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The Impact of Artificial Intelligence in Military Operations in Light of the International Humanitarian Law Rules

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Abstract:

Modern warfare has significantly advanced with the introduction of Artificial Intelligence (AI) into operations. AI technologies improve military capabilities by enhancing decision-making procedures, streamlining logistics, and enabling autonomous weaponry. However, using AI in military applications presents difficult moral and legal issues, especially when it comes to adhering to International Humanitarian Law (IHL). IHL sets regulations that guard civilians and control hostilities to reduce the suffering caused to civilians during armed conflicts. The compatibility of AI technology with core IHL principles such as distinction, proportionality, military necessity, and humanity is examined in this article. There is still significant worry about AI systems' capacity to reliably discriminate between military targets and people, raising the possibility of unintentional harm to civilians. Furthermore, responsibility for autonomous systems actions and decisions presents legal dilemmas regarding responsibility and liability in cases of IHL violations. This study evaluates the potential of AI to comply with IHL requirements and suggests strategies for mitigating associated risks. It emphasizes the importance of developing robust legal frameworks and international cooperation to ensure that AI applications in military operations adhere to humanitarian standards, thereby balancing technological innovation with the imperatives of human rights and ethical warfare.

Keywords: Artificial Intelligence, Military Operations, International Humanitarian Law, Military Technology, Autonomous Weapons, Distinction and Proportionality, Accountability and Responsibility

الملخص :

شهـدت الحـروب الحديثة تطـورًا كبيرًا مع إدخـال الذكاء الاصطناعـي (AI) فـي العمليـات العسكريـة. من خـلال تحسين عمليات اتخـاذ القرار وتبسيـط اللوجستيات وتمكـين استخـدام الأسلحة الذاتيـة التحكم، تسهـم تقنيات الـذكاء الاصطناعي فـي تعزيز القدرات العسكرية. ومع ذلك، فإن استخدام الذكاء الاصطناعي فـي التطبيقات العسكريـة يثـير قضايا أخلاقية وقانونيـة صعبة، خاصة فيما يتعلـق بالامتثال لقواعد القانون الدولي الإنساني (IHL).

يضـع القانون الـدولي الإنساني لوائح تهـدف إلى حماية المدنيـين وتنظيم الأعمال العدائيـة للحد من المعانـاة التي تلحق بهم خلال النزاعات المسلحة. ويتناول هذا المقال مـدى توافق تقنيات الذكاء الاصطناعي مع المبادئ الأساسية للقانون الدولي الإنساني، مثـل التمييـز والتناسب والضـرورة العسكريـة والإنسانية. ومع ذلك، يظـل هناك قلق كبـير بشأن قدرة أنظمة الذكاء الاصطناعـي على التمييز بدقة بين الأهداف العسكرية والمدنيين، مما يزيد من احتمالية وقوع أضرار غير مقصودة للمدنيين.

عـلاوة على ذلك، تثـير مسألة تحمل المسؤولية عن أفعال وقـرارات الأنظمة الذاتية التحكـم تحديات قانونية تتعلـق بالمساءلة والالتزام فـي حال حـدوث انتهاكات للقانون الدولي الإنساني.

يقـوم هـذا البحث بتقييـم إمكانية امتثـال الـذكاء الاصطناعي لمتطلبـات القانون الدولي الإنساني ويقترح استراتيجيات لتخفيف المخاطر المرتبطة بذلك. كما يؤكد على أهمية تطوير أطـر قانونية قوية وتعزيز التعاون الدولي لضمان امتثال تطبيقات الذكاء الاصطناعي فـي العمليات العسكريـة للمعايير الإنسانية، مما يحقق توازنًا بين الابتكار التكنولوجي ومتطلبات حقوق الإنسان وأخلاقيات الحرب.

I. Introduction:

Technological developments in the information society have been an important determinant of our lives in the last era. Within the scope of technological developments, artificial intelligence can be defined as a branch of the science of computers and engineering that deals with the development of systems that can perform tasks that require human intelligence. The use of artificial intelligence in military operations, especially in modern military operations, is one of the prominent issues of our day. The widespread use of artificial intelligence in international military operations, in principle, is due to the fact that such technologies can reduce human loss and facilitate the provision of specific information. Nevertheless, the use of artificial intelligence in military operations also constitutes an important problem in terms of international law. Therefore, it is compulsory that the use of artificial intelligence in military operations be carried out within the framework of the rules of International Humanitarian Law.

The 20th-century wars have become more destructive and catastrophic with the development of technological tools. Our age is defined as the age of artificial intelligence and robot wars. The artificial intelligence and robot technologies produced for military operations have become a concern for international law since they cause direct damage to the right to life and violate human rights. This article contains a reflection on the norms of international humanitarian law regarding military operations using artificial intelligence and robots. The article addresses the concept and scope of artificial intelligence and robots, and their impacts are investigated within the scope of the principles of International Humanitarian Law.

This legal and quantitative research aims to study and analyze the use of artificial intelligence in military operations in accordance with the rules of

International Humanitarian Law. The focus will be on the legal and humanitarian issues related to the use of this technology and its impact on the course of armed conflicts, and the following research methodologies will be used:

- **Descriptive approach:** It will be used to describe the current status of artificial intelligence technology in the military field and highlight the most important applications and modern innovations in this field.
- **Analytical approach:** The legal and ethical challenges associated with the use of artificial intelligence in military operations will be analyzed, and the extent to which they are compatible with the principles of International Humanitarian Law such as distinction, proportionality, and responsibility.

II. Objective of the Study:

This study aims to explore and analyze the use of artificial intelligence in military operations and its impact on the rules of International Humanitarian Law. The study seeks to achieve the following objectives:

- **Understanding and clarifying methods and techniques:** Providing a deep understanding of the various methods and techniques through which artificial intelligence is applied in military operations, such as the use of drones, armed robots, and data analysis systems.
- **Analyzing compliance with International Humanitarian Law:** Evaluating the extent to which these technologies are compatible with the principles of International Humanitarian Law, including the principles of distinction, proportionality, military necessity, and humanity.
- **Identifying legal and ethical challenges:** Identifying the legal and ethical challenges arising from the use of artificial intelligence in military operations, such as issues of legal responsibility and accountability when violations occur.

- **Exploring risks and opportunities:** Analyzing the potential risks of using artificial intelligence in armed conflicts, as well as the opportunities it provides to improve the effectiveness of military operations while reducing collateral damage.
- **Evaluating existing legal frameworks:** Studying the current international and national legal frameworks related to the use of artificial intelligence in military operations, and identifying shortcomings that may need to be developed or modified.

III. Historical Context of AI in Military Operations:

The progression of AI in military operations from guided missiles to autonomous weapon systems is a noteworthy historical development that highlights the inventive origins of AI-powered weaponry. With its present applications already influencing the dynamics of international security, artificial intelligence (AI) has evolved into a defining technology in the battlefield, serving as a disruptor, force multiplier, and analytical facilitator(1). From implanted Brain-Computer Interfaces to augmented reality gadgets, the integration of AI with human decision-making processes to improve cognitive performance on the battlefield has prompted ethical concerns(2). While the ethics of utilizing deadly autonomous weapon systems are a common topic of discussion, artificial intelligence (AI) technologies offer more potential for decision support optimization across the military decision-making process, with the goal of improving both performance and moral considerations in military operations. A new philosophy of war centered on quick decision-making is emerging as a result of the integration of AI with conventional

(1) Artificial Intelligence in Warfare. (2023). pp 12-36. doi: 10.4324/9781003218326-2.

(2) Jonathan, D., Moreno., Michael, L., Gross., Jack, Becker., Blake, Hereth., Neil, Shortland., Nicholas, Evans. The ethics of AI-assisted warfighter enhancement research and experimentation: Historical perspectives and ethical challenges. Frontiers in big data, (2022).;5 doi: 10.3389/fdata.2022.978734.

military equipment, highlighting the significance of AI in military applications for enhanced cybersecurity, tracking, and targeting[1].

