Artificial Intelligence and War: The Role of Drones

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Abstract

The momentous technological advances of the twenty-first century have initiated a fundamental change in the landscape of warfare. Specifically, drones have posed new challenges to the traditional principles of just war. Consequently, this paper seeks to outlinean analytic summary of the scholarly discourse surrounding the evolution of AI technology and drone employment in contemporary warfare and propose some new laws regarding ethical concerns. Within this framework, the paper's focus will be on the legal and ethical issues related to employing drones as weapons, analyzing and contrasting the artificial intelligence strategies promoted by the major players in the worldwide AI race, namely the USA, China, and Russia. The strengths and weaknesses of each country are stated in terms of both descriptive and critical analysis of existing empirical material acquired from ongoing scholarly discussion on this topic.

Keywords: *Artificial intelligence; drones; warfare; USA; China; Russia*

الملخص:

تقدمت التكنولوجيا بشكل كبير في القرن الحادي والعشرين، مما أدى إلى تغيير جذري في مشهد الحروب. على وجه الخصوص، طرحت الطائرات بدون طيار تحديات جديدة للمبادئ التقليدية للحرب العادلة. بناء على ذلك، يسعى هذا البحث إلى تقديم ملخص تحليلي للنقاش العلمي حول تطور تكنولوجيا الذكاء الاصطناعي واستخدام الطائرات بدون طيار في الحروب الحديثة، واقتراح بعض القوانين الجديدة في ما يتعلق بالاهتمامات الأخلاقية. ضمن هذا الإطار، سيركز البحث على القضايا القانونية والأخلاقية المتعلقة باستخدام الطائرات بدون طيار كأسلحة، مع تحليل ومقارنة استراتيجيات الذكاء الاصطناعي التي تروج لها الدول الكبرى في السباق العالمي للذكاء الاصطناعي، وهي الولايات المتحدة الأمريكية، الصين، وروسيا. سيتم توضيح نقاط القوة والضعف لكل دولة من خلال التحليل الوصفي والنقدي استنادًا إلى المواد التجريبية الموجودة والمكتسبة من النقاش العلمي الجاري حول هذا الموضوع.

Introduction

Recognized as the '4th Industrial Revolution' ("Army of None," n.d.), AI has materialized as a tangible force in today's society, promoting many experts to argue that it should be viewed not as a specific weapon but as "an enabler, a general-purpose technology with a multitude of applications" (Horowitz, 2018). While "AI could potentially enable several military innovations, it is not a military innovation itself." Kevin Kelly, a renowned technology expert, linked AI to electricity, suggesting that "just as electricity animates objects around us with power, so too will AI animate them with intelligence." ("Kevin Kelly: 'There Are No A.I. Experts Today' | Fortune," n.d.) It is not only technology experts who stress AI's importance. World leaders highlighted the importance of AI, including Obama, Trump, Xi, and Putin. In September 2017, Putin succinctly captured this sentiment by declaring that the one who succeeds as the leader in AI will essentially rule the world. ("'Whoever Leads in AI Will Rule the World': Putin to Russian Children on Knowledge Day — RT World News," n.d.).

A practical definition of AI is required, given the complexity of the situation. For computer scientists and engineers, no specific definition is universally accepted. Nevertheless, a shared

definition of AI is the ability of a computer system to carry out tasks that ordinarily involve human intelligence, such as speech recognition, visual perception, and decision-making. Yet, since there is disagreement about what defines intelligent behavior, this definition is necessarily oversimplified. Under this standard, a home thermostat is considered intelligent because it can detect and modify the temperature. This is very distinct from AI, which is the prevalent premise for autonomous weaponry in which an unmanned aerial vehicle (UAV) chooses and engages targets without meaningful human control.

Modern military operations and defense systems are rapidly incorporating AI into their operations. "AI is already altering the character of warfare, and this evolution will continue over time as AI technology becomes mature," according to John Arquilla, a military strategist and scientist (Intelligence & Steve, 2023). AI is used in autonomous drones and robotics, intelligent logistics systems, and other military applications requiring productivity enhancement, precision, and safety improvement. However, its usage may also introduce some complex issues regarding ethics and lawfulness and a strategy that requires careful examination.

On the other hand, drones, also identified as UAVs, are increasingly used in military and commercial situations. This has sparked a contentious discussion about whether such "killer robots," as labeled by some ("Arms," 2013), should be explicitly banned. Theoretically, these robots—which may be in the air, on the ground, or in and under the water—incorporate "artificial intelligence" (AI) that would enable them to carry out tasks independently. The question of whether artificially intelligent machines should be permitted to carry out such military tasks, particularly if there is a chance that any human life may beat risk, involves many facets and stakeholders.

Current warfare has witnessed a significant use of AI, especially in the operation of UAVs. One has reduced the possibility of military operations being compromised and made them more precise, while the other has freed humans from danger zones, among others. Nevertheless, it also creates ethical concerns when considering the potential for AI algorithms to act independently or the absence of accountability and transparency in their use.

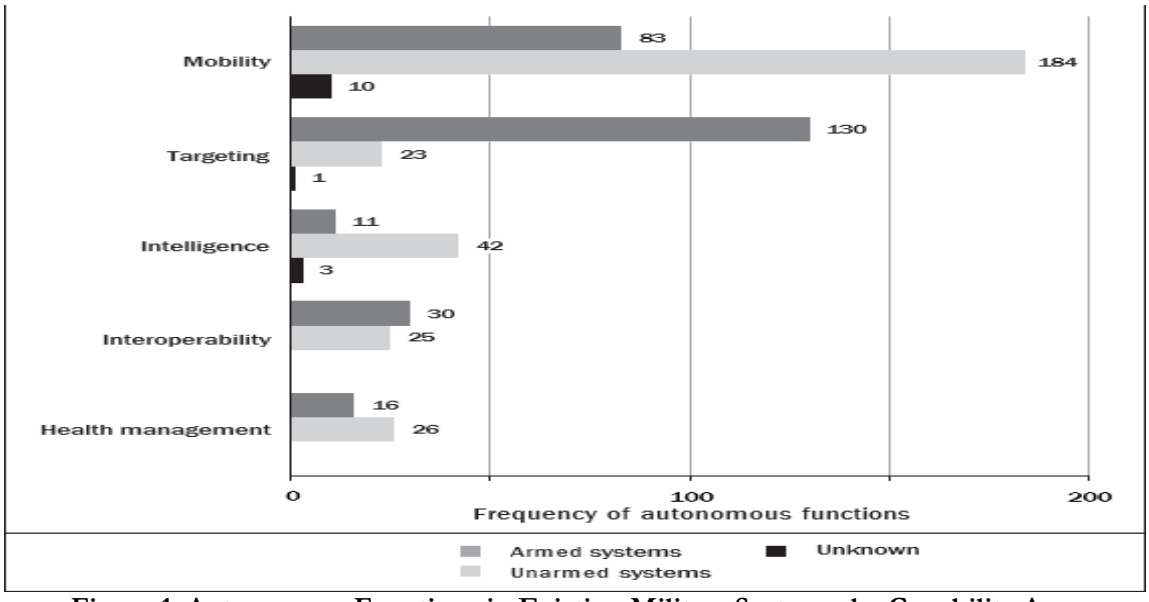

Figure 1: Autonomous Functions in Existing Military Systems, by Capability Area
Source: SIPRI dataset on autonomy in weapon systems (Boulanin & Verbruggem, n.d.)

Extensive research shows that existing military systems already include multiple autonomous functions.These functions can be divided into five capability areas, which are presented here in order of recurrence: (a) mobility, (b) targeting, (c) intelligence, (d) interoperability, and (e) health management, asdemonstrated in Figure 1.

Thus, this comparative study offers a critical review of the impact of rapid developments in artificial intelligence (AI) technologies on the moral and legal implications of drone warfare. It delves into how AI has reshaped conventional ways of interpreting just war principles, leading to complex moral dilemmas. The paper synthesizes previous research findings and academic discussions to emphasize an urgent requirement for new global legal frameworks that will effectively address the ethical problems and risks arising from the use of AI in warfare.

