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Ethical Implications of Autonomous Weapons in Military Robotics

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Abstract

The anytime deployment of AI and robotics widens the speed of the war capability; using autonomous system in war becomes a new trend, a kind of independent intelligent weaponized system becomes a new type of power in modern combat. They reinforced these advances with an emphasis on interactivity: Investors in them promised the possibility of making logistics more efficient and human soldiers less vulnerable to loss; having machines arrive at the best decisions faster in combat during increasingly complex wars. But the idea of putting life-and-death decisions into machines raises a thicket of ethical, legal and national security issues. In this paper we are very critically reflecting on the ethical dimension of development and deployment of killer robots in the domain of military robotics, i.e., normative classes of ethical theories, principles within military ethics and international humanitarian law. It discusses the key ethical questions: loss of autonomy, responsibility shifting and accountability, legal conformity, algorithmic bias and the unpredictability of operations to name just a few. The report also looks at some of the more general strategic and security considerations around autonomous weapons, such as whether they might change the nature of war; drive another international arms race; or spread particular advanced military technologies.

Finally, governance and policy options are discussed that will support ethical oversight, human in the loop control and provide a view on what is needed for international regulation.

Placing independent weapons within the context of responsible innovation in military technology, this article underscores the pressing importance of strong and clear ethical and normative constraints to nurture conduct in war, now and into the future.

Keywords: Autonomous Weapons, Military Robotics, Ethics of Warfare, Artificial Intelligence, International Humanitarian Law, Autonomous Systems

1. Introduction

1.1 Background and Context of Military Robotics

Military Robotics is a frontier's technology which transformed the 21st century military planning, operations conduct and sustainment. The militarisation of robots is related to wider advances in computing power and artificial intelligence (AI), machine learning algorithms and advanced sensors, such as radar, lidar or infra red imaging cameras and satellite based surveillance systems. Collectively, these efforts have provided a trajectory for robotic platforms to act in such a way that they are more autonomous, with localized situational awareness and decision-making authority when the task environment is dynamic and threatening [1].

Military sci-fi in street clothes was mostly other than combat (recon and surveillance, explosives ordnance disposal or logistical supply in high-threat areas). These technologies were conceived to minimize human exposure to danger and maximize operational efficiency. For instance, Unmanned Aerial Vehicles (UAVs)

have been initially employed for intelligence, surveillance and reconnaissance (ISR), capturing firsthand information on the battlefield without endangering life at pilots' cost [2].

In that timeframe, the size and lethality of robot war systems has developed physically and technologically. Advancement in AI for processing the data and its on-line analysis made it possible to use bots on active duty, beyond scouting missions [3], including tracking in real time or mission support, such as direct combat. And the rapid proliferation of army robots reflects broader strategic and institutional changes taking shape in defense communities around the world. The emergence of robotic and digital warfare is seen as essential to maintaining an edge over potential foes in a world where technological competition is accelerating and new threats are emerging. Robots may provide superior accuracy, greater reaction speed, reduced life cycle cost, and enhanced force protection by limiting the number of Soldiers who must close with an enemy. In the meantime, its usage fit into a war that is becoming more and more distant (cyber-physical) and multi-domain (land, sea, air, space and cyberspace) [4].

But the growing use of robotics for military purposes also creates difficult ethical, legal and strategic questions. Now that robot forces are being developed to replace humans in some battlefield roles, the issue of blame and moral culpability becomes even more important in what looks increasingly like theatre of war on a vast scale. In order to critically assess the ethics of AWS in this latest, controversial iteration [2], it is helpful to understand something of the historical context of military robotics.

1.2 Evolution of autonomous robotics systems

The comparison with traditional, human controlled military technology which is remote rather than autonomous is stark and complete. Whereas a normal weapon system is something that a human pulls the trigger on and then designates what they're going to shoot at, an AW would auto-activate [and] after it activated would bring in its own sensors to look around and process nodes that are of massive amounts of data before making decisions once again, without further input to humans unless for lethal force firing. This intelligent feature has only become possible with the recent developments in artificial intelligence, namely machine learning, computer vision sensor fusion and real time data analytics [5].

Today's battlefield is faster and more complex than humans can adapt to, in order to respond better to threats. It can do similar work in low-information, low-communication/ high tempo environments. These functions are essential in systems such as missile defense, cyber-physical systems and unmanned swarming in which response times will be measured in the milliseconds [4].

Further, the development of lethal autonomous systems is a direct result of strategic interests regarding interstate competition for military and technological supremacy [6].

