reaction to changes on the battlefield, optimization of resource allocation, use of the concept of smart warfare, prediction of enemy actions, reduction of the human factor and evolution of command structures – all these aspects demonstrate how technology is affecting the course of modern conflict.

However, such changes not only increase the effectiveness of military operations, but also create new challenges related to the ethical and legal aspects of using these technologies.

Ethical and legal aspects. The use of artificial intelligence in combat actions raises several ethical and legal issues that require serious analysis and discussion. In the context of the war between russia and Ukraine, these issues are becoming particularly relevant for several reasons.

Liability for AI actions. One of the main ethical issues is the responsibility for actions taken by autonomous systems that use AI. If an autonomous combat module decides to use force without human intervention, who will be held responsible in case of mistakes that lead to civilian deaths or infrastructure damage? Serious legal and moral dilemmas arise.

The issue of liability also applies to the software that runs these systems. If the code is buggy or incorrectly designed, how can this affect the liability of developers and commanders? These issues require clear legal regulation, which currently remains insufficiently developed.

Principles of international humanitarian law. According to international humanitarian law, the principles of proportionality, distinction and necessity must be observed in the conduct of hostilities. The use of artificial intelligence in warfare calls into question the possibility of adhering to these principles. Yes, automated systems can make decisions about the use of force based on data analysis, but can they adequately assess the context, including possible civilian casualties?

Studies show that many artificial intelligence algorithms may not consider human aspects and ethical norms, and thus cause gross violations of international humanitarian law [19]. The use of AI in warfare requires a rethinking of approaches to compliance with these norms and principles.

Discrimination and bias. Artificial intelligence systems learn from data, which can lead to bias in their decisions. If such data contains biases or errors, it can lead to discrimination in actions against certain groups, which, in the context of armed conflict, can have serious consequences, especially with regard to the protection of human rights and civil liberties.

Examples of bias in AI algorithms have already been documented in areas such as law enforcement and social services. The use of the same algorithms by the military can create similar problems [20].

Transparency and accountability. Transparency in the development and use of AI systems is critical to ensuring accountability. In a conflict context, when decisions are made based on AI analysis, it is important to be able to track how decisions were made and what data they were based on. This poses a challenge for

developers and commanders who need to ensure transparency in their systems.

Lack of transparency can lead to distrust on the part of the public and the international community, which in its turn affects the legitimacy of the hostilities and international support.

Impact on civilians. The use of artificial intelligence in armed conflicts also has an impact on civilians. Autonomous systems can act beyond human control and cause unpredictable consequences. Thus, the use of drones for attacks can lead to mistakes and civilian casualties, which will cause public discontent and protests.

In addition, using AI in cyber operations can threaten civilian infrastructure and create large-scale disruptions in life. This raises the question of whether it is ethical to use such technologies in circumstances where they can threaten the lives and safety of civilians.

Regulation and international law. Currently, international law does not fully cover all aspects of the use of AI in warfare. Such norms as the Geneva Conventions and other international agreements must be adapted to new technologies. New legal frameworks are needed that can regulate the use of autonomous systems in conflicts, taking into account ethical and legal norms.

To limit and regulate the use of AI for military purposes, some experts call for the creation of international agreements similar to those developed to combat chemical and biological weapons. This includes bans on certain types of autonomous systems or requirements for their use under human control.

The role of civil society and public opinion. Civil society and public opinion play an important role in shaping policy and regulating the use of artificial intelligence by armed forces. Civil society organizations and activists can raise ethical, human rights and accountability issues that require governments and military structures to take a more careful approach to the development and implementation of technologies.

Discussions and research conducted within the scientific and professional communities will help shape public opinion and, in its turn, influence government agencies to adopt stricter rules and regulations. Transparent discussion of the use of AI will help to avoid misuse and ensure a more ethical use of technology.

Education and training. Given the rapidly evolving technologies and their impact on the course of armed conflicts, the issue of personnel training is becoming important. Military and civilian specialists should be trained not only in the technical aspects of working with AI, but also in ethical and legal issues. This means understanding the norms and standards that govern the use of AI in conflict, as well as learning critical thinking and risk analysis.

The creation of educational programs that combine technical knowledge with ethical and legal aspects will help train a new generation of specialists capable of using AI effectively and responsibly in military and civilian areas.

The ethical and legal aspects of using AI in warfare are an important area for further research and discussion. Given the significant impact of technology on conflicts, it is necessary to develop new rules and regulations that will guarantee compliance with human rights and international humanitarian law. This requires joint efforts by governments, international organizations, scientific communities and civil society.

The future of artificial intelligence in armed conflicts. The use of AI in warfare continues to develop and evolve. Predicting the future of artificial intelligence in this area depends on a number of factors, including technological advances, political decisions, international relations and public opinion.

Increased autonomy of combat systems. One of the most notable trends is the increasing autonomy of combat systems. Autonomous drones and ground vehicles are already being used in some conflicts, and their number is expected to grow. This will significantly change the dynamics of warfare, enabling the military to perform tasks with minimal human intervention.

However, with increased autonomy comes new ethical and legal challenges, as discussed above. The ability to make decisions on the use of force without human intervention can lead to unpredictable consequences and humanitarian disasters.