This extensive theoretical framework will help fill a significant void in the literature by synthesizing differing views and unveiling unexplored fields for research, especially within the realms of AI ethics, autonomous warfare, and the strategic consequences of drones driven by AI. The detailed case studies presented in this paper also provide rich empirical data, enriching our understanding of how AI technologies are currently applied in various conflict situations. The paper also presents strategic suggestions for incorporating AI and drones into military tactics, offering insights to strategists regarding the effective utilization of AI technologies that would upgrade operational capacities while addressing security and ethical concerns.

Methodology

This study uses a qualitative research design to examine in detail the different subtle roles that AI and drones play in modern warfare. The main purpose of this research is to uncover the hidden information by using different qualitative data collection methods, which will provide deeper insights and perspectives. Thus, this study provides an opportunity to comprehend complicated matters regarding ethical dilemmas and complications surrounding the application of AI and drones and their modes of warfare in military settings.

Research Questions

This research is an attempt to analyze and comprehend the role of AI in general and drones in particularin modern warfare. As such, the paper will try to seek answers to the following questions:

- How has the incorporation of AI into military drones improved their capabilities?
- What is the effect of AI-driven drones on decision-making in military operations?
- What ethical considerations are there regarding the use of AI in military drones?
- How do international laws and regulations contemplate the use of AI-enabled drones during war?
- What are the possible consequences for future armed conflict due to AI within military drones?
- By what means do different countries employ AI in their UAV projects, and what can be learned from such implementations?
- What laws can be suggested to address ethical problems while considering the established national and international rules?

These research questions could guide readers through a broad understanding, covering the diversity offacets concerning the use of AI and drones in modern warfare.

Data Collection Method

To fully comprehend the subtle use of AI and drones in modern warfare, this paper will implement a data collection method intended to gather qualitative data from different sources. Such following methods willbe used to guarantee a rich and varied dataset:

The first step entailing data collection encompasses conducting a comprehensive literature review. Thisgives rise to a theoretical base and a contextual setting for the study. The chosen sources

will include scholarly journal articles, books, policy documents, and articles from credible databases like Google Scholar, JSTOR, and ProQuest. The researcher will also study the reports and documents published by different governments. The research framework is detailed in Figure 2. The assessment will dwell on major issues, including how artificial intelligence has evolved through history, drone technology changesand deployment, and its ethical considerations. By determining the existing gaps in what has been published so far on the matter, this study will help frame research questions and direct the collection of subsequent data.

Case Studies

Extensive case studies will be analyzed to investigate specific situations where warfare has used AI and drones. The case studies, including China, the USA, and Russia, are selected based on their important role in shaping modern warfare, data accessibility, diversity of conflict areas, trade operations, and results. Each case study will be studied by collecting data from various sources, like military reports, news coverage, and academic evaluations. This will result in each case study outlining the setting, operational specifics, and consequences of utilizing AI and drones in warfare, offering specific instancesto illustrate broader ideas or patterns detected by the study.

Document Examination

Besides primary data derived from literature reviews and case studies, secondary data will be gathered through examining pertinent documents. Such documents may encompass policy papers, military strategy acts or reports, ethical guidelines for the military use of drones or AI technologies during wars, and international treaties governing the usage of drones in warfare. This method of document analysis enhances the triangulation of results obtained from other sources of data, thus providing additional background information and richness to the research.

Data Analysis

Thematic and comparative analysis techniques will be implemented to analyze the collected data thoroughly. The thematic analysis involves coding data in order to identify patterns and themes, while comparative analysis examines similarities and differences across different sources and cases. This approach will offer a diverse understanding of the role of AI and drones in current warfare, adding valuable insights into academic and policy discussions concerning this issue.

Screening Methods for Research Papers Related to AI and Drones

To search for high-impact papers on aerial robots or UAVs that are used in warfare, many of the keywords come from top journals and conferences, including academic databases such as JSTOR, Google Scholar, and ProQuest to access peer-reviewed articles, conference papers, and dissertations related to AI and drone warfare. The collected keywords were grouped into A1, A2, A3, and A4 groupsand searched in various search engines. Then, the results were filtered for the next step. The keyword groupings used and the detailed search method for the articles are shown in Figure 2.

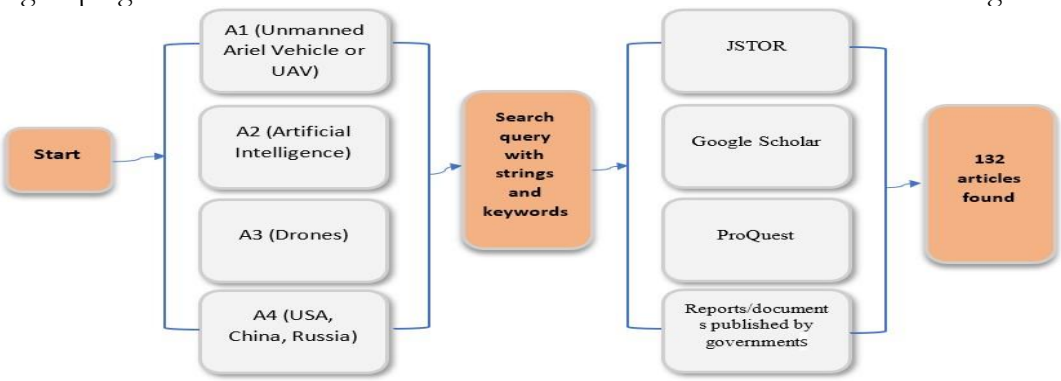

Figure 2: Pipeline for the Literature Search Methods

Literature Review

Scholars face substantive issues concerning the multifunctionality and different functionalities of dronesas they are presented in this form. Through the case studies illustrated by Milic et al., drones have been critically examined in terms of their potential use in urban settings (Milić, Randjelovic, & Radovanović, 2019). Radovanovic et al. demonstrate the feasibility of employing civilian drones for land security zoneprotection and monitoring (Milić et al., 2019). Adamski assesses the effectiveness of Unmanned Combat Aerial Vehicles (UCAVs) in modern armed conflicts (Milić et al., 2019). Jović examines the combat utilization of drones in counter-terrorism operations (Milić et al., 2019).

According to Prussian general Carl von Clausewitz, who wrote the book 'On War', the tactics used on the battlefield have not altered throughout time. Though the nature of warfare will not change, its character will. Clausewitz's followers are aware that violence will increase until a winner is ultimately determined, that war has no boundaries and that it is an undeniable reality. Hopefully, we will learn from the past and recognize that such damage is comparatively uncommon and more hypothetical than actual. Clausewitz explains that this is due to fog, friction, and politics; armies are unsure what lies in the next valley, engines will run out of oil, and politicians will be indecisive (“‘Melancholic and Fascinated’: Artificial Intelligence, Authentic Humanity, and the Future of War » Wavell Room,” n.d.). The fact that humans have constantly avoided destruction is primarily owing to these causes. It has been outlined in Clausewitzian theory that since wars are given their form by human beings, it is justified that drones and other machines were to replace humans in warfare, which would mark a radical shift in war nature. (“‘Melancholic and Fascinated’: Artificial Intelligence, Authentic Humanity, and the Future of War » Wavell Room,” n.d.). Thus, there is a vital need to consider the historical outlook when looking at opportunities for war.

Villacres and Bassford present a powerful argument that AI is regarded to improve combat, reduce suffering, and eliminate friction; it should “de-politicize war, changing it from a phenomenon characterized by an amalgam of reason, irrationality, and non-rationality.” (Villacres & Bassford, 1995).Moreover, Ankerson suggests warfare will evolve towards hyper-rationality (“‘Melancholic and Fascinated’: Artificial Intelligence, Authentic Humanity, and the Future of War » Wavell Room,” n.d.). In this case, AI would only function according to reason and logic. Human weaknesses like fear, partiality, and tiredness will no longer exist, which is a strong argument that the character of conflict will alter as a result. However, the philosophical principle of Clausewitz is that strategy is complex because it involves countless variables and irrational battles. If humans did not exist, social systems where warfare occurs would cease to exist. Our weaknesses largely confine the nature of conflict; thus, it is a product of human nature. The cruelty and sacrifice of battle are essential safeguards, so humanimperfections should not be viewed as signs of weakness.

