MARITIME AFFAIRS: THE JOURNAL OF THE NATIONAL
MARITIME FOUNDATION OF INDIA
2024, VOL. 20, NO. 1

Artificial Intelligence in Maritime Spaces and Forces: A Legal Primer

Mayank Mishra

Keywords: Maritime spaces, Digital Public Infrastructure, DPI, Artificial Intelligence, AI, Military AI, Dual-use, Healthcare, Marine Insurance, Marine Commerce, Indo-Pacific, Privacy, Bias, Discrimination, Political Economy, Law, Technology, Responsible AI, Explainable AI, XAI.

Introduction

Artificial Intelligence (AI) will transform the maritime domain and its actors. For better or for worse, this transformation will extend to the fighting and functioning of maritime forces like navies and coast guards.[1] Living in a hostile neighbourhood and aware of the transformative potential of technology, India's maritime security agencies and forces too have clear intentions to develop and use AI in peace as well as conflict.[2]

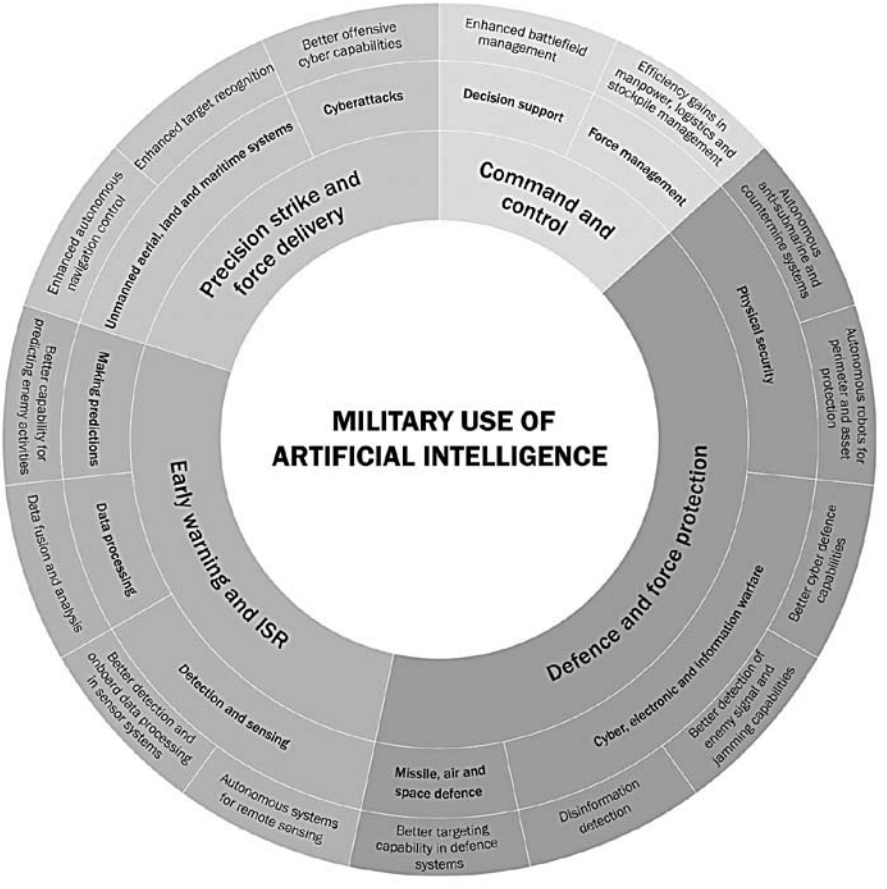
The figure 1 shows potential – and in many cases, existing - applications of AI in maritime spaces and forces:[3]

In addition to Indian maritime forces and agencies, the Government of India also recognises, at a policy level, this transformative potential of AI.[4] For instance, in January 2019, the Minister of State in the Ministry of Defence informed Parliament: *"Artificial Intelligence (Al) based tools would aid the defence forces constructively in areas such as decision support, sensor data analysis, predictive maintenance, situational awareness, accurate data extraction, security etc. These tools will assist defence personnel in better operations, maintenance and logistics support."*[5]

India's AI plans for the maritime domain are not limited to military or kinetic contexts alone. She also intends to extensively use AI in more 'civilian' maritime matters - like port operations and management, maritime commerce and insurance (including 'ease of doing business'), etc. Dr Harsh Vardhan (who, in January 2019, was simultaneously the Union Minister for Science and Technology, Earth Sciences, and Environment, Forest, and Climate Change) explained thus the link between AI and maritime airspace (although its applicability to civilian and military uses of the *waters* is also self-evident):

> *"In automation, machines and production processes are controlled and managed by Artificial Intelligence and Internet of Things (IoT) devices. Self-learning, Robots, Man-machine interface and predictive maintenance and analytics are slowly getting into automation. Artificial Intelligence (AI) and Internet of Things (IoT) are core contributing technologies. Similarly in aerospace, Artificial Intelligence (AI) and Internet of Things (IoT) has enormous usage in fleet management, scheduling, predictive maintenance, and better customer experience and resource optimization. Artificial Intelligence (AI) and Internet of*

Figure 1: Uses and applications of AI in Maritime spaces and forces



Things (IoT) can [also] be used for supply chain, logistics, predictive maintenance….. AI has a potential to have transformative impact on Cyber Security and Security for physical infrastructure, thereby [strengthening] National Security and Defence."[6]

Notwithstanding however this seeming consensus, there is inadequate knowledge and understanding amongst India's policymakers and general public alike about the legal issues that arise in the wake of such AI use. In particular, and despite increasing adoption of AI in India's maritime spaces (and forces), the legalities concerning such use(s) and application(s) of AI have received less than adequate attention in India.

Accordingly, this article seeks to provide a primer on the main legal issues associated with use(s) and application(s) of AI in maritime spaces and forces. Even as its primary focus remains uses of AI by navies and coast guards (***"Military AI"***), many of the issues identified herein apply equally – due in no small measure to the inherently dual-use nature of AI - to spaces or matters that might be considered 'non-military.'

It is believed that this article will inform opinion and policy (on deployment as well as development) of AI in India's maritime spaces and forces, and spur further debate and

research. The article ends by making some recommendations on the subject of military AI in India.

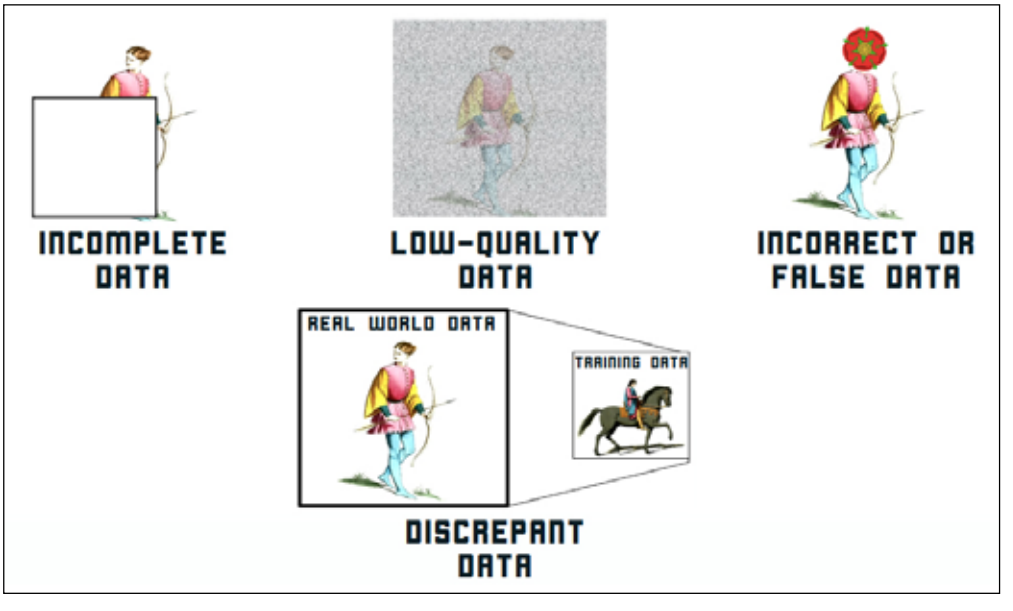
Reliability of Data

Perhaps the most important issue from a legal perspective is the reliability of input and output data – especially training data - of an AI system. When the data is faulty or unreliable, the errors multiply with each successive operation/iteration thereof. Figure 2 below shows some common data issues in military AI:[7]

The epistemic authority of the input (including, and in particular, training and testing data) is linked directly to the correctness, propriety, and legitimacy of the output, which may be in the form of data, or action(s), or both. This relationship between reliable data and legitimate action is particularly stark and true in cases where military AI system(s) – which use data for a variety of functions like planning, targeting, post-incident analysis, etc. - effectuate kinetic military action(s) leading to loss of human life or injury/disablement and varying levels of collateral damage to property.