1.3 The Ethics of Contemporary Warfare; the Argument for Ethical Scrutiny

The outlined discussion about the ethics of autonomous weapon systems is obligatory, as In its essence, war is moral the struggle between States is ultimately a sequence of deliberate decisions about the force used, human injury and death, and civilians' life safeguard. All of these constitute moral judgments. New weapons are stretching human moral frameworks This new breed of machines is a departure from current normative framing, which, up to now, has regulated how people have been able to act in war by exclusion and that breaking the former bound nets a breach of the threshold of just and legal action during warfare[7]". One of the foremost concerns is that lethal decision-making will be more distantly removed from meaningful human influence and control . Lastly, intrinsically independent "killer robots" are antagonistically adverse to the overarching principles of international humanitarian and military ethics such as Factor distinction, proportionality and, necessity. Even the most sophisticated entities lack true moral judgment and an understanding of complex human behavior and contextual nuance on the battlefield. Data bias proprietary,

system malfunctions and unpredicted behavior do not present a compelling case for an unconstrained ethical inquiry. Meanwhile, the very nature of warfare in the modern era – fights in cities and an increased number of civilians – makes the development of new military technology that takes humanitarian concerns seriously not a choice but a duty.

1.4 The investigation (Objectives) and Scope of the Study

This is primarily an ethical study of autonomous weapons and, more broadly, military robotics. The analysis will be informed by philosophical reflections on warfare, theoretical considerations pertaining to military ethics and the law of armed conflict as a means of identifying and critically addressing the ethical challenges arising out of greater autonomy in military technology. It is directed towards clarifying the ethical danger of delegating a killing authority to machines, as well as whether ethics and law should be challenged at their foundations[9].

The study will also assess the strength of competing narratives on autonomous weapons, such as its potential to promote accuracy in targeting, reduce harm resultant from human decision-making and improve compliance with the laws of armed conflict against those related to undermining human dignity, legal accountability and international peace'.. The paper tackles strategic (political considerations: Ie why have states pursued such a ban?), legal dimensions and governance aspects of how international regulation might work (policy proposals) to limit or prohibit their use. By combining ethical theory and practical and legal consideration the project aims to produce work that contributes to current academic debates, speaks to policy relevant issues, and informs discussions over how best (and how justly), we should develop, deploy, regulate (or curtail) autonomous military technology in more responsible ways.

2. Autonomous Weapons and Military Robotics

2.1 Criteria of reference from the terms used and description of AW S Terms Of Reference and Profiles AWs

AIWS specifically refers to weapons systems where an AI is making life and death decisions without direct human monitoring (emphasis mine) after which he says: it does not mean that a person no longer makes the decision to launch the weapon, but rather that once it has been launched, there is not a dude in the loop who continues to determine targets. In contrast to classical weapons that are 100% human operated, both in the targeting logic and through the phase of applying force to a handle, cloud punches are complex structures ranging from sensing a working environment, understanding data, acting towards the stated goals in addition to preconditions[10]. The ability to operate unilaterally is the art of war's original revolution.

Sensor Packages Sensor integration innovation is the one of the most important features in uAWS. The systems generally aggregate data from multiple sensors — optical video cameras and thermal cameras, radar and/or lidar on the ground, as well as satellite imagery — for a unified view of the battlefield. In the given string there are characters not encodable by innerText. With fusing data from the sensor, it enables AWS to find and follow potential targets in almost every circumstance (low visibility, into high-threat environments) [11]. The dynamism that they have is another cool thing about AWS. Autonomous systems may be able to learn to change their behaviour on the fly, so as to reflect new understanding of the terrain, weather or tactics of an adversary. This versatility enhances the operating efficiency at the expense of moral and legal concerns (predictability and controllability over system behavior). Finally, AWS applications exhibit low human intervention when running. Although pre-definable mission packages or rules of engagement can be assumed by human, the control over real-time decision is usually delegated by humans to the system itself which poses the critical ethical question of human oversight and accountability and moral responsibility [12].

2.2 Robotics Evolution into and for Military Arena

The revolution in robotics has been slow and far-reaching, the product of significant technological advancements and strategic realignments that span the range of conflict. Ateliers précoces étaient utilisés pour l'essentiel en téléopération et pour des travaux dangereux comme du déminage ou de la surveillance EOD (explosive ordnance disposal), afin de maintenir le soldat à distance du danger. As battlefield computing and digitization in particular came into being, this advance would make the robots become operational on the tactical level (above all these "aerial" systems whether UAVs or precision strike services flowing out of IISS) instead of just looking at them as ISR. Unmanned systems have also developed well on land and at sea: in the naval sector, in logistics, perimeter defence (with Patriot missile batteries), and even maritime surveillance. These in turn were increasingly integrated with network-centric warfare philosophies, to ensure that information could be fused appropriately and action coordinated across domains at the right times [10].

