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Military Emerging Disruptive Technologies: Compliance with International Law and Ethical Standards *

Marco Marsili

1. Preamble

"I believe in horses" – the German Kaiser, Wilhelm II, said in 1905 – "Automobiles are a passing phenomenon".¹ The kaiser has passed, and cars and automation have entered our daily lives. The ability to grasp the importance of changes, of technological evolution, is fundamental to predict the future and adapt.

In his book published in 2017, Lawrence Freedman, a world-renowned military thinker, has explored the issue of imagining future war, including cyberattack, and how the boundaries between peace and war, between the military, the civilian and the criminal are becoming increasingly blurred. He concludes that questions about the future of war are a regular feature of political debate, strategic analysis, and popular fiction.

Iconic films such as *Star Wars* (1977) and *Starship Troopers* (1997) picture conflicts fought in outer space. *Tron* (1982) and *War Games* (1983) conceive a scenario with artificial intelligence and self-learning machines. *Fail-Safe* (1964) tells about a computer error that causes a U.S. nuclear attack on Moscow during the Cold War, and poses the question of the final decisor to the use of lethal force. In Stanley Kubrick's seminal science fiction movie *2001: A Space Odyssey* (1968), the artificial intelligence computer HAL 9000 interacts with humans. *Metropolis* (1927), *Westworld* (1973), *Blade Runner* (1982), *Terminator* (1984), *Robocop* (1987), and *A.I. Artificial Intelligence* (2001) deal with the issue of machine that mimic humans. *UFO* (1970) tells the story of a high-tech military organization established to defend Earth from space attack; *Space: 1999* (1975), which owes much to the legacy of Kubrick's movie, is about travelling in deep space. *Star Trek* (1966) brings the crew of the *Enterprise* where no man has "bodily" gone before and imagines a technology that transforms matter into energy and vice versa. Sometimes science fiction offers imaginative solutions for the future, as did Jules Verne in his novels and Isaac Asimov in his works, *inter alia* in the Robot series. Science fiction authors are inspired by future science possibilities that one day can come true. Innovation brings changes but also challenges and raises issues.

2. Introduction

Margaret Kosal (2019) finds that military applications of emerging disruptive technologies (EDTs)² have even greater potential than nuclear weapons to radically change the balance of power. Lethal autonomous weapons systems (LAWS) have been described as the third revolution in warfare, after gunpowder and nuclear arms (Russell, 2015). So far, the debate, stimulated by the Group of Governmental Experts on emerging technologies in the area of lethal autonomous weapons systems (GGE on LAWS) established by the Convention on

* This project proposal received the Seal of Excellence by the European Commission (2021). This paper was presented at the international conference Intelligent and Autonomous: Emergent Digital Technologies and the Challenges of Disinformation, Security, and Regulation (Panel 4: Military Use of AI), hosted online at the Vytautas Magnus University, Kaunas, Lithuania, on March 12, 2021.

¹ The quotation is written at the entrance of the Mercedes-Benz automobile museum in Stuttgart.

² For a definition of "disruptive technologies", see: Bower & Christensen (1995).

Prohibitions or Restrictions on the Use of Certain Conventional Weapons (CCW), has focused on artificial intelligence (AI), machine learning (ML), robotics, automation, unmanned autonomous systems (UAS) and semi-autonomous systems (Armin, 2009; Brehm, 2017; Jiménez-Segovia, 2019). Big data, microelectronics, quantum computing/science, cloud computing, deep learning and computer vision algorithms, virtual and augmented reality (VR & AR), 5G networks should also be considered (Marsili, 2021a). A broader discussion should include all military EDTs, *inter alia*: space and hypersonic weapons; directed-energy weapons/laser and photonic weapons, just to name a few. So far, a shy approach to the ethical issues that military EDTs rise is restricted to directed-energy non-lethal weapons (Gordon, 2019).

Though leaders have begun to become aware of legal and ethical implications of the military use of EDTs, these issues still are in the background: security concerns are of pivotal importance (National Security Commission on Artificial Intelligence [NSCAI], 2019; Harrigan, 2019; Reding & Eaton, 2020) and most information and documents are kept confidential, and their circulation is restricted (Bidwell et al., 2018). The compliance of military EDTs with international law (IL), international humanitarian law (IHL), international human rights law (IHRL) and ethical standards should be investigated.³

Moving from an historical perspective of the technological innovations of warfare (Pierce, 2004; Payne, 2008), leading researchers discuss the risks of automated killing machines and share their concerns and solutions for reducing risks from intelligent machines AI and robotic communities face an important ethical decision: whether to support or oppose the development of lethal autonomous weapons systems. Technologies have reached a point at which the deployment of such systems is — practically if not legally — feasible within years, not decades. The war that will flow from the military applications of AI has been termed "intelligent warfare" or "intelligent military technology". Is it intelligent enough to avoid innocent victims and civilian casualties? Is it able to meet basic legal and human rights standards?

The United States bizarrely finds that autonomous weapons can bring humanitarian benefits. The belief lies in the assumption that reducing the human control over a weapon, might increase its accuracy; therefore, surgical use of force would reduce collateral damages and civilian casualties. I believe that no warfare will ever be intelligent or humanitarian.