In his book *Modern Strategy*, Colin Gray stated, “There is a unity to all strategic experience: nothing essential changes in the nature and function [or purpose] in sharp contrast to the character— of strategyand war.” (“Modern Strategy - Paperback - Colin Gray - Oxford University Press,” n.d.). Additionally, for Murray, the fog and friction of battle are part of the character of war, and any claim that thiscan be changed is wrong. He also claims that technology cannot eliminate this aspect of war (“Lifting the Fog of War | Hopkins Press,” n.d.). Besides, “No amount of computing power can anticipate the varied moves and the implications of an enemy’s capacity to adapt in unexpected ways” (Murray, 2024). Therefore, the enemy always has a say in security strategy.

Case studies

China

The Chinese prospect of AI as a strategic technology is crucial for future international competition, whereit positions significant emphasis on its national security and strengthening its competitiveness.

China's new development AI Plan ("Full Translation," n.d.), released in July 2017, sets out how to be among the key players worldwide in the AI sector by 2025. Furthermore, the Made in China 2025 plan also represents China's desire to develop a sophisticated manufacturing center through the adoption of Fourth Industrial Revolution technologies such as artificial intelligence ("Is 'Made in China 2025' a Threat to Global Trade? | Council on Foreign Relations," n.d.).

In this pursuit, China aims to stand against the dominance of the USA in civilian and military domains. In this context, Beijing adopts the strategy of 'civil-military fusion,' blurring the lines between civilian and military resources to advance science and technology ("China's Military Looks to Civilians to Boost Innovation | Free IISS Analysis," n.d.). This approach targets harnessing all national resources, academic institutions, the military, and private enterprises to boost military modernization and economic growth ("Whoever Predicts the Future Will Win the AI Arms Race – Foreign Policy," n.d.). AI takes center stage in the intelligentization doctrine, where generals can use satellite images or global tracking system information on soldiers across continents for strategic decision-making ("China's Ambitions for AI- Driven Future Warfare | CSBA," n.d.).

A revolutionary transition is taking place in the Chinese military, particularly the Peoples Liberation Army, as they focus more on UAVs than human agents for special operations ("Drone 007: Chinese Military Plans to Replace Human Agents with Machines in Special Operations Overseas | South China Morning Post," n.d.). This combination of state-of-the-art technology and strategic military motives is a remarkable change from the established practices on conflict and monitoring in China.

The transition to Drone Technology ("Drone Technology," 2024), was led by a unit in PLA, referred to as 78092, whereby they partnered with scientists from Chengdu. To such an effect, advanced UAVs are to be developed that can perform various tasks accurately and in a concealed manner, as reported by the South China Morning Post ("Will Drones Replace Human Agents in Chinese Military Missions within 10 Years?," 2024). These drones have unique abilities, including flying for long distances, moving underwater, and performing continuous surveillance for extended periods. This is so that they respond quickly to threats and disappear before they can be detected, an ability unattainable to human agents. This method is consistent with China's policy of non-involvement because these UAVs do not require any contribution from Chinese figures in foreign matters.

In a theoretical operation set in 2035, the PLA outlines a conflict with a neighboring country where drones assume a crucial role ("China's Revolutionary Drone Strategy," 2024). The war operation uses little equipment to cut costs and avoid escalation, focusing on small arms and UAVs. Given such a situation, the mission sets out to hit a command center responsible for vital roles using drone devices that carry torpedo deployment mechanisms to enable them to fly underwater and escape enemy radar by maintaining low heights during their flights. These drones have post-strike damage assessment and enemy follow-up capabilities after a hostile target is compromised, which means it becomes possible to successfully achieve any task objective if they are employed as intelligence assets during combatoperations.

The development of China's UAV program is inspired by the United States armed forces; however, they are trying to exceed it. PLA aims to dominate the UAV field by exploiting the industrial capabilities of its civilian drone. The ultimate goal goes beyond possessing better technology; it transcends to being superior in acquiring cost-effective drone technology, daunting infrequent difficulties for other competitors.

The USA

In 2014, the USA Department of Defense (DoD) released its Third Offset Strategy, placing its focus on making sure that it maintained its strategic superiority over near-peer competitors such as Russia and China by integrating AI into the military domain (Gentile et al., 2021, pp. 2014–2018). This strategy outlines how technology can be harnessed to mitigate the military disadvantage face to face with these competitors, with a strong focus on human-machine association, termed the 'Centaur Model' (Horowitz, 2018). The goal is to combine the strengths of humans and machines to complement each other by addressing their respective weaknesses.

Given this perspective, the Pentagon's AI strategy, released in February 2019, specified these areas to prioritize: application of AI for enhanced situational awareness, decision-making process support systems (DPSSs), equipment safety measures, prognostic and health management (PHM) actions, as well as optimization of business operations (Blackburn, 2018). The overarching aim is to enhance troop capabilities by relieving them of tedious and cognitive tasks. This includes delegating tasks to AI that humans may find dull and time-consuming, such as analyzing surveillance data ("Pentagon's Artificial Intelligence Programs Get Huge Boost in Defense," n.d.). For instance, the DoD's Project Maven increased in funding significantly from 2018 to 2019, focusing on analyzing feeds gathered by several drones ("Pentagon's Artificial Intelligence Programs Get Huge Boost in Defense," n.d.). Besides, robots carry out hazardous tasks in the field, such as detecting improvised explosive devices (IEDs). Regarding the business sphere, the top companies, including Facebook, Apple, Amazon, Netflix, Google (FAANG), and Microsoft, outdo their Chinese counterparts in terms of having access to data thathave proven critical for the AI technology evolution.

The US Army has been using drones for almost a hundred years, flying them in times of war since World War II. Ever since then, they have been used by military forces for surveillance and strikes, especially in the Iraqi and Afghan wars. Only in recent years have US troops come to face off against hostile drone aircraft, albeit not as sophisticated or big machines, but small commercial unmanned aerial vehicles converted for offensive attacks.

In 2017, ISIS initiated numerous drone attacks each month in northern Iraq and Syria. Despite the adaptation of new tactics and technology by US troops and their Iraqi counterparts ("How the Army Out- Innovated the Islamic State's Drones - War on the Rocks," n.d.), modified drones continued to pose a threat to US forces in northeastern Syria in early 2020. General Frank McKenzie, the top US commander in the region at the time, attributed these attacks to the remnants of ISIS ("Drones Are Being Used to Drop Bombs on US Troops in Syria," n.d.). Drone wars have been initiated under the purview of the US Deputy Secretary of Defense in a current setting through the launch of a daring "Replicator" projectmeant to commission several smart war drones within 18–24 months ("US Military Plans to Thwart China with 1,000s of Autonomous War Drones," 2023). This focuses primarily on averting suspected Chinese aggression on Taiwan.

The US committed to deploying thousands of self-sufficient drones by September 2025, some with flying capabilities and others that can move on the ground, swim in water, and even orbit around space. Thesemachines have the potential to operate independently without being controlled by people, specifically incases where there is no network communication. In addition, these drones could be created as "dispensable," implying their level of importance. Besides, as stated by Hicks, all robots developed by the Replicator initiative must use AI and autonomous systems in ethical ways ("US Military Plans to Thwart China with 1,000s of Autonomous War Drones," 2023).

Russia

When compared to the USA and China, Russia is frequently not considered a "frontrunner in the global AI race" ("A Closer Look at Russia's AI-Powered Artillery," n.d.) and is sometimes

regarded as an outsider in this regard ("The Outsider: Russia in the Race for Artificial Intelligence | Policy Commons,"n.d.). Russia does not hold up its competitors concerning the metrics of assessing technological capabilities, especially the number of patents, publications in journals, and total investment in research and development (R&D). Its digital economy is viewed as poor, with fewer private individuals involved. Although Russia boasts a solid basis in mathematics and basic sciences ("Whoever Predicts the Future Will Win the AI Arms Race – Foreign Policy," n.d.), the country struggles with enticing the gifted workforce that would develop AI as many talented people prefer to relocate to the USA, where there are more favorable terms. Unlike China or the USA, AI strategy implementation and innovation in Russia are significantly determined by companies owned by a state (Petrella, Miller, & Cooper, 2021). Like China, Russia has delegated the development of technology roadmaps to various state-owned entities. To illustrate, Rostec has been mandated to create a 5G implementation roadmap, whereas Rosatom is responsible for developing a quantum computer roadmap. Also, entities created by the state, such as Sberbank, Rostec, Yandex, and Gazprom Neft, participate in the evolution of AI systems for different tasks, including, but not limited to, refining banking operations, strengthening the military-industrial complex, autonomous automobile creation, and optimizing oil production (Petrella et al., 2021).