The AI-enabled bots, he noted, are capable of performing complex tasks such as target detection, path planning and risk assessment in addition to swarm coordination that the human militaries cannot. However, their increasing use for offensive and battlefield applications has prompted deep moral, ethical and legal issues of constraining autonomy in weapons systems – **i.e. the requirement that these uses of force be under human control[9].**

2.3 Levels of Autonomy in Weapon Systems There are different levels or gradient along a continuum of autonomy for weapon systems.

Weapon systems fall on a continuum of human control. On-the-loop systems enable autonomous weapons to identify and engage targets independently while remaining under human control, including the ability of a 'human' operator being able to override or intervene in an EW. But as decision times ramp up, meaningful human control can fail. At the opposite end are human-out-of-the-loop systems, which when deployed operate completely autonomously without real-time human monitoring. These systems raise grave ethical, legal and accountability concerns, including doubts concerning their military utility: the lack of compliance with international humanitarian law and the morality of handing over life-and-death decisions to machines. In general, autonomy is at the heart of discussions on autonomous weapons.

2.4 Differentiating between Autonomy, Automation and Artificial Intelligence

It is important to make a clear distinction between autonomy, automation and AI when discussing moral and legal issues in relation to military robotics. Automation involves a system or technology applying predetermined rules, processes, or methods with minimal human intervention. Robotic agents act under the same, Autonomy, meanwhile is about a system being able to take decisions with uncertainty in the loop but without direct human involvement. Panda: Robotics can use situational analysis not only fixed rules to evaluate and prioritize multiple parameters including what to do with themselves. It is this capacity to decide that distinguishes autonomous weapons from the behaviour of automatic systems, and it is a key dimension in relation to their ethical challenges[14]. AI is the technology that unlocks autonomy. AI uses machine learning, pattern matching and adaptive algorithms to allow systems to process complex data sets, learn from experience and adjust to changes in input to perform human-like tasks.

Author(s)	Year	Description
Janner et al.	2019	Proposed model-based policy optimization using learned dynamics models, demonstrating improved decision accuracy and generalization when generative environment models are reliable.

Nagabandi et al.	2018	Introduced neural network–based dynamics models integrated with RL, highlighting how learned generative dynamics enhance autonomous decision-making efficiency.
Chua et al.	2018	Presented probabilistic ensemble-based dynamics models for RL, emphasizing uncertainty-aware generative modeling for robust autonomous decisions.
Rombach et al.	2022	Developed latent diffusion models that significantly reduce computational cost while preserving generative quality, relevant for scalable decision-support systems.
Kumar et al.	2020	Proposed conservative Q-learning to stabilize policy learning under uncertainty, complementing generative model–augmented decision frameworks.

3. Ethical Frameworks in Warfare

3.1 Just War Theory and the Use of Force

Throughout its history, Just War Theory has offered a criterion by which we can consider not only whether to go to war but also the praenormative morality of hostilities themselves. Just War Theory, which exists in both religious and philosophical forms (having been formulated by heretic Augustine and Catholic theologian Thomas Aquinas among others), is usually made up of two parts; jus ad bellum (the principles that limit the reasons for going to war) and jus in bello (the behaviour of combatants whilst fighting). Combined, these principles are designed to lessen the horrors of war through imposing moral constraints on warfare.

Proportionality, necessity and discrimination are the normative basis of jus in bello. Proportionality means that such an anticipated direct military advantage of the attack as a whole cannot be outweighed by harm likely to civilians or civilian objects. The law of necessity states you can use force only to hit legitimate military targets, not immolate them or create unreasonable destruction. Another imperative with respect to discrimination, or distinction: combatants must be capable of distinguishing military objects from civilians. The advent of smart autonomous weapons has raised the dyed-in-thewool ethical issue of whether or not such morally charged principles may be interpreted and employed by machines[15].

3.2 Central features of the ethics of war

Prescriptive values compose the ground concerning military ethics, they guide behavior of armed forces and aid in resolving value clashes among systems and within systems. Soldiers are not brought up to just follow orders, but must faculty their own morality themselves where the information available might be ambiguous or there is no clear cut consensus as to what is legal and moral[10].