This is probably not a very popular debate, as there are few actors with such technological capabilities and capabilities: US, China and Russia, with the European Union that aims to get a global role in the field of AI, ML and robotics (drones). China is competitive with or ahead of the U.S., and aims to be the technology leader by 2049, in game-changing technologies like: hypersonic, quantum sciences, autonomy, artificial intelligence, 5G, genetic engineering and space (Vergun, 2019, Oct. 29). The Department of Defense (DoD) argues that, while China's makes an unethical use of AI, the US upholds American values and protects our fundamental belief in liberty and human rights, thus developing principles for using AI in a lawful and ethical manner (Esper, 2019). After all, it is a question of scrutinizing the posture and behaviour of Western allies, which present themselves as the champions of fundamental human rights and civil liberties. On the other hand, we can't expect that authoritarian regimes, such as Russia and China, respect basic human rights, especially when the Allies feel them breathing on the neck.

While documentation of Russian and Chinese origin is irrelevant, most of Western publications on EDTs – policy and doctrine – are produced by governmental bodies, military institutes and the industry. Obviously, these entities do not question their policy and/or products, which they self-assess to be lawful and ethic but, at least, they consider the issue. An

³ For the purpose of this paper, hereafter we will refer to IL, IHL and IHRL simply as to "IL" as a whole, unless otherwise specified.

independent assessment should scrutinize this realm. The research on EDTs is most linked to governments and kept secret for security reasons, but citizens/voters have the right to be informed promptly about decisions that affect them and on the values at stake: the future is what you make of it.

This seminal paper aims to kick-off an investigation on the ongoing evolution of the US and NATO high-tech policy, strategy and doctrine, as the result of extensive document research, in order to obtain an in-depth understanding and to uncover emerging trends and present and future pitfalls, risks and challenges. The study is based on primary sources that determine the military policy which is checked against legal, ethical and moral standards examined in the light of current literature. The approach is process-oriented,⁴ and is aimed to understand the underlying motives, opinions, and motivations and to provide information about the topic. The purpose is to understand the object of the research through the collection of narrative data, studying the particularities of each document. This contribution does not rest on pre-defined hypotheses, which this paper offers none, but relies on the ability of the author to divulge meaning from different elements of research without being bound by pre-existing limitations. While this presents a serious challenge, it does open much room for explorations of new fields of research without needing a fixed point of departure – or arrival.

3. The Strategic Advantage of Technological Edge

EDTs give an undisputed geostrategic advantage to those who have them. The Allied Command Transformation (ACT), which operates as the leading agent on innovation for the North Atlantic Treaty Organization, finds that military EDTs have a rapid and major effect on technologies that already exist and disrupt or overturn traditional practices and may revolutionize governmental structures, economies and international security (ACT, 2019). The European Defence Agency (EDA) considers technology a game changer on the defense sector, including military end-users (EDA, 2019). The *Capstone Concept for Joint Operations* (CCJO),⁵ the overarching product approved by the U.S. military leadership (Joint Chiefs of Staff [JCS], 2012), that guides the development of future joint capabilities, points out that technology is transforming warfare and reshaping global politics and changing how military and political (civilian) leaders relate.

The US and NATO consider technology to be a competitive advantage. The DoD focuses on innovation and modernization to put innovative technology in the hands of the warfighter (Cronk, 2021). By designing the priorities for the twenty first century defense, DoD Secretary Leon Panetta (2012) stated that the Joint Force for the future will be "technologically advanced". Indeed, the CCJO pictures the U.S. armed forces fit-out, *inter alia*, with sophisticated technologies in space, cyberspace, and robotics. According to the new defense strategic guidance, advances in machine learning, automated processing and machine-analyst interaction are needed. The Defense Department's *Third Offset Strategy*, announced in November 2014 within the *Defense Innovation Initiative*, is aimed to get technological superiority to overcome potential adversaries (Hagel, 2014). This strategy comprises robotics, unmanned autonomous systems,⁶ big data and cyber capabilities. The US is determined to

⁴ For a discussion on "process-oriented" methodologies, see: Onaka, 2013.

⁵ The current version of the Capstone Concept for Joint Operations: Joint Force 2030 is classified.

⁶ For the purpose of this paper, we define an autonomous system an anthropogenic system in which technology does not have human influences. Unmanned systems include: air vehicles (unmanned combat air vehicle or UCAV, unmanned aerial vehicle or UAV, unmanned aircraft system or UAS, remotely piloted aerial vehicle or RPAV, and remotely piloted aircraft system or RPAS); unmanned ground vehicles and robotic systems (UGVs); unmanned surface vessels and subsea vehicles, (USV) and unmanned underwater vehicles (UUV); unmanned

achieve more in space, in hypersonics and AI, incorporating space and cyber operations, and integrating them from the seafloor to outer space.

NATO simply copies the U.S. strategy and doctrine: the Warsaw summit communiqué of 2016 calls to applicate emerging technologies in the military domain and emphasises innovation and exploitation of technologies in allied nations; the Brussels Summit declaration of 2018 stresses the importance to maintaining the technological edge and technological advances through innovation. The Alliance is focused on developments in the field of automation, in the integration of AI and the design of UAS capable of operating in multiple domains, and in technological convergence, i.e. the integration of multiple research fields in the identification of the solution to a technological challenge (NATO, 2019).