Integration of artificial intelligence into military tactics. AI systems are becoming an integral part of military tactics. It is expected that the military will use AI to analyze large amount of data, thus identifying patterns and anticipating enemy actions. This will change warfare strategies due to more accurate data and forecasts.

The integration of AI into tactics also enables the combined use of different types of troops, improving coordination between them and increasing the overall effectiveness of operations.

Threats and cybersecurity. With the increasing reliance on AI in the military, the threat of cyberattacks is also growing. Autonomous systems and algorithms are becoming a target for an enemy who will try to disrupt their operation or manipulate the data on which they are based. This creates cybersecurity challenges and forces countries to invest in protecting their AI systems.

In the future, new methods will be developed to protect and counter cyberattacks, which will become an important component of military strategy and include the use of AI to predict and detect threats in cyberspace.

Development of international norms and standards. Given the potential consequences of the use of AI in armed conflicts, the need to develop international norms and standards is an important aspect of the future. The issue of regulating the use of autonomous systems and the rules for their use will become increasingly relevant.

There are already initiatives to create international agreements that would regulate the use of AI in warfare (similar to existing agreements on chemical and biological weapons). Such agreements could establish a framework for the use of AI, ensuring the respect of human rights and international humanitarian law.

Impact on society and military personnel. The growing use of artificial intelligence by the armed forces is changing the role of military personnel. They are expected to need new skills: working with AI systems and analyzing large amounts of data. Education and training will include new technologies and methods, which will change the approach to military training.

In addition, the use of AI has the potential to change the public perception of war. Automation of combat operations can help reduce the number of casualties among military personnel, but it can also trigger ethical debates about the extent to which the use of such technologies in conflict is justified.

The future of artificial intelligence in resolving conflict issues by military means is seen as dynamic and complex. The increasing autonomy of combat systems, the integration of AI into tactics, cyber security threats, the need to develop international norms, and the impact on society and military personnel – all these aspects require careful analysis and discussion. It is important that the development of technology is in line with security, human rights and international humanitarian law.

Conclusions

Artificial intelligence is already having a significant impact on warfare, changing approaches to strategy, tactics and operational planning. Countries that effectively integrate it into their armed forces gain a significant tactical advantage. This requires military structures to continuously improve technologies and methods, as well as to be ready to adapt to a rapidly changing environment.

The increasing use of artificial intelligence in warfare raises serious ethical and legal issues. Responsibility for the actions of autonomous systems, compliance with international humanitarian law and human rights law, algorithmic bias, and transparency of actions – all these aspects require careful consideration and the development of new norms and standards.

The future of armed conflicts in which artificial intelligence is actively used may be unpredictable. Increased autonomy of combat systems, integration of artificial intelligence into military tactics, and new threats in cyberspace will shape new scenarios of warfare. The development of international agreements and standards to regulate the use of artificial intelligence in warfare is becoming increasingly important.

At the same time, public opinion and the active participation of civil society play an important role in shaping policies related to the use of artificial intelligence in armed conflicts. Open discussions about the ethical aspects, legal norms, and consequences of the use of artificial intelligence contribute to a more responsible and humane approach to warfare.

Artificial intelligence has the potential not only to change the face of modern warfare, but also to create new challenges for the international community. Therefore, it is important that all stakeholders – governments, militaries, academic circles and society – work to ensure that the use of artificial intelligence in armed conflicts is within the framework of ethical norms and legal standards, ensuring security and protection of human rights. Therefore, the direction of further research is to develop practical recommendations for the ethical and legal regulation of the use of artificial intelligence in the context of hostilities.

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ВПЛИВ ШТУЧНОГО ІНТЕЛЕКТУ НА РОЗВИТОК ЗБРОЙНИХ КОНФЛІКТІВ

Розглянуто вплив штучного інтелекту на сучасні збройні конфлікти з урахуванням змін, які він вносить у військову стратегію, тактику й оперативне планування. Досліджено роль штучного інтелекту у трансформації підходів до ведення війни, а також визначено етичні, правові й соціальні проблеми, пов'язані з його застосуванням.

Проводиться аналіз ключових аспектів використання штучного інтелекту у військових діях: автоматизація бойових систем, застосування аналітичних технологій для прогнозування загроз. Розглядаються етичні і правові питання, пов'язані з відповідальністю за дії автономних систем, дотриманням гуманітарного права та прав людини, а також із алгоритмічною упередженістю, що може призвести до дискримінаційних рішень.

Крім того, висвітлюються нові загрози, які виникають через використання штучного інтелекту, зокрема кіберзагрози та потенціал для зловживання технологіями. Важливим аспектом є заклик до міжнародної співпраці у розробленні норм і стандартів, що регулюють використання штучного інтелекту у збройних конфліктах.

У висновках наголошується, що майбутнє використання штучного інтелекту у військових операціях потребує глибокого аналізу та обговорення. Важливо, щоб усі зацікавлені сторони – уряди, військові організації, наукова спільнота та громадянське суспільство – працювали разом, аби забезпечити етичне й відповідальне використання нових технологій. Лише таким чином можна досягти безпеки й захисту прав людини в умовах сучасних збройних конфліктів, що робить цю тему надзвичайно актуальною в сучасному світі.

Ключові слова: *штучний інтелект, автоматизація процесів, оброблення даних, аналіз даних, алгоритмічні рішення, збройні конфлікти, міжнародне гуманітарне право, етичні норми, кібероперації.*

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