Artificial Intelligence (AI): The Game Changer in Modern Warfare

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Introduction: Historically, military tactics and strategies have evolved in response to technological advancements and changing geopolitical dynamics. The evolution of military technology from 1900 to the present day has witnessed transformative shifts in warfare, including advancements such as aerial combat, stealth aircraft, tanks, nuclear weapons, precision-guided munitions, unmanned aerial vehicles (UAVs), and biotechnology. These innovations have revolutionised tactics, strategy, and global security dynamics. Since 2000, Artificial intelligence (AI) research has expanded, becoming a provider of military and commercial products and services (Szabadf oldi., 2021). AI serves as a tool for machines to act or behave intelligently. AI-powered algorithms are capable of pattern recognition, Natural Language Processing (NLP), object identification, decision-making, and making future predictions. Furthermore, these intelligent machines or agents are used in applications such as intelligent transport, healthcare, agriculture, security, etc.

The use of AI technology in developed countries has already had an impact on their citizens' daily lives through the use of the Internet of Things (IoT), smart cities, navigation systems, NLP, Robotic process automation (RPA), targeted online marketing and self-driving vehicles become more prevalent, this trend is expected to bring about even more remarkable transformations in the future.

One of the most significant domains where AI is reshaping the landscape is the military sector. As the global security landscape becomes increasingly complex, armed forces around the world are recognising the transformative potential of AI in enhancing their tactical and strategic capabilities. The advent of AI marks a paradigm shift that enables armed forces to leverage data-driven insights, automation, and machine learning algorithms to optimise their operations. The capability of artificial intelligence to analyse vast amounts of data in real time provides military leaders with unparalleled knowledge of the situation, empowering them to make well-informed decisions during combat.

AI has shown significant improvement in the military within a generation. Indeed, AI is applied in military operations in many ways. Therefore, This article delves into how AI is revolutionising military operations, transforming the very nature of warfare.

AI: From Science Fiction to Reality: Artificial intelligence, once confined to the realm of science fiction, is now a tangible force shaping our daily lives. It goes beyond academic research, providing practical solutions across various sectors, including the military.

(Source: https://www.gamespot.com/reviews/call-of-duty-modern-warfare-2)

AI in Action

In recent years, integrating artificial intelligence (AI) technologies into military operations has sparked a transformative revolution, redefining how armed forces approach strategy, decision-making, and combat readiness. This section delves into the multifaceted applications of AI within the military domain, shedding light on its profound impact on various aspects of modern warfare.

1. Autonomous Systems: One significant application of AI in the military is the deployment of autonomous systems for reconnaissance and surveillance missions. Unmanned aerial vehicles (UAVs), commonly known as drones, equipped with AI-driven algorithms, enable real-time data collection and analysis in hostile environments without endangering human lives. These systems can conduct aerial reconnaissance, monitor enemy movements, and detect potential threats, offering invaluable intelligence to military commanders.

A study conducted by Koeneke et al., (2019) focuses on achieving successful reconnaissance mission outcomes through factors such as data collection efficiency, distributed data storage,

collision avoidance, and maintaining the integrity of the Micro Air Vehicles (MAV) swarm mission. The study utilises a proof of concept simulation to validate the swarm MAV model deployment and establish a foundation for more extensive deployment model simulations.

Furthermore, Mersten et al., (2001) presented a paper on The Advanced Battle Management System (ABMS) Program and the Autonomous Operations Unmanned Aerial Vehicle (AO UAV) Autonomy to discuss the challenges related to increased crew multitasking and interruptions.

Their research focuses on developing technologies for the Man-Machine Interface (MMI) to facilitate human multitasking, manage alerts, and ensure the smooth resumption of interrupted tasks. The core research objective is to enhance crew coordination through the creation of systems that can anticipate and address coordination breakdowns.

2. Decision Support: AI's ability to process and analyse vast volumes of data has transformed the way military leaders formulate strategies and make informed decisions. Advanced algorithms and machine learning models can sift through complex data sets, extracting actionable insights and identifying patterns that human analysts might overlook. This data-driven approach enhances situational awareness, aids in predictive analysis, and allows for more effective resource allocation.

The integration of artificial intelligence (AI) capabilities into operations research (OR) and decision support systems (DSSs) has significantly impacted decision-making processes across various domains. As highlighted in the study by Gupta et al.,(2022) operations research has delved into the existing research landscape, exploring the integration of AI within DSSs and OR to enhance decision-making capabilities. This advancement sheds light on the future of intelligent decision-making in complex and uncertain environments.

(Source: https://www.techspot.com)

3. Precision Targeting and Autonomous Weapon Systems: AI-powered precision targeting systems have revolutionised the accuracy of military strikes. Autonomous weapon systems, guided by AI algorithms, can accurately locate and engage targets with minimal collateral damage. These systems improve the efficiency of military operations while mitigating the risk to civilian populations.