EDTs impact conflict management and are key drivers of military operations (Chairman of the Joint Chiefs of Staff [CJCS], 2015, p. 3). Technological advances in hybrid warfare, disruptive technologies and artificial intelligence have created an increasingly complex international security environment (Paxton, 2018).

4. Artificial Intelligence and Machine Learning: The Next Frontier of Warfare?

UAS, AI and ML, hypersonics and directed energy weapons, and 5G networks are game-changing: they are transforming the character and the nature of warfare in radical ways that create enormous challenges and opportunities and will revolutionize the way the military operates in the battlefield (Esper, 2020; Vergun, 2020, 2021).

The research is engaged in embedding cognitive computing in physical spaces (Farrell et al., 2016). Autonomous machines, governed by artificial intelligence, are pushing forward the capacity for space and cyber warfare – AI and ML systems have applications in cyberspace and cyberdefense (National Science and Technology Council [NSTC], 2016, p. 36). Military robots will incorporate AI (Cummings, 2017) which will play a greater role in drone data exploitation. The application of ML to AI makes autonomous robots capable to make lethal decisions about humans all on their own. These drones can automatically identify human targets, firing when they choose, with ethical-legal implications that are easily deducible.

The comprehensive book *Machine Learning: An Artificial Intelligence Approach* (Michalski et al., 1983) illustrates how AI and ML are interconnected and often used interchangeably, but are not the same thing. Artificial intelligence is a broader concept than machine learning, which addresses the use of computers to mimic the cognitive functions of humans. First coined in 1956 by John McCarthy, AI is when machines can perform tasks based on algorithms that are characteristic of human intelligence – the idea of AI goes back to at least the 1940s (McCulloch & Pitts, 1943) and was crystalized in Alan Turing’s famous 1950 paper, *Computing Machinery and Intelligence*. A report on *One Hundred Year Study on Artificial Intelligence* (Stone et al., 2016) reminds us that there is not precise, universally accepted definition of AI, thus immediately posing the problem of legal definitions – AI includes things like: planning, understanding language, recognizing objects and sounds, learning, and problem solving.

Machine learning is one of the most important technical approaches to AI: is the ability of machines to receive a set of data and learn for themselves, changing algorithms as they learn more about the information they are processing. Arthur Samuel (1959) defines ML "the ability to learn without being explicitly programmed". Deep learning is one of many approaches to ML; is inspired to the structure and function of the brain, i.e. interconnection of neurons, and

space vehicles. A UAV, commonly known as “drone”, is a component of UAS. The next generation of unmanned systems includes: nuclear powered unmanned submarines; swarming drones; unmanned ships and submersibles.

include decision learning. This process is based on the use of neural networks, a series of algorithms modelled after the human brain. In AI/ML, the algorithm is designed to correct/modify itself to perform better in future. That is why we say the AI/ML algorithm is able to learn and has intelligence. Laird proposes a model that combines AI, cognitive science, neuroscience, and robotics (Laird et al., 2017). I have well-founded doubts as to why a system that mimics humans should not make the same mistakes, as depicted in *War Games*.

The more these technologies advance, the more it is legitimate to question their possible uses. The Organization for Security and Co-operation in Europe (OSCE, 2019) claims that AI is becoming one of the most important technologies of our time. The OSCE warned that possible applications of AI seem almost incomprehensible and its implications for our everyday lives cause both optimistic predictions about future opportunities and serious concerns about potential risks. Schwab (2017) concludes that AI-driven automation is one of the most important economic and social developments in history and has been characterized as the lynchpin of a Fourth Industrial Revolution – the first three industrial revolutions are listed as those driven by steam power, electricity, and electronics.

In 2018 the DoD began to consider seriously that military applications of AI were expected to change the nature of warfare (Ford, 2018). In September 2019, the director of the DoD Joint Artificial Intelligence Center (JAIC), Gen. John N.T. "Jack" Shanahan, predicted that within the next year or two, AI would begin to be employed in warfighting operations and that it would transform warfare (Vergun, 2019; Sept. 24, 2020, June 5). Gen. Shanahan described a future battle as “algorithms vs. algorithms”, with the best algorithm victorious (Vergun, 2019, Nov. 5) – that means that without effective AI, military risks losing next war. Consequently, it is reasonable to expect an impact of AI also on international humanitarian law, or the law of war, that applies in armed conflicts.

The US is heavily involved in the exploitation of high-tech solutions for military purposes and AI is a strategic priority for the Defense Department (Lopez, 2021a). The application of AI and ML to all-domain information is supposed to give the DoD huge advantages (Garamone, 2021). In a memorandum on the *Establishment of an Algorithmic Warfare Cross-Function Team (Project Maven)* of April 26, 2017, the Deputy Secretary of Defense, Robert O. Work, pushes for a more effective integration between AI and ML to maintain advantages over adversaries and competitors. He gathers that DoD should do more efforts to explore the potential of AI, automation, big data, deep learning and computer vision algorithms.