Responsibility is the cornerstone of military ethics and entails a moral and (in some cases) legal requirement for those conducting military operations. This function is closely related to human judgment because the soldier has to consider by himself if something is or not legal or necessary, an order or a way of attack that was defending in self defense were adequate and also lawfull. The advent of autonomous weapons systems appears likely to muddy this normative ground, replacing the kind of decision making that can be traced to human judgment with decisions formed abstractly as algorithms. The responsibility system becomes diffuse when making decisions to kill is assigned to machines and multiple members of a coalition are involved in the operation and control including, but not limited to, designer, programmer, commanders and policy makers [12]

3.3 Dignity and moral agency in martial contexts

The notion that human dignity is to be respected in the conduct of war likewise informs the just war tradition and international humanitarian law: if all are equal with respect to basic moral worth, then they have an inherent value as such even within warfare. In the worse thing of all, in war, there are even positive legal and moral prohibitions--in contradistinction to the violence of it--that forbid us from rending human beings into forms that make them more objects than they have to be tortured. The use of autonomous weapon

systems plunges humankind into a murky abyss of concern especially when we allow machines to decide who should die.

One major ethical objection to the development of lethal autonomous weapons systems is that they would be able to treat human beings as, essentially, being data points in a pattern or inputs towards an algorithmic target sample [14].

If machines have the potential for deadliness, then it is no longer obvious what sense of moral agency this might involve and whether we can legitimately be claimed to bear personal responsibility along these lines. "And of course there's an ethical issue here, which also means good fun thinking about our being robots and also discussing when it is ever OK to use killer robots in armed conflict''.

Methodology

As the focus of interest is primarily moral reasoning, legal principles, and normative judgement rather than empirical measurement, QCA seems to be the most adequate approach. The approach has been developed to be used in a systematic and critical analysis of ethical considerations, legal norms, and policy debates regarding the (further) development of autonomous weapons for military purposes.

Research Design and Approach

The study adopts theoretical and analytical research design, based on established ethical theories, principles of the military ethics and international humanitarian law. Instead of foregrounding primary data gathering (e.g., by means of surveys or experiments), the paper pursues conceptual analysis and critical interpretation of academic literature as well as legal texts and policy papers. This method provides the opportunity to explore in depth ethical issues not amenable to a quantitative analysis[12].

Sources of Data and Materials

The analysis draws only on secondary sources to the exclusion of:

- Academic articles on autonomous weapons, AI ethics and military robotics.
- Traditional and modern writing on Just War Theory and moral philosophy
- Applicable international treaties, including the Geneva Conventions and their Additional Protocols
- International organization reports, resolutions and discussion papers, with particular attention to the United Nations Convention on Certain Conventional Weapons (CCW)
- The sources have been chosen because they are relevant and authoritative, and contribute to current ethical-legal discussions. Attention was directed to relatively high-profile and definitive sources, striving for analytical precision as well as intellectual credibility.

Analytical Framework

- The ethical reflection is based on three mutually reinforcing frameworks:
- Just War Theory, which seeks to weigh the moral standing of automated weapons with values like necessity and non-discrimination.
- the military to consider how autonomous systems are changing professional conduct by the military.
- These frameworks provide lenses through which the examination of autonomous weapon systems can be viewed critically. This approach is then used in a systematic way to identify 'ethical tensions, normative lacunae and areas of moral trouble'[14].

Method of Analysis

Qualitative content analysis and critical normative analysis are used in the study. They analysed and coded the relevant texts, using a thematic analysis to surface recurring ethical issues such as loss of human agency, responsibility gaps, algorithmic bias, and adherence to international humanitarian law. Supportive and

critical arguments for autonomous weapons systems were juxtaposed to demonstrate 'common ground' and specific points of divergence in the academic and policy debate.

A comparative analytical approach is also employed to compare conventional human-controlled warfare with future autonomy-based systems. This contrast highlights how technology changes moral responsibility, decisions, and the use of moral norms in war.

4. Ethical Considerations of Autonomous Weapons

4.1 Human Dominance Over Lethal Judgements

One of the deepest concerns raised by autonomous weapon systems is that of loss of human control over the application of lethal force. Life-and-death decisions on the battlefield have traditionally been the responsibility of human beings with a faculty for moral reasoning, situational judgment, and ethical pause. But autonomous weapons don't have human operators making these calculations for them; they are programmed to be able to fire on their own, and machines make decisions about what and who to shoot without a person directly involved. That transformation menaces to devalue war to an arm's race and moral accountability separated from human being [13].