Russia's 2019 AI strategy, as outlined by the Ministry of Digital Development, Communications, and Mass Media of the Russian Federation, along with reports from Bendett (2019) ("Дорожная Карта Развития «сквозной» Цифровой Технологии «Нейротехнологии и Искусственный Интеллект» :: Министерство Цифрового Развития, Связи и Массовых Коммуникаций Российской Федерации," n.d.), sketches a goal for the country rank as one of the most aggressive players when it comes to AI. This is expected by reinforcing current strengths regarding science, engineering, and mathematics while making programming competence available to all. Nevertheless, Russia has been relatively reserved regarding its intentions regarding military applications of AI, as noted by Bendett (2019) ("Sneak Preview: First Draft of Russia's AI Strategy - Defense One," n.d.). Despite this, there is a conscious awareness from the Russian side, which is attempting to incorporate machine learning into its defense force. Any other objectives are still kept secret, but the latest news shows Russia has already started using artificial intelligence systems to create more effective arms. In general terms, this nation's strategy for using AI in military areas encompasses two main factors: the incorporation of AI elements in available types of weaponry and platforms and the application of asymmetrical tactics underpinned by AI. Theoretically, AI is introduced into several weapon systems for Russia, such as electronic warfare, air defense, guided missile systems, and drones.

Since 2009, Russia has devoted many resources to developing UAVs, mainly for military purposes. These drones have been used for different functions like spying, targeting, electronic warfare, and outright attacks. Since 2014, few UAVs have been utilized in places of conflict like Ukraine and Syria. However, as of early 2022, combat UAVs such as the Orion and Altius were still in the research and development phase.

Following a year of warfare in Ukraine, the Russian military suffered significant losses in its tactical reconnaissance and targeting of UAVs. Despite continued attempts, advanced combat UAVs have not been deployed. By the fall of 2022, approximately six months into Russia's full-scale invasion of Ukraine, the country had commenced massive utilization of Iranian loitering munitions.

The Russian military strategies for UAVs and its UAV industrial infrastructure faced notable challenges due to extensive aggression against Ukraine. Following the invasion and subsequent Western embargoes,along with the dwindling financial, technological, and human resources available to the Kremlin, Moscow's UAV projects initiated in the 2010s faced significant delays and obstacles.

According to open-source intelligence from Oryx, between February 24, 2022, and September 13, 2023, there were approximately 300 confirmed losses of Russian reconnaissance and combat UAVs in Ukraine, as evidenced by photographic or video documentation. These losses included 183 Orlan-10 drones and their variants, thirty-eight Eleron drones, thirty-eight Zala drones, six Orion drones, and six Forpost drones, among others ("Russia's Drone Industry Hits Serious Turbulence," n.d.).

The Russian government recently released a blueprint for how the country will work with drones until 2030. For instance, over 330,000 people will be involved in research and development on UAVs by theyear 2026, as per this plan. In addition, the expectation prevails that, up to 2030, at least one million individuals will take part in manufacturing and operating drones. Nevertheless, by 2035, this figure is projected at one and a half million people. Another aspect outlined by the strategy includes provision for the manufacture of approximately 177,700 drones during the 2031–2035 period ("Правительство утвердило Стратегию развития беспилотной авиации до 2030 года," 2024). However, the basic scenario and the progressive one described in the strategy are split from the realities of the Russian labormarket and demographic tendencies.

Hence, the crisis in the drone manufacturing sector of Russia is expected to last or even deteriorate over the next few years, hindering the addressing of numerous questions concerning drone manufacture, especially in military zones, by Russian authorities. However, abandoning this model is politically unfeasible for the Russian political elite, as it serves as an additional mechanism for redistributing resources in favor of the military sector alongside other arms procurement programs. Subsequently, regardless of government hard work, the Russian armed forces are likely to become increasingly reliant on consumer-grade small drones for exploration purposes and simple loitering munitions, known as expendable drones, for short, medium, and long-range strikes. This signals the onset of Russia's decline, if not stagnation, in exploration, targeting, and high-precision weapons shortly. Russia might face obstacles to regaining its prominence in this domain of military power within a short period because of the notable strides Ukraine has made in employing military drones with support from its allies.

Ethical Analysis

Technologies generate moral accountability gaps. Addressing them requires appropriate technical solutions and legal regulations ("NATO Review - Autonomous Military Drones," 2017). Advanced weaponry that relies on technology has become prominent in modern warfare. Ethical issues arise from the use of AI and drones in wars. Just war theory, accountability and transparency, bias, and the unintended consequences and limitations of humans and AI are central to these problems. Hence, this paper examines the various ethical concerns surrounding such technologies from a military perspective.

Just War Theory

The Just War Theory is an important framework for determining the morality of warfare and ensuring fairness in armed conflict. The importance of this theory is more pronounced in the context of modern warfare, where advanced technologies such as drones and AI have a great impact. There are several important principles that guide the application of Just War Theory to the use of these technologies:

- Warfare can only be conducted for a fair reason, including self-defense or saving innocent lives. The use of AI and drones must conform to these justifications, guaranteeing that they will not be used in wrongful aggression or provincial conquest. Thus, the use of drones and UAVs should be utilized for real justification and humanitarian protection only.
- Only those who are rightfully recognized or have legitimate authority can declare war. This principle guarantees accountability as well as supervision in terms of using AI and drones during

war. Additionally, it helps deter unwarranted utilization of such technologies, hence encouraging responsible leadership.

- The main purpose of war should attain a just result, such as reestablishing peace, instead of running for ulterior motives like economic advantage. In this context, UAVs should lessen injuries and promote peace through humanitarian objectives while emphasizing ethical warfare principles. Accordingly, it is necessary to devise principles guiding the use of AI and drones in conflict scenarios.
- The initiation of war should take place only if there is a sensible and realistic chance of success. It is necessary to have an in-depth analysis of how effective and reliable AI and drones could be to ensure attaining strategic goals. Unjustified employment of such technologies without a clear, pre-marked road to success would be unethical.
- Before restoring to waging war, all non-violent options must be considered. The application of AI and drones should always come after thorough tenets of diplomacy, along with other alternatives to peace.
- The anticipated outcomes of warfare have to be commensurate with the probable consequencesas far as injury is concerned. This implies that employing artificial intelligence and UAVs in warfare aims at reducing causalities and minimizing unintended harm. Usage should be weighed out and regulated based on the non-excessive harm inflicted compared to the advantages gainedby the military.

Accountability and Transparency

The operators and developers of AI technologies must be held accountable for their actions. This includesestablishing a transparent framework for any oversight and accountability. Thus, everyone involved in the design process, deployment, and management of these technologies will be accountable for their choices and the consequences of their use. On the other hand, all organizations involved in deploying AIin warfare should uphold transparency, which is vital regarding the decision-making process in warfare.This means that the methods and criteria used should be open to questioning and examination, while at the same time, they need to be clear and pertinent to stakeholders. Consequently, such a level of transparency fosters trust and supports the ethical evaluation of the military use of AI.

Bias and AI Algorithm

It is extremely important to prevent any kind of prejudice in AI algorithms to evade targeting and discrimination. AI systems need to be properly designed and thoroughly tested in order to eliminate biases that lead targeted individuals and groups into excessive harms. This also means that the developers should continuously monitor the algorithms and update them where necessary to ensure fairness and transparency in their application and avoid favoritism.

Human Recognition vs AI Limitations in Warfare

There are various perspectives regarding the obligations of autonomous weapon systems. In his "The Case for Ethical Autonomy in Unmanned Systems", roboticist Ronald C. Arkin (Arkin, 2010), claims that computers would find it hard to operate autonomously. He points out that current AI systems have yet to accurately mimic human cognitive functions to allow humans to be original and recognize similarities. For example, differentiating between soldiers and innocent civilians remains a prominent obstacle for unmanned weapons systems, a mission easily performed by humans.

An advanced authorization system must be in place to enable the progress and certification of aircraft that use this technology, which is considered one of the most challenging obstacles since safety and usageexpectations must be met. For example, compared to ordinary aircraft, the development of intelligent drones requires extensive programming, making them practically unreliable and unstable

against the challenging standards performed by manned aircraft.