The integration of artificial intelligence (AI) in military operations has evolved significantly over the decades. Here is a detailed overview of the historical context:

A. Early Beginnings (1950s-1960s):

The conceptual foundation for AI was laid in the 1950s with the work of pioneers like Alan Turing, a British mathematician, who introduced the Turing test in 1950, which measures the ability of a machine to exhibit intelligent behavior similar to humans. This test laid the theoretical foundations for the idea that computers could have intelligence similar to humans. The initial Military interest was manifested during this period through the military exploration of the potential of computers for tasks such as cryptography and logistics. Early AI research, primarily focused on problem-solving and symbolic reasoning, started gaining attention.

The early advances in military artificial intelligence (AI) throughout the 1950s and 60s concentrated on the nexus between computing algorithms and physical structures to enhance AI capabilities. Technologists from MIT and Stanford conducted experiments utilizing «armed algorithms» in microworlds, which are calibrated designed settings[2], with the goal of advancing robotics and artificial intelligence. Furthermore, the military started integrating AI knowledge into its battle plans with the goal of employing cutting-edge AI techniques to destroy enemies' capabilities and make quick, accurate judgments and preparations. During this time, artificial intelligence

(1) H., W., Meerveld., Roy, Lindelauf., Eric, O., Postma., Mark, Postma. The irresponsibility of not using AI in the military. Ethics and Information Technology, (2023).; - Vol. 25, Iss: 1 .doi: 10.1007/s10676-023-09683-0

(2)Li, Yi., Hongje, Cho., Gyun-yeol, Park. The Advent of AI and Its Some Implications to MILITARY AFFAIRS. Journal of Instrumentation, (2020).; Vol. 5, Iss: 1, pp 38-47. doi: 10.22471/MILITARY.2020.5.1.38.

(AI) was only beginning to be incorporated into military applications[1]. This showed how AI may completely change military operations by offering quicker information processing, better targeting, and tracking capabilities. An illustration of this:

- Major militaries, such as the US Army, have begun to invest in computing technology to process and analyze data more quickly than humans can do. Initial applications were related to message encryption and analysis as well as logistical data processing.
- Research centers, such as the Artificial Intelligence Laboratory,were established at the Massachusetts Institute of Technology (MIT) with support from the US Department of Defense. These centers worked on developing algorithms and prototypes for smart systems[2].
- The Defense Advanced Research Projects Agency (DARPA) was established in 1958 in response to the Soviet Union›s launch of the Sputnik satellite. DARPA has begun funding research in the areas of computing and artificial intelligence to improve US military capabilities.
- The Korean War (1950-1953) Although the Korean War did not witness the use of artificial intelligence in the modern sense, it did witness the use of computing in analyzing logistical data and encryption. Computerization has helped improve logistical efficiency and supply management.

B. Cold War Era (1970s-1980s):

Artificial intelligence (AI) was not used as much for strategic purposes in the 1970s and 1980s Cold War era as it is now. However, it is well known

(1) Salem, Elzway. Armed Algorithms. Osiris, (2023).; Vol. 38, pp 147-164. doi: 10.1086/725092.
(2) Liang, Du., Guangdong, Li., Hai, Chang., Heyuan, Hao. Military Applications of Artificial Intelligence. (2020). pp 1067-1072. doi: 10.1007/978-981-15-6978-4_122.

that AI may influence strategic stability. According to research, artificial intelligence (AI) technology can improve decision-making procedures, increase nuclear asset security, decrease human error, and improve the performance of weapons systems by integrating them. Moreover, the potential of artificial intelligence (AI) to significantly impact national security has been recognized, prompting NATO member states to allocate resources towards this technology and integrate it into their military plans. Even while there may not have been as many sophisticated AI applications during the Cold War, it was already becoming clear that AI had significant strategic ramifications for the military and security sector[1].

Significant developments in artificial intelligence (AI) are affecting society broadly. Concerns over the development of an "AI arms race" or "AI cold war that threatens us all," namely between China and the United States, are being raised as part of this. AI was formerly defined as "the science of making machines do things that would require intelligence if done by men" by the groundbreaking researcher Marvin Minsky fifty years ago[2]. The goal of intelligent machines is still far off from reality in the foreseeable future. Instead, algorithm-based machine systems are improving significantly in their ability to self-optimize their performance via a variety of methods, many of which are connected to data matching and pattern recognition.

This might enhance machine systems' capacity to carry out various crucial military tasks with a higher degree of autonomy. Experts in venues like the 1980 Convention on Certain Conventional Weapons (CCW Convention) have been prompted by this to consider the ethical and legal ramifications

(1) A.G., Nadibaidze. The Impact of AI on Strategic Stability is What States Make of It: Comparing US and Russian Discourses. Journal for peace and nuclear disarmament, (2023). Vol. 6 Iss (1):47-67. doi: 10.1080/25751654.2023.2205552.

(2) A.G., Nadibaidze. The Impact of AI on Strategic Stability is What States Make of It: Comparing US and Russian Discourses. Journal for peace and nuclear disarmament, (2023). Vol. 6 Iss (1):47-67. doi: 10.1080/25751654.2023.2205552.

of automated systems that strike or target people without direct human oversight[1].

Conventional warfare's use of robotic systems has dominated CCW talks. Six Certain experts are worried that the application of AI-related research advancements (like machine learning) to automation and increased autonomy in nuclear early warning and command and control could potentially increase the likelihood of nuclear weapons being used, for example as a result of accidents, or negatively affect nuclear stability in other ways. However, there is a lot of ambiguity about this. AI is a fast-developing area[2]. In theory, faster, more dependable, increasingly autonomous technologies might lower the likelihood that nuclear weapons would be used in emergency scenarios by assisting people in making better judgments. The details of nuclear early-warning or command-and-control systems, whether they are in place now or are planned, are not widely shared by states possessing nuclear weapons. It is challenging to predict the extent or kind of practical influence that increasingly autonomous machine systems will have due to this secrecy. However, based on the scant data that is known about the Cold War command-and-control and nuclear early-warning systems, plausible hypotheses regarding AI's potential impact on these systems may be formulated. In light of this, this essay explores the lessons that the Cold War experiences of the US and the USSR may teach us about the effects of automation and autonomy in nuclear weapon systems.

Some terminology-related issues are resolved before moving further with it. We use the words 'autonomy' and 'automation' with caution. Automated machine systems are traditionally controlled by strict regulations that do not allow for flexibility. Even though they are also automated, autonomous

(1) Antonio, Carlo. Artificial Intelligence in the Defence Sector.. (2020). pp 269-278. doi: 10.1007/978-3-030-70740-8_17.

(2) Hanuman, Prasad, Singh. Artificial intelligence affecting strategic stability. International journal of advanced research, (2022). Vol. 10 Iss (03):01-04. doi: 10.21474/ijar01/14356.

systems function more or less independently of humans in the real world as well as in digital or virtual environments. They make decisions about what to do based on an evaluation of the environment as it is at any given time.

The ability to perceive and then choose which is more suitable based on algorithms is what drives the activities. In general, machine systems' technological complexity was lower during the Cold War era than it is now, and it is challenging to discern much autonomy in their operation. However, as the following examples demonstrate, these systems have a significant influence on human nuclear command-and-control choices, which are important both today and in the future as AI permits more autonomous features(1).

In general, "systems incorporating autonomy at rest operate virtually, in software, and include planning and expert advisory systems, whereas systems incorporating autonomy in motion have a presence in the physical world and include robotics and autonomous vehicles," according to a distinction made by some experts regarding increasingly autonomous systems(2). For the reasons that will be discussed below, the aspect of regulating nuclear weapons that is of special concern in this context is how autonomy at rest will affect human decision-making. Systems using algorithms do not "learn" in the sense that humans do. Instead, these methods allow computers to iteratively enhance their capacity to do pattern recognition or matching tasks based on data sets (which often require human curation beforehand), at least in theory if not in reality. These kinds of skills are appealing because they can handle and quickly interpret vast amounts of sensory and other data, which may be useful in emergency circumstances where people have to make snap judgments.