Consider the USA's Patriot System, an air defence system which operates 'autonomously' and is currently used by 18 countries.[8] In 2003, it caused at least two cases of fratricide (an *"unacceptable fratricide rate"*) during Op Iraqi Freedom.[9] In two separate instances, it shot down and killed pilots of US as well as coalition (UK's Royal Air Force or RAF) forces. In the case of the RAF, a Board of Inquiry found that the Patriot system's Identification Friend or Foe System (IFF System), working in *"autonomous"* mode, mis-identified a UK Tornado aircraft as an incoming anti-radiation missile.[10] The Board stated that the Patriot system gave its crew *"about one minute to decide whether*

Figure 2: Common Data Issues in Military AI



to engage."[11] (A separate study stated that *"the operators were given ten seconds to veto a computer solution.*"[12]) In any event, the Patriot crew, *"trained to react quickly, engage early and to trust the Patriot system,"* did engage, killing two RAF personnel in the Tornado.[13]

Thus, *"fascination-with and blind faith in technology [and] trusting the system without question"* has led in the past to the loss of human lives.[14] There are also historical instances where false alarms in early-warning systems could have led to the use of nuclear weapons.[15] Even in contemporary terms, the sufficiency of the quality - and quantity - of military AI's training and testing data remains suspect.[16] As such, military AI and the data produced by it deserves to be treated with caution, particularly in a legal, operational, intelligence, or nuclear context.[17]

International Humanitarian Law (IHL)

The development and use of military AI does not take place in a legal vacuum. Consider International Humanitarian Law (IHL), a body of international law which seeks to limit the means, methods, and effects of armed conflict.[18] Some of its core principles and rules, applicable in varying ways to the development and use of military AI, are first outlined below:[19]

Table 1: Overview of some applicable IHL Rules and/or Principles

Rule/Principle	Legal source in IHL
'Distinction' obliges parties to an armed conflict to distinguish between the civilian population and combatants, between militarily active combatants and those *hors de combat* (e.g. those expressing an intention to surrender or who are wounded or sick), and between civilian objects and military objectives, and accordingly to direct attacks only against military objectives. The principle of distinction prohibits making a civilian population, as well as individual civilians, the object of attack.	Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts, 8 June 1977 (***"Additional Protocol I"***): Articles 41, 48, 51(2), 51(4), 51(5). Customary IHL: Rules 1, 6, 7, 13, 47.[20]
'Proportionality' prohibits the conduct of an attack that may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, that is excessive in relation to the concrete and direct military advantage anticipated.	Additional Protocol I: Article 51(5)(b). Customary IHL: Rule 14.
'Prohibition against indiscriminate attacks' (distinct from the prohibition of the use of weapons that are indiscriminate by nature, referred to in Customary IHL, Rule 71) prohibits attacks that are of a nature to strike military objectives and civilians or civilian objects without distinction, because such an attack: a) is not directed at a specific military objective, b) employs a method or means of combat which cannot be directed at a specific military objective, or	Additional Protocol I: Article 51(4)(5)(a). Customary IHL: Rules 11-13.

c) employs a method or means of combat the effects of which cannot be limited as required by IHL.	
'Precautions in attack' requires taking constant care in military operations to spare the civilian population, civilians and civilian objects. Those who plan, decide on, or carry out attack(s) must:	Additional Protocol I: Article 57. Customary IHL: Rules 15-19.
a) do everything feasible to verify that the objectives to be attacked are neither civilians nor civilian objects and are not subject to special protection but are military objectives, b) take all feasible precautions in the choice of means and methods of attack with a view to avoiding, or at least minimizing, incidental loss of civilian life, injury to civilians and damage to civilian objects, and c) refrain from deciding to launch any attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated. d) cancel or suspend an attack if it becomes apparent that the objective is not a military one or is subject to special protection, or that the attack may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.	

To be sure, one notes here three things about the 'rules' of customary IHL. First, purported 'rules' contained in a decades-old 'study' deserve, for multiple reasons, scrutiny and examination.[21] Two, State practice in the area of emerging technologies like military AI continues to develop and evolve at speed, and it is not inaccurate to say that the formation of customary IHL in this area is in flux.[22] Third, India has her reservations regarding Additional Protocols I and II of the Geneva Conventions of 1949, and has signed or ratified neither.[23] As such, the strict legal applicability of Additional Protocols I and II to India and her actions, is doubtful.

The presence of these three factors notwithstanding however, sovereign India will still find it difficult to argue that distinction and proportionality are *not* IHL principles, or that they can be legitimately ignored. As such, these IHL principles remain factors for consideration.

These general points about IHL applicability having been made, this article now considers below some of these principles and/or rules more closely. The ability of AI (or lack thereof) to adhere to aforesaid IHL principles is examined below in greater detail.

Adherence to IHL frequently requires subjective and contextual assessments, and the (present) ability of AI to make such assessments – especially of *electronic* representation(s) of fact(s) and/or reality - is dubious. Consider the figure 3:[24]

Figure 3: The contextual and subjective nature of sense-making.

The present ability of AI to understand the content, meaning, and import of this image - including, in particular, its humour - is doubtful. While the AI may be able to recognise Barack Obama and describe the scene, it is unlikely to grasp, for instance, *why* some people are laughing while one person is not. Such subjective and contextual assessment comes easily to humans. Military AI appears unequipped – at least presently – to emulate humans in this area.[25]

To demonstrate further this point about the limitations of AI to make 'human' assessments, the context of IHL rules/principles of distinction and proportionality is examined below.

Distinction. In practical terms, it is doubtful whether current state of technology can satisfactorily perform so as to enable compliance with the rule/principle of distinction. In 2011, Dr James A Ratches (who retired as Chief Scientist of the US Army's Night Vision & Electronic Sensors Directorate or NVESD, and thereafter continued his research at Sensors & Electron Devices Directorate or SEDD) concluded as follows after an extensive review of target acquisition technologies:

> *"The extreme difficulty of the military target acquisition task has thwarted progress in the development of image-processing techniques that enable an acceptable level of performance for the war fighter in harm's way…. [M]edium to highly cluttered backgrounds introduce an unacceptable amount of false alarms, whereas target variability and operational environmental conditions also have a significant degrading effect. Higher level discriminations, such as target recognition and identification, fall off significantly compared to detection…... [E]xcept for some small number of applications, the attainable level of performance must be significantly improved to handle all the false alarms and environmental variables that are encountered in military scenarios. We cannot look to improvements in*

the imaging sensors being used as the front ends for [aided/automatic target recognition]. They are already pushing the limits of physics. Performance improvements must be in the [automatic target recognition] algorithm concepts… Most prevalent state-of-the-art [aided/ automatic Target Recognition] algorithms today are shape based, in which performance degrades significantly under realistic operational conditions, such as clutter, variable target set, and variability."[26]

Proportionality. The notion and/or principle of 'proportionality' is invoked in both *Jus ad bellum* (or the law of recourse to force) and *Jus in bello* (or the law of governing conduct of hostilities).[27] Military AI continues to affect both bodies of law.[28]

Given the contextual, subjective, and dynamic nature of inquiries into 'proportionality' and 'military advantage', it is unlikely that military AI is – presently at least - able to satisfactorily perform this inquiry. Stockholm International Peace Research Institute (SIPRI), a reputed research institute working on conflict, armaments, arms control and disarmament, correctly explains:

"The rule of proportionality illustrates [the 'numbers' challenge]. Neither the incidental civilian harm - loss of civilian life, injury to civilians and damage to civilian objects - expected from an attack nor the anticipated military advantage can be easily quantified. Nor can the relationship between these dissimilar values be fixed in numerical terms. The prohibition on causing excessive civilian harm requires persons to assign values and make judgements that are not purely calculations; in other words, it requires uniquely human judgement."[29]

In more technological terms, the inability of military AI to adequately assess proportionality may be understood as follows:

"[T]he two main components forming the principle of proportionality in military operations can be seen and are as a matter of fact two different entities and models. These are collateral damage depicting the unintentional effects affecting civilians and civilian objects, and military advantage symbolizing the intentional effects contributing to achieving the military objectives defined for military operation conducted. These two entities are complex processes relying on available information, projection on time to the moment of target engagement through estimation and are strongly dependent of common-sense reasoning and decision making. As a deduction, these two components and the proportionality decision result are processes surrounded by various sources and types of uncertainty."[30]

There are of course views that it may be possible to introduce objective criteria into the determination of 'proportionality' (assuming of course that one prefers objective criteria to subjective assessments).[31]