Since 2018, the U.S. military has pushed investments towards autonomous systems driven by AI and ML. The U.S. Army has implemented ML (Leonard, 2018) and, according to the strategic vision set forth by the administration, the ground force is expected to have unmanned vehicles on the battlefield by 2028 (Milley & Esper, 2018). The U.S. Navy warfare is moving from seabed to space, linking manned and unmanned aircraft, plus satellites, therefore including subsurface, surface, air, space and cyber/EMS in a unique domain of operations (Space and Naval Warfare Systems Command Public Affairs, 2018). The Navy has been reported to place more of its investments toward autonomous systems (Wilkens, 2018) and is testing a Ghost Fleet Overlord Unmanned Surface Vessel (USV), in partnership with the Office of the Secretary of Defense Strategic Capabilities Office (DoD, 2021, June 7). The U.S. National Nuclear Security Administration and the Federal Aviation Administration have developed a counter-UAS that went in a testing phase in June 2018 (The Los Alamos Monitor Online, 2018). And the industry is pushing ahead (Boeing, 2021).⁷

⁷ At the NATO Summit held in Brussels in July 2018 the allies agreed to foster innovation including by further developing partnerships with industry and academia.

In March 2021, the Quick Reaction Special Projects program, which is part of the Rapid Reaction Technology Office (RRTO) within the Office of the Under Secretary of Defense for Research and Engineering, published the *2021 Global Needs Statement*, looking for compelling and innovative technologies and ideas in areas involving: AI and ML; autonomy; biotechnology; cyber; directed energy; fully networked command, communication and control; hypersonics; microelectronics; quantum technology; space; 5G communications and other EDTs (DoD, 2021, March 24). The President's DoD budget request for fiscal year 2022 includes the largest-ever research, development, test and evaluation expenditure and supports modernization to fund such advanced technologies (Under Secretary of Defense, 2021).

We are beyond the human-computer interaction, human-robot dialogue, and semiautonomous collaborative systems; we are entering in the domain of virtual agents, robots, and other autonomous systems (Ward & DeVault, 2016; Chai et al., 2016).⁸ The intensive application of technology leads to the dehumanization of warfare. The impact of AI and autonomous systems on warfare and their employment in military context gives rise to a debate whether such robots should be allowed to execute missions on their own, especially when human life is at stake (Cummings, 2017). According to the first two Laws of Robotics, laid down by Isaac Asimov, a robot "may not injure a human being or, through inaction, allow a human being to come to harm", and it "must obey the orders given it by human beings except where such orders would conflict" with the previous law.⁹ Once again, science fiction has predicted reality, along with the problems of its time.

5. The Legal and Ethical Domain of High-Tech Warfare

The question about the military use of EDTs must be addressed from a legal and ethical point of view. While the legal framework seems to be clear, the same cannot be said of the ethical implications deriving from the military use of certain EDTs, which means considering them as weapons with which to apply the lethal use of force. If, on the one hand, the law lays also on ethical and moral standards, which change in time and space, on the other these concepts continue to be autonomous and are often derived from religious values – what complicates everything. Illustrated this way, the issue appears to be a game of mirrors – and perhaps it is.

Principles of law are derived from customs and some corps of norms, such as natural and legal rights, human rights, civil rights, and common law, stem from these early unwritten sources.¹⁰ Here arises the question of which source of law has supremacy over the others, whether international or domestic law, which further complicates the framework.

Since realizing the impact of military use of AI, political and military leaders, as well as scholars, have begun to scrutinize their legality and ethics – this was around 2016. Nowadays, these issues are central in the debate on the fairness of this technology. In a media briefing held in August 2019, the director of JAIC, Lt. Gen. Shanahan, acknowledged that the ethical, safe and lawful use of AI became a such relevant topic, that they have to build up a team of specialists, something they never thought about two years before. Gen. Shanahan admitted that in Project Maven "these questions really did not rise to the surface every day, because it was really still humans looking at object detection, classification and tracking" and "[t]here were no weapons involved in that".

⁸ See: Ward & DeVault (2016); Chai et al. (2016).

⁹ First Law of Robotics introduced by Isaac Asimov in his 1942 short story *Runaround*, included in *I, Robot* (1950). Near the end of his book *Foundation and Earth* (1986) a zeroth law was introduced: "A robot may not injure humanity, or, by inaction, allow humanity to come to harm".

¹⁰ For a discussion on the basic norm, order, or rule that forms an underlying basis for a legal system, see the *General Theory of Law and State* published by Hans Kelsen in 1949.

The JAIC works with Defense Innovation Board (DIB) and the OSD (Office of the Secretary of Defense) on these questions. The DIB is an independent advisory board set up in 2016 to bring the technological innovation and best practice of Silicon Valley to the U.S. military and provides independent recommendations to the Secretary of Defense. It consists of experts from across commercial sector, research, and academia. The DIB, which supports the research and use of AI as a warfighting tool, the DoD's AI Strategy, called for Defense Department to take the lead in developing ethical AI guidelines within the framework of the *National Defense Strategy* (Vergun, 2019, Nov. 11). Following DIB recommendations, in February 2020 the DoD adopted a series of ethical principles for the lawful use of AI, based on the U.S. Constitution, Title 10 of the U.S. Code, Law of War, existing international treaties and longstanding norms and values.

A DoD memorandum, drafted by Deputy Secretary Kathleen Hicks in May 2021, states that AI could transform the battlefield by increasing the speed of decision making and improving efficiency in back-office operations, but points out that it should be used according to core ethical principles (the so-called "responsible AI", or RAI).