(1) Yifan, Yu. Military AIs impacts on international strategic stability. Applied and Computational Engineering, (2023).; Vol. 4, Iss (1):pp20-25. doi: 10.54254/2755-2721/4/20230339.

(2) BORRIE, J. (2019). Cold war lessons for automation in nuclear weapon systems. In V. BOULANIN (Ed.), The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk: Volume I Euro-Atlantic Perspectives (pp. 41–52). Stockholm International Peace Research Institute. http://www.jstor.org/stable/resrep24525.11.

C. Technological Advancements (1990s):

The 1990s saw the development of machine learning, which includes various algorithms for independent learning. The most promising ones are based on brain-inspired techniques classified as artificial neural networks (ML) algorithms like artificial neural networks (ANNs). These developments made the integration of artificial intelligence (AI) in weapons possible(1). These developments also led to the understanding of AI and the capabilities of microprocessors. ANNs are now commonly referred to as deep neural networks (DNN) and convolution neural networks (CNN) since they have developed larger and deeper structures over time.

The introduction of multicore processors coincided with the advent of ML approaches in a variety of contexts and uses. Recently, some microprocessors have begun to provide application-specific instruction-set design for artificial intelligence applications. As a result, ongoing advancements in microprocessor technology have made it feasible to deploy sophisticated, real-time intelligent applications like as speech recognition, computer vision, object identification, data security, and spectrum sensing. This article provides a summary of the development of artificial intelligence (AI) and explains how the usage of AI has increased across a wide range of application sectors due to microprocessors' growing capabilities.

These developments made it possible to develop more potent processors that could manage sophisticated real-time intelligent applications like speech recognition, object identification, and computer vision. Additionally, AI's introduction of cutting-edge technologies to support combat operations in urban settings, strengthen equipment reliability, and improve decision-making

(1) J., Caballero., Olaya, Perez-Mon., María, D., R-Moreno., Julio, de., Oliveira, Filho. Integral AI-based planning for management of WSNs in military operations. (2023). - pp 341-348. doi: 10.1109/ictai59109.2023.00056.

processes had a tremendous impact on military operations during the 1990s[1]. Artificial Intelligence (AI) techniques were included into Battle Management Systems (BMS) to enable dynamic job planning, resource allocation, and Wireless Sensor Network (WSN) monitoring in order to optimize communications and adapt to uncertain settings [2]. Furthermore, the aerospace and defense industries now have stronger defense capabilities because of to AI's application in security techniques including threat detection and automated reaction to network attacks. But the development of AI also brought to light the necessity of putting capabilities in the context of real mission tasks in order to prevent inflated expectations, as well as the necessity of creativity in order to propel innovative applications using cutting-edge technology[3]. Machine learning algorithms, big data analytics, and advanced sensor technologies have all contributed to the development of AI-based weapon systems, which have improved military operations' speed, precision, and efficiency.

The integration of artificial intelligence (AI) into weapons has been further accelerated by the development of autonomous military systems with better AI decision-making capabilities and the ongoing advancement of microprocessor capabilities, resulting in extremely effective new generation of weapons. AI has the ability to completely transform military operations; furthermore, the development of AI weapon guidance systems in the military sphere aims to improve target precision and allow systems to recognize possible threats autonomously.[4] .

(1) Dasharathraj, K, Shetty., Gayathri, Prerepa., Nithesh, Naik., Ritesh, Bhat., Jayant, Sharma. Revolutionizing Aerospace and Defense: The Impact of AI and Robotics on Modern Warfare. (2022). doi: 10.1145/3590837.3590856.

(2) Chris Whitlock & Frank Strickland ,The Three Imperatives to Develop AI Leaders. (2022). pp 1-11. doi: 10.1007/978-1-4842-8814-6_1.

(3) Fatima, Hameed, Khan., Muhammad, Adeel, Pasha., Shahid, Masud. Advancements in Microprocessor Architecture for Ubiquitous AI-An Overview on History, Evolution, and Upcoming Challenges in AI Implementation.. Micromachines, (2021).; Vol. 12, Iss: 6, pp 665-. doi: 10.3390/MI12060665.

(4) Stanislav, Abaimov., Maurizio, Martellini. Artificial Intelligence in Autonomous Weapon Systems. (2020). pp 141-177. doi: 10.1007/978-3-030-28285-1_8.

D. Post 9/11 and Modern Warfare (2000s-2010s):

Artificial intelligence (AI) technology has been heavily integrated into military operations and national security plans throughout the post-9/11 era and the contemporary wars of the 2000s-2010s. There has been discussion on artificial intelligence's ability to change military operations, as well as its role in warfare(1) . Artificial intelligence (AI) in military applications has demonstrated promise in improving combat capability, reducing human losses, and speeding up decision-making. AI's revolutionary influence on contemporary warfare situation is further demonstrated by the critical role that cutting-edge AI approaches have played in enhancing targeting, tracking, and cybersecurity measures in military operations.

Artificial intelligence (AI) has already begun to appear in warfare, serving as a force multiplier, disruptor, and analytical enabler. These actions have affected the dynamics of international security by tipping the strategic balance in favor of attack and posing a threat to rapid proliferation(2). AI's revolutionary potential in military applications has been demonstrated by the creation of novel warfare theories based on quick decision-making and accurate removal of adversary capabilities, which have been made possible by integrating AI with conventional military technologies. Further highlighting the changing role of AI in national security and defense plans is the debate over the implications of AI for military superiority, the creation of lethal autonomous weapon systems, and the moral and legal issues surrounding AI in warfare(3). Moreover, debates surrounding the potential transformation of

(1) Artificial Intelligence in Warfare. (2023). pp 12-36. doi: 10.4324/9781003218326-2.

(2) Henning, Lahmann., Robin, Geiss. The use of AI in military contexts: opportunities and regulatory challenges. Revue de droit militaire et de droit de la guerre, (2022).; Vol. 59, Iss: 2, pp 165-195. doi: 10.4337/mllwr.2021.02.02.

(3) Implementation of Artificial Intelligence Technologies for Ensuring National Security and Defense Capability of Ukraine: Legal Issues and Prospects for the Post-War Period. Teorìâ ì praktika ìntelektual□noï vlasnostì, (2023). Iss: 3, pp 68-78. doi: 10.33731/32023.282185.

the nature and character of warfare due to AI technologies have been ongoing, with considerations on whether AI will change the essence or just the character of future wars.

Therefore, the use of cutting-edge technology in armed conflicts has presented new ethical and legal issues, even though these innovations have improved military operations and decreased casualties. An illustration of this follows:

1. Adapting war strategies: It has a significant impact on military plans worldwide, particularly those of the US. As a result, attention shifted from traditional interstate conflicts to asymmetric conflicts and counterterrorism. In reaction to these assaults, the US launched extensive military campaigns in Afghanistan (2001) and Iraq (2003) to eliminate Al-Qaeda and overthrow Saddam Hussein›s government(1).
2. Investing more in technology: To improve their capacity to fight terrorism and strengthen national security, the United States and its allies invested heavily in military hardware and artificial intelligence following September 11, 2001. The emphasis was on creating cutting-edge intelligence and surveillance tools and big data analysis to identify possible dangers before they materialize.
3. Electronic attacks: Nowadays, a contemporary military strategy must include them. Countries employ cyberattacks to take down vital enemy systems, such as the financial, communications, and energy infrastructure. The 2010 «Stuxnet» cyberattack against Iran›s nuclear program serves as an illustration of this, as it disabled centrifuges used for uranium enrichment.

(1) 张智敏., 石飞飞., 万月亮., 徐阳., 张帆., 宁焕生. Application progress of artificial intelligence in military confrontation. Chinese journal of engineering, (2020).; Vol. 42, Iss: 9, pp 1106-1118. doi: 10.13374/J.ISSN2095-9389.2019.11.19.001

4. Autonomous systems: These systems are now more advanced and can handle complicated tasks without the need for human involvement[1]. These systems have been deployed for defense, attack, and reconnaissance missions. Unmanned ground vehicles (UGVs) are one example of this; they have been employed to conduct information-gathering and reconnaissance operations in dangerous settings.