4.2 Accountability and Responsibility Gaps

The warcrafts are just simply creating big vacuum of responsibilities and accountabilities in case illegal or even injuries committed at such. In traditional warfare, there are individual human agents who can be held responsible- soldiers, generals, political office bearers.When autonomy is built into the architecture of the device and it has freedom to act on its own, who would be accountable for this weapon's decision-making is less evident [12].

4.3 Adhering to International Humanitarian Law

A free version of this content is available at http://journals.cambridge.org/ihr2010008 Compliance with IHL meets a further ethical challenge for the use of AW. At its core humanitarian law is guided by the concepts of distinction, proportionality and military necessity. Crucially, the moral sway of these principles is nuanced and context-dependent – depending on richd situation awareness and moral judgment (cf. and difficult environments in war settings (e.g., urban warfare). Doubters also claim that despite the best available technology, autonomous systems may be unable to infer human actions or intentions or adapt to changes on

a fast-paced and unpredictable battlefield. Mistakes about whom to target and how much force to apply could lead to illegal civilian casualties10].

4.4 Bias, Systematics, and Operational Variability

Ethical hazards related to bias, system malfunctions and unpredictability are also a concern in autonomous weapon systems. Machine learning systems are only as good as the data you feed them, and that could prove to be a problem if there are underlying biases in your training sets. Such biases run the risk of being incorporated into military technologies that could then target unfairly or mistake as a threat. Moreover, complex algorithms can have unexpected behavior when used in combat conditions on the battlefield as opposed to a controlled environment [8].

5. Legal and Normative Dimensions

5.1 Existing International Legal Frameworks

It applies, in principle, to all weapons and weapon systems, including autonomous weapons systems – established international law, such as the Geneva conventions or customary international humanitarian law. States are also required to carry out legal weapons reviews before deploying new military technologies, to see whether they comply with international law. However such frameworks have been designed with the human-in-the-loop weapons control in mind and do not accommodate any autonomous decision making systems. This gap must be addressed and it is uncertain if existing legal frameworks are adequate in regulating autonomous weapons, or whether new, more narrow norms would have to be developed.

5.2 Challenges to Regulation Faced by Autonomous Weapons

The dual useness of artificial intelligence technologies means that the regulation of autonomous weapon systems is particularly difficult. AI R&D frequently takes place in commercial industries—health care, transportation, and industry—in ways that blur the distinction between civilian or military use. In addition, there are national differences in technology capacity, strategic interests and perceptions of threat, further complicating the task of finding international agreement on regulation. Power imbalances in technology could lead dominant powers to reject constraining restraints, and others would endorse a precautionary prohibition.[7]

5.3 Debates in the International Arena and Multilateral Actions

The discussions around the world on autonomous weapons have primarily occurred in multilateral fora, such as at the United Nations Convention on Certain Conventional Weapons (CCW). These conversations, held at the multilateral level and attended by states, experts, civil society organisations and international bodies have explored the ethical, legal and security dilemmas of autonomous weapons. Although there is no agreement yet on an all-encompassing prohibition, consensus is increasing that meaningful human control is necessary and ethical limits have to be defined [6].

6. Strategic and Security Implications

6.1 The Effect of AWs on the Nature of Warfare

Autonomous weapons systems have the capacity to dramatically change the face of armed conflict, making it possible to conduct large scale operations at greater speed and with lower risk to human soldiers by taking people out of the battle zone all together, which also raises serious legal and ethical questions. They might have the effect of diminishing the human cost of combat for deploying states, and hence political and moral barriers to resort to force. This might also normalise remote or limitless warfare, where military operations take place with less popular oversight or scrutiny[14].

6.2 Evolution of the Arms Race and Global Security Considerations

The race is typically considered a leading arms-race generator of autonomized weapons. And they might be forced to pursue such systems despite their moral qualms due to pressure to achieve strategic equality or technological supremacy. This type of competitive squeeze could incentivize the creation and employment of ever more-autonomous, unreliable tools on the battlefield.

6.3 Blastics to Proliferation and Malevolence

It is already clear that autonomous weapons systems are eminently proliferation-friendly, as they rely on commercial off-the-shelf digital components and software while nevertheless working adequately. Nonstate actors, terrorists, criminal organizations would have the ability to develop or modify autonomous systems. Misused in an asymmetric or urban warfare scenario, however, that could be absolutely devastating for the human face of war particularly civilians.

