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Acknowledging the difficulties in defining artificial intelligence (AI), this paper critiques some popular misconceptions about AI and looks toward the scale and prioritization of actual military AI investments of China and the U.S. -the "AI Superpowers"- to consider ethical dilemmas associated with AI governing principles and capabilities. In 2017, Chinese Communist Party (CCP) promises to dominate AI by 2030 elicited a major bureaucratic response from the United States including several new Department of Defense (DoD) agencies and a flurry of policies. Among these the February 2020 proclamation of ethical principles for AI, followed by a May 2021 Memo on "Implementing Responsible Artificial Intelligence" (RAI), lay out five "DoD AI Ethical Principles" and name the Joint Artificial Intelligence Center (JAIC) as the responsible agent for transforming the Department through AI. The five DoD ethical principles are laudable but inadequate to the ethical challenges AI is already bringing. As competition toward developing AI intensifies, and certainly if AI is ever deployed in combat, sincere advocates for "responsible" AI will need more specific and stable guideposts than these principles and vague commitments to "our values" if they are to respond with sound ethical reasoning

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Ethics and the "Intelligentization" of Warfare:
A Brief Survey of Progress and Problems of the Artificial Intelligence Superpowers

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ABSTRACT

Acknowledging the difficulties in defining artificial intelligence (AI), this paper critiques some popular misconceptions about AI and looks toward the scale and prioritization of actual military AI investments of China and the U.S. -the "AI Superpowers"- to consider ethical dilemmas associated with AI governing principles and capabilities. In 2017, Chinese Communist Party (CCP) promises to dominate AI by 2030 elicited a major bureaucratic response from the United States including several new Department of Defense (DoD) agencies and a flurry of policies. Among these the February 2020 proclamation of ethical principles for AI, followed by a May 2021 Memo on "Implementing Responsible Artificial Intelligence" (RAI), lay out five "DoD AI Ethical Principles" and name the Joint Artificial Intelligence Center (JAIC) as the responsible agent for transforming the Department through AI. The five DoD ethical principles are laudable but inadequate to the ethical challenges AI is already bringing. As competition toward developing AI intensifies, and certainly if AI is ever deployed in combat, sincere advocates for "responsible" AI will need more specific and stable guideposts than these principles and vague commitments to "our values" if they are to respond with sound ethical reasoning.

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INTRODUCTION

Angst over Artificial Intelligence (AI) long predates computers. Images of clay, like Prague's Golem, or of flesh, like Frankenstein's monster, may lack the circuitry of Clarke's HAL-9000 and any of Azimov's robots but they connote the same anxiety over autonomous human creations running amok. The likelihood of releasing such creatures on the battlefield multiplies fears in the popular imagination. Militaries have long deployed autonomous systems; however, the augmentation of these with AI raises new ethical issues that first demand clearer distinctions. Though progress toward *super* or *general* AI is overrated, investment in *narrow* military AI has skyrocketed since 2017 with both China and the U.S. racing for dominance in what the former has dubbed the "Intelligentization" of warfare to describe "a new round of military revolution characterized by networked, intelligent, and autonomous systems and equipment."[1] According to Congressional reporting, such warfare is "defined by the expanded use of artificial intelligence (AI) and other advanced technologies"[2] while the Chairman of the Joint Chiefs of Staff very recently crowned AI as "mother of all technologies."[3] Perhaps because this and other definitions of AI are so vague, this "expanded use" offers new ethical dilemmas well beyond those that have grown since the advent of merely autonomous systems. The autonomy is not new; the intelligence offers revolutionary and thus scarier application. After highlighting this distinction and recounting the growing interest and investments of the "AI Superpowers," this paper examines a few of the applications and systems that have challenged U.S. Government attempts to ensure "responsible" development and deployment of AI.

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[1] Ryan Fedasiuk et al., "Harnessed Lightning: How the Chinese Military is Adopting Artificial Intelligence," Center for Security and Emerging Technology (CSET), October, 2021, 4.
[2] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020*, 86.
[3]

Notes Toward a Definition

> "I don't know what the hell this 'logistics' is that Marshall is always talking about, but I want some of it."
>
> -Admiral E. J. King[4]

Admiral King's relationship to logistics, however apocryphal, may reflect the world's attitude toward the even slipperier phrase, "Artificial Intelligence." However poorly the world's great powers seem to understand the term, they signaled an explosion of desire for it in 2017. Xi Jinping published China's plans to dominate the field by 2030;[5] Vladimir Putin affirmed, "Artificial intelligence is the future of not only Russia, but of all mankind," and "whoever becomes the leader in this sphere will become the ruler of the world."[6] In response, a flurry of new offices and agencies alongside policy and strategy documents from the U.S. acknowledge AI's criticality but, like Russian and Chinese counterparts, lack a single useful definition.