E. Contemporary Applications (2020s-Present)

Through its ability to change tactics and enhance operational capabilities, artificial intelligence (AI) will play an increasingly significant role in military operations in the 2020s and beyond. AI is utilized for a wide range of applications, including as intelligence analysis, influence analytics, weapon autonomy, and support for target engagement decision-making. For military operations in urban settings, it is integrated with Battle Management Systems (BMS) to facilitate task planning, resource allocation, and operation monitoring of Wireless Sensor Networks (WSNs)[2].

In the areas of terrestrial warfare, cybersecurity, and space security, artificial intelligence (AI) applications enhance the U.S. Army's decision-making processes, operational effectiveness, and equipment reliability. Furthermore, AI-based Visual Attention Scenario Identification Models aim to improve situational awareness and lessen the risks faced by military personnel by seeing potential threats in challenging terrain. But AI also raises practical, ethical, and legal concerns that make the creation and application of AI-based systems safe and accountable. The application of artificial intelligence (AI) in military operations highlights the need for human judgment in decision-

(1) Atif, Ali., Zulqarnain, Farid., Zeeshan, Ahmad, Khan., Al, Momani. Development and use of Artificial Intelligence in the Defense Sector. (2023). pp 1-10. doi: 10.1109/ICBATS57792.2023.10111113.
(2) Clara, Maathuis. Towards Trustworthy AI-based Military Cyber Operations. (2024) pp129-136. doi: 10.34190/iccws.19.1.1986.

making, the need for meticulous planning, and a full understanding of the legal, technological, and strategic repercussions involved[1]. Developing dependable AI-driven military cyber operations that adhere to global legal frameworks and agreements, ensure responsibility, and reduce unintended consequences is becoming more and more important as AI continues to advance, there has been a lot of scholarly discussion on the ethics of research on improving human performance in a civilian setting.

In addition to developments in related fields like artificial intelligence (AI), which aims to create machines that are capable of performing tasks that would typically require human cognition, and cognitive neuroscience, which studies the structure of the human brain and cognition, this discussion has included considerations for upholding traditional ethical standards[2].

These technologies offer promise to enhance human capacities and performance in a range of tasks through the use of brain-to-brain interfaces and brain-computer interfaces (BCI), which connect people to computers potentially in both directions. Additionally, these domains are related: The study of the human brain and the creation of novel instruments for health diagnosis, treatment, and improvement are made possible by artificial intelligence, which is a key component of neuroscience. Applications include things like using WiFi, enhancing alertness, and suppressing emotions[3]. AI, on the other hand, creates "smarter," more sophisticated computers that can function independently by using understanding of human neurology

(1) Jonathan, D., Moreno., Michael, L., Gross., Jack, Becker., Blake, Hereth., Neil, Shortland., Nicholas, Evans. The ethics of AI-assisted warfighter enhancement research and experimentation: Historical perspectives and ethical challenges. Frontiers in big data, (2022). Vol. 5,doi: 10.3389/fdata.2022.978734.

(2) Jonathan, D., Moreno., Michael, L., Gross., Jack, Becker., Blake, Hereth., Neil, Shortland., Nicholas, Evans. The ethics of AI-assisted warfighter enhancement research and experimentation: Historical perspectives and ethical challenges. Frontiers in big data, (2022). Vol. 5,doi: 10.3389/fdata.2022.978734.

(3) J., Caballero., Olaya, Perez-Mon., María, D., R-Moreno., Julio, de., Oliveira, Filho. Integral AI-based planning for management of WSNs in military operations. University of Alcalá, (2023). pp 341-348,doi: 10.1109/ictai59109.2023.00056.

and cognition. The ability to combine the instinct and lateral thinking of warfighters with the processing capacity of AI makes these convergence sectors especially appealing to industries like the defense sector.

IV. The most important applications of artificial intelligence in military operations.

A-Autonomous weapons:

As per the US Department of Defense and US Congress, autonomous weapons are defined as follows: "a special class of weapon systems that Sensor systems and computer algorithms are used to autonomously identify, engage and destroy the target without human control of the system, and "a weapon system or systems that, once activated, can select and engage targets without additional intervention by a human operator"(1).There are multiple primary types of these weapons, such as unmanned aerial vehicles, or drones, and military robots that are capable of carrying out diverse duties in combat(2).

- Military robots: Depending on their role in a military conflict, military robots come in a variety of sizes, forms, and capabilities. Some of them must endure extreme conditions like heavy smoke and high temperatures in order to move and evacuate soldiers. The US Navy›s SAFFiR robot is one of these types. This robot can handle a variety of combat situations because of its sensors, infrared detecting cameras, and surveillance cameras. These include the robots in charge of engaging targets, launching missiles, and spotting explosives and mines(3).
- Drones: Also referred to as «drones,» these are unmanned aerial vehicles. These are the designations for tiny, remote-controlled airplanes. They

(1) The Ethics of Autonomous Weapons Systems, Nov 2014, accessed Oct 18, 2019, available on:https://www.law.upenn.edu/institutes/cerl/conferences/ethicsofweapons.
(2) Defense Primer: U.S. Policy on Lethal Autonomous Weapon Systems, Congress research service, March 27, 2019, accessed Oct 19, 2019, available on https://fas.org/sgp/crs/natsec/IF11150.pdf
(3) Peter Shadbolt, U.S. Navy unveils robotic firefighter, CNN, February 12, 2015, accessed OCT 19, 2019, available on: https://edition.cnn.com/2015/02/12/tech/mci-saffir-robot/index.html.

were first employed for scientific, environmental, and research purposes, but they were soon turned to military uses, such as spying on people or taking pictures of buildings, and eventually carrying explosives to carry out assaults and attacks and target people and property(1).

B- Autonomous and semi-autonomous vehicles:

Sometimes referred to as Supervised Autonomous Weapon Systems, semi-autonomous unmanned vehicles conduct reconnaissance, espionage, intelligence collection, and target destruction while being supervised by humans in control rooms who can choose the target and issue firing commands. Additionally, there are totally autonomous/fully autonomous unmanned vehicles that use artificial intelligence systems to carry out all of these tasks—including recognizing, destroying, and even ignoring targets—during a mission without requiring any human participation at all(2). These chemicals exist in these forms:

- Unmanned tanks: These are a class of vehicles that can be small or large and are used for a variety of tasks in military conflicts. They have been around since the US Army put the Ripsaw MS1 unmanned tank into service in 2000. It was lightweight and had a limited range of uses. They frequently trail other military vehicles that are remotely controlled and piloted by soldiers. Rapid advancements in the construction of these vehicles have led to the emergence of various forms and styles of light tanks. Its missions were severely limited, though, in February 2019, the US Army called upon a group of artificial intelligence and unmanned vehicle experts to develop self-driving unmanned tanks that

(1) Will Nicol, 9 military robots that are totally terrifying … and oddly adorable, digital trends, March 4, 2017, accessed Oct 19, 2019, available on https://www.digitaltrends.com/cool-tech/coolest-military-robots/
(2) Autonomous Weapon Systems Technical, Military, Legal And Humanitarian Aspects, Geneva, Switzerland 26 To 28 March 2014

are affordable and lightweight, capable of taking on a variety of military targets on their own(1). The goal is to build an army of these compounds that can collaborate and operate as a unit. Experts predict that by 2021, these cars will be in use.

- Unmanned submarines: The US Navy commemorated the world's first unmanned submarine launch in April 2016. Its primary task is to locate and destroy targets in the deep water. It bears the Sea Hunter's name. It can sail despite being 132 feet long. It finds enemy submarines, communicates their whereabouts and all of their data to the control centers, and waits for a response on whether to engage the target or not for months without having any crew members on board at all(2) .