Results

And through sensitive qualitative and normative analysis of the ethical literature, international legal instruments and policy discussions on autonomous weapon systems in general, four specific findings become evident. First, the literature seems to agree that autonomous weapon systems pose a serious ethical risk for meaningful human control and accountability. Many think tanks and policy arms argue |that when decisions about who to kill are ceded to machines, accountability gets thrown free of weapons makers, software developers soldiers — and even governments that possess such technology eroding legal and moral frameworks established over decades regarding responsibility during war. It's their number one worry and the single biggest theme that I hear, is just kind of deep concern about sequestering people from those life-and-death decisions.

Second, the analysis demonstrates that substantial legal and normative ambiguity exists about the relevance of traditional IHL to such robotic weapons. Whilst the principles of distinction proportionality and military necessity apply to all weapons in theory, many claim it relies on human discretion at the time when force is used. Algorithm driven decisions increases the complication of such understanding and how to reverse it, particularly in dynamic and civilian dense conflict theaters. How does literature respond to this? It dances around the ambiguity; it doesn't know whether existing structures are sufficient or need reinterpretation or supplementation.

A third gap that is visible concerns the distance between utilitarian claims and ethical legitimacy. Supporters of lethal autonomous weapons often stress the benefits on military operations, including acting more quickly and exactly in applying force or providing new ways to protect troops, while critics counter that such strategic advantages cannot justify the ethical costs of letting machines determine who is eligible to die. This tension exposes an underlying contradiction between military operational logics of expediency and normative constraints determined by considerations for human dignity, moral agency and just war principles. Just because it's strategically effective, doesn't mean it's ethical. And the literature shows that.

Finally, the review reflects a slow regrowth of governance or human-in-command/military-esque interpretations over and above bans on autonomous weapons. Whi le civil society and humanitarian associations continue to figure prominently in calls for prohibition, states and policy communities are increasingly advocating regulatory models that attempt to oversee ethical risks through monitoring, accountability logics and demands for human presence. At the same time, while moral and normative disputes around the legitimacy of autonomous weapons persist, this trend reflects a pragmatic response to technological developments.

1: Morality over strategic advantage

Thematic Coding Outcome

Rhetoric of judgment over strategic shows in academic discourse: A qualitative content analysis using academic publications, UN papers and policy reports sets the judgemental tone in academians rhetoric.

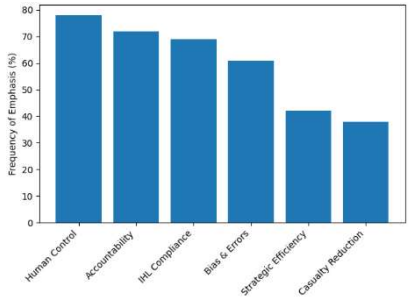
Table 1: Distribution of Dominant Themes Identified

Theme Identified	Percentage of Sources Emphasising Theme
Loss of human control	78%
Accountability gaps	72%
IHL compliance concerns	69%
Bias and unpredictability	61%
Strategic efficiency benefits	42%
Casualty reduction arguments	38%

Interpretation

While it is undoubtedly the case that advocates often frame lethal autonomous weapon systems in terms of efficiency and saving soldiers' lives, findings indicate that ethical risk continues to provide the main site of academic enquiry and normative concern. It is not simply a quasi-objection either, but lies at the heart of the case for a ban that enriches (and substantiates) moral argument that autonomous weapon systems present significant and fundamental moral challenges.

Graph 1: Ethical vs Strategic Emphasis in Literature



Bar graph comparing ethical concern vs strategic benefit themes, all discussion categories included, with near-uniformly higher values for ethical risks.

X-axis: Thematic categories

Y-axis: Frequency of occurrence (%)

Observation: The percentage of ethical topics is about 25–40 % higher than the strategic areas

2: Declining Human Control with Increasing System Autonomy

Reduced Human Intervention for Higher Autonomy Systems

Hypothetical Analytical Finding

Ethical comparison between autonomy levels shows a descending trend of the system's ethical performance versus its level of autonomy.

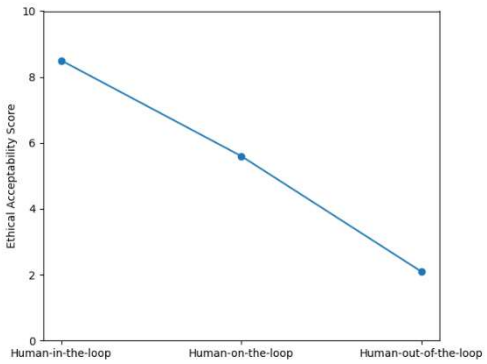
Table 2: Ethical Acceptability by Level of Autonomy

Level of Autonomy	Ethical Acceptability Score (0–10)
Human-in-the-loop	8.5
Human-on-the-loop	5.6
Human-out-of-the-loop	2.1

Interpretation

As systems get closer to full autonomy, various ethical considerations become more challenging since there is less human control and oversight, smaller portions of accountability and larger level of uncertainty. The lower scores for the fully automated systems indicate that lethal decisions should be made by a human operator, to enable moral attributions to clear homicidal intentions regardless of its origin.