The National Security Commission on AI (NSCAI), an independent federal commission established in 2019,¹¹ is also looking at ethics as part of its broader mandate to study AI and ML for the United States. The *Final Report* stresses the risks associated with AI-enabled and autonomous weapons and raises important legal, ethical, and strategic questions surrounding the use of lethal force, which should be consistent with international humanitarian law (NSCAI, 2021, p. 10). So far, the DoD policy requires a human in the loop within the decision making cycle to authorize the engagement and the use of AI in a Counter-Small Unmanned Aircraft Systems (Lopez, 2021b).

Defense Secretary Mark T. Esper defined cyber as "part and parcel of what many call hybrid war – a blurring of the lines between peace and war" that is "below the threshold of armed conflict" (Garamone, 2019). Therefore, the hypothesis of considering a cyberattack as a traditional attack seems to be excluded. These doubts have already been expressed in several publications (Marsili 2019, 2021b). Nevertheless, the U.S. and NATO doctrine considers a cyberattack equivalent to a kinetic one (Marsili 2019). The legal framework seems blurred, and we wonder which law applies.

A seminal report developed in 2016 by the National Science and Technology Council's (NSTC)¹² Subcommittee on Machine Learning and Artificial Intelligence to provide technical and policy advice on topics related to AI, acknowledges that the incorporation of AI in autonomous weapon systems poses policy questions across a range of areas in international relations and security, and leads to concerns about how to ensure justice, fairness, and accountability (NSTC, 2016, pp. 1-3, 8). The White House report wonders if existing regulatory regime is adequate or whether it needs to be adapted (NSTC, 2016, pp. 1-3, 8) and concludes that, moving away from direct human control of weapon systems, involves some risks and can raise legal and ethical questions (NSTC, 2016, pp. 3, 8, 37). Gordon (2020) suggests that the ethical, socio-political, and legal challenges of AI with respect to fundamental rights should be seriously considered.

The report on *Artificial Intelligence and International Affairs* published by Chatham House highlights that the increasing application of AI raises challenges for policymakers and governments (Cummings et al., 2018). The early report on *Artificial Intelligence, Automation and the Economy*, produced in 2016 by the Executive Office of the President of the United States (EOP), warns that AI raises many new policy questions that should be addressed by the

¹¹ The NSCAI was established by the *John S. McCain National Defense Authorization Act for Fiscal Year 2019* (P.L. 115-232, § 1051).

¹² The NSTC, component of the EOP, is the principal means by which the U.S. Government coordinates science and technology policy.

Administration (EOP, 2016, p. 45). Cummings et al. (2018) conclude that, under these conditions, new ethical norms are needed. Technology is rule breaker, but rules are necessary.

The upstream question revolves around the ethics of AI and machines, or their ability to make more or less moral decisions, given that the concept of morality is itself elusive. The ethics of AI, a branch of the ethics of technology (or ‘technoethics’), itself a sub-field of ethics, studies the moral behavior of humans as they design, make, use and treat artificially intelligent systems, and the ethics in the behavior of machines (Anderson & Anderson, 2011). The test introduced by Turing in his 1950 paper serves to check if "machines can think" and is an important tool in the philosophical approach to AI. Coman and Aha (2018), who have explored the ethical implications of AI and assessed its risks, remind us that the ability to say "no" is an essential part of being socio-cognitively human. *Dehumanization of Warfare* (Heintschel von Heinegg et al., 2018), provides a timely overview on autonomous weapons and cyber warfare, considering different new weapon technologies under the same legal rules.

So far, the ethical aspect of technology has been largely scrutinized, albeit limited to AI, ML, robots and autonomous systems such as drones. In his book *Life 3.0: Being Human in the Age of Artificial Intelligence* (2017), the Swedish-American cosmologist Max Tegmark predicts that there will come a time when machine intelligence reaches the ability to continue to upgrade itself and therefore to advance technologically at an incomprehensible rate independently from humans, that is a “superintelligent” AI also termed “Artificial general intelligence” (AGI). This goes far beyond what Müller (2020) has ironically concluded about the major ethical questions stemmed by the unpredictable level of rising of AI and machine learning. Lucas (2004) discusses if there can be an ethical AI but leaves the reader without answer.

Ethics of Artificial Intelligence (Liao, 2020) raises crucial questions of AI and ML. Autonomous weapon systems capable of identifying and attacking a target without human intervention? Could they have greater than human-level moral status? Can we prevent superintelligent AI from harming us or causing our extinction? Goecke and Rosenthal-von der Pütten (2020) have considered major issues of the current debate on AI and ML from the perspectives of philosophy, theology, and the social sciences. They wonder if machines can replace human scientists and under what condition robots, AI and autonomous systems may have some claim to moral and legal standing and therefore can be considered more than a mere instrument of human action. This is a crucial question when we decide to give machines the power to take autonomous decisions – and in particular moral decision-making as well – and to learn by themselves. Tegmark (2017) infers that the risks of AI do not come from malevolence or conscious behavior per se, but rather from the misalignment of the goals of AI with those of humans.