Identification Challenges

Human-machine partnership, an intermediate perspective of autonomy where humans collaborate with artificial intelligence, is far more reasonable ("Trustworthy Human-AI Partnerships - PMC," n.d.). A combination of human inventiveness and clear, impartial decisions conducted by computers are characteristics of this method. One of the main challenges facing the development of fully autonomous UAVs is that they cannot accurately differentiate between enemies and allies. At the same time, individuals also find it challenging to arrive at wise decisions about conflict, and this is evident in many cases of crimes against humanity committed during wartime. This means that the partnership between humans and machine gun systems is a shared control system where humans partake in ethical responsibility laid down in different international instruments that regulate armed activities. This partnership eliminates moral ambiguity, as the drone's actions are ultimately attributed to the human operator.

The roadmap for Unmanned Systems between 2007 and 2032, issued by the DoD, provides another reason to develop self-reliant weapons platforms. It also indicates that machines are better suited for tasks falling within the ambit of "dull, dirty, or dangerous missions" ("Military Review," n.d.). For instance, lengthy sorties represent monotonous missions, while those involving exposure to harmful radiological substances typify unsanitary ones. Meanwhile, explosive ordnance disposal exemplifies hazardous missions ("The Strategy Bridge," n.d.). According to the US Department of Defense, $850,000 is the annual upkeep cost of a soldier in Afghanistan ("Pros and Cons of Autonomous Weapons Systems," n.d.). Francis, however, a TALON robot costs as low as $230,000; this particular type of robot has been described as a compact four-wheel vehicle that can be mounted with a range of weapons ("Pros and Cons of Autonomous Weapons Systems," n.d.).

Human Limitations: Physical and Mental Stress

Another dimension to be explored is that fighter pilots may be exposed to physical and mental stress when pulling high-G maneuvers, in addition to a high level of attentiveness and staying aware of the situation. Such aspects cause tiredness and weariness in a human pilot. However, these physiological limitations do not apply to drones or robotic pilots. Moreover, programming fully autonomous aircraft to execute actions that are genuinely random and unpredictable could potentially perplex adversaries.

Ethical Advantages of AI in Warfare

Supporters of fully autonomous weapon systems, like Ronald Arkin, claim that nowadays, unmanned weapons can display better behavior perspectives in war than people. They might have flaws, but it is worth creating them as long as they are more ethical. They can reduce collateral damage and property destruction to a vast extent. Arkin proclaims that no human being could ever run as fast, be as intelligent, or have more strength than robots, signifying that they would behave ethically (Arkin, 2010). Indeed, it is difficult for people to distinguish between fighters and civilians; however, some robotic systems that are fully self-contained may outperform human beings in every way during combat operations in the future.

Robots do not prioritize self-protection when faced with unclear or indistinguishable targets, including innocent civilians. Dissimilar to humans, autonomous robots are known for their inability to possess self-preservation, let alone prioritize it. Military officials argue that fully autonomous robots could be used in a sacrificial way with which they could avert war crimes since they lack human emotions. At the same time, current AI technology cannot imitate various human knowledge and skills despite its validity. If humans were completely extracted from UAVs, it would lead to the desertion of their stored knowledge to deal with unexpected circumstances—something that

computers do not excel at. Present artificial intelligence still cannot accurately simulate the nuanced psychological processes of human cognition that enable creativity and pattern recognition. For instance, fully autonomous weapon systems struggle to differentiate between combatants and non-combatants, a task that humans typically find less challenging.

Human-Robot Partnership

Opting for a human-robot partnership strategy is a more discerning choice when compared to having entirely independent unmanned machines. Also, it is an approach that can easily be put into practice because it combines human operators' creativity with drones' sensor capabilities and highly developed data processing systems. Humans should focus on decision-making, particularly in situations that are not clear to a person, like unseen targets in reduced visibility conditions; meanwhile, the computer focuses on the collection and processing of data.

Humans, being part of drone operations, are constantly aware of the drone's settings and thus held accountable for their actions; this notion is omitted from fully autonomous systems. Additionally, the human operator can leverage additional data acquired from the computer to make wiser choices. For instance, the human operator of a naval vessel can use sensor data to classify objects around him and settle disputes about objects whose identities are unclear. This partnership model gives drones more independence with fewer human direction requirements for their operation and reduces costs. However, pivotal choices, such as stopping a target, remain within human control.

Within the approach of human partnership, the human operator has a clear responsibility for what the drone does, which is an ethical border within which they make decisions based on the rules of war. In a mission, for instance, the drone sees enemies on the ground and then alerts the human partner using its highly efficient sensors and data processing, which sometimes outdoes human abilities due to the militaryscenario influencing human targeting.

It falls upon the human operator to utilize all the advanced information provided by the drone to determine the ethical permissibility of carrying out the strike. In this case, there is no doubt about who is responsible for what the drone does. The drone collects and processes data and follows particular instructions without human supervision. Nevertheless, key choices, especially when it comes to lethal force, are still taken by the human operator. This implies that the drone operator will bear full responsibility for what will happen next.

Downsides of Human-Robot Partnership

Human-robot interaction is about "how people work or play with robots" (Scharre & Horowitz, n.d.) at work or leisure. Robots, being distinct "physically situated agents" compared to other computers or tools, interact differently with human beings. This area of inquiry transcends engineering, embracing psychology, cognitive science, and communications (Scharre & Horowitz, n.d.).

Even though human-robot partnerships in drone operations are realistic and benefit from their respective strengths, this approach has its downsides. Advocates for full automatization in warfare argue that humans are unable to make ethical decisions when facing real-life situations that include chaos like military conflicts ("Autonomous Drones Have Attacked Humans — This Is a Turning Point," 2021). Furthermore, employing drones may lead to humans being emotionally detached from the victims, eventually worsening dehumanization and hence increasing the chances of involvement in war crimes.

If emulating human behaviors and decisions becomes practical, drones might independently make moral decisions. Robotic technology could alternatively enable a more ethical performance than humanity, thereby significantly reducing the incidence of war crimes and immoral behaviors

that occur during conflicts ("Autonomous Drones Have Attacked Humans — This Is a Turning Point," 2021).

Operational and Ethical Barriers to Autonomous UAV Deployment in Conflict Zones

It could be difficult to assert with conviction that UAVs qualify for operation under the Law of Soldiering principle, which requires distinguishing between military actions governed by just war traditions from others. Moral assessments concerning acceptable targets in battle are not easy for common troops either. Embedding AI into unmanned drones is feared to trigger unintentional deaths of innocent civilians and other sorts of damages that are considered outrageous. Yet, it is unclear if they could estimate proportionality before striking to avoid needless anguish.

Moreover, beyond the uncertainty surrounding the future potential of autonomous drones to make such distinctions, it is argued that if these weapon systems are unable to operate as required by the 'law of war,' they would be unlikely to be deployed, especially in operational conditions where there is a high risk of causing undue harm to the civilian population.

Discussion

The revolution of the 21st century is embodied in the utilization of AI in military technology, especially drones, which play a crucial role in today's warfare. It is evident that drones are utilized by various nations in numerous military operations to exploit their unique abilities.

The first significant application of drones in combat came during the Afghanistan War. US military officials used drones for carrying out reconnaissance and surveillance missions in order to gather information that significantly helped to identify the positions of Taliban fighters. Moreover, drones enabled the US forces to launch pinpointed strikes against top Taliban commanders. Across the world, other disputes have also engaged drones. Specifically, the US military employs drones for surveillance, reconnaissance, and strike missions against ISIS positions in Syria. In Pakistan, Libya, Yemen, and other turbulent nations, the CIA carried out targeted killings through remotely piloted UAVs. The fact that by2014, the US Air Force was already training more drone pilots than any other type of human-flown aircraft is revealing in this respect ("Dilbert at War," n.d.). The Pentagon predicts that 70% of USAF aircraft will be remotely piloted by 2035, yet we are only at the beginning of this development. However, the drone race has now become a worldwide phenomenon, with analysts predicting at least 80,000 UAVs and two thousand attack drones to be produced in the next decade ("Killer Drones: How Many Are There and Who Do They Target? | Drones (Military) | The Guardian," n.d.).