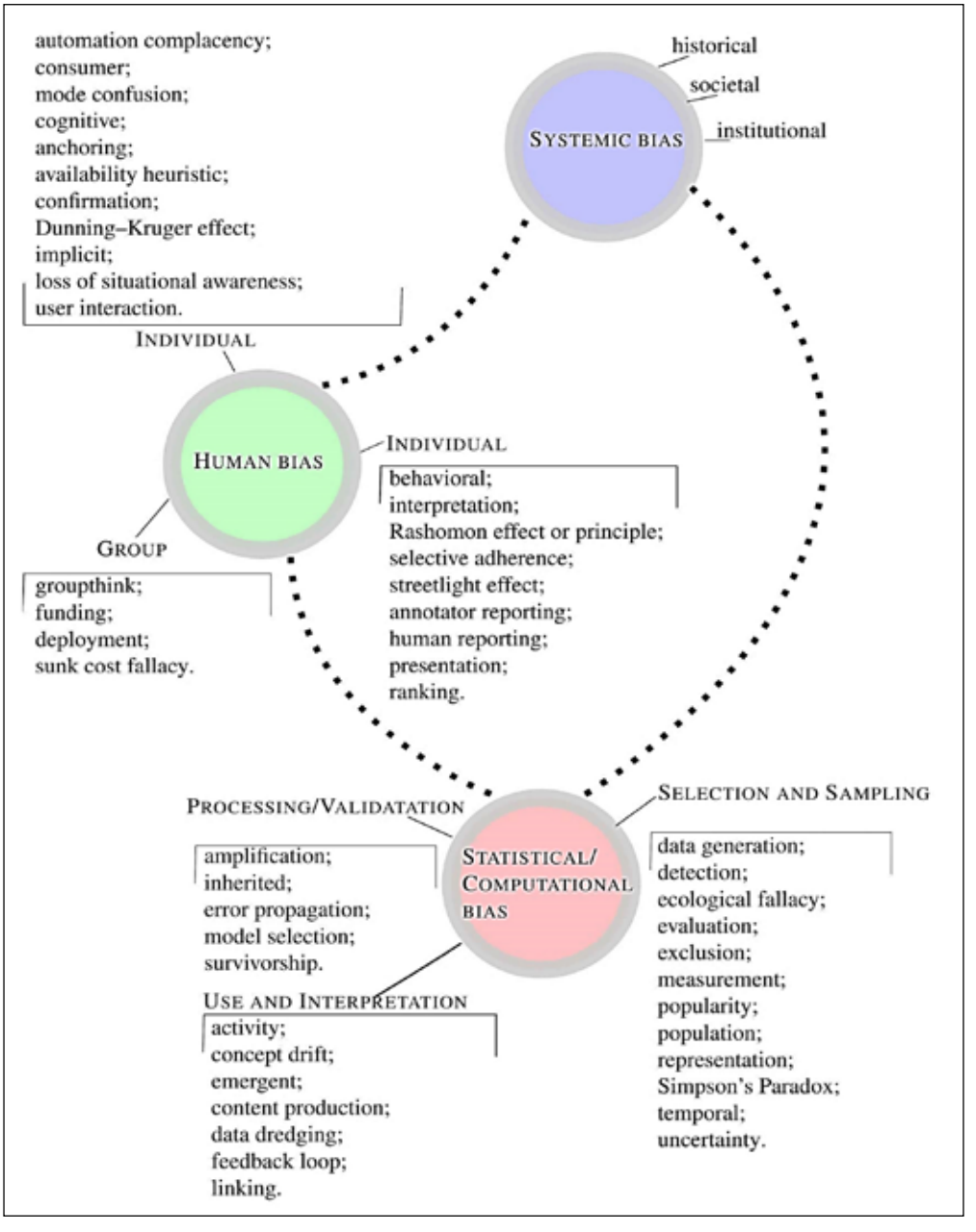
The debate continues, including on the larger question of the ability (or inability) of military AI to adhere to IHL.[32]

Bias/Discrimination

Bias and discrimination - purposeful or inadvertent, and especially of a racial nature - in the development and deployment of military AI is an acknowledged fact.[33] For obvious reasons, bias or discrimination throws up legal issues (particularly where rights are violated) and can attract the application of/action by law.

In one sense, bias is inevitable. The 'logic' and 'common sense' of human beings is frequently if not always tainted by a variety of cognitive and normative errors and biases. The figure below – indicative, and not exhaustive - shows the complex and multi-factorial nature of the bias/discrimination that can enter AI (including military AI) through its creator, the human being:[34]

Figure 4: Types of Bias



Matters of bias or discrimination are further complicated in a military context. A 2021 study by the United Nations Institute for Disarmament Research illustrated the possible consequences and complications:

> *"The consequences of bias in machine learning are augmented in a military context. Consider, for example, a machine translation program used by military intelligence that would assign "male" as the gender of a person of unspecified gender. Or an algorithm designed to recruit military personnel that might pass overqualified women candidates given their historically low levels of participation in the armed forces. Or a voice-control system that does not recognize the voice of a woman pilot. Or an automated system designed to provide emergency relief that does not include provisions specific to women and girls. On top of these considerations, one must contemplate the potential consequences of gender and racial biases in autonomous weapon systems. The criteria that will inform who is and is not a combatant - and, therefore, a target - will be likely to involve gender, age, race and ability. Assumptions about men's roles, for example, may miscategorise civilian men as combatants due to encoded gender biases among human operators as well as within the data-driven process itself."*[35]

In legal terms, the presence of bias or discrimination in a decision - particularly as a contributory factor behind the decision - vitiates the decision and affects its legality and fairness.[36] This is also true for decision(s) made by AI, including military AI.[37] Accordingly, the issue of bias or discrimination in military AI deserves attention and scrutiny.

Accountability

The law demands accountability for actions, particularly where such actions lead to harm or cause other wrong(s). However, determining and fixing accountability for the 'action' of military (or civilian) AI is tricky.

First, a fundamental legal question concerns the legal personality of AI, and whether AI itself can or should be held accountable for its 'actions.' Put another way, it is unclear if it is possible or desirable to assign accountability or responsibility to AI *qua* artificial agent.[38]

Second, autonomy and/or responsibility may be understood as stemming from and operating in at least three distinct conceptual and ontological domains – of causality, legality, and morality.[39] In legal terms therefore, there is *"conceptual fuzziness"* in accountability and/or responsibility whereby the concept(s) are understood, invoked, and argued differently by lawyers, technologists, social scientists, policymakers, ethicists, etc.:

> *"Appeals to accountability among AI commentators reflect a general trend in public discourse that both lionises the concept and struggles to specify what it means. Historians of accountability note that the term originates in practices of financial record-keeping and only entered mainstream usage in the late twentieth century. It has since become an ever-expanding concept, used both for narrow purposes and as a catch-all term for normative desirability.*

This conceptual fuzziness is on full display in AI debates, where no two commentators seem to use the term in precisely the same way. Some scholars treat accountability as a kind of master virtue, using accountability as more or less synonymous with moral justifiability. According to this perspective, AI is accountable when all its features are justifiable to all concerned. Others assign accountability a far more limited role, such as to verify that algorithms comply with existing legal standards or that aspects of system performance are traceable. Some understand accountability as a mechanism for regulating professional roles and organizational relationships; others suggest that accountability is a basic component of moral responsibility that exists independently of institutional practices. Some presume that accountability is a quality of those who design and deploy AI systems, while others treat accountability as a quality of the systems themselves. Because these conceptual disagreements are rarely made explicit, participants in debates about AI accountability often talk past each other."[40]

Third, domestic accountability for regular and/or peacetime operation(s) of military (and civilian) AI is not the same as individual criminal responsibility - under *international* law - for any excesses of military AI in conflict. The two issues are separate, and equally difficult to resolve.[41]

Even if agreement is reached on the conceptual and philosophical issues, the practicalities of evidence and proof, and the difficulties of transparency and attribution, will continue to present obstacles to successful prosecutions for incidents. This will be particularly true in international contexts, where alleged wrongdoers may frequently play role(s) in matters of investigation, arrest, detention, transfers, etc.[42]

The debate continues.

Privacy and Consent

AI is effective at finding patterns in vast amounts of data. As such, it is particularly useful for certain tasks in maritime spaces and forces - like surveillance, migration management, border controls, etc.[43] However, legal issues of privacy and consent clearly arise in the context of such use(s) of AI. These issues become particularly acute in three contexts:

- In the case of citizens who may have constitutional rights protecting their privacy, agency, and consent.
- Where personal data may be used by military (or civilian) AI for aspects related to 'non-military' things like healthcare, personnel and inventory management, provision of entitlements or public services, etc.
- In the case of 'soldier enhancement', a special case of military AI.[44] Here, issues of consent - and the legal aspects of policy and risk appetite for such enhancement - are particularly pregnant with possibilities and problems.[45] Contemporary historian and academic Vincent M Guérin describes the phenomenon as *"the mirror of a loss of control, the expression of a technological counter-productivity threshold, [and] the symptom of an emerging vulnerability linked to an unbridled quest for technological power."*[46]

It can be seen that issues of privacy and consent in AI, given their cross-cutting implications for wide sections of society, deserve perhaps special attention and analysis.

In the final section (below), this article is concluded, and two recommendations are offered.

Conclusion and Recommendations

Human beings and Technology continue to shape each other. As technology evolves, more legal issues may well emerge. This article is a legal primer on AI uses and applications in maritime spaces and forces, and as such does not seek to provide an exhaustive list of all existing legal issues. For instance, some emerging legal issues associated with military AI in maritime spaces and forces are:

1. State Responsibility (separate from individual responsibility), for wrong(s) or harm(s) caused by or otherwise attributed to military AI.[47]
2. Legal Reviews of Military AI.[48]
3. The effects of Military AI upon *Jus ad Bellum* and the distribution of *Jus ad Bellum* powers. (For instance, military AI may affect India's nuclear posture, doctrine, and operations, including 'No First Use,' such as it is. These effects deserve standalone, interdisciplinary examination.)[49]
4. Explainability/Transparency/Understandability, in the design and decision(s) of Military AI.[50]

Furthermore, and as mentioned in the introduction, many of the issues identified herein – like accountability, reliability, transparency, bias, etc., – also have applicability and implications for AI operating *outside* a kinetic context in maritime forces (like for maritime commerce and insurance, personnel management and healthcare in maritime forces, etc.).[51] Thus, for instance, given India's plans for Digital Public Infrastructure and the provision of benefits, entitlements, and services therethrough, issues of accountability, bias, transparency, etc., gain particular salience for policymakers, social scientists, and general public alike.[52] Further research on the legalities, risks, ethics, etc. of AI accordingly becomes doubly important.