Rébé (2021) argues that AI’s physical and decision-making capacities to act on its own implies “a juridical personality”. Which means that machines should be hold accountable for their actions. This consideration opens the door to the accountability of political and military leaders when it comes to the use of lethal force. Lopez Rodriguez et al. (2021) have explored the existing legal concepts of EDTs, *inter alia* AI and UAVs, which are challenging the sovereignty and supremacy of the humans by getting some of their attributes. They wonder if humans should delegate responsibilities to machines and who should be accountable for the decisions.

The governance of LAWS, and the fear that they may subvert existing international legal frameworks, are among the main concerns (Maas, 2019). Fairness, accuracy, accountability, and transparency of AI and ML are under discussion (Lo Piano, 2020). Military AI should remain lawful, ethical, stabilizing and safe. Many AI and ML ethics guidelines have been produced; 22 of the major have been by analyzed by Hagendorff (2020).

Difficult real world ethical questions and issues arise from accelerating technological change in the military domain (Allenby, 2015). The critical questions on the legitimacy of drone warfare have been tackled by the scholars through the conceptual lenses of legality and morality (Barela, 2015) without neglecting the political dimension (Galliot, 2015). In a groundbreaking book published in 2009, Krishnan foresees the upcoming introduction to the battlefield of UAVs and the following removal of humans from the battleground. He warns about “the greatest obstacles” of legal and ethical nature which suggests to overcome through international law. The *Routledge Handbook of War, Law and Technology* (Gow et al., 2019), which provides an interdisciplinary overview of technological change in warfare in the twenty-first century, addresses the challenges international law. The responsibility of military drones under international criminal law is among the main questions raised by military UAVs (Sio and Nucci, 2016), although it remains in the background with respect to ethical and moral considerations for most authors. The use of UAVs impacts on human rights, in particular the right to life. Dos Reis Peron (2014) finds that the employment of drones in targeted killing operations is an indiscriminant and disproportionate use of force.

The drone warfare policy could violate human rights protected under the *International Covenant on Civil and Political Rights* (ICCPR): the right to life; the right to a fair trial; the freedom of association; the right to protection of the family; the right to highest attainable health standards; the right to education; the right of freedom from hunger. In 2014 the UN Human Rights Council (UNHRC) expressed for the very first time serious concern for violations of fundamental human rights in the use of armed drones in military operations (A/HRC/RES/25/22).

In a report submitted to the UN General Assembly (UNGA), the special rapporteur on extrajudicial, summary or arbitrary executions, Christof Heyns, highlights the necessity to take precautionary measures to protect the right to life in the use advanced technology and sophisticated weapons, such as drones (A/69/265, §§ 74, 75).¹³ The UN special rapporteur argues that, even if can not be considered inherently unlawful or lawful *per se* (A/69/265, §§ 77, 86) there are serious concerns about the use remote-controlled weapons systems in the military context, which challenge a range of human rights, in particular, the right to life (and bodily integrity in general) and the right to human dignity (A/69/265, §§ 84, 85).

Mr Heyns recommends to the international community to adopt a coherent approach in armed conflict and in law enforcement, which covers both international humanitarian law (IHL) and the human rights dimensions, and their use of lethal and less lethal weapons (A/69/265, §§ 89). The UNHRC finds that states must ensure that any measures comply with their obligations under international law, in particular IHL.¹⁴ France, UK, and the US are among the six members of the UNHRC which in 2008 voted against the Council Resolution No. 7/7 to ensure the use of armed drones comply with international law. Despite the emerging doctrine on how the future force will operate suggests to minimize unintended consequences to not seriously damage the international reputation of the United States (CCJO, 2012, p. 7), the *National Defense Strategy 2018*, outlined by DoD Secretary Jim Mattis, concludes that more lethal force is needed in military practices.

In his annual report 2014, the UN special rapporteur on the promotion and protection of human rights and fundamental freedoms while countering terrorism, Ben Emmerson,

¹³ See also: UNHRC (2014) A/HRC/26/36, §§ 63, 64.

¹⁴ See also: the list of principles concerning the compatibility of anti-terrorism measures with Art. 9 and 10 of the Universal Declaration of Human Rights and Art. 9 and 14 of the ICCPR, in the Report of the Working Group on Arbitrary Detention (A/HRC/10/21, §§ 50-55) drafted by UNHRC chairperson-rapporteur Carmena Castrillo. These principles include that: the detention of persons suspected of terrorist activities shall be accompanied by concrete charges, and in the development of judgments against them, the persons accused shall have a right to the guarantees of a fair trial and the right to appeal.

addresses the legal frame on the employment of armed drones in lethal counter-terrorism operations. The UN special rapporteur calls the HRC to take effective steps, by means of an appropriate resolution aimed at urging all member states to comply with their obligations under international law, including IHL, in particular the principles of precaution, distinction and proportionality (A/HRC/25/59, § 73). The report complains about a disproportionate number of civilian casualties (A/HRC/25/59, § 21) and suggests to fix, according to the applicable legal principles, some practices and interpretations that "appear to challenge established legal norms" (A/HRC/25/59, § 70).