Many countries have a robust enthusiasm for drones, not only the Pentagon. The employment of unmanned flying devices was observed in almost forty regions in 2005. In 2012, their quantity reached up to seventy-six. Presently, over ninety states, including nearly all members of NATO, own such planes, and at least sixty-three produce them (Bergen & Rothenberg, 2014). However, the widespread use of LAWs (Lethal autonomous weapons) is supported by their comparably inexpensive cost that of conventional aircraft, occasionally quite basic avionics, and most of all, their adaptability: The Stockholm International Peace Research Institute estimated that there were 381 different automated military systems in operation in 2017, with 175 of them having offensive capability (Boulanin & Verbruggem, n.d.).

There is no shortage of diversity; the arsenals contain drones of all shapes and sizes, from tactical rucksack-sized drones to aircraft that can stay in the air for more than 30 hours while surveying 100,000 square kilometers of ground per day with their incredibly accurate sensors. Models are developed to be launched from ship decks and even underwater from submarines. Drones with rotary wings and fixed wings are frequently used. But why limit ourselves to only the third

dimension? As previously mentioned, military AI has undergone tremendous development for use on Earth as well. Although the initial uses of this technology were limited to risky mine-clearing or explosive weaponry dump operations, the most recent generation of these platforms now incorporates offensive armament, enabling effective engagement with the foe. Regarding this matter, General Robert Cone, a former commander of the United States Army Training and Doctrine Command (TRADOC), said that in ten years, at least a quarter of the land forces will be made up of robots ("U.S. Army General Says Robots Could Replace One-Fourth of Combat Soldiers by 2030 - CBS News," n.d.).

Similar advancements are conducted in the military, where remote-control micro-submarines coexist with autonomous surface vehicles. These vehicles were first utilized in rescue missions before being deployed for minesweeping, surveillance, and intelligence gathering. The most recent advancements concern platforms that can operate in underground environments, which are especially useful in urban areas where ongoing conflicts are taking place. At the same time, there are upcoming buildings with very creative biomimetic engineering solutions focused on implementing live-fighting robots.

In this case, digital technologies drive these robots beyond human capacities; we will see those getting more lightweight, fast, and lethal over time. The result of AI advancement will be intelligent weapons systems capable of choosing targets and making decisions about whether to launch an attack on their own, according to the United Nations Institute for Disarmament Research (UNIDIR). Above all, their cognitive capabilities will increase, and the remote presence of a human operator will become increasingly marginal.

What are the significant military transformations brought on by drone warfare? How should we interpret this powerful unleashing of technology? When there is no longer any connection between the territorial area that the force is projected upon and the force that is exerting power. We may thus ask if the introduction of LAWs into war situations indicates types of post-human warfare that will compel us to reconsider the concept of enmity itself.

Caution brings us to a halt before the opening up of such problems. Even though the prognosis may be complicated, we must still consider one of the key components of the diagnostic, namely, the fundamentally pessimistic character of autonomous weapons systems. The drone is the main driver of this process, which involves technological, ethical, and legal dimensions. Remotely piloted aircraft represent the ideal of air power, vertical and immune from all physical restraints. State territory is thus neutralized and reduced to a uniform field of observation subject to sudden lethal projections of violence. They are also significantly more effective than conventional aircraft and more lethal than satellites. Drones, in this context, give the phrase "global war on terror" unprecedented intensity by heralding the arrival of an all-seeing, never-ending power that, above all, has nearly endless capacities. The eye may transform into a weapon and launch assaults with incredible speed.

Nevertheless, such power causes countries and personal sovereignties to shrink and vanish. The catastrophic impacts of US UCAV activities on West Pakistani people have been underscored by documents from the Stanford International Human Rights and Conflict Resolution Clinic (School, n.d.). The continual threat of drone monitoring and the possibility of an unplanned, unanticipated assault have made the locals feel vulnerable. This has had extremely detrimental psychological impacts. Being constantly at risk of being struck has gone hand in hand with realizing how unable the state is to provide proper defense. We should also consider if this effect is a deliberate goal rather than the incidental harm of drone warfare. In other words, the use of drones is compatible with the most widely accepted conceptions of air power. However, the intensity and pervasiveness of drone warfare mark a change from earlier uses of the Air Force, making them incomparable.

The situation in which both competitors deploy force constitutes the logical presumption of war as a legally significant reality. As a result, when drone technology emerges, this balanced connection is broken, and the logic of the duel is renounced when AI robots take the place of men and violence becomes unilateral.

However, the point of severe nihilism is reached when cybernetic and algorithmic systems alone are used to decide how to wage war. The human component has now been markedly compressed, if not completely eradicated in the case of nuclear weapons, by the development of ever more deadly and sophisticated weapons. The culmination of this trend in history is essentially the emergence of LAWs because without incurring any casualties, one can fight using automatic warfare. However, on reaching this target, there would be no doubt that obstacles will be surmounted; thus, war will assume an after-human form where foes undergo serious debilitation when AI machines assume command over battlefields, turning them into no more than electronic impulses on a computer terminal.

Contrarily, it is essential to remember that certain nations are unable now, due to budgetary issues, to develop, manufacture, and use modern weapons. Therefore, because of these financial constraints, their capacity to procure contemporary weapons is significantly restricted.

Countries like the USA, UK, France, Germany, and Italy have seen a standstill or a decrease in military financing within the last ten years. Mostly, it is due to austerity measures in these places. At the same time, unit production costs for weapon systems have risen. This has prevented various states from purchasing cutting-edge weapons like combat planes without presenting projects that enhance collaboration among different countries. Even in cases where procurement is possible, member units are constantly falling in quantity, which in terms of defense economics is called Augustine's law ("Trends in the Costs of Weapon Systems and the Consequences," n.d.).

Figure 3 shows the countries that dominate drone warfare until the year 2028. As demonstrated, the United States, China, and Russia are winning the race for dominance.

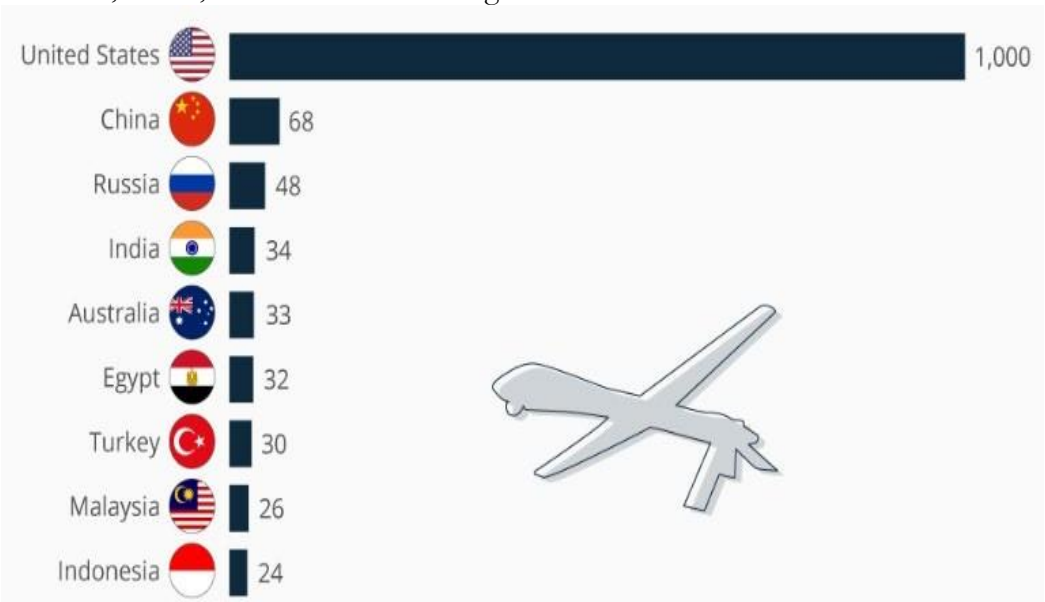

Figure 3: Countries Set to Dominate Drone Warfare ("Infographic," 2019).

For AI technologies, ethical dilemmas arise as they introduce new challenges to the already existing principles of warfare. AI has substantial chances of operating autonomously, which leads to significant personal accountability problems since these technologies have the potential to make

decisions concerning life or death. Robots without human emotions, such as anger or revenge, could become ethicalwarriors compared to their human counterparts. Nonetheless, it is presumptuous that technology would develop to be able to perform ethical deliberations faster than humans.