"Artificial intelligence" (AI) has always been notoriously difficult to define.[7] Even before John McCarthy coined the phrase in 1955,[8] Alan Turing's answer to his famous question in 1950, "Can machine's think? . . . should begin with definitions of the meaning of the terms 'machine' and 'think'."[9] Difficulties with the former remain simple in comparison to the latter. One need not cite many footnotes to Plato to realize just how problematic and controversial remain questions of origin, process, and limits to human thinking in Western epistemology.

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[4] Reluctantly cited from: Jack Uldrich, *Soldier, Statesman, Peacemaker: Leadership Lessons from George C. Marshal,* AMACOM, New York, NY, 2005, 129.
[5] Chinese State Council, "Development Plan for a New Generation of Artificial Intelligence," 2017, Tr. Graham Webster et al, New America Foundation, accessed January 12, 2022, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017; see also "Military and Security Developments Involving the People's Republic of China, 2021," 146.
[6] Radina Gigova, "Who Vladimir Putin Thinks Will Rule the World," *CNN,* 2 September 2017.
[7] Congressional Research Service Report, "Artificial Intelligence and National Security," 10 November 2020, 1; see also, Ryan Fedasiuk, et al., "Harnessed Lightning," 9.
[8] John McCarthy et al., "A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence: August 31, 1955," *The AI Magazine* 27, no. 4 (2006).
[9] A. M. Turing, "Computing Machinery and Intelligence," *Mind,* Volume LIX, Issue 236, October 1950, 433–460.

Though some scholars believe a quick tour of empiricism and rationalism help explain AI,[10] the exercise raises far more questions than it solves. For even if a machine's imitation persuades us that it is "thinking," it does not persuade us that it does so through the divine clarity of Augustinian or Thomistic illumination, the earthy utility of a Peircean Pragmatism or the bounded ambiguity of a Kantian Idealism -nor whether those thoughts (let alone our own) are predicated on the presence of Cartesian innate ideas or their absence in a Lockean *tabula rasa*.

The point here is not to survey the history of philosophy or even to critique AI schools from one or more of these traditions. Rather, these references illustrate how enthusiasm for AI drives its proponents to skip most of epistemology's central questions and reduce thinking and knowledge to their least sophisticated conceptions. McCarthy himself is content to say that yes, "even machines as simple as thermostats can be said to have beliefs;" when challenged by John Searle, he admits these are three: "[I]t's too hot in here; it's too cold in here, and it's just right in here."[11] I heat therefore I am. Searle builds here on a critique of AI he developed more famously with his "Chinese Room" thought experiment in 1980.[12] Suppose a human who speaks no Chinese is locked in a room with boxes of Chinese symbols and a book of instructions for manipulating them. More symbols slip in from under the door. Unbeknownst to him, the incoming symbols are questions (inputs) that, when manipulated according to the instructions, let him put out new symbols that, also unbeknownst to him, constitute answers (outputs). Such an exchange of questions and answers could easily pass the Turing test. But because the man understands no Chinese and has no reference from the symbol to the world, he has no "intelligence" of the messages he is translating; nor do computers when they merely manipulate

[10] Patrick Sullivan, et al., "Theory and Conceptual History of Artificial Intelligence," in, Sam Tangredi and George Galdorisi, *AI at War : How Big Data, Artificial Intelligence, and Machine Learning Are Changing Naval Warfare*, Annapolis, Maryland: Naval Institute Press, 2021, 24-44.
[11] John Searle, *Minds, Brains, and Science*, Cambridge, MA: Harvard University Press, 1984, 30.
[12] John Searle, "Minds, Brains, and Programs." *Behavioral and Brain Sciences,* 3, 417-457, 1980.

symbols. This is the famous distinction between syntax, as set of rules for manipulating symbols, and semantics, "-the processes by which people make meaning."[13] Our man in the Chinese Room can exchange symbols but, lacking reference from symbols to the world, he can make no meaning. To summarize Searle's conclusion, "syntax alone is not sufficient for semantics and digital computers insofar as they are computers have, by definition, a syntax alone."[14] Every decoding is another encoding. For a computer, and likewise for AI, that is all it is; the exchange of symbols for other symbols signifies only grammar, not meaning.

