

## MILITARY APPLICATION OF ARTIFICIAL INTELLIGENCE

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**Abstract:** *The application of artificial intelligence for military purposes can be broadly divided into three main areas. The first area involves enabling weapons and military equipment to operate without human supervision. The second area focuses on the processing and interpretation of large amounts of data, which aids in intelligence work, defining military strategy, and making strategic decisions. The third area pertains to assisting military systems in executing commands and observations independently during combat situations. AI applications offer armed forces a competitive advantage by accelerating decision-making through transforming the OODA decision-making loop, enhancing overall command capability. As the technology evolves, the "unpredictable, fragile, inflexible, and inexplicable characteristics of artificial intelligence" remain to be fully understood, allowing it to continue surpassing strategy and human error. However, like any revolutionary technology, artificial intelligence is likely to intensify competition among militarily powerful states, leading to a security dilemma that increases the potential for escalation.*

**Key words:** *artificial intelligence, decision making, challenges*

### 1. INTRODUCTION

The massive influx of information, coupled with rapid technological advancements, is transforming the nature of modern warfare. In the information age, data becomes a critical component of national power, and those who are best informed will gain strategic superiority through improved decision-making and increased efficiency. Artificial intelligence (AI) will play a pivotal role in reshaping the OODA loops (decision-making loops) in the digital age and will be at the core of commanding military operations. By applying AI to conventional capabilities, decision-making can be accelerated, enabling warfare at machine speed and surpassing human cognitive abilities. As the technology continues to mature, AI is already shaping military doctrine and defining future strategies.

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Despite the potential advantages in military applications, artificial intelligence also presents specific challenges. It can be susceptible to unique forms of manipulation. When AI augments conventional military capabilities, it has the potential to destabilize strategic stability and disrupt the current global balance of military forces among great powers. This may exacerbate the "fog of war," unintentionally escalating conflicts, and increasing the likelihood of nuclear confrontations.

## **2. BASICS OF ARTIFICIAL INTELLIGENCE**

The term "artificial intelligence" was first mentioned in 1956 at a scientific meeting in the USA, organized by the American computer scientist John McCarthy. The further development of artificial intelligence has been marked by ups and downs and periods of stagnation. However, at the beginning of the 21st century, there was a breakthrough in this area, primarily due to the increased possibilities of computer information processing and easier access to ever-increasing amounts of data. Although artificial intelligence is not a new concept, its development has been accelerating in the 21st century, and scientists continuously revise its definition. For the purposes of this paper, we can use the widely accepted definition from the professional bodies of the European Union, which states that "artificial intelligence (AI - Artificial Intelligence) refers to systems that exhibit reasonable, intelligent behavior based on the analysis of their environment and make decisions - with a certain degree of autonomy - to achieve concrete goals" (AI development strategy in the Republic of Serbia, 2020-2025).

It is important to understand that artificial intelligence is the ability of computer systems to perform tasks that require human intelligence. Currently, artificial intelligence surpasses human intelligence in performing a narrow set of specific tasks. However, further research is needed to achieve artificial superintelligence, where machines' abilities exceed human cognitive ability (Sweijts, 2018). In the context of artificial intelligence, the term "artificial" refers to an inanimate being that performs intelligent actions, imitating natural intelligence, which is a characteristic of humans and other living beings. What makes artificial intelligence intelligent is its ability to apply logical rules and principles established by the human mind, and also its machine learning capability. However, artificial intelligence falls short in achieving self-awareness – the awareness of one's own identity and what distinguishes a person from others. The global recognition of AI as a strategic technology and a valuable asset for exercising power and influence on the international stage has triggered a global race for supremacy in the AI economy and military affairs. Major world powers have already announced their artificial intelligence development programs. In July 2017, the Government of the People's Republic of China announced a strategy with the aim of becoming a global leader in the field of artificial intelligence by 2030. In September 2017, Vladimir Putin announced Russia's intention to develop artificial intelligence, with the ambition of becoming a global leader in this field. In January 2018, the US national defense strategy identified artificial intelligence as one of the key technologies that will "ensure that the US can fight and win the wars of the future." The US military has already integrated artificial intelligence systems within the "Project Maven," which was used to identify insurgents in Iraq and Syria.

## **3. ARTIFICIAL INTELLIGENCE IN CURRENT MILITARY ACTIVITIES**

Military organizations consider Artificial Intelligence (AI) as a family of general-purpose technologies that enable machines to perform tasks typically requiring human intelligence or biological intelligence. AI plays a significant role in various military applications, with some notable areas influencing the strategy of using military forces (Defence Artificial Intelligence Strategy, 2022).