C-Public intelligence and improving the decision-making process:

Artificial intelligence systems examine every bit of data that is accessible from satellites, security cameras, social media platforms, webpages, apps that gather personal data, bank accounts, and sensors that gather data from smart cars and the streets, in addition to the data found in newspapers, magazines, and television networks. radio, novels, periodicals, and television.

In the end, it helps to provide real-time and immediate analyses and scenarios that consider the rapid changes that have become a major feature of this era and are consistent with the state of «uncertainty» that has dominated the analysis of many security phenomena(3). This is made possible by

(1) Darpa's Grand Challenge At 15: How Far Have Autonomous Military Vehicles Come?, Global Defence Technology, accessed Oct 19, 2019, available on https://defence.nridigital.com/global_defence_technology_jul19/darpa_s_grand_challenge_at_15_how_far_have_autonomous_military_vehicles_come.
(2) Dan Robitzski, The Military Wants to Build Deadly AI-Controlled Tanks, futurism, FEBRUARY 27TH 2019, accessed Oct 19, 2019, available on https://futurism.com/military-build-deadly-ai-controlled-tanks
(3) David Axe, The U.S. Army's Robot Tanks Could Arrive Years Early, national interest, October 14, 2019, accessed Oct 19, 2019, available on.

analyzing such a large amount of Big Data. Enhancing the process of making decisions and providing assistance to military personnel in the field, this can be explained through the following:

- Providing real-time information about the conditions surrounding the forces on the ground, either through images from satellites and some websites, or through tweets, comments, posts, and personal videos from locals, in order to support the military forces with information and intelligence. Artificial intelligence technologies assess military operations on social media and news websites and provide soldiers in the field with prompt recommendations.
- Offering logistical support to the armed forces, by means of artificial intelligence systems that gather and analyze data from publicly accessible sources. Examples of such data include the locations of water in areas where the military forces are present, as well as temperature, humidity, and line-of-sight distances. The systems also provide information about civil infrastructure, power plants, paved and paved roads, the endurance of bridges, port capacity, locations suitable for aircraft landing, air supply areas, and electronic and computing infrastructure, including communications lines, the Internet, and hospital locations[1].

D-Control, command and control systems:

Combat forces have many different military missions, whether they are carried out in cyberspace, on land, at sea, or in the air. This makes managing military operations extremely challenging and complex for the decision-maker, as there is a limited amount of time to consider all the options and a lot of information flowing in. The ability to effectively and efficiently

(1) https://nationalinterest.org/blog/buzz/us-army%E2%80%99s-robot-tanks-could-arrive-years-early-88121.

command, control, and administer military operations is contingent upon the continuous use of artificial intelligence technologies. Artificial intelligence systems facilitate the unification of information collection and analysis processes across military units in various fields. This reduces the number of possible scenarios, allowing decision-makers to select the most favorable scenario and assess its potential impact on other combat units(1).However, a lot of weapon systems now rely on artificial intelligence-based command and control systems to monitor, analyze, and make decisions on their own. One example of this is autonomous military drones, which can identify threats and take action against them without the need for human intervention at all. The US Air Force also developed systems to predict malfunctions that could befall aircraft, with the aim of maintaining them before damage occurs or the aircraft is exposed to a major problem while carrying out its military missions.

International Humanitarian Law (IHL) over AI-based Weapon System

International Humanitarian Law (IHL) plays a critical role in the use and deployment of AI-based weapon systems. The use of these systems must comply with the principles and rules of IHL, which aim to protect civilians and combatants from the effects of armed conflict. One of the critical principles of IHL that applies to AI-based weapon systems is the principle of distinction. This principle requires that parties to a conflict distinguish between civilians and combatants, and that attacks are only directed at military targets. AI-based weapon systems must be designed to discriminate between civilians and combatants, and to ensure that only military targets are attacked(2). Another essential principle of IHL that applies to AI-based weapon systems is the principle of proportionality. This principle requires

(1) Artificial Intelligence and National Security, Congressional research service, Nov 21, 2019, available on https://fas.org/sgp/crs/natsec/R45178.pdf .

(2) International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 11 Issue IV Apr 2023,pp3364-3365. Available at www.ijraset.com.

that the harm caused by an attack must not be excessive compared to the military advantage sought. AI-based weapon systems must be programmed to ensure that the use of force is proportional to the military objective sought. Additionally, IHL requires that parties to a conflict take precautions in attack to minimize harm to civilians and civilian objects. This includes ensuring that AI-based weapon systems are not programmed to cause unnecessary harm to civilians or civilian objects. IHL also prohibits the use of weapons that are indiscriminate or cause unnecessary suffering. AI-based weapon systems must be designed to comply with these rules and ensure that they are not indiscriminate or cause unnecessary suffering. Furthermore, IHL requires that parties to a conflict respect and protect medical and humanitarian personnel, as well as civilian objects that are necessary for the survival of the civilian population. AI-based weapon systems must be designed to comply with these rules and avoid attacks on medical and humanitarian personnel, as well as civilian objects that are necessary for the survival of the civilian population. In conclusion, IHL plays a critical role in the development and deployment of AI-based weapon systems. These systems must comply with the principles and rules of IHL to ensure that they are used in a responsible and safe manner and do not cause unnecessary harm to civilians or civilian objects[1].

- **The first requirement:** The extent to which AI-powered weapons comply with the principles of international humanitarian law.

The question of whether already-existing legal regulations are sufficiently clear in light of the unique and possibly unprecedented characteristics of this technology and its impact is raised when pre-existing legal regulations are applied to new technology. It is also unclear if these regulations are essentially

(1) Henckaerts, J.-M. and Doswald-Beck, L. (2005). Customary International Humanitarian Law, VolumeI:Rules. Cambridge University Press. www.icrc.org/en/doc/assets/files/other/customary-international-humanitarian-law-i-icrc-eng.pdf

suitable for application or if new, more appropriate, and precise regulations must be adopted because these weapons challenge pre-existing regulations(1). Nevertheless, there is no question that international humanitarian law can be applied to these weapons, which are subject to the rules of this law because most of them are in fact binding customary principles that are applied in times of conflict, such as the principle of distinction, proportionality, military necessity, and taking possible precautions, in addition to the Martens Clause, which is an effective means in the absence of special legal rules regulating use as follows:

A-Section One: The extent to which AI-powered weapons comply with the principle of distinction

The primary obstacle that these weapons must overcome is the principle of distinction. This principle is a fundamental component of customary international humanitarian law and a non-negotiable peremptory rule that safeguards civilians and civilian property. In addition to being the cornerstone of the provisions of the Additional Protocols to the Four Geneva Conventions of 1977, the principle of distinction is regarded as the fundamental tenet of the law and the most significant idea that needs to be followed in the field. According to Article 48 of Additional Protocol I, "The parties to the war should strive to distinguish between civilian objects and military objectives, as well as between the civilian population and fighters, and consequently shall direct their operations against military objectives, only Regarding civilian objects, international humanitarian law prioritizes granting civilian status to humans and forbids targeting anything that does not qualify as a military target. When in doubt, a target whose status is uncertain should be considered

(1) Dinstein, Y. The Conduct of Hostilities under the Law of International Armed Conflict*. Cambridge University2012 Press https://doi.org/10.1017/CBO9781139048050.

civilian and should not be targeted. The objectives that are defined as military objectives in Article 52 of the Protocol are those that, by virtue of their nature, position, purpose, or usage, effectively contribute to military operations and whose destruction provides a clear military advantage. This principle states that attacking civilians and military targets is forbidden. Since current technology cannot decode between military and civilian targets, in parallel, the principle of discrimination is the most problematic for autonomous weapons, as they do not have the ability to distinguish between civilians and combatants, to differentiate between combatants and non-combatants(1). In this context, Noel Sharkey, an artificial intelligence scientist and founding member of the campaign (Stop Killer Robots), said that: These systems lack the basic elements to comply with the principle of discrimination, and he gave an example in this regard regarding the escape of a mother with her son carrying a fake toy gun, as the human soldier has the ability to interpret and assess the situation as not posing a danger, while the machine does not have that ability. It is worth noting that there is an ongoing debate about the ability of autonomous weapons based on artificial intelligence technologies to distinguish, as studies indicate the existence of major challenges related to(2): The ability of weapons to distinguish, which is the challenge related to the weakness of machine perception. The challenge related to the difficulty of interacting with the combat environment. The challenge related to the difficulty of interacting with the combat environment and the challenge related to software(3).