This discussion delineates an understanding that there are no fully autonomous drones yet, making it reasonable to have a hybrid approach where human-robot engagement is most feasible. It combines both the positive attributes of human beings and the ones found in machines. While humans tend to handle ethical issues better than any other existence due to their sense of attachment and responsibility, unmanned aerial vehicles excel at gathering information from various sources quickly and over long distances.

Thus, a comprehensive legal and ethical framework is mandatory to regulate the use of artificial intelligence in warfare. These include proposals for human control, accountability mechanisms, and the prohibition of autonomous weapons, which are essential to address ethical concerns brought about by the ascendance of AI systems. The aim is to ensure that the implementation of AI in warfare does not contradict the IHL principles.

Conclusion

This informative paper aims to show the significant role of AI and drones in the next generation of warfare and propose some laws regarding their ethical issues because of their rapid advancement and excessive use. The question of accountability for the drone's actions has progressed and become unclearsince the military endeavors for greater autonomy in drones to reduce the costs of operation. There are different viewpoints concerning how to guarantee ethical conduct in drones, spanning cynicism to championing totality in independence. Most unlawful acts come from human emotions like rage leadingto irrational or wrong decisions in warfare; however, robots do not experience such feelings as to engagein vengeful activities like retaliations. Instead, they have modernized sensors and data processing power that could make them perform better as ethical combatants. Yet, robots nowadays have their challenges,whereby the technology enabling drones to evaluate situations and make moral decisions as quickly as human beings does not yet exist. This is why, although drones could make better ethical decisions than humans one day, they remain far from achieving this due to the existing state of technology. Understanding human behavior and decision-making is difficult, perhaps the most complicated aspect ofprogramming drones. Due to this fact, it is more feasible to create human-robot partnerships that will rely on their strengths. Drones operate without human operators in such partnerships, especially on matters that are not critical for using modern sensors to collect information about the available task. Nevertheless, major decisions, like using lethal power, are kept reserved for humans. The drone operatoruses its sensors to detect mission situations and then decides whether to prosecute targets or not. This partnership between humans and drones will remain necessary until AI technology surpasses the human level in fully autonomous drones. However, to limit death among humans during wars, a transitional approach should be taken toward fully autonomous drones. Since they can differentiate between civilians and hostiles, autonomous drones can act more ethically and be resistant to emotional biases compared tohumans.

The rapid incorporation of AI, especially drone technology, in contemporary warfare leads to profound ethical and legal challenges. As these technologies develop, it is crucial to propose laws to address the sensitive issues they raise while considering the existing national and international legal frameworks. In this regard, the following proposals are intended to provide a decisive ethical and legal framework for the application of AI in warfare:

***Human Control Prerequisite*:** Human control should be mandated for all military operations involvingAI to ensure that such vital decisions can only be made by human beings, especially with

lethal force (Rosen, 2023). The principle of meaningful human control is crucial in order to prevent machines from making autonomous decisions on matters relating to life and death, as this authority may be misused, resulting in unforeseen outcomes that violate international humanitarian law (IHL).

Accountability Framework: A clear accountability structure has to be implemented for the actions carried out by AI. The obligations of operators, commanders, and developers of these technologies need to be stated clearly in this framework. Furthermore, it should have provisions for investigating events where civilians have been affected or violations against IHL occurred, ensuring that those responsible for unlawful acts are held accountable ("The Ethics of Automated Warfare and Artificial Intelligence," n.d.).

Prohibition of Fully Autonomous Weapons: The development of fully automated weapon systems (LAWS) ought to be prohibited ("The Ethics & Morality of Robotic Warfare," 2016). Their operation without human intervention raises deep ethical concerns, such as excessive violence and loss of dignity in war. Thus, there is a need for an international treaty that would make LAWS illegal, as suggested by some countries and the International Committees of the Red Cross (ICRC).

Constitutional Relevance on International Humanitarian Law: The use of any kind of AI in warfare should strictly comply with IHL principles such as necessity, proportionality, and distinction (Rosen, 2023). This law will require military forces to validate that they adhere to these principles when employing AI, especially when choosing targets. There should be regular audits and assessments to ensure compliance and transparency.

Systematic Ethical Audits of AI: Every AI system applied in war should regularly be subjected to ethical audits that examine its decision-making processes and potential biases. Such audits must be open, and the findings shared with oversight agencies and the general public to guarantee responsibility and confidence in the application of AI technology in warfare.

Improved Training and Learning: Military forces should engage in thorough training regarding the ethical implications of employing AI, especially drones, in warfare. Such training ought to stress the significance of moral choices, the ramifications of unmanned aerial vehicle attacks, and applicable laws regulating their deployment.

Although artificial intelligence has not made any significant dent in warfare thus far, experts predict its potential role in future wars. Several factors will determine this effect, including investment rates from private companies, competition from other countries, research communities' advancements in AI abilities, the military stance towards AI application, and the course of AI-centered warfare strategies. Despite being acknowledged by various analysts as being in the early stages of military AI technology, finding an expert who does not believe in the lasting significance of AI proves impossible. AI critics are suggesting that some of the trends observed today may render this technology less effective. From a technical standpoint, it is also possible that current safety issues could be too severe to allow for military use of AI.

On the other hand, AI critics raise several trends that may hinder its influence. There may be a possibility from a technical viewpoint that current safety apprehensions concerning AI might turn out to be insuperable, leading to its unsuitability for military use. The extension of the UAV's capacities and development of the drone industry could represent a two-edged sword that will indisputably affect different armies worldwide in uncharted ways.

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References

A closer look at Russia's AI-powered artillery. (n.d.). Retrieved March 10, 2024, from https://analyticsindiamag.com/a-closer-look-at-russias-ai-powered-artillery/

Arkin, R. C. (2010). The Case for Ethical Autonomy in Unmanned Systems. *Journal of Military Ethics*, *9*(4), 332–341. https://doi.org/10.1080/15027570.2010.536402

Arms: New Campaign to Stop Killer Robots | Human Rights Watch. (2013, April 23). Retrieved March 11, 2024, from https://www.hrw.org/news/2013/04/23/arms-new-campaign-stop-killer-robots Army of None. (n.d.). Retrieved March 8, 2024, from https://wwnorton.com/books/Army-of-None/ Autonomous Drones Have Attacked Humans—This Is a Turning Point. (2021, November 2). Retrieved March 11, 2024, from Popular Mechanics website: https://www.popularmechanics.com/military/weapons/a36559508/drones-autonomously- attacked-humans-libya-united-nations-report/

Bergen, P. L., & Rothenberg, D. (Eds.). (2014). *Drone Wars: Transforming Conflict, Law, and Policy*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139198325

Blackburn, R. A. (2018). *Summary of the 2018 Department of Defense Artificial Intelligence Strategy*.Boulanin, V., & Verbruggem, M. (n.d.). *Mapping the development of autonomy in weapon systems*.

China's Ambitions for AI-Driven Future Warfare | CSBA. (n.d.). Retrieved March 8, 2024, from https://csbaonline.org/about/news/chinas-ambitions-for-ai-driven-future-warfare

China's military looks to civilians to boost innovation | Free IISS analysis. (n.d.). Retrieved March 8, 2024, from IISS website: https://www.iiss.org/online-analysis/online-analysis/2020/05/china-civil-military-innovation/

China's Revolutionary Drone Strategy: Replacing Special Ops Agents by 2035. (2024, February 4). Retrieved March 8, 2024, from DroneXL.co website: https://dronexl.co/2024/02/04/chinas-revolutionary-drone-strategy-2035/

Dilbert at war. (n.d.). Retrieved March 11, 2024, from https://www.economist.com/united-states/2014/06/23/dilbert-at-war

Drone 007: Chinese military plans to replace human agents with machines in special operations overseas | South China Morning Post. (n.d.). Retrieved March 8, 2024, from https://www.scmp.com/news/china/science/article/3249831/drone-007-chinese-military-plans-replace-human-agents-machines-special-operations-overseas

Drone Technology. (2024, March 8). Retrieved March 8, 2024, from DroneXL.co website: https://dronexl.co/drone-technology/

Drones Are Being Used to Drop Bombs on US Troops in Syria. (n.d.). Retrieved March 8, 2024, from https://www.businessinsider.com/drones-used-to-drop-bombs-on-us-troops-in-syria-2020-3