In the realm of enemy *target detection and recognition*, AI techniques can enhance the accuracy of target identification. Intelligent systems can predict enemy activity and aggregate combat environment data. Machine learning is used to track targets and collect data, and AI plays a crucial role in intelligence and reconnaissance applications, mainly due to its ability to analyze large datasets. The US Army's Project Maven is an example where AI automates intelligence data processing for counter-terrorism campaigns. Computer vision and machine learning algorithms are used to analyze drone footage, identifying enemy activities for intelligence and targeting purposes. This automation can save human analysts significant time and enable more efficient decision-making based on collected data. The intelligence community, particularly the Central Intelligence Agency, is actively engaged in developing around 140 projects involving AI for tasks like image recognition and predictive analytics. These efforts encompass language recognition, speech translation in noisy environments, geolocation image analysis without metadata, and the development of building function identification tools based on lifestyle pattern analysis.

In the context of *combat environment awareness and reconnaissance*, unmanned systems equipped with AI can follow predetermined routes to enhance threat assessment and situational awareness. Combining unmanned aerial vehicles and AI facilitates border monitoring and threat identification, leading to faster response times.

Artificial Intelligence significantly *contributes to strategic decision-making* by improving the accuracy and speed of conflict scenario analysis, eliminating biases in decision-making, and enabling rational choices during urgent situations.

To enhance the *command and control of military forces*, the US aims to utilize AI's analytical potential. The development of a multi-domain command and control system by the American Air Force seeks to centralize planning and execution of operations across various domains (air, space, cyber, maritime, and ground). AI could merge sensor data from these domains to create a comprehensive "common operating picture" for decision-makers.

However, there are *some limitations and challenges* associated with AI in military use. Strategic decision-making using AI can negatively impact stability during crisis situations due to rapid assessments and decisions. Decision-making algorithms can be biased and susceptible to adversarial influence. In military operations, problems may arise, including supply chain risks, uncertainty about using automated vehicles in complex situations, and the high cost of implementing AI. The complexity of engineering involved in creating AI-equipped weapon systems, along with high maintenance costs, pose significant obstacles, especially in wartime conditions.

#### **4. ARTIFICIAL INTELLIGENCE AND STRATEGIC DECISION-MAKING**

What sets artificial intelligence apart as a world machine is its autonomy in executing John Boyd's OODA loop (Observe-Orient-Decide-Act), i.e., independence on the battlefield, consisting of observing the environment, orienting one's own position in relation to all important elements of the environment, making a decision on executing an action, and taking action itself. The primary conceptual differences in the application of artificial intelligence in military affairs relate to the role of humans in the decision-making loop, whether they are "in the loop" (HITL concept - Human-In-The-Loop) or "on the loop" (concept of Human-On-The-Loop). If a person ultimately decides on "pulling the trigger" it is a matter of supervised autonomy, while leaving that right to the machines implies full autonomy (Sar, 2020).

The application of artificial intelligence to conventional military capabilities has the potential to speed up decision-making, enable warfare at machine speed, and surpass human cognitive

abilities. Already, AI significantly shapes military doctrine and will continue to define future strategy as the technology matures (Lastovych, 2021).

Early studies suggest that AI will be useful both at the tactical and strategic levels. However, on the strategic decision-making level, there might be more ambiguity about data and the rewards each machine aims to achieve. The immediate role of artificial intelligence may be in the tactical domain, but it will still have significant strategic implications (Kenneth, 2018).

In addition to its strategic effect through tactical victories, AI will also shape strategy by providing insights to decision-makers based on the processing of vast datasets. Strategic-level AI can act as a "prophet" for decision-makers, testing and rejecting false associations and assumptions about adversaries, and identifying key vulnerabilities in the enemy. Strategic AI will be free from the individual and collective psychological processes influencing human decision-making, such as groupthink, bias, bureaucratic politics, excessive optimism, and poor risk assessment.

To enhance accurate decision-making and predict conflict scenarios, war games using artificial intelligence and advanced simulations can be employed. These measures theoretically support strategic stability.

However, the most challenging problems related to warfare are actually strategic problems, which involve uncertainty or the "fog of war," as famously noted by Clausewitz. In such unclear strategic situations, as Jon Lindsay, an associate professor in the School of Cyber Security and the Sam Nunn School of International Affairs, states, "human sense is needed to make moral, ethical, and intellectual decisions in an incredibly confusing, tense, and frightening situation."

Lindsay emphasizes that decision-making using AI is based on four key components: data on the situation, interpretation of that data (or prediction), determining the best way to achieve goals and values (or reasoning), and taking action. While machine learning has made predictions easier, data and human judgment are still valuable. In war, however, unbiased data is usually lacking, and judgments about goals and values are inherently controversial, making human intervention essential (Goldfarb & Lindsay, 2022).