Searle's critique-by-semantics is not the first. Anatoly Petrovich Mickevich, Ukrainian physicist, science fiction author, and Aide to Marshal Georgy Zhukov at the German Surrender in 1945, published a story under the pseudonym Anatoly Dneprov. "The Game"[15] did not attract much attention in the West when it was published in 1961 but inspired a popular theme. Stanislaw Lem included an admiring essay in his *Summa Technologiae* (1964)[16] and it inspired several other imitations including, most recently, an episode in Liu Cixin's *Three Body Problem* (2006).[17] Similar to Searle's "Chinese Room," Dneprov's "Portuguese Stadium" offers a thought experiment to challenge the notion of machine thinking. His protagonist, Professor Zarubin, enlists the help of 1400 delegates to the Soviet Congress of Young Mathematicians to act as individual circuits in a "computing machine" to imitate operations of the then state-of-the-art Soviet "Ural" computer. Much like Searle's later scenario, the group's binary operations translate a sentence from Portuguese to Russian though no student or professor in the

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[13] Neil Postman, *Technopoly: The Surrender of Culture to Technology,* New York: Vintage Books, 1993, 194.
[14] John Searle, *Minds, Brains, and Science*, 32.
[15] "A Russian Chinese Room Story Antedating Searle's 1980 discussion." *Moscow Center for Consciousness Studies*, 15 June 2018, accessed 31 December 2021, http://www.hardproblem.ru/en/posts/Events/a-russian-chinese-room-story-antedating-searle-s-1980-discussion/.
[16] Stanisław Lem, "A Lampoon of Evolution," *Summa Technologiae* (1964). Tr. Joanna Zylinska. Minneapolis, Minnesota: University of Minnesota Press, 2013.
[17] Cixin Liu, *The Three Body Problem*, New York, NY: Tom Doherty Associates, LLC, 2016.

"computing system" understand the former. But the story is more interesting for the argument it recalls than the later imitations it inspires. As Professor Zarubin asks:

> "Remember that part of Turing's article in which he said that to find out whether machines are able to think, you have to become a machine. Experts in cybernetics believe that the only way to prove that machines can think is to turn yourself into a machine and examine your thinking process."[18]

This is not a challenge anyone has met, though self-reflection of this kind is precisely what some AI enthusiasts have in mind.

Perhaps the richest case for turning oneself into a machine thinker comes from Ray Kurzweil whose faith in a "law of accelerating returns" adapts Moore's Law (that the number of transistors in a dense circuit and by analogy computing capacity doubles about every two years even as it becomes cheaper) to suggest that exponentially accelerating computation heralds not only *The Age of Intelligent Machines*[19] but even *The Age of Spiritual Machines*[20] such that *The Singularity is Near: When Humans Transcend Biology*.[21] By transcendence of biology he actually means the ability to digitize consciousness and upload it on to a computer system where purely digital human persons will dwell by 2045.[22] In his ecstatic view, even spirituality becomes a function of computation's exponential growth as digital persons experience "greater levels of subtle attributes such as love."[23] Kurtzweil devotees will suffer through the next 23 years with greater hope and intensity than those still anticipating Woody Allen's orgasmatron - but perhaps with lower levels of subtle attributes such as humor, another accident of human thinking AI has yet to master. More commonly, the quest is not to *become* artificial intelligences but to *create* them. As Micah Clark of the Florida Institute for Human and Machine Cognition

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[18] Anatoly Dneprov, "The Game." *Knowledge-Power*, No. 5, 1961: pp. 39-41, 41.
[19] Ray Kurzweil, *The Age of Intelligent Machines*, Boston, MA: MIT Press, 1990.
[20] Ray Kurzweil, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*, New York: Penguin Books, 2000.
[21] Ray Kurzweil, *The Singularity Is Near: When Humans Transcend Biology*, New York: Penguin Books, 2006.
[22] Kurzweil, *The Singularity Is Near,* 136.
[23] Kurzweil, *The Singularity Is Near,* 389.

puts it, "AI has been about building persons . . . It's not about playing chess or driving cars."[24] Regardless of your hopes for the Singularity or building an artificial person, "DOD's AI is not anywhere near being able to outthink a human." [25]