Full Translation: China's "New Generation Artificial Intelligence Development Plan" (2017). (n.d.). Retrieved March 8, 2024, from DigiChina website: https://digichina.stanford.edu/work/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/

Gentile, G. P., Shurkin, M. R., Evans, A. T., Grisé, M., Hvizda, M., & Jensen, R. (2021). *A history of the Third Offset, 2014-2018*. Santa Monica, Calif: RAND Corporation. https://doi.org/10.7249/RRA454-1

Horowitz, M. C. (2018, May 15). Artificial Intelligence, International Competition, and the Balance of Power. Retrieved March 8, 2024, from Texas National Security Review website: https://tnsr.org/2018/05/artificial-intelligence-international-competition-and-the-balance-of-power/

How the Army Out-Innovated the Islamic State's Drones—War on the Rocks. (n.d.). Retrieved March 8, 2024, from https://warontherocks.com/2020/12/how-the-army-out-innovated-the-islamic-states-

drones/
Infographic: The Countries Set To Dominate Drone Warfare. (2019, November 19). Retrieved March 11, 2024, from Statista Daily Data website: https://www.statista.com/chart/20005/total-forecast-purchases-of-weaponized-military-drones
Intelligence, A., & Steve. (2023, January 27). The Future of Defense: The Role of Artificial Intelligencein Modern Warfare. Retrieved March 11, 2024, from Wavell Room website: https://wavellroom.com/2023/01/27/artificial-intelligence/
Is 'Made in China 2025' a Threat to Global Trade? | Council on Foreign Relations. (n.d.). Retrieved March 8, 2024, from https://www.cfr.org/backgrounder/made-china-2025-threat-global-trade
Kevin Kelly: 'There are no A.I. experts today' | Fortune. (n.d.). Retrieved March 8, 2024, from https://fortune.com/2023/03/09/kevin-kelly-no-artificial-intelliegence-experts-today-great-time- to-enter-field/
Killer drones: How many are there and who do they target? | Drones (military) | The Guardian. (n.d.).
Retrieved March 11, 2024, from https://www.theguardian.com/news/2019/nov/18/killer-drones-how-many-uav-predator-reaper
Lifting the Fog of War | Hopkins Press. (n.d.). Retrieved March 11, 2024, from https://www.press.jhu.edu/books/title/1876/lifting-fog-war
'Melancholic and Fascinated': Artificial Intelligence, Authentic Humanity, and the Future of War » Wavell Room. (n.d.). Retrieved March 11, 2024, from https://wavellroom.com/2020/06/30/melancholic-and-fascinated-artificial-intelligence-authentic-humanity-and-the-future-of-war/
Milić, A., Randjelovic, A., & Radovanović, M. (2019, October 4). *Use of drones in operations in the urban environment*.
Military Review. (n.d.). Retrieved March 11, 2024, from https://www.armyupress.army.mil/Military-Review/English-Edition-Archives/May-June-2017/Pros-and-Cons-of-Autonomous-Weapons-Systems/
Modern Strategy—Paperback—Colin Gray—Oxford University Press. (n.d.). Retrieved March 11, 2024, from https://global.oup.com/ukhe/product/modern-strategy-9780198782513
Murray, D. W. (2024). *TRANSFORMATION AND PROFESSIONAL MILITARY EDUCATION:*
NATO Review - Autonomous military drones: No longer science fiction. (2017, July 28). Retrieved March 11, 2024, from NATO Review website: https://www.nato.int/docu/review/articles/2017/07/28/autonomous-military-drones-no-longer-science-fiction/index.html
Pentagon's artificial intelligence programs get huge boost in defense. (n.d.). Retrieved March 8, 2024, from https://www.fastcompany.com/90219751/pentagons-artificial-intelligence-programs-get-huge-boost-in-defense-budget
Petrella, S., Miller, C., & Cooper, B. (2021). Russia's Artificial Intelligence Strategy: The Role of State-Owned Firms. *Orbis*, *65*(1), 75–100. https://doi.org/10.1016/j.orbis.2020.11.004
Pros and Cons of Autonomous Weapons Systems. (n.d.). Retrieved March 11, 2024, from https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/May-June-2017/Pros-and-Cons-of-Autonomous-Weapons-Systems/
Rosen, B. (2023, October 3). AI and the Future of Drone Warfare: Risks and Recommendations. Retrieved July 31, 2024, from Just Security website: https://www.justsecurity.org/89033/ai-and-the-future-of-drone-warfare-risks-and-recommendations/
Russia's Drone Industry Hits Serious Turbulence. (n.d.). Retrieved March 10, 2024, from Jamestown website: https://jamestown.org/program/russias-drone-industry-hits-serious-turbulence/
Scharre, P., & Horowitz, M. C. (n.d.). *An Introduction to Autonomy in Weapon Systems*.
School, S. L. (n.d.). Living Under Drones: Death, Injury and Trauma to Civilians from US Drone

Practices in Pakistan. Retrieved March 11, 2024, from Stanford Law School website: https://law.stanford.edu/publications/living-under-drones-death-injury-and-trauma-to-civilians-from-us-drone-practices-in-pakistan/

Sneak Preview: First Draft of Russia's AI Strategy—Defense One. (n.d.). Retrieved March 10, 2024, from https://www.defenseone.com/technology/2019/09/whats-russias-national-ai-strategy/159740/

The Ethics & Morality of Robotic Warfare: Assessing the Debate over Autonomous Weapons | AmericanAcademy of Arts and Sciences. (2016, September 21). Retrieved July 31, 2024, from https://www.amacad.org/publication/daedalus/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons

The Ethics of Automated Warfare and Artificial Intelligence. (n.d.). Retrieved July 31, 2024, from Centrefor International Governance Innovation website: https://www.cigionline.org/the-ethics-of- automated-warfare-and-artificial-intelligence/

The Outsider: Russia in the Race for Artificial Intelligence | Policy Commons. (n.d.). Retrieved March 10,2024, from https://policycommons.net/artifacts/1405903/the-outsider/2020167/

The Strategy Bridge. (n.d.). Retrieved March 11, 2024, from The Strategy Bridge website: https://thestrategybridge.org

Trends in the costs of weapon systems and the consequences. (n.d.). Retrieved March 11, 2024, from https://www.researchgate.net/publication/24078227_Trends_in_the_costs_of_weapon_systems_and_the_consequences

Trustworthy human-AI partnerships—PMC. (n.d.). Retrieved March 11, 2024, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8365362/

U.S. Army general says robots could replace one-fourth of combat soldiers by 2030—CBS News. (n.d.). Retrieved March 11, 2024, from https://www.cbsnews.com/news/robotic-soldiers-by-2030-us-army-general-says-robots-may-replace-combat-soldiers/

US military plans to thwart China with 1,000s of autonomous war drones. (2023, September 1). RetrievedMarch 8, 2024, from New Atlas website: https://newatlas.com/military/replicator-usa-drone/

Villacres, E. J., & Bassford, C. (1995). Reclaiming the Clausewitzian Trinity. *The US Army War College Quarterly: Parameters*, *25*(1). https://doi.org/10.55540/0031-1723.1730

'Whoever leads in AI will rule the world': Putin to Russian children on Knowledge Day—RT World News. (n.d.). Retrieved March 8, 2024, from https://www.rt.com/news/401731-ai-rule-world-putin/

Whoever Predicts the Future Will Win the AI Arms Race – Foreign Policy. (n.d.). Retrieved March 8, 2024, from https://foreignpolicy.com/2019/03/05/whoever-predicts-the-future-correctly-will-win-the-ai-arms-race-russia-china-united-states-artificial-intelligence-defense/

Will drones replace human agents in Chinese military missions within 10 years? (2024, February 5).
Retrieved March 8, 2024, from South China Morning Post website: https://www.scmp.com/news/china/science/article/3249831/drone-007-chinese-military-plans-replace-human-agents-machines-special-operations-overseas

Дорожная карта развития «сквозной» цифровой технологии «Нейротехнологии и искусственный интеллект»: Министерство цифрового развития, связи и массовых коммуникаций Российской Федерации. (n.d.). Retrieved March 10, 2024, from https://digital.gov.ru/ru/documents/6658/

Правительство утвердило Стратегию развития беспилотной авиации до 2030 года. (2024, March
10). Retrieved March 10, 2024, from http://government.ru/news/48875/

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