The law - including law in India - is rightly concerned with the epistemic authority and overall legitimacy of the inputs, processing, and outputs of all AI (including military AI). Petra Molnar, a lawyer, anthropologist, and faculty at Harvard university's Berkman Klein Center for Internet and Society, sums up the big picture that ought to inform law and lawmaking on maritime military AI (and AI in general):

> *"Technology is far from neutral. It reflects norms, values, and power in society. The development of technology occurs in specific spaces that are not open to everyone and its benefits do not accrue equally. Decision-making around implementation (and experimentation) occurs without consultation or even sometimes without consent of the affected groups."*[53]

Such asymmetries of power, coupled with the political economy of technological development, will play their role in the future just as they have played their roles in the past. Like with nuclear weapons and technology (which were once 'new'), States that master contemporary new technologies like AI will seek to become *"normative entrepreneurs"* even as the technology itself stays (mostly) beyond the reach of specific legal regulation.[54] Time will tell.

In light thus of the analysis undertaken in this article, the following recommendations are made:

Ensuring maximum compliance with IHL is only part of the problem. As mentioned in the introduction, when AI is used for instance in the provision of healthcare on or off the battlefield, it is imperative that issues of accountability, reliability, privacy, etc. are clarified in the law and policy governing use of AI by Indian maritime forces. Thus, much more research is needed (and ought to be commissioned) on the law and legalities of such AI use in India.

India's National Strategy for AI makes an excellent recommendation that deserves to be highlighted, and of course implemented. The strategy highlights the roles and successes of USA's Defence Advanced Research Projects Agency (DARPA), like its role in the creation of the modern internet.[55] It recommends that India should have its own version of DARPA for AI research, and identifies for this role the International Centre for Transformational Artificial Intelligence (ICTAI Inc.) in Bengaluru.[56] This article adds that ICTAI's efforts can be supplemented and complemented by the Centre for Development of Advanced Computing (C-DAC), a research and development organisation under the Ministry of Electronics and Information Technology (MeitY) which continues to do substantial work on AI.[57]

Notes

1 Amy Ertan, "Exploring the Security Implications of Artificial Intelligence in Military Contexts" (PhD diss., University of London, May 2022), https://pure.royalholloway.ac.uk/ws/portalfiles/portal/46513266/2022ErtanAPhD.pdf
See also: Michael C Horowitz et al., "Policy Roundtable: Artificial Intelligence and International Security," *Texas National Security Review* (2 June 2020), https://tnsr.org/roundtable/policy-roundtable-artificial-intelligence-and-international-security/#
See also: Vincent Boulanin et al., "Artificial Intelligence, Strategic Stability, and Nuclear Risk," June 2020, *Stockholm International Peace Research Institute (SIPRI)*, 38, 42-43, 50, 58, 60, 68, 77, 92, 99, 104, https://www.sipri.org/sites/default/files/2020-06/artificial_intelligence_strategic_stability_and_nuclear_risk.pdf
See also: US Army, *Robotic and Autonomous Systems Strategy*, March 2017, 3, 7, 17, https://mronline.org/wp-content/uploads/2018/02/RAS_Strategy.pdf
See also: Abib Bin Rashid et al., "Artificial Intelligence in the Military: An Overview of the Capabilities, Applications, and Challenges," *International Journal of Intelligent Systems* (2023), Article ID 8676366, https://doi.org/10.1155/2023/8676366

See also: Sarah Grand-Clément, "Artificial Intelligence Beyond Weapons: Application and Impact of AI in the Military Domain", 11 October 2023,United Nations Institute for Disarmament Research (UNIDIR), https://unidir.org/publication/artificial-intelligence-beyond-weapons-application-and-impact-of-ai-in-the-military-domain/

2 Directorate of Indigenisation (IHQ MoD Navy), *Indian Naval Indigenisation Plan (INIP) (2015-2030)*, 40-41, https://www.ddpmod.gov.in/sites/default/files/INIP%20(2015-2030).pdf

See also: Department of Defence Production (Ministry of Defence, Government of India), *The New Age of Defence: Presenting AI Preparedness of the country in Defence*, 8 July 2022, https://www.ddpmod.gov.in/sites/default/files/ai.pdf

See also: Indian Coast Guard, *Safe Waters*, August 2023, 21-24, https://indiancoastguard.gov.in/WriteReadData/bookpdf/20230918060158070058OSAFEWATERSAUG2023.pdf

See also: Oishee Majumdar, "Aero India 2023: Tardid Technologies develops USV for Indian Navy," 15 February 2023, *Janes*, https://www.janes.com/defence-news/news-detail/aero-india-2023-tardid-technologies-develops-usv-for-indian-navy

See also: Ministry of Defence (Government of India), "Task Force for Implementation of AI," 28 March 2022, *Press Information Bureau*, https://pib.gov.in/PressReleasePage.aspx?PRID=1810442

See also: Vincent Boulanin et al., "Artificial Intelligence, Strategic Stability, and Nuclear Risk," 78-86.

3 Vincent Boulanin, Kolja Brockmann, and Luke Richards, "Responsible Artificial Intelligence Research and Innovation for International Peace and Security," November 2020, Stockholm International Peace Research Institute (SIPRI), 4, https://www.sipri.org/sites/default/files/2020-11/sipri_report_responsible_artificial_intelligence_research_and_innovation_for_international_peace_and_security_2011.pdf

4 Directorate of Indigenisation (IHQ MoD Navy), Ministry of Defence (Government of India), *Swavlamban 2.0 Indigenisation Plan*, 62, 96, 98-99, 131, 134, https://www.ddpmod.gov.in/sites/default/files/SWAVLAMBAN%202.0.pdf

See also: "Reply of Subhash Ramrao Bhamre (Minister of State, Ministry of Defence, Govt. of India) to Unstarred Question no. 3626 in Lok Sabha," 02 January 2019, *Parliament Digital Library*, https://eparlib.nic.in/handle/123456789/2966081?view_type=search

See also: "Reply of Nirmala Sitharaman (Union Minister of Defence, Govt. of India) to Starred Question no. 312 in Lok Sabha," 02 January 2019, *Parliament Digital Library*, https://eparlib.nic.in/handle/123456789/2966081?view_type=search

See also: "Reply of Harsh Vardhan (Union Minister, Ministry of Science & Technology, Ministry of Earth Sciences, MoEFCC, Govt. of India) to Unstarred Question no. 3655 in Lok Sabha," 02 January 2019, *Parliament Digital Library*, https://eparlib.nic.in/handle/123456789/2966081?view_type=search

See also: "Reply of Y S Chowdhary (Minister of State, Ministry of Science & Technology, and Minister of State, Ministry of Earth Sciences, Govt. of India) to Unstarred Question no. 823 in Lok Sabha," 07 February 2018, *Parliament Digital Library*, https://eparlib.nic.in/handle/123456789/774207?view_type=search

See also: Ministry of Ports, Shipping and Waterways (Government of India), "Maritime Amrit Kaal Vision 2047," 223, 322, 444, https://shipmin.gov.in/sites/default/files/Maritime%20Amrit%20Kaal%20Vision%202047%20%28MAKV%202047%29_compressed_0.pdf

See also: Niti Aayog (Government of India), "National Strategy for Artificial Intelligence,"

June 2018, 61, 104, https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-Artificial-Intelligence.pdf

See also: Ministry of Electronics and Information Technology (Government of India), *Draft National Policy on Electronics 2018*, 10 October 2018, 6, 10, 12, https://www.meity.gov.in/writereaddata/files/Draft_NPE_2018_10thOct2018.pdf

5 "Reply of Subhash Ramrao Bhamre (Minister of State, Ministry of Defence, Govt. of India) to Unstarred Question no. 3626 in Lok Sabha."

6 "Reply of Harsh Vardhan (Union Minister, Ministry of Science & Technology, Ministry of Earth Sciences, MoEF&CC, Govt. of India) to Unstarred Question no. 3655 in Lok Sabha."