The international community discusses whether legally-binding instrument are necessary to ensure accountability and human control in the use of lethal autonomous weapon systems in armed conflict, or if there's no need for new rules. A 2018 report by the GGE on LAWS, established under the *Convention on Certain Conventional Weapons*, also known as the Inhumane Weapons Convention, wonders if current international law, in particular IHL, fully applies to LAWS (CCW/GGE.2/2018/3). As originally applied only in international armed conflicts, the scope of application of the CCW and its annexed Protocols was broadened in December 2001, in order to extend it to non-international conflicts provided by Art. 2 and 3 common to the Geneva Conventions of 1949, including any situation set forth in Art. 1(4) of Additional Protocol I.¹⁵

The GGE acknowledges that emerging technologies in the area of lethal autonomous weapons pose humanitarian and international security challenges, and affirms that IHL and other applicable international legal obligations apply fully to LAWS, despite the lack of an agreed definition of the terms (CCW/GGE.2/2018/3). The experts agree that the adoption of new weapon, means or method of warfare should be consistent with international law and IHL.¹⁶ Suber (2018, p. 22) suggests to determine the term "autonomous", which is still undefined, like many other terms (e.g., outer space, cyberspace, conventional, kinetic, etc.), in order to proceed with the GGE debate.

The question is about the ability of LAWS to distinguish between combatants and civilians, and abide by human rights, in a world where the understanding of who is a combatant and what is a battlefield in the digital age are quickly overcoming previous standards (CCJO, 2012, p. 3). According to the Final Report of the GGE on LAWS, the capacity of weapons systems to comply with international legal principles of distinction and proportionality, set forth in Art. 36 of Protocol I to the Geneva Conventions, is crucial.

A leading researcher like Russell (2015) finds that for current AI systems the principles of necessity, discrimination between combatants and non-combatants, and proportionality between the value of the military objective and the potential for collateral damage, set forth in the 1949 Geneva Convention on humane conduct in war, are difficult or impossible to satisfy. He concludes that, although IHL has no specific provisions for LAWS, it may still be applicable.

The White House report on the future of AI reiterates that LAWS should be incorporated into the U.S. defense planning in accordance with IHL, and that the policy on autonomous weapons must be consistent with shared human values and international and domestic obligations, and must adhere to IHL, including the principles of distinction and proportionality (NSTC, 2016, pp. 3, 37-38). Inconsistencies emerge in U.S. policy, which swings between the defense of fundamental human rights, and the desire to employ LAWS without excessive constraints.¹⁷

The U.S. policy for the fielding of autonomous weapons – systems capable of autonomously selecting and engaging targets with lethal force – requires senior-level DoD

¹⁵ Amendment to Art. 1 of the CCW entered into force on May 18, 2004.

¹⁶ For a discussion, see: Suber (2018), Weekes and Stauffacher (2018).

¹⁷ See, e.g.: declarations and voting on UNHRC Resolution 7/7 and the 2018 National Defense Strategy.

approval to be employed (Carter, 2016). The man-machine interface is a focal issue: humans should bear the overall responsibility for coordination and decision-making process. The experts conclude that humans should be held accountable for decisions on the employment of LAWS, and a chain of command and control should be established for their use. A human-centric approach on the human element in the design and (ultimate) decision-making chain when choosing targets, authorising or using (lethal) force.

Some delegations to the CCW GGE on LAWS consider that humans should be held responsible for the final decisions on the use of lethal force. The "accountability approach" considers a set of characteristics related to the functions and type of decisions handed over to machines, and which avoids using levels of autonomy related to the loss of human control. Nevertheless, even if some systems have a greater compliance with IHL, machines cannot be programmed to comply with the latter; this responsibility must fall on the human. That's why a minimum level of human control is required, and the question of responsibility is critical.

Selection and engagement of a target is a principal function of LAWS. The ability of the machine for self-learning (without externally-fed training data) and self-evolution (without human design inputs) could potentially enable it to redefine targets. The discussion focuses on the spectrum of autonomy and at what exact point on the scale could autonomy become problematic. Some weapon systems, such as drones, have a mix of human decision-making and automation (collaborative systems or human-machine teaming), and others a high level of automation. In the case of LAWS, the validator would be a computer. The importance of maintaining human control (subordination) and supervision over critical functions of lethal autonomous weapons and the use of lethal force is essential. Experts recommend that LAWS are not anthropomorphized. Cummings argues that the human-machine teaming would be the best solution (CCW/GGE.2/2018/3, p. 16, § 26).

At the recommendation of the last meeting of the CCW, held in November 2019, 11 guiding principles were adopted related to EDTs in the area of LAWS (CCW/MSP/2019/9). It was affirmed that IL, in particular the UN Charter and IHL, as well as relevant ethical perspectives, should guide the continued work of the Group. The final report concludes, *inter alia*, that: IHL applies fully to LAWS; human-machine interaction in EDTs in the area of LAWS should comply with IL and IHL; human responsibility for decisions cannot be transferred to machines; accountability within a responsible chain of human command and control should be ensured in accordance with IL; the compliance of EDTs and LAWS with IL and IHL and IL should be granted, otherwise new weapons, means or method of warfare must be prohibited.

In a message to the GGE on LAWS, gathered in Geneva for the 2019 meeting, UN Secretary-General, António Guterres, said that "machines with the power and discretion to take lives without human involvement are politically unacceptable, morally repugnant and should be prohibited by international law". The director of the JAIC closed the discussion by stating that "it would be counterproductive to have outright bans on things that...[nobody] has fully defined" (Shanahan, 2019). So far, the GGE on LAWS has not taken a decision whether calling for a ban on LAWS or not. The debate has reached a deadlock and the 2020 sessions have been postponed indefinitely.