For others, AI is not about building artificial humans so much as building just one all-encompassing intelligence – "summoning the Demon" that Elon Musk warns may destroy human civilization.[26] Against optimists like Kurzweil, high profile pessimists like Musk, Bill Gates, and Stephen Hawking express some concern over the dangers both Artificial General Intelligence (AGI) and its potential successor in Artificial Super Intelligence (ASI). [27] Their objections are more rooted in whether we ought to develop AI this far, not so much whether we can. Their voices join a chorus of moralistic fables highlighting the dangers of such hubris -- from Eden itself through the ancient and modern Prometheus myths to Mickey Mouse's broomsticks and the latest version of *Battlestar Galactica*. But soberer voices demonstrate that the moral arguments against AI of this kind remain superseded by both the technical and epistemological. Despite proclamations that the Singularity is nigh, "Machine thinking" is at least as opaque as human thinking. Though narrow AI already excels at games, consensus remains that many technical factors[28] ensure the riskier prospects of intelligent machines are not imminent[29] but "far off in the future."[30]

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[24] Paul Scharre, *Army of None: Autonomous Weapons and the Future of War*, New York, NY: W.W. Norton & Company, 2018, 234.
[25] U.S. Government Accountability Office, Artificial Intelligence: Status of Developing and Acquiring Capabilities for Weapon Systems: Report to the Committee on Armed Services, U.S. Senate (Washington, DC: GAO, 2022), 5-6.
[26] Matthew Hill, "Are You Scared Yet, Human??" London, UK: *BBC Worldwide*, 2021, (00:02:05), accessed 12 January 2022, https://video.alexanderstreet.com/watch/are-you-scared-yet-human.
[27] See Searle, *Minds, Brains, and Science*, 28; Scharre, *Army of None*, 232-235.
[28] "Perspectives on Research in Artificial Intelligence and Artificial General Intelligence Relevant to DoD" JASON, The MITRE Corporation, McLean, Virginia, January 2017, 38.
[29] Michael L. Littman, et al., "Gathering Strength, Gathering Storms: The One Hundred Year Study on Artificial Intelligence (AI100) 2021 Study Panel Report," Stanford University, Stanford, CA, September 2021, 8, 30, accessed 12 January 2022, http://ai100.stanford.edu/2021-report.
[30] Ryan Sullivan, "The U.S., China, and Artificial Intelligence Competition Factors," China Aerospace Studies Institute, 04 October 2021, iv, accessed 12 January 2022, https://www.airuniversity.af.edu/CASI/Display/Article/2793710/the-us-china-and-artificial-intelligence-competition-factors/.

Meanwhile philosophers point beyond the merely technical reasons toward the best arguments that AGI of this kind is not possible at all. Some point to AI enthusiasts' failure to distinguish between different *kinds* of knowledge. Kurzweil's invocation of Moore's Law is instructive here. As he and other enthusiasts point to acceleration of the speed with which machines can make calculations, they fail to notice that calculation does not constitute intelligence. Josef Pieper's famous distinction between *ratio* and *intellectus* in *Leisure the Basis of Culture*, for example, demonstrates just two very different kinds of knowing from the Western tradition.[31] Pieper distinguishes between the *active* mode of thinking in ratiocination from the *passive* mode of contemplation to highlight how we know virtues like love, beauty, and justice differently than we calculate sums and products or recognize obstacles in space or in images. A researcher from DeepMind claims with remarkable confidence that when it comes to the search for "human-level" intelligence, "The Game is Over! It's about making these models bigger, safer, compute efficient, faster..."[32] Despite entertaining similar claims throughout *Wired for War*, even Peter Singer acknowledges, "Software codes are not a moral code; zeroes and ones have no underlying meaning."[33] Regardless of its speed, machine intelligence is, at best, a metaphor. Put another way, human intelligence and machine intelligence differ not only in *quantities* but in *qualities* of knowledge; accelerating the former does not augment the latter.

Thus, the central AGI fallacy is the reduction of all human knowing to the same kinds of calculation that computers do -faster, and increasingly faster than we do. In that view, human consciousness is *nothing but* the brain whose structure we can duplicate in "neuron-by-neuron"

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[31] Josef Pieper, *Leisure, the Basis of Culture*, South Bend, IN: St. Augustine's Press, 1998, 32.
[32] "Google's DeepMind Says It Is Close to Achieving 'human-Level' Artificial Intelligence," *Daily Mail Online*, 18 May 2022, accessed 18 May 2022. https://www.dailymail.co.uk/sciencetech/article-10828641/Googles-DeepMind-says-close-achieving-human-level-artificial-intelligence.html.
[33] Peter Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century*, New York: Penguin Press, 2009, 425.

simulations.[34] The shallowness of this vision both elevates mere computation to the highest status of human thinking and sinks human consciousness to the level