See also: Ministry of Ports, Shipping, and Waterways (Government of India), 'Maritime Indian Vision 2030," 22 February 2021, 104-123, https://sagarmala.gov.in/sites/default/files/MIV%202030%20Report.pdf

See also: Col Benjamin P Donham, "Data Desert: Military Medicine's Artificial Intelligence Implementation Barriers," 24 November 2023, *Military-Medicine*, https://military-medicine.com/article/4256-data-desert-military-medicine-s-artificial-intelligence-implementation-barriers.html

See also: Jonathan R Spirnak et al., "The Need for Artificial Intelligence Curriculum in Military Medical Education," *Military Medicine* (2023): usad412, https://doi.org/10.1093/milmed/usad412

See also: Ajinkya Jadhav, "Developing AI in Combat Healthcare," 22 October 2021, *Centre for Land Warfare Studies*, https://www.claws.in/developing-ai-in-combat-healthcare/

See also: Abib Bin Rashid et al., "Artificial Intelligence in the Military: An Overview of the Capabilities, Applications, and Challenges," 21.

7 Arthur Holland Michel, "Known Unknowns: Data Issues and Military Autonomous Systems," 17 May 2021, United Nations Institute for Disarmament Research (UNIDIR), 3, https://doi.org/10.37559/SecTec/21/AI1

8 "Patriot," 23 August 2023, *CSIS Missile Defense Project*, https://missilethreat.csis.org/system/patriot/

9 John K Hawley, "Looking Back at 20 Years of MANPRINT on Patriot: Observations and Lessons," Army Research Laboratory, ARL-SR-0158, September 2007, ii, https://apps.dtic.mil/sti/tr/pdf/ADA472740.pdf

See also: Ingvild Bode and Tom Watts, "Meaning-less Human Control: Lessons from Air Defence Systems on Meaningful Human Control for the Debate on AWS," February 2021, Center for War Studies (University of Southern Denmark), 51-59, https://dronewars.net/wp-content/uploads/2021/02/DW-Control-WEB.pdf

See also: John K Hawley, "Patriot Wars: Automation and the Patriot Air and Missile Defense System," January 2017, Center for a New American Security (CNAS), https://s3.amazonaws.com/files.cnas.org/documents/CNAS-Report-EthicalAutonomy5-PatriotWars-FINAL.pdf

10 Ministry of Defence (Government of UK), "Aircraft Accident to Royal Air Force Tornado GR MK4A ZG710," May 2004, 2-5, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/82817/maas03_02_tornado_zg710_22mar03.pdf

11 *Ibid*, 3.

12 Mary L Cummings, "Automation Bias in Intelligent Time Critical Decision Support Systems," *Decision making in aviation*, Routledge, 2017: 5, https://maritimesafetyinnovationlab.org/wp-content/uploads/2023/02/Automation-Bias-in-Intelligent-Time-Critical-Decision-Support-Systems.pdf

13 Ministry of Defence (Government of UK), "Aircraft Accident to Royal Air Force Tornado GR MK4A ZG710," 3.

14 John K Hawley, "Looking Back at 20 Years of MANPRINT on Patriot: Observations and Lessons," 3-4.

See also: "Psychological aspects of AI," in ed. Christoph Bartneck et al., *An Introduction to Ethics in Robotics and AI* (Springer, 2021), 57-58.

See also: Ingvild Bode and Tom Watts, "Worried about the autonomous weapons of the future? Look at what's already gone wrong," 21 April 2021, *Bulletin of the Atomic Scientists*, https://thebulletin.org/2021/04/worried-about-the-autonomous-weapons-of-the-future-look-at-whats-already-gone-wrong/

15 Vincent Boulanin et al., "Artificial Intelligence, Strategic Stability, and Nuclear Risk," 20.

16 Peter Svenmarck et al., "Possibilities and Challenges for Artificial Intelligence in Military Applications," in *Proceedings of the NATO Big Data and Artificial Intelligence for Military Decision Making Specialists' Meeting* (2018), NATO Science & Technology Organisation, https://www.sto.nato.int/publications/STO%20Meeting%20Proceedings/STO-MP-IST-160/MP-IST-160-S1-5.pdf

See also: John M Fossaceca and Stuart H Young, "Artificial Intelligence and Machine Learning for Future Army Applications," *Ground/Air Multisensor Interoperability, Integration, and Networking for Persistent ISR IX* 10635, SPIE (2018): 4-6, https://doi.org/10.1117/12.2307753

See also: Kishore Sugali, Chris Sprunger and Venkata N Inukollu, "Software Testing: Issues and Challenges of Artificial Intelligence & Machine Learning," *International Journal of Artificial Intelligence and Applications* 12, No 1 (January 2021): 103-105, https://ssrn.com/abstract=3948930

See also: Brent J Lance et al., "Minimizing Data Requirements for Soldier-interactive AI/ML Applications through Opportunistic Sensing," *Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications II* 11413, 19-27, SPIE (2020), https://www.researchgate.net/profile/Jonathan-Touryan/publication/340878249_Minimizing_data_requirements_for_soldier-interactive_AIML_applications_through_opportunistic_sensing/links/632dacef165ca2278769b200/Minimizing-data-requirements-for-soldier-interactive-AI-ML-applications-through-opportunistic-sensing.pdf

See also: Bonnie Johnson, "Artificial intelligence systems: Unique Challenges for Defense applications,"), SYM-AM-21-087, 10 May 2021, *Naval Postgraduate School (Acquisition Research Program)*, 322, 325-327, 331, https://www.dair.nps.edu/bitstream/123456789/4394/1/SYM-AM-21-087.pdf

17 Arthur Holland Michel, "Known Unknowns: Data Issues and Military Autonomous Systems."

See also: Kelsey Atherton, "Understanding the errors introduced by military AI applications," 6 May 2022, Brookings, https://www.brookings.edu/articles/understanding-the-errors-introduced-by-military-ai-applications/

See also: Department of Defense (Government of USA), *Data, Analytics, and Artificial Intelligence Adoption Strategy: Accelerating Decision Advantage*, 27 June 2023, 19-21, https://media.defense.gov/2023/Nov/02/2003333300/-1/-1/1/DOD_DATA_ANALYTICS_AI_ADOPTION_STRATEGY.PDF

See also: Adam C and Richard Carter, "Large Language Models and Intelligence Analysis," July 2023, *CETaS Expert Analysis*, https://cetas.turing.ac.uk/publications/large-language-models-and-intelligence-analysis

See also: Seamus Miller, Mitt Regan, and Patrick F Walsh, *National Security Intelligence and Ethics* (Routledge, 2022), https://doi.org/10.4324/9781003164197
See also: James Johnson, "Inadvertent escalation in the age of intelligence machines: A new model for nuclear risk in the digital age," *European Journal of International Security* 7, No 3 (2022): 337-359, https://doi.org/10.1017/eis.2021.23
See also: Michael C Horowitz, Paul Scharre, and Alexander Velez-Green, "A Stable Nuclear Future? The Impact of Autonomous Systems and Artificial Intelligence," 13 December 2019, *Arxiv*, https://doi.org/10.48550/arXiv.1912.05291

18 Marco Sassòli et al., "How does Law protect in War: Cases, Documents and Teaching Materials on Contemporary Practice in International Humanitarian Law," Vol 1 (third edition), *ICRC Online Casebook*, https://www.icrc.org/en/doc/assets/files/publications/icrc-0739-part-i.pdf
See also: Jean Pictet, "The principles of international humanitarian law," *International Review of the Red Cross* (1961-1997) 6, No 66 (1966): 455-469, https://international-review.icrc.org/sites/default/files/S0020860400011451a.pdf
See also: "What is International Humanitarian Law?," *International Committee of the Red Cross*, https://www.icrc.org/en/doc/assets/files/other/what_is_ihl.pdf
See also: "Understanding International Humanitarian Law,: An Introduction to the Law of Armed Conflict", 2022, *Diakonia International Humanitarian Law Centre*, https://apidiakoniase.cdn.triggerfish.cloud/uploads/sites/2/2022/02/Understanding_IHL-booklet.pdf
See also: "International Humanitarian Law," *College of Law Library (University of Illinois)*, https://libguides.law.illinois.edu/internationalhumanitarianlaw

19 Laura Bruun, Marta Bo, and Netta Goussac, "Compliance with International Humanitarian Law in the Development and Use of Autonomous Weapon Systems," March 2023, *Stockholm International Peace Research Institute (SIPRI)*, 2, https://www.sipri.org/sites/default/files/2023-03/ihl_and_aws.pdf
See also: "Fundamental Principles of IHL," *ICRC Online Casebook*, https://casebook.icrc.org/a_to_z/glossary/fundamental-principles-ihl
See also: "The Geneva Conventions Act, 1960," Act no 6 of 1960, 12 March 1960, *Indiacode*, https://www.indiacode.nic.in/bitstream/123456789/1559/3/a1960-6.pdf
See also: "IHL and the Mandate of the Constitution of India," *eGyanKosh*, https://egyankosh.ac.in/bitstream/123456789/40103/1/Unit-23.pdf
See also: Hafsa Bhat, "Geneva Convention: A Case Study in India," 12 May 2013, *SSRN*, https://dx.doi.org/10.2139/ssrn.2263664
See also: Vincent Boulanin et al., "Limits on Autonomy in Weapon Systems," June 2020, *Stockholm International Peace Research Institute (SIPRI)*, 4, https://www.sipri.org/sites/default/files/2020-06/2006_limits_of_autonomy.pdf