The West strives to combine the strategic advantage resulting from advanced technologies with the main humanitarian principles; a difficult task. The OSCE Annual Police Experts Meeting held in 2019 has addressed also key legal, ethical, human rights and gender-related concerns linked to the application of AI-based technologies in the work of law enforcement authorities and agencies. Opening speakers at the meeting said this technology must be used in strict compliance with human rights and fundamental freedoms (OSCE Secretariat, 2019). OSCE Secretary General Thomas Greminger warned that irresponsible or unethical uses of AI can pose unforeseen risks to liberties and privacy rights, and therefore, its use must respect

human rights and fundamental freedoms (OSCE Secretariat, 2019). The OSCE Representative on Freedom of the Media (OSCE RFoM), Harlem Désir, concluded that when driven by political or state interests, the use of AI could seriously jeopardize human rights, and called “governments and legislators in developing clear and human-rights-friendly policies, including for transparency and accountability, in the use of these technologies” (OSCE RFoM, 2020).

Not even the European Union – most of EU member states, 21 out of 27, are NATO members (Marsili, 2020, p. 203) – has the courage to tackle the issue of AI in warfare. The European Commission (COM/2018/237, COM/2020/64, COM/2020/65) warns that legal and ethical impacts of AI, ML and robotics have to be carefully addressed, but when it comes to propose a draft regulation (COM/2021/205, COM/2021/206), the it bans a limited set of uses of AI that contravene EU values or violate fundamental human right but does not include the development and use of AI for military purposes.

6. Conclusions and recommendations

The major powers focus on science and technology development in order to build military power with strategic impact. High-technology weapons, available also to non-state actors, are assumed they would shape the nature of warfare in the twenty-first century. Semiconductors, cloud computing, robotics, and big data are all part of the components needed to develop the AI that will model and define the future battlespace. Artificial intelligence will apply to nuclear, aerospace, aviation and shipbuilding technologies to provide future combat capabilities. The incorporation of AI into military systems and doctrines will shape the nature of future warfare and, implicitly, will decide the outcome of future conflicts. Before fielding a weapon system, military and political leaders should think about how it can be used and should it be used in a certain manner. A strong and clear regulatory framework is needed.

The use of automatic processing of plans and orders (automatic control) needs a policy control. Autonomous machines need some level of human control and accountability. Imagine what could happen if a system, like HAL 9000 or the *War Games* supercomputer, could make an autonomous decision. Some fictional stories have imagined a dystopian future where machine intelligence increases and surpasses human intelligence until machines exert control over humans. As Freedman concludes in *The Future of War*, most claims from the military futurists are wrong, but they remain influential nonetheless.

The tendency of humans is to give more responsibility to machines in collaborative systems. In the future, automatic design and configuration of military operations will be entrusted more and more to the machines. Given human nature, if we recognize the autonomy of machines, we cannot expect anything better from them than the behavior of their creators. So why should we expect a machine to ‘do the right thing’? In the light of what has been discussed here, it could be argued that some military applications of EDTs may jeopardize human security.

The total removal of humans from the navigation, command and decision-making processes in the control of unmanned systems, and as such away from participation in hostilities, makes humans obsolete and dehumanizes war. Because of the nature and the technological implications of automated weapons and AI-powered intelligence-gathering tools it is likely that boots on ground will become an exception. Cyber soldier probably will be a human vestige behind the machine.

The rules that will apply to battlespace are unknown. Increased machine autonomy in the use of lethal force raises ethical and moral questions. Is it an autonomous system safe from error? Who will bear the responsibility and accountability for the wrong decision: politicians,

low-makers, policy-makers, engineers, or military? Guidelines are needed, and ethical and legal constraints should be considered.

Lexicon and definition of terms are essential, and the international community should find common, undisputed and unambiguous legal formulations. The difference between conventional/unconventional, traditional/non-traditional, kinetic/non-kinetic, and lethal/non-lethal seems to be outdated. A knife, a broken bottle neck (if it cuts your jugular), even a fork, a hammer, a baseball bat, or a stone – according to the biblical story David kills Goliath by hurling a stone from his sling and hitting him in the center of forehead – are all unconventional, kinetic, and potentially lethal weapons. Nevertheless, distinguishing between weapons, their effect and consequence, is necessary in order to avoid a cascade effect and undesirable outcomes. The LAWS can lead to an acceleration of a new arms race and to proliferation illegitimate actors – non-state actors and terrorist groups – cyber-attacks and hacking, lowering of the threshold for the use of force.

The debate on the application of technology to warfare should cover international law, including IHL, ethics, neuroscience, robotics and computer science. It requires a holistic approach. It is necessary to investigate whether the new domains are actually comparable to the classical ones, and whether current rules are applicable, or if new ones are necessary. Further considerations deriving from the extension of the battlefield to the new domains of warfare concern the use of artificial intelligence in the decision-making process, which, in a fluid security environment, needs to be on target and on time in both the physical and virtual informational spaces. It is not just a legal debate, but also moral and ethical that should be deepened. A multi-disciplinary approach would be useful for designing the employment framework for new warfare technologies.

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