(1) Schmitt, M.N. ‹The Principle of Discrimination in 21st Century Warfare›, Yale Human Rights and Development Journal,2011,pp. 35–78.
(2) Müller, V.C. ‹Autonomous Killer Robots Are Probably Good News›, *Frontiers in Artificial Intelligence and Application, 2016, pp. 297-306. doi:10.3233/978-1-61499-480-0-297.
(3) Crootof, R. ‹The Killer Robots Are Here: Legal and Policy Implications, Cardozo Law Review, 2015, pp. 1837–1915.

B-Section Two: The Extent of Compliance of AI-Powered Weapons with the Principle of Proportionality

When applying this principle, one must consider the proportionality between the harm done to the enemy and the potential military gains from using force during combat operations. This is because using force against an enemy must adhere to certain principles, the most crucial of which is the principle of proportionality.

The fifth paragraph of Article 51 of Additional Protocol I, which emphasizes that combat operations should not exceed the requirements capable of achieving the military objective, confirms this principle that the parties to hostilities must exercise continuous care by taking all reasonable precautions and avoiding indiscriminate attacks that harm civilians and It need to be restricted to subduing the adversary's might or defeating him. This principle aims to reconcile the competing interests of humanity and military necessity(1).

Frequently, these weapons will not be able to carry out the necessary evaluations without a human operator present. No matter how sophisticated the artificial intelligence technology that comes with the weapon is, it will not be able to recognize battlefield modifications that impact the targets' legality and cause the assault to be canceled. The issue of programming a smart weapon to adhere to the proportionality principle is another issue brought up by proportionality. Theoretically, the algorithms used by an autonomous weapon to autonomously evaluate the principle of proportionality may be configured to adhere to this principle. However, in reality, how can programmers create weapons if even humans can't always determine whether an attack is

(1) Sharkey, N. ‹The Automation and Proliferation of Military Drones and the Protection of Civilians, Law, Innovation and Technology,2011, pp. 229-240.

proportionate that automatically estimate the principle of proportionality[1] ?

AI systems, in addition, rely on mathematical algorithms to identify targets and make decisions. However, assessing potential civilian harm requires an understanding of the environment and context that machines cannot fully achieve. **Proper damage assessment involves the ability to weigh the military benefits of an operation against the potential harm to civilians and civilian property. The challenge is that AI systems are often unable to accurately distinguish between military and civilian harm due to their inability to perceive human factors such as ethical standards and cultural considerations[2].

C-Section Three: The extent to which AI-powered weapons comply with the principle of military necessity.

The preamble to the St. Petersburg Declaration, paragraph 5 of the preamble to the Hague Convention of 1907, the four Geneva Conventions and their first additional protocol, as well as the text of Article 17 of the second additional protocol, all place a strong emphasis on military necessity in international humanitarian law conventions. The use of force to the extent required to gain a military advantage is known as military necessity. Humanity and the military needs must be the foundation for determining the kind and extent of force. Given the state of current weapons and their capacity to uphold the military necessity criterion, some claim that autonomous weapons' capacity to meet the requirements of this principle depends on meeting another principle, which is the principle of distinction, to determine whether the destruction of this target is a military necessity[3]. Compliance with the principle of military necessity

(1) Sauer, F. ‹Stopping ‹Killer Robots›: Why Now Is the Time to Ban Autonomous Weapons Systems›, Arms Control Today, 2016, pp. 8-14.
(2) Brehm, M. ‹Defending the Boundary: Constraints and Considerations in the Use of Autonomous Weapon Systems›,International Review of the Red Cross. (2017), pp. 115-142.
(3) Schmitt, M.N. ‹Military Necessity and Humanity in International Humanitarian Law: Preserving the Delicate Balance›, Virginia Journal of International Law. (2011), pp. 795-839.

also requires that the force exercised by these weapons be limited to the amount of force necessary to achieve the legitimate goal of the conflict. Allowing autonomous weapons to use an unlimited amount of force violates this principle.

Applications of AI in military operations pose new challenges in how the principle of military necessity is applied, especially when offensive decisions are based on big data analysis and automated analysis and AI systems rely on complex algorithms to identify appropriate targets to achieve military objectives. These algorithms must be designed to ensure that military objectives are achieved by means consistent with the principle of military necessity(1).

VI. Ethical and Legal Issues

Many ethical and legal concerns are brought up by the employment of AI in weapon systems, such as the possibility of inadvertent harm or damage, the possibility of malfunction or poor decision-making, and the requirement for human oversight and accountability. AI systems run the danger, for instance, of malfunctioning or making bad decisions that cause damage or unintended injury. Furthermore, because there is a chance that autonomous weapons may be utilized to conduct military operations without the necessary human input, the employment of these weapons raises concerns about accountability, transparency, and human oversight(2).

A. Ethical Issues:

1. Responsibility: Using AI in weaponry begs the question of who bears accountability for the system's decisions. Who is at fault if an autonomous weapon malfunctions or causes harm? Is it the system itself, the operator, or the manufacturer?

(1) Greenwood, C. ‹The Concept of War in Modern International Law›, *International and Comparative Law Quarterly.(2000). pp. 292-309.
(2) Ziyu, Hua. AI Ethics and Governance in Defence Innovation. (2023)pp.59-79. doi: 10.4324/9781003218326-4.

2. Accountability: Concerns regarding accountability are linked to those of responsibility. How can the people who use an autonomous weapon be held liable if it causes harm? Is it possible for an AI system to face the same consequences as a human being?

3. Discrimination: The employment of AI-based weaponry raises concerns regarding discrimination as well. AI systems could not be able to recognize combatants from civilians or determine the proportionality of an attack, which could lead to violations of IHL.

4. Human Control: The necessity of human control over AI-based military systems has drawn ethical scrutiny. While some contend that human decision-making should be included in the weapon system's development and deployment at every stage, others contend that using autonomous weapons completely eliminates the need for human decision-making.

5. Unintended Consequences: There can be unforeseen repercussions from the application of AI in weaponry. An AI system might, for instance, be trained on skewed data and produce discriminating results. On the other hand, an AI system can be susceptible to hacking or malfunction, which could have unforeseen or even disastrous results(1).

6. Proportionality: Finally, there are concerns about the principle of proportionality in the use of AI-based weapon systems. The use of force must be proportionate to the military objective, and there is concern that AI-based weapons may not be able to make this assessment accurately. Given these ethical concerns, many experts argue that there is a need for clear ethical guidelines and regulations to govern the development and deployment of AI-based weapon systems. These guidelines should be

(1) Imre, Négyesi. Social and Ethical Issues of the Military Use of Artificial Intelligence. Advanced sciences and technologies for security applications, (2024).pp.421-430. doi: 10.1007/978-3-031-47990-8_37

based on a clear understanding of the principles of IHL and the need to ensure that the use of force is proportionate, discriminate, and necessary.

B. There are several ways in which the development and use of AI-powered weapon systems may be impacted by ethical concerns around the technology. The following are some significant ways that moral concerns may affect the application of AI in weaponry:

1. Stigma and public perception: The use of AI in weapon systems raises ethical questions that may lead to stigma and an unfavorable public image of these systems. This may affect the governments' and military' desire to invest in the creation of AI-based weaponry and may cause soldiers and other personnel to be reluctant to employ them.

2. Safety and Reliability: AI-based weapon systems' safety and dependability may be impacted by ethical concerns. Should these systems be viewed as immoral or untrustworthy, military people might not have faith in them, increasing the likelihood of them failing during war.