20 "Rules of Customary International Humanitarian Law," *ICRC International Humanitarian Law Databases*, https://ihl-databases.icrc.org/en/customary-ihl/v1
See also: "Customary International Humanitarian Law - Volume 1: Rules," *ICRC Shop*, https://shop.icrc.org/customary-international-humanitarian-law-volume-1-rules-pdf-en.html
See also: "Customary International Humanitarian Law - Volume 2: Practice," *ICRC*, https://www.icrc.org/en/doc/assets/files/other/customary-international-humanitarian-law-ii-icrc-eng.pdf
See also: Yoram Dinstein, "The ICRC Customary International Humanitarian Law Study," *International Law Studies* 82 (07 May 2015): 99-112, https://digital-commons.usnwc.edu/ils/vol82/iss1/6/

21 Yoram Dinstein, "The ICRC Customary International Humanitarian Law Study."
See also: Department of State (Government of USA), "Initial response of U.S. to ICRC study on Customary International Humanitarian Law with Illustrative Comments," 03 November 2006, *US Department of State*, https://2009-2017.state.gov/s/l/2006/98860.htm
See also: John B Bellinger III and William J Haynes II, "A US government response to the International Committee of the Red Cross study Customary International Humanitarian Law," *International Review of The Red Cross* 89, No 866 (June 2007), https://www.icrc.org/en/doc/assets/files/other/irrc_866_bellinger.pdf

22 Ian Hurd, "Targeted killing in international relations theory: Recursive politics of technology, law, and practice," *Contemporary Security Policy* 38, No 2 (2017): 307-319, https://static1.squarespace.com/static/55bc2903e4b0b7e056744a52/t/5988c2a7f5e231a168357b63/1502134954828/2017+CSP+targeted+killing+norms.pdf
See also: Paul Przemysław Polański, "Cyberspace: A new branch of international customary law?," *Computer Law & Security Review* 33, No 3 (2017), https://tadbirsaz.org/assets/filemanager/userfiles/research/%D8%AD%D9%82%D9%88%D9%82/2020-Cyberspace-A-ne-%20branch-of%20international.pdf

23 Reply of Gen Dr V K Singh, (Minister of State, Ministry of External Affairs) to Unstarred Question no. 3570 in Lok Sabha," 02 January 2019, *Parliament Digital Library*, https://eparlib.nic.in/bitstream/123456789/804254/1/AU3570.pdf
See also: Md Tabish Eqbal, "Revisiting India's Non-Ratification of the Additional Protocols to the Geneva Conventions: Do They Hold Up Today?," 20 August 2017, *Jurist News*, https://www.jurist.org/commentary/2017/08/md-tabish-eqbal-india-nonratification/
See also: Srinivas Burra, "India's Strange Position on the Additional Protocols of 1977," 05 February 2019, *EJIL: Talk*, https://www.ejiltalk.org/indias-strange-position-on-the-additional-protocols-of-1977/
See also: Magda Pacholska, "The Legal Fiction of the Two-Element Approach: The Role of International Organizations in Customary IHL Identification," 30 August 2023, *EJIL: Talk*, https://www.ejiltalk.org/the-legal-fiction-of-the-two-element-approach-the-role-of-international-organizations-in-customary-ihl-identification/

24 Andrej Karpathy, "The state of Computer Vision and AI: we are really, really far away," 22 October 2012, *Andrej Karpathy Blog*, https://karpathy.github.io/2012/10/22/state-of-computer-vision/

25 "Introduction to the Human Brain," Youtube video, 43:15 – 54:05, "MIT OpenCourseWare," 27 October 2021, https://youtu.be/ba-HMvDn_vU?si=tbhS2OEoHRP9wSUw
See also: Brenden M Lake et al., "Building Machines That Learn and Think Like People," *Behavioural and Brain Sciences* 40 (2017): 5-9, https://doi.org/10.1017/S0140525X16001837

26 James A Ratches, "Review of current aided/automatic target acquisition technology for military target acquisition tasks," *Optical Engineering* 50, No 7 (2011): 5, 7, https://doi.org/10.1117/1.3601879

27 "What are jus ad bellum and jus in bello?," 22 January 2015, *International Committee of The Red Cross*, https://www.icrc.org/en/document/what-are-jus-ad-bellum-and-jus-bello-0%EF%BB%BF
See also: Enzo Cannizzaro, "Contextualizing proportionality: jus ad bellum and jus in bello in the Lebanese war," *International Review of the Red Cross* 88, No 864 (2006): 779-792, https://www.icrc.org/en/doc/assets/files/other/irrc_864_cannizzaro.pdf

28 Alexander Blanchard and Mariarosaria Taddeo, "Autonomous weapon systems and jus ad

bellum," *AI & Society* 39 (2022): 1-7, https://link.springer.com/article/10.1007/s00146-022-01425-y

See also: Francis Grimal and Michael J Pollard, "Embodied Artificial Intelligence and Jus Ad Bellum Necessity: Influence and Imminence in the Digital Age," *Georgetown Journal of International Law* 53 (2021): 209, https://www.law.georgetown.edu/international-law-journal/wp-content/uploads/sites/21/2023/02/GT-GJIL230002.pdf

See also: Ashley Deeks, Noam Lubell, and Daragh Murray, "Machine learning, Artificial Intelligence, and the Use of Force by States," *Journal of National Security Law & Policy* 10 (2019): 1, https://jnslp.com/wp-content/uploads/2019/04/Machine_Learning_Artificial_Intelligence_2.pdf

See also: Michael N Schmitt, "The Influence of Weaponry on the Jus ad Bellum," 29 January 2024, *Articles of War*, https://lieber.westpoint.edu/influence-weaponry-jus-ad-bellum/

29 Vincent Boulanin et al., "Limits on Autonomy in Weapon Systems," 5.

30 Clara Maathuis and Sabarathinam Chockalingam, "Tackling Uncertainty Through Probabilistic Modelling of Proportionality in Military Operations," *Proceedings of the 22nd European Conference on Cyber Warfare and Security* (2023), 276, https://ife.brage.unit.no/ife-xmlui/bitstream/handle/11250/3114457/Maathuis-EWS-028.pdf?sequence=1

See also: Mateus de Oliveira Fornasier, "The Regulation of the Use of Artificial Intelligence (AI) in Warfare: Between international humanitarian law (IHL) and Meaningful Human Control," *Revista Jurídica da Presidência* 23, No 129 (2021): 89, https://revistajuridica.presidencia.gov.br/index.php/saj/article/download/2229/1370

31 Clara Maathuis, Wolf Pieters, and Jan van den Berg, "Decision support model for effects estimation and proportionality assessment for targeting in cyber operations," *Defence Technology* 17, No 2 (2021): 352-374, https://doi.org/10.1016/j.dt.2020.04.007

See also: Marco Sassóli, "Autonomous Weapons and International Humanitarian Law: Advantages, Open Technical Questions and Legal Issues to be Clarified," *International Law Studies* 90, No 1 (2014), 331-335, https://digital-commons.usnwc.edu/ils/vol90/iss1/1/

See also: Michael N Schmitt and Jeffrey S Thurnher, "'Out of the Loop': Autonomous Weapon Systems and the Law of Armed Conflict," *Harvard National Security Journal* 4 (2013): 253-257, https://ssrn.com/abstract=2212188

32 Vincent Boulanin et al., "Limits on Autonomy in Weapon Systems," 5-10.

See also: Vincent Boulanin, Laura Bruun, and Netta Goussac, "Autonomous Weapon Systems and International Humanitarian Law," June 2021, *Stockholm International Peace Research Institute (SIPRI)*, 14-27, https://www.sipri.org/sites/default/files/2021-06/2106_aws_and_ihl_0.pdf

33 Working Paper submitted by Austria, Belgium, Canada, Costa Rica, Germany, Ireland, Luxembourg, Mexico, Panama and Uruguay (Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems), *Addressing Bias in Autonomous Weapons*, CCW/GGE.1/2024/WP.5, March 2024, https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-Group_of_Governmental_Experts_on_Lethal_Autonomous_Weapons_Systems_(2024)/CCW-GGE.1-2024-WP.5.pdf

See also: Ingvild Bode, "Falling under the radar: the problem of algorithmic bias and military applications of AI," 14 March 2024, *ICRC Humanitarian Law & Policy Blog*, https://blogs.icrc.org/law-and-policy/wp-content/uploads/sites/102/2024/03/falling-under-the-radar-the-problem-of-algorithmic-bias-and-military-applications-of-ai-PDF.pdf

See also: United Nations Institute for Disarmament Research (UNIDIR), *Algorithmic Bias and the Weaponisation of Increasingly Autonomous Technologies: A Primer*, 22 August 2018,

https://unidir.org/wp-content/uploads/2023/05/algorithmic-bias-and-the-weaponization-of-increasingly-autonomous-technologies-en-720.pdf

See also: Reva Schwartz et al., "Towards a Standard for Identifying and Managing Bias in Artificial Intelligence," March 2022, National Institute of Standards and Technology (NIST) Special Publication 1270, 1-10, 47, https://www.dwt.com/-/media/files/blogs/artificial-intelligence-law-advisor/2022/03/nist-sp-1270--identifying-and-managing-bias-in-ai.pdf

34 Reva Schwartz et al., "Towards a Standard for Identifying and Managing Bias in Artificial Intelligence," 8.

See also: Amos Tversky and Daniel Kahneman, *Judgment under Uncertainty: Heuristics and Biases* (Office of Naval Research Technical Report, August 1973), https://apps.dtic.mil/sti/pdfs/AD0767426.pdf

35 Katherine Chandler, "Does Military AI Have Gender? Understanding bias and promoting ethical approaches in military applications of AI," 7 December 2021, United Nations Institute for Disarmament Research (UNIDIR), 12, https://unidir.org/wp-content/uploads/2023/05/UNIDIR_Does_Military_AI_Have_Gender.pdf

36 In strict legal terms, matters of 'policy' – particularly when based on reasonable classification or intelligible differentia – are exceptions to this principle. Examples include laws concerning 'positive discrimination' or reservation, rules reserving seats in public transport for old/pregnant persons, etc.