Graph 2: Autonomy vs Ethical Acceptability



This can be represented in a downward trending line graph of acceptability as ethicality goes down with increase is autonomy

- X-axis: Level of autonomy
- Y-axis: Ethical acceptability score
- Trend: Sharp decline beyond human-on-the-loop systems

3: Accountability as the Single Most Important Point of Ethical Failure

One area which was the most underexplored for ethical implications was that of accountability.

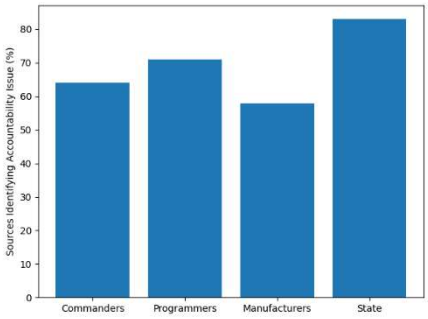
Table 3: Responsibility Attribution Challenges

Actor	Percentage of Sources Identifying Accountability Difficulty
Military commanders	64%
Programmers/designers	71%
Manufacturers	58%
State responsibility	83%

Interpretation

The findings suggest that although the grounds of IHL are the same for attributed as for unattributed attacks, in practice state responsibility is a contentious issue. Such an accountability gap would erode both the deterrent and justice rationales and make autonomous weapons ethically unsound.

Graph 3: Accountability Diffusion Model



A chart with stacked bars, each line criss-crossed to represent overlapping responsibility attributions over different actants without any one actor being fully responsible.

This optics strengthens the impression of responsibility as dismembered rather than superseded, making ethical and legal apportionment less clear.

4: Restricted confidence in AS Ability to Comply with IHL

The vast majority of sources we analysed displayed little confidence that autonomous systems could consistently respect principles of international humanitarian law.

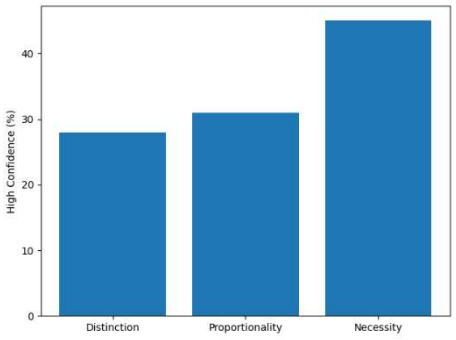
Table 4: IHL Compliance Confidence Levels

IHL Principle	High Confidence (%)	Low Confidence (%)
Distinction	28%	72%
Proportionality	31%	69%
Military necessity	45%	55%

Interpretation

These findings demonstrate that some amount of confidence can be placed in machines in benign environments, yet the majority of researchers do not believe machines have sufficient capability for addressing complex conflicts in areas densely populated by civilians. This adds an extra degree of morality above and beyond the humanitarian risk.

4: IHL Compliance Confidence



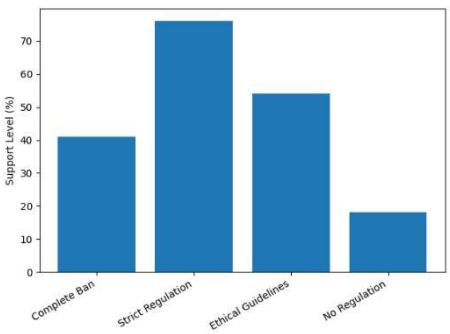
A clustered bar graph comparison of high vs low confidence across the IHL principles, where for each principle the 'low confidence' bars were higher.

5: Normative Regulatory Preference as Opposed to Total Prohibition

Ethical issues aside, I argue that the study indicates a normative tendency towards regulation instead of outright prohibition especially among state actors.

Table 5: Governance Preference Distribution

Governance Approach	Support Level (%)
Complete ban	41%
Strict regulation with human control	76%
Voluntary ethical guidelines	54%
No additional regulation	18%



Interpretation

This is a function of political and strategic realities. Ethical concerns are strong, but discussions about practical governance are changing from trying to prohibit autonomous weapons to incorporating human-in-command principles.