3. Legal Liability: The creation and application of AI-based weaponry may be subject to legal ramifications as a result of ethical considerations. For instance, someone in charge of a weapon system that harms people or transgresses international law may be held legally liable.

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C. There are serious moral and legal issues with the employment of AI-based weapons in relation to International Humanitarian Law (IHL) and the laws of armed conflict.

Because autonomous weapons systems (AWS) function without direct human control, they pose a challenge to the established norms of international humanitarian law (IHL), including military necessity and humanity[(1)]. Weapon guidance systems using AI technology improve target precision and performance, which may lower the danger of armed conflict. The transition to algorithmic decision-making in the military sphere, however, presents difficulties since it could result in dehumanization and unpredictable violence, calling for revisions to international law to govern the application of AI in combat. In addition, it is difficult to assign combatant status to military AI technologies because of the fuzziness of the distinction between combatants and means of warfare caused by these technologies' human-like skills. In addition, it is difficult to assign combatant status to military AI technologies because of the fuzziness of the distinction between combatants and means of warfare caused by these technologies' human-like skills.

A lot of legal questions are also raised by the employment of AI-based weaponry, especially regarding the laws of armed conflict and international

(1) Ahmad, Khalil., S., Anandha., Krishna, Raj. Assessing the Legality of Autonomous Weapon Systems: An In-depth Examination of International Humanitarian Law Principles. Law Reform, (2024). doi: 10.14710/lr.v19i2.58497.

humanitarian law (IHL)[1]. The following are some of the main legal concerns pertaining to AI-powered weaponry:

1. Compliance with IHL: IHL, which regulates the conduct of hostilities in armed conflicts, must be followed by all weapons, including those that use AI. This covers regulations of the separation of people and combatants, the proscription of indiscriminate strikes, and the duty to reduce civilian casualties.

2. Human Responsibility: The employment of AI-powered weaponry begs the question of who bears ultimate responsibility for the choices the system makes. IHL stipulates that there must always be human control over weapons and distinct accountability channels for using force[2].

3. Discrimination and Proportionality: Concerns regarding discrimination and proportionality are raised by the deployment of AI in warfare systems. Artificial intelligence (AI) systems might be unable to discern between combatants and civilians or determine if an attack is proportionate, which could result in IHL violations.

4. Accountability and Transparency: Concerns have been raised over AI-based weapon systems' perceived lack of accountability and transparency. It could be challenging to assign blame for judgments taken.

5. Liability for Harm: Last but not least, there are concerns over responsibility for harm brought about by AI-powered weaponry. If an autonomous system breaks down, who pays the victims' compensation? A rising number of people are interested in creating moral standards

(1) Jan, Maarten, Schraagen. Responsible use of AI in military systems: Prospects and challenges.. Ergonomics, (2023)pp.1-16. doi: 10.1080/00140139.2023.2278394.

(2) Ivana, Zirojević. The use of artificial intelligence in modern armed conflicts. Војно дело, (2024),pp.73-90. doi: 10.5937/vojdelo2401073z.

and legal frameworks to control the application of AI in weapon systems because of these legal concerns. Many experts contend that the foundation of any such frameworks must be a thorough comprehension of international humanitarian law, as well as the concepts of military necessity, distinction, and proportionality.

6. Use for terrorist purposes: Artificial intelligence technologies offer significant opportunities for terrorist groups and organizations, in addition to the state and conventional armies. According to certain sources, ISIS has effectively deployed drones to carry explosives, track, and identify targets throughout the Syrian war(1). The Hmeimim facility and the Russian naval support point in Tartus were the targets of an attempted drone attack in January 2018, which was foiled by the Russian Ministry of Defense. Similarly, in 2018, the Houthis conducted 38 drone operations, including 28 inside Yemen, as opposed to 10 against military installations and events in Saudi Arabia and the United Arab Emirates, which means that the danger of this technology could easily extend to reach the hands of terrorist groups and organizations(2).

VII. International Responsibility for the Use of Artificial Intelligence in Military Operations

A state may be held accountable for transgressing international law through the use of artificial intelligence (AI) technology in military operations. The issue of assigning blame for improper behavior is among the most important modern AI concerns, yet the topic of state accountability under international law is still largely unexplored. Furthermore, the majority of academic

(1) Fareed, Mohd, Hassan., Noor, Dzuhaidah, binti, Osman. AI-Based Autonomous Weapons and Individual Criminal Responsibility Under the Rome Statute. (2023).:pp.464-480. doi: 10.21202/jdtl.2023.19.

(2) Tomasz, Żurek., Jonathan, Kwik., Tom, M., van, Engers. Model of a military autonomous device following International Humanitarian Law. Ethics and Information Technology, (2023). doi: 10.1007/s10676-023-09682-1.

and policy discussions have concentrated on the concerns brought up by autonomous weapons systems (AWS), giving little thought to the problems brought up by other possible military uses of artificial intelligence(1).

The use of artificial intelligence (AI) in military operations is subject to international responsibility, which encompasses several factors including state accountability, adherence to international law, and the requirement for human oversight. States may be held accountable for improper behavior involving AI-enabled military technology, such as neglecting to guarantee adherence to international law during the technology's development or procurement. To adhere to international law, which currently requires human legal agency, the use of AI technologies in armed conflict must be observable and accountable by human agents. Furthermore, a framework guaranteeing that people can rely on the technical elements of AI tools is necessary for the responsible use of AI in armed situations. the behavior of persons engaged in their creation and application, as well as state-level procedures and regulations, to maintain responsibility and adhere to international humanitarian law(2) . But AI technologies are much more comprehensive and offer prospects for optimizing decision support over the whole range of the military decision-making process (MDMP). We cannot pass up these chances(3). Rather than concentrating solely on the dangers associated with employing AI in target engagement, the discussion of responsible AI should (i) address each phase of the MDMP and (ii) take into account improved military operations performance as well as ethical issues.

(1) Mark, Azer. State responsibility in relation to military applications of artificial intelligence. Leiden Journal of International Law, (2022).; Vol. 36, Iss: 1, pp 133-150. doi: 10.1017/s0922156522000607.
(2) Berenice, Boutin. State responsibility in relation to military applications of artificial intelligence. Leiden Journal of International Law, (2022):pp133-150. doi: 10.1017/S0922156522000607.
(3) Dustin, A., Lewis. On ‹Responsible AI› in War: Exploring Preconditions for Respecting International Law in Armed Conflict. (2022).pp488-506. doi: 10.1017/9781009207898.037.

A- The nature of international responsibility and the conditions for its realization:

- **The concept of international responsibility:**

The definitions of international responsibility have varied according to the opinions of jurists; some jurisprudence believes that the state bears responsibility for its actions that cause harm to others outside the scope of this responsibility, criminal or civil; and that the state is responsible for the actions it commits and the resulting harm to the international public order; and the basis of this responsibility is that the state has the will in the field of international relations and is the most prominent person of the persons of international public law.

International law commentators have defined the principle of international responsibility as "the legal penalty imposed by international law on the failure of one of the persons of this law to respect his international obligations." Therefore, it is clear that international responsibility is the penalty that results from violating the rules of international public law, which work to determine the binding nature of its provisions and distinguish its rules from the rules of international courtesies, which are devoid of necessary force and do not result in any international responsibility from their violation[(1)].

B-International Liability Types:

Civil and criminal liability are crucial aspects when considering harms caused by the use of AI in military operations. While civil liability deals with compensation and redress, criminal liability focuses on accountability and punishment for individuals or states.

(1) Crawford, J. Brownlie's Principles of Public International Law. 8th ed. Oxford University Press. (2012), pp. 3-45.

Criminal responsibility:

It is predicated on holding the individual directly liable for criminal acts that constitute a violation of international law. Its goal is to hold individuals and entities accountable for international crimes committed. This liability pertains to people or organizations who utilize, build, or administer intelligent systems in a way that facilitates the commission of international crimes when it comes to the use of artificial intelligence in military operations(1).