See Also: Srishti Aishwarya, "Equality before Law and Affirmative Action under the Constitution of India: Whether the Creamy Layer concept is still relevant?" *Comparative Constitutional Law and Administrative Law Quarterly* 2, No 4 (2015), https://docs.manupatra.in/newsline/articles/Upload/1E4ADF5E-09B0-45F1-9993-302D98990920.4-c__constitution.pdf

See also: "Ensuring Equality: The Doctrine of Object and Nexus in Indian Constitutional Law," *Bhatt & Joshi Associates*, https://bhattandjoshiassociates.com/ensuring-equality-the-doctrine-of-object-and-nexus-in-indian-constitutional-law/

See also: Ananya Bali, "Doctrine of Reasonable Classification as an Exception to the Right to Equality: Critical Analysis in Light of the Legal Provisions and Relevant Case-Laws," *International Journal of Law Management & Humanities* 4, No 1 (2021): 1414, http://doi.one/10.1732/IJLMH.25848

37 Timnit Gebru, "Race and Gender," in *The Oxford Handbook of Ethics of AI*, ed. Markus D Dubber, Frank Pasquale, and Sunit Das (New York: Oxford University Press, 2020), 253-269.

See also: Mary L Cummings, "Automation Bias in Intelligent Time Critical Decision Support Systems."

See also: Sandra Wachter, Brent Mittelstadt, and Chris Russell, "Bias Preservation in Machine Learning: The Legality of Fairness Metrics Under EU Non-Discrimination Law Metrics Under EU Non-Discrimination Law," *West Virginia Law Review* 123, Issue 3 Article 4 (April 2021), https://researchrepository.wvu.edu/cgi/viewcontent.cgi?article=6331&context=wvlr

See also: Anastasia Siapka, "The Ethical and Legal Challenges of Artificial Intelligence: The EU response to biased and discriminatory AI," 11 December 2018, Panteion University of Social and Political Sciences, 23-41, https://dx.doi.org/10.2139/ssrn.3408773

See also: Janneke Gerards and Frederik Zuiderveen Borgesius, "Protected Grounds and the System of Non- discrimination law in the context of Algorithmic Decision-making and Artificial Intelligence," *Colorado Technology Law Journal* 20, (2022), 5-16, https://repository.ubn.ru.nl/handle/2066/288634

38 Alex Leveringhaus, *Ethics and Autonomous Weapons* (Palgrave Macmillan, 2016), 76-77.

39 *Ibid*, 69.

40 Theodore M. Lechterman, "The Concept of Accountability in AI Ethics and Governance," in Justin B Bullock et al., eds., *The Oxford Handbook of AI Governance* (Oxford Academic, 2022).

See also: Dierdre K Mulligan et al., "This Thing called Fairness: Disciplinary Confusion Realising a Value in Technology," *Proceedings of the ACM on Human-Computer Interaction* 3, No 119: 1-36, https://doi.org/10.1145/3359221

41 Marta Bo, Laura Bruun, and Vincent Boulanin, "Retaining Human Responsibility in the Development and Use of Autonomous Weapon Systems: On Accountability for Violations of International Humanitarian Law Involving AWS," October 2022, *Stockholm International Peace Research Institute (SIPRI)*, https://www.sipri.org/sites/default/files/2022-10/2210_aws_human_responsibility.pdf

See also: Vincent Boulanin, Laura Bruun, and Netta Goussac, "Autonomous Weapon Systems and International Humanitarian Law: Identifying Limits and the Required Type and Degree of Human-Machine Interaction," June 2021, *Stockholm International Peace Research Institute (SIPRI)*, 40-50, https://www.sipri.org/sites/default/files/2021-06/2106_aws_and_ihl_0.pdf

42 Jacob Katz Cogan, "The Problem of Obtaining Evidence for International Criminal Courts," *Human Rights Quarterly* 22 (2000): 404, https://core.ac.uk/download/pdf/327690647.pdf

See also: Lindsay Freeman, "Digital Evidence and War Crimes Prosecutions: The Impact of Digital Technologies on International Criminal Investigations and Trials," *Fordham International Law Journal* 41, Issue 2 Article 1 (2017): 283, https://core.ac.uk/download/pdf/216957527.pdf

See also: Bartłomiej Krzan, "Admissibility of evidence and international criminal justice," *Rev. Brasileira de Direito Processual Penal* 7 (2021): 161, https://www.redalyc.org/journal/6739/673972096005/html/

See also: Peter Tomka and Vincent-Joël Proulx, "The evidentiary practice of the World Court," NUS Law Working Paper 2015/010 (December 2015), https://law.nus.edu.sg/wp-content/uploads/2020/04/010_2015-_Vincent-Joel-Proulx_Tomka.pdf

43 Matt McLaughlin, "Identity Enabling Soldiers, Supporting the Mission," *Military Review* (January-February, 2019), https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/JF-19/McLaughlin-Identity.pdf

See also: Ameera Kawash, "Impacts of AI Technologies on Palestinian Lives and Narratives," February 2024, *7amleh - The Arab Center for the Advancement of Social Media*, https://7amleh.org/storage/AI%20&%20Racism/7amleh%20-AI%20english1-1.pdf

See also: Petra Molnar, "AI and Migration Management," in *The Oxford Handbook of Ethics of AI*, ed. Markus D Dubber, Frank Pasquale, and Sunit Das (New York: Oxford University Press, 2020), 769-787.

See also: Petra Molnar, "Technological Testing Grounds: Migration Management Experiments and Reflections from the Ground Up," November 2020, *EDRI*, https://edri.org/wp-content/uploads/2020/11/Technological-Testing-Grounds.pdf

See also: Irena Leisbet Ceridwen Connon et al., "Review of emerging technologies in policing: findings and recommendations," (University of Dundee, 2023), https://discovery.dundee.ac.uk/ws/portalfiles/portal/98288751/review_emerging_technologies_policing_report_1_.pdf

44 Daniel C Billing et al., "The implications of emerging technology on military human performance research priorities," *Journal of Science and Medicine in Sport* 24, No 10 (2021): 947-953, https://doi.org/10.1016/j.jsams.2020.10.007

See also: Max Michaud-Shields, "Personal Augmentation - The Ethics and Operational Considerations of Persona Augmentation in Military Operations," *Canadian Military Journal* 15, No 1 (2014), 24-28, http://www.journal.forces.gc.ca/vol15/no1/eng/PDF/CMJ151Ep24.pdf

See also: UK Ministry of Defence, "Human Augmentation - The Dawn of a New Paradigm," December 2020, *Bundeswehr Office for Defence Planning*, 17-42, https://www.bundeswehr.de/resource/blob/5016368/fdc7f1c529ddfb014d4e321e8b666a2d/210111-sip-ha-data.pdf

45 Zoe Stanley-Lockman, "Responsible and Ethical Military AI," August 2021, *Center for Security and Emerging Technology (Georgetown University)*, 27, 60-62, https://cset.georgetown.edu/wp-content/uploads/CSET-Responsible-and-Ethical-Military-AI.pdf

See also: Gérard de Boisboissel and Magdalena Revue eds., *Enhancing Soldier: A European Ethical Approach*, 16 October 2019, *EuroISME*, https://www.euroisme.eu/images/Documents/OtherPublications/Le-soldat-augmente-19-06-2020-web-VFinal.pdf

See also: Jean-François Caron, *A theory of the super soldier: The Morality of Capacity-increasing Technologies in the Military* (Manchester University Press, 2018).