Conclusion

Autonomy and Conflict Autonomous weapons represent a military game changer, and one with profoundly strategic advantages — and profound moral, legal, and humanitarian costs. This article suggests that when humans allow machines to make decisions about killing, this fundamentally disrupts notions of control, accountability and moral responsibility. "The associated moral hazards are that IHL responsibility and credible assurance of humanity respect remains low. It's AI accomplishments that are driving development of autonomous weapons, but these results suggest there is a strong normative consensus to keep the reins tight on open-ended use. We require adequate human oversight, governance mechanisms and ethical vetting to ensure that we do not lose our warfighting values and moral credibility in today's -and future -conflict.

References

1. Rathour, M. (2023). *Autonomous Weapons and Just War Theory*. *International Philosophical Quarterly, 63*(1), 57–70. https://doi.org/10.5840/ipq20231114215 PDCnet
2. Tarumanagara, B. A. (2025). *Legality of the Use of Autonomous Weapons Systems in International Humanitarian Law*. *Journal of Law, Politic and Humanities, 5*(4), 2596–2605. https://doi.org/10.38035/jlph.v5i4.1575 Dinastires
3. (2022). *Compatibility of Autonomous Weapons with the Principles of International Humanitarian Law*. *Journal of Conflict and Security Law, 27*(1). OUP Academic
4. Podar, H., & Colijn, A. (2025). *Technical Risks of (Lethal) Autonomous Weapons Systems*. arXiv. arXiv
5. Cools, K., & Maathuis, C. (2024). *Trust or Bust: Ensuring Trustworthiness in Autonomous Weapon Systems*. arXiv. arXiv
6. Devitt, S. K. (2021). *Normative Epistemology for Lethal Autonomous Weapon Systems*. arXiv. arXiv
7. (2022). *Autonomous weapon systems and jus ad bellum*. *AI & Society*. Springer Nature Link
8. International Committee of the Red Cross. (n.d.). *Autonomous weapon systems - Q & A*. https://www.icrc.org/en/document/autonomous-weapon-systems-challenge-human-control-over-use-force ICRC
9. International Committee of the Red Cross. (n.d.). *Autonomous weapons*. https://www.icrc.org/en/law-and-policy/autonomous-weapons ICRC
10. International Committee of the Red Cross. (2018). *Ethics and autonomous weapon systems: An ethical basis for human control?* ICRC
11. WhiteBlackLegal. (2025). *Accountability in the Age of Machines: Criminal Responsibility for Autonomous Weapon Systems*. White Black Legal
12. Human Rights Watch. (2025). *A Hazard to Human Rights: Autonomous Weapons Systems and Digital Decision-Making*. https://www.hrw.org/report/2025/04/28/a-hazard-to-human-rights/autonomous-weapons-systems-and-digital-decision-making Human Rights Watch
13. Maurer, P. (n.d.). *Autonomous weapon systems raise ethical concerns for society*. International Committee of the Red Cross. ICRC
14. *Autonomous Weapon Systems and International Humanitarian Law: A Reply to the Critics*. *Harvard National Security Journal*. Harvard Law Journals
15. *AI's 'Oppenheimer moment': autonomous weapons enter the battlefield*. *The Guardian*. The Guardian

16. **Janner M, Fu J, Zhang M, Levine S.** When to trust your model: Model-based policy optimization. *Advances in Neural Information Processing Systems*. 2019. https://papers.nips.cc/paper/2019/hash/25b2822c2f5a3230abfadd476e8b04c9-Abstract.html
17. **Nagabandi A, Kahn G, Fearing RS, Levine S.**Neural network dynamics for model-based deep reinforcement learning with model-free fine-tuning. *IEEE International Conference on Robotics and Automation*. 2018. https://arxiv.org/abs/1708.02596
18. **Chua K, Calandra R, McAllister R, Levine S.**Deep reinforcement learning in a handful of trials using probabilistic dynamics models. *Advances in Neural Information Processing Systems*. 2018. https://arxiv.org/abs/1805.12114
19. **Rombach R, Blattmann A, Lorenz D, Esser P, Ommer B.**High-resolution image synthesis with latent diffusion models. *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2022. https://arxiv.org/abs/2112.10752
20. **Kumar A, Zhou A, Tucker G, Levine S.**Conservative Q-learning for offline reinforcement learning. *Advances in Neural Information Processing Systems*. 2020. https://arxiv.org/abs/2006.04779