The following international crimes could result from the application of AI to military operations:

- War crimes: Grave transgressions of international humanitarian law, like premeditated assaults on civilians or the deployment of weapons that aren't allowed, like using artificial intelligence to locate military targets, which could result in the unlawful targeting of civilians(2).
- Crimes against humanity: Consist of pervasive or organized acts against civilians, including murder, torture, and population transfer under duress. Examples of such crimes include the use of artificial intelligence for unauthorized civilian surveillance or mass arrests(3).

International Civil Liability:

One of the key topics in international law is international civil liability, which is the responsibility of nations or entities participating in the international system for damages arising from their unlawful activities towards other states or individuals. The employment of artificial intelligence in military operations

(1) Sassòli, M. ‹Autonomous Weapons and International Humanitarian Law: Advantages, Open Technical Questions and Legal Issues to be Clarified›, International Law Studies,(2014), pp. 308-340.
(2) Robillard, K. and Yazdiha, H. ‹Autonomous Weapons Systems and International Humanitarian Law: Identifying Limits and the Move Towards Regulation›, Denver Journal of International Law & Policy,(2015), pp. 151–173.
(3) Casey, B. and Niblett, A. ‹Self-Driving Laws: When Artificial Intelligence Misbehaves, Iowa Law Review(2017), pp. 1949–1982.

has raised the significance of this duty. Artificial intelligence-based illegal activities may violate the rights of people or other governments, giving rise to a claim for damages from such parties(1). There are hazards and opportunities associated with the tremendous technological advancement.

An illustration of the use of civil liability in the context of military artificial intelligence One of the most common applications of AI in the military is the harm that autonomous weapons cause to civilians(2).

C- Conditions for the realization of international responsibility:

International responsibility is the fundamental pillar on which international public law is built. It was established to ensure and achieve deterrence and prevent future violations of the rules of international public law and in order to protect potential victims from human rights violations and war crimes. Because every unlawful act that causes harm to others requires the perpetrator to repair the harm, the conditions of international responsibility are divided as follows:

International responsibility for unlawful acts: In order for international responsibility to be achieved for the unlawful acts of the state, it is required that:

1. The state commits an unlawful act.

There is an unlawful act committed by the state; if the act committed by the state is lawful, then in that case, its action cannot result in international responsibility; even if that leads to harm to the other party; However, the state is responsible for its actions if it violates the legal rule or abuses its actions with the intent to cause harm. If it is proven that the state has violated the rules

(1) Van Dam, C European Tort Law. Oxford University Press. (2013)., pp. 96-125.
(2) -Frueh, K. Liability and Autonomy in Military Applications of Artificial Intelligence. AI & Society. (2014), pp. 147-155.

of international law or abused its right, it is responsible for compensating the other party for the damages it has suffered. The act attributed to the state must be internationally unlawful, and the unlawful act must include a violation of the provisions of public international law and the provisions of convention and custom(1).

2. The unlawful act must be attributed to one of the persons of public international law.

The unlawful act must be attributed to one of the persons of public international law. Since an internationally unlawful act can be legitimately attributed to the state if it is issued by the three authorities of the state, which are the executive, legislative and judicial authorities; and whether it is issued by one of the state's agencies as a legal entity or by an employee belonging to one of those agencies; for example, autonomous weapons can be attributed to the state for the action issued by its government agencies or persons affiliated with it who act based on special instructions from the state's oversight agencies(2).

Therefore, countries developing autonomous weapons must enact domestic laws that oblige individuals and companies developing weapons, and that legislation must be consistent with international rules and not violate them. However, the behavior of autonomous weapons can be attributed to the state according to the rules of attribution stipulated in Article 91 of the Additional Protocol of 1977 attached to the four Geneva Conventions of 1949, which stipulates that the state is responsible for all acts committed by persons forming part of its armed forces. This responsibility is based on the principle that the state that commits a certain act must compensate for all

(1) Klabbers, J*International Law. Cambridge University Press. (2017), pp. 6-32.
(2) Shaw, M. N. *International Law. 8th ed. Cambridge University Press,((2017. pp. 435-489.

damages resulting from its act, regardless of whether or not it violated a rule of international law related to armed conflicts, under the pretext of providing protection for the victims of those conflicts(1).

International responsibility for acts not prohibited by international public law:

Due to the technological development that the world has reached today, the resulting effects have gone beyond the use of technology without attributing a mistake to a specific country. As a result of the risk theory in administrative law, international jurisprudence has introduced the name "absolute responsibility" for the theory of risks and bearing dependency, which is based on the illusion of:

- The occurrence of an internationally unlawful incident;
- The occurrence of damage;
- The existence of a causal relationship between them.

As a result of this theory, if a specific project or facility is exploited by a person and this exploitation is accompanied by the emergence of many exceptional risks, in that case the person bears responsibility for any damage that befalls another; even if it is difficult to attribute the error to the project owner.

Regarding the condition of the occurrence of damage, which is a basic condition for applying the risk theory, the damage must be serious; i.e. the damage incurred must be unusual, which provides justification for adopting a more just standard than the standard of risk-based liability; and serious damage results in the resulting damage having a significant and real impact.

As a result of the absence of a binding international text prohibiting or

(1) Crawford, J.State Responsibility: The General Part. Cambridge University Press,(2013).pp. 54-87.

regulating the use of military AI applications, most countries in 2018, at the meeting on the Convention on Conventional Weapons of 1980, stressed the importance of maintaining human control over military AI application systems, maintaining control and using the force that is launched from them; and the assembled countries showed their support for establishing a new international law that regulates lethal autonomous weapons systems. In addition, China called for the need to establish a new protocol attached to the Convention on Conventional Weapons that prohibits the use of fully autonomous weapons systems; in addition to the call of the International Committee for Combating Robotic Weapons, which was established in 2009, to ban these weapons and work on the peaceful use of robots, and to be limited only to serving humanity(1).

Conclusion:

This study indicates that the use of artificial intelligence in military operations represents both a challenge and an opportunity. On the one hand, artificial intelligence technologies offer new possibilities to improve the efficiency of military operations and reduce the loss of human life by improving the accuracy of targets and reducing collateral damage. On the other hand, this technology raises important legal and ethical issues related to compliance with the rules of international humanitarian law, especially concerning the principles of distinction, proportionality, and accountability.

There are still major challenges in ensuring that artificial intelligence systems used in military operations fully comply with the rules of international humanitarian law. Accurately distinguishing between military and civilian targets requires advanced artificial intelligence capabilities, which may not be sufficiently available yet. Additionally, Autonomous weapons raise the issue of responsibility in the event of errors or violations, as it is difficult to

(1) Aust, A. Modern Treaty Law and Practice. 2nd ed. Cambridge University Press, (2007). pp. 211-239.

determine who is directly responsible for the decisions made by automated systems. The study shows that current legal frameworks may not be sufficient to deal with the complexities arising from the use of artificial intelligence in armed conflicts, highlighting the need to develop new laws and regulations. Therefore, while AI can reduce human risks in conflicts, it can also increase the likelihood of conflicts if not managed properly.

Recommendations:

Based on the findings of this study, we offer the following recommendations to promote the responsible use of AI in military operations in accordance with the International Humanitarian Law:

1. Develop new legal and regulatory frameworks: states and international organizations should work to update legal frameworks to keep pace with rapid developments in AI technology, emphasizing the protection of civilians and ensuring that military technologies adhere to humanitarian principles.
2. Establish international agreements: new international agreements can be drafted to set standards for the use of AI in armed conflicts and ensure that states adhere to them.
3. Promote transparency and accountability: clear mechanisms for accountability for decisions made by autonomous systems should be established, and the legal responsibility of the parties involved should be determined.
4. Conduct ethical research and development: research and development in the field of AI should include studying the ethical dimensions of using these technologies in armed conflicts.

5. Impact assessment and future technology: conduct regular studies to assess the impact of current and future technologies on armed conflict and compliance with international humanitarian law.

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