See also: Heather A Harrison Dinniss and Jann K Kleffner, "Soldier 2.0: Military Human Enhancement and International Law," *International Law Studies* 92, No 432 (2016): 433-482, https://digital-commons.usnwc.edu/ils/vol92/iss1/14/

46 Vincent Guérin, "The concept of enhanced soldier: beyond boundaries," in Gérard de Boisboissel and Magdalena Revue eds., *Enhancing Soldier: A European Ethical Approach,* (16 October 2019), 62, https://www.euroisme.eu/images/Documents/OtherPublications/Le-soldat-augmente-19-06-2020-web-VFinal.pdf

47 "State Responsibility," *ICRC*, https://casebook.icrc.org/a_to_z/glossary/state-responsibility

See also: "The Responsibility of States," *Britannica*, https://www.britannica.com/topic/international-law/The-responsibility-of-states

See also: James Crawford, "The International Law Commission's Articles on State Responsibility: Introduction, Text, and Commentaries," Cambridge University Press (2003), https://assets.cambridge.org/97805218/13532/sample/9780521813532ws.pdf

See also: James Crawford, "Articles on Responsibility of States for Internationally Wrongful Acts," 2001, *United Nations Audio Visual Library of International Law*, https://legal.un.org/avl/ha/rsiwa/rsiwa.html

See also: International Law Commission, "Draft articles on Responsibility of States for Internationally Wrongful Acts, with commentaries, 2001," United Nations (2008), https://legal.un.org/ilc/texts/instruments/english/commentaries/9_6_2001.pdf

48 Kathleen Lawand, "A Guide to the Legal Review of New Weapons, Means and Methods of Warfare: Measures to Implement Article 36 of Additional Protocol I of 1977," *International Review of the Red Cross* 88, No 864 (December 2006), https://www.icrc.org/en/doc/assets/files/other/irrc_864_icrc_geneva.pdf

See also: Netta Goussac, "Safety net or tangled web: Legal reviews of AI in weapons and war-fighting," 18 April 2019, *Humanitarian Law & Policy Blog (ICRC)*, https://blogs.icrc.org/law-and-policy/2019/04/18/safety-net-tangled-web-legal-reviews-ai-weapons-war-fighting/

See also: Vincent Boulanin et al., "Responsible Military Use of Artificial Intelligence: Can the European Union Lead the Way in Developing Best Practice?," November 2020, *Stockholm International Peace Research Institute (SIPRI)*, 9-15, https://www.sipri.org/sites/default/files/2020-11/responsible_military_use_of_artificial_intelligence.pdf

See also: Thompson Chengeta, "Are Autonomous Weapon Systems the Subject of Article 36 of Additional Protocol I To The Geneva Conventions?," *UC Davis Journal of International Law and Policy*, 65-99, https://jilp.law.ucdavis.edu/archives/23/1/are-autonomous-weapon-systems-subject-article-36-additional-protocol-i-geneva

See also: James Farrant and Christopher M Ford, "Autonomous Weapons and Weapon Reviews: The UK Second International Weapon Review Forum," *International Law Studies* 93, No 389 (2017), https://digital-commons.usnwc.edu/ils/vol93/iss1/13/

See also: Tobias Vestner and Altea Rossi, "Legal Reviews of War Algorithms," *International Law Studies* 97, No 1 (2021), https://digital-commons.usnwc.edu/ils/vol97/iss1/26/

See also: Rain Liivoja, "AWS Legal Review Series - Protracted Debate, Incremental Progress, Unexpected Outcomes," 15 March 2024, *Articles of War*, https://lieber.westpoint.edu/protracted-debate-incremental-progress-unexpected-outcomes/

49 Jovana Davidovic and Milton Regan, "AI-enabled weapons and Just preparation for War," *Babl AI*, 3-4, 7, https://babl.ai/wp-content/uploads/2023/10/AI-Enabled-Weapons-and-Just-Preparation-for-War.pdf

See also: Dana Gingrich, "Coding Just War Theory: Artificial Intelligence in Warfare," 11 September 2019, *The Simsons Center*, https://thesimonscenter.org/wp-content/uploads/2019/08/IAJ-10-3-2019-pg33-39.pdf

See also: Edoardo Datteri and Guglielmo Tamburrini, "Robotic weapons and democratic decision-making," in E Hilgendorf and J-P Günther, eds., *Robotik und Gesetzgebung* (Nomos Verlagsgesellschaft, 2013), 6-13.

See also: Ben Lerner, "UAVs and Force: Current Debates and Future Trends in Technology, Policy and the Law," 23 October 2013, Center for Security Policy, https://www.jstor.org/stable/resrep05082.7

See also: Bharat Karnad, "A lot of Twaddle about AI and nuclear weapons, tacnukes," 19 May 2023, *Security Wise*, https://bharatkarnad.com/2023/05/19/a-lot-of-twaddle-about-ai-and-nuclear-weapons-tacnukes/

50 Arthur Holland Michel, "The Black Box, Unlocked: Predictability and Understandability in Military AI," 22 September 2020, *United Nations Institute for Disarmament Research (UNIDIR)*, https://unidir.org/publication/the-black-box-unlocked/

See also: David Gunning et al., "DARPA's explainable AI (XAI) program: A retrospective," *Applied AI Letters* 2, No 4 (December 2021), https://doi.org/10.1002/ail2.61

See also: Panu Tamminen, "Operationalizing Transparency and Explainability in Artificial Intelligence through Standardization" (Master's Thesis, University of Turku, 2022), https://www.utupub.fi/bitstream/handle/10024/154054/Tamminen_Panu_Thesis.pdf?sequence=1

See also: Vincent Boulanin, Kolja Brockmann, and Luke Richards, "Responsible Artificial Intelligence Research and Innovation for International Peace and Security," 5.

See also: Chih-Kuan Yeh and Pradeep Ravikumar, "Objective criteria for explanations of machine learning models," *Applied Letters* 2, No 4 (2021), https://doi.org/10.1002/ail2.57

51 Niti Aayog (Government of India), "National Strategy for Artificial Intelligence," 24-45.

See also: Ministry of Ports, Shipping, and Waterways (Government of India), 'Maritime Indian Vision 2030,", 104-123.

See also: Ajinkya Jadhav, "Developing AI in Combat Healthcare."

See also: Col Benjamin P Donham, "Data Desert: Military Medicine's Artificial Intelligence Implementation Barriers."

See also: Jonathan R Spirnak et al., "The Need for Artificial Intelligence Curriculum in Military Medical Education."

See also: Abib Bin Rashid et al., "Artificial Intelligence in the Military: An Overview of the Capabilities, Applications, and Challenges," 21.

52 Ministry of Electronics and IT (Government of India), "Prime Minister announces completion of Global Digital Public Infrastructure Repository and creation of a Social Impact Fund to advance Digital Public Infrastructure in Global South," 23 November 2023, *Press Information Bureau*, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1979113
See also: Sreevas Sahasranamam and Jaideep Prabhu, "Digital Public Infrastructure for the Developing World," 25 March 2024, *Stanford Social Innovation Review*, https://ssir.org/articles/entry/digital-public-infrastructure-developing-world
See also: "G20 Digital Ministers Recognize Digital Public Infrastructure as an Accelerator of the SDGs," 19 August 2023, *UNDP India*, https://www.undp.org/india/press-releases/g20-digital-ministers-recognize-digital-public-infrastructure-accelerator-sdgs

53 Petra Molnar, "AI and Migration Management," 784.

54 Markus Gunneflo and Gregor Noll, "Technologies of Decision Support and Proportionality in International Humanitarian Law," *Nordic Journal of International Law* 92, No 1 (2023): 103, https://doi.org/10.1163/15718107-bja10055
See also: Ingvild Bode, "Contesting Use of Force Norms Through Technological Practices," *Heidelberg Journal of International Law* 83, No 1 (2023): 39-64, https://doi.org/10.17104/0044-2348-2023-1-39

55 Niti Aayog (Government of India), "National Strategy for Artificial Intelligence," 61.
See also: Vinton Cerf, "How the Internet came to be," 1993, NetValley, https://www.netvalley.com/archives/mirrors/cerf-how-inet.html
See also: Mitch Waldrop, "DARPA and the Internet Revolution," *DARPA*, https://www.darpa.mil/attachments/(2O15)%20Global%20Nav%20-%20About%20Us%20-%20History%20-%20Resources%20-%2050th%20-%20Internet%20(Approved).pdf

56 Niti Aayog (Government of India), "National Strategy for Artificial Intelligence," 60.
See also: Samaya Dharmaraj, "International Centre for Transformational Artificial Intelligence set up in Bengaluru," 18 September 2018, *OpenGov Asia*, https://opengovasia.com/2018/09/18/international-centre-for-transformational-artificial-intelligence-set-up-in-bengaluru/

57 "Centre for Development of Advanced Computing (C-DAC)," *Ministry of Electronics and Information Technology (MeitY)*, https://www.meity.gov.in/c-dac
See also: NITI Aayog (Government of India), "AIRAWAT: Establishing an AI-specific Cloud Computing Infrastructure for India," Approach Paper, January 2020, https://www.niti.gov.in/sites/default/files/2020-01/AIRAWAT_Approach_Paper.pdf
See also: Ministry of Electronics and Information Technology (Government of India, "AI Supercomputer 'AIRAWAT' puts India among top supercomputing league: 'AIRAWAT' ranks 75th in top 500 Supercomputing List," 24 May 2023, *Press Information Bureau*, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1926942

Note on Contributor

Mr Mayank Mishra is an Associate Fellow within the Public International Maritime Law (PIML) Cluster of the National Maritime Foundation (NMF). While his research essentially focuses upon the vitally important intersection of maritime law with maritime 'hard security' policy, he is also keenly interested in the equally critical and fascinating interplay between law and emerging technologies, especially where relevant to the maritime domain. The views expressed are those of the author, who can be reached at law9.nmf@gmail.com