The Autonomous Weapon Systems (AWS) systems are divided into five categories: air defence, active protection, robotic sentries, guided munitions, and loitering munitions (Amoroso et al., 2020). Air defence systems detect airborne threats (such as missiles or aircraft) and defend by releasing missiles or rockets. The active protection systems guard armoured vehicles by detecting and intercepting anti-tank missiles and rockets. The robotic sentries are designed for surveillance and security, often equipped with sensors and weaponry, to monitor and defend specific areas or locations.

Guided munitions autonomously identify and engage targets that are not visible to the attacking aircraft. The loitering munitions fly over a designated area to locate targets, dive-bomb, and destroy them.

4. Human-Machine Teaming and Cognitive Assistance: AI technologies are also being used to enhance the capabilities of human operators on the battlefield. Human-machine teaming leverages AI's ability to process and analyse data quickly, providing soldiers with real-time insights and recommendations. This collaboration improves decision-making and allows for rapid adaptation to dynamic and unpredictable situations.

Flemisch, F. (2023) present a paper highlighting the importance of countering Cognitive Warfare (CogWar), which should encompass research into human cognition, artificial cognition, and, most notably, collaborative and shared cognition within the design of Robotic and Autonomous Systems.

Challenges and Concerns: Integrating artificial intelligence (AI) into military operations has opened up new horizons and possibilities for armed forces worldwide. However, this technological advancement also brings along a host of challenges that demand attention and consideration. This section delves into the applications of AI in military contexts, highlighting the significant challenges it poses while also exploring the trends that are shaping the future of warfare.

There are concerns about the ethical and legal implications of using AI in war or enhancing security during peacetime. Lethal autonomous weapon systems (LAWS), also known as autonomous weapons or killer robots, are weapons that can select and engage targets without human intervention. Although still in the early stages of development, there is growing concern about their potential use in warfare due to their unreliability, susceptibility to hacking, and unpredictable emergent behaviours. Most countries support a ban on LAWS, but significant military powers are reluctant to ban the expansion of AI in autonomous weapons. China has put forward a proposition to prohibit LAWS, but both Russia and the United States are opposed to it. Nevertheless, the proposed ban introduced by Beijing is so limited in its definition of LAWS that it would not impede China's advancement or utilisation of these weapons (Morgan et al., 2020), the acceptance of this idea by the international community is questionable. It brings up concerns about Beijing's regard for human dignity and moral responsibility. Moreover, China and Russia seem to be less attentive to ethical matters, including their citizens' right to privacy.

(Source:)

Since Russia's invasion, an arms race in artificial intelligence (AI) weaponry has played out on Ukrainian soil. The low-price Quadcopter drones with modern AI capabilities outperform well-skilled soldiers on the battlefield. Moreover, the challenge of accountability will intensify as a growing number of international entities gain access to lethal autonomous weapon systems (AWS). Notably, Houthi rebels now wield armed drones, and extremist groups like ISIS and Boko Haram have repurposed drones for deploying improvised explosive devices (Kunertova, D. 2023).

The Future of Warfare: Recent events, like Russia's incursion into Ukraine, highlight the growing importance of AI in military operations. AI-equipped drones are outperforming traditional soldiers, sparking an arms race in AI weaponry. Major global players are aggressively pursuing AI capabilities, setting the stage for significant changes in the future of warfare.

Moreover, AI technologies have experienced rapid development and are progressively being incorporated into a growing array of military applications. While predicting exactly when military AI will possess the potential to fundamentally alter the nature of warfare is challenging, current research indicates substantial advancements are likely within the next decade. Countries such as China, Russia, the USA, and South Korea, along with various state and non-state entities, are vigorously pursuing AI capabilities. Nevertheless, these technological advancements carry significant implications for a broad spectrum of warfighting capabilities.

Conclusion: The evolution of military tactics and strategies has historically responded to technological advancements and geopolitical shifts. From 1900 to the present, warfare has witnessed transformative changes due to innovations like aerial combat, nuclear weapons, UAVs, and biotechnology. This evolution has reshaped strategies and global security.

In the 21st century, AI has become a significant tool, transitioning from research to practical use in various sectors. It impacts daily life through smartphones, navigation, and marketing. The military domain is profoundly affected, with AI enhancing tactical and strategic capabilities. AI's ability to analyse real-time data empowers military leaders to make informed decisions during combat.

This article focuses on AI's substantial impact on military operations, covering applications like autonomous systems, precision targeting, human-machine teaming, and cognitive assistance. Challenges include adversarial AI, cybersecurity, and biases. Ethical concerns arise around the use of AI in warfare, particularly lethal autonomous weapon systems (LAWS), with differing global viewpoints.

AI's rapid evolution in the military predicts significant changes in the next decade. Countries and non-state actors aggressively pursue AI capabilities, suggesting profound shifts in warfighting. The military's journey with AI showcases adaptation to technological advancements with wide-ranging effects on war strategies and global security dynamics.