The idea of substituting soldiers with automated systems to reduce reliance on human labor and enhance battlefield effectiveness is called substitution theory AI. However, Lindsay and Goldfarb argue that AI should not be seen as a replacement but rather as a supplement to existing human strategy. Machines are good at predicting, but they depend on data and judgment. The most difficult problems in war are information and strategy, which are challenging to fulfill in the unpredictable military environment. In war, a wealth of unbiased data is usually lacking, and judgments about goals and values are inherently controversial, but that doesn't mean it's impossible to address.

If AI replaces humans as the central decision-making element in war, it could lead to changes in the structure and hierarchy of military leadership. People will be responsible for designing and maintaining data systems and making political decisions. Adversaries will aim to compromise both data and judgment, making human intervention even more critical.

Lindsay and Goldfarb conclude that while AI can automate prediction, judgment and data remain crucial. They question when armies will automate judgment or whether some analyses and assessments cannot be automated. Hence, the adoption of tactical and strategic decisions by humans remains the most important aspect of warfare.

However, the fact remains that making fast and correct decisions is a challenge for today's strategic military leaders. A method of rapid decision analysis involves fully utilizing cognitive

abilities, empirical intuition, and logical reasoning to guide the decision-making process. With the development of science and technology, reliance on scientific decision-making and group decision-making becomes "mainstream" in modern military management at the strategic level. Despite the use of technology and big data, intelligent decision-making will still depend on human experience and intuition to achieve accurate and quick decisions.

Practice has shown that in the absence of military experience from combat operations, joint decision-making has become the primary approach to commanding and leading military operations. With the advancement of science and technology, the art of war has gradually been replaced by the reliance on scientific and group decision-making, which has become mainstream, as evidenced by its application in the Gulf War, aggression against FRY, and conflicts in Kosovo and Metohija, Iraq, Afghanistan, Libya, Syria, and other regions (Xianjin & Qiwang, 2018). Traditional decision-making based on personal experience is no longer sufficient for military commanders. Instead, group decision-making highlights the advantage of collective wisdom, along with scientific decision-making, which relies on contemporary decision-making models and operational research. This has become the primary method of modern military management at the strategic level, thus enabling precise decision-making.

In traditional military decision-making, commanders relied on their own experience, intuition, and intelligence to make critical choices. However, the emergence of technology and big data tools has offered a new approach to decision analysis. Big data has shifted away from traditional reliance on experience and intuition, emphasizing the importance of data and analysis. This shift not only enhances the results of scientific decision-making but also alleviates the immense mental stress that decision-makers face. Intelligent decision-making is now liberated from human experience and intuition, mitigating the errors that can occur in human decision-making and allowing for accurate and swift decisions.

With this transformation in decision-making, the military can achieve more efficient and effective strategies. The fusion of scientific methods and big data enables decision-makers to make well-informed choices, leveraging collective insights and reliable analysis. As technology continues to evolve, the potential for even more sophisticated decision-making capabilities increases, further enhancing the military's ability to respond to complex and dynamic situations.

## **5. CHALLENGES OF MILITARY APPLICATION OF ARTIFICIAL INTELLIGENCE**

However, the application of artificial intelligence in conjunction with nuclear or missile weapons, with their high range and destructive capabilities, goes beyond technological challenges and raises ethical considerations. Ethical and political guidelines dictate that decision-making should remain in the hands of humans, who must "pull the trigger" when circumstances demand it. Nonetheless, this perception may change as artificial intelligence technologies mature and become more reliable.

Robert Work, the Deputy US Secretary of Defense, stated in 2016 that the US Department of Defense "will not delegate lethal authority to a machine to make a decision" regarding the use of force. However, he further elaborated that if adversaries with nuclear weapons, such as China or Russia, are more willing to entrust decision-making to machines than the US, then the US would have to consider how to best compete in such a scenario (Lamothe, 2016). This suggests that the United States might seriously contemplate removing the human element from the loop if their adversaries adopt autonomous decision-making. This willingness to engage in autonomous warfare is concerning, as it confirms predictions that AI could escalate friction, uncertainty, and instability in international security at the strategic level.

## 6. CONCLUSION

Artificial intelligence serves as a potent military force multiplier. Its applications can offer armed forces a competitive advantage by accelerating decision-making, transforming the OODA decision-making loop, and enhancing command, control, and supervision capabilities. However, until we fully comprehend the "unpredictable, fragile, inflexible, and inexplicable characteristics of AI," the technology will continue to surpass traditional strategies and human errors (Johnson, 2020). It is foreseeable that artificial intelligence, as a revolutionary technology, will intensify competition between nuclear-armed states, potentially leading to a security dilemma. The unpredictable nature of AI, coupled with an increasingly multipolar world order, may inadvertently trigger escalation and heighten the risk of conflicts. The immense potential of artificial intelligence could also introduce uncertainty into the international security landscape, disrupting the predictability of conflicts and increasing the likelihood of their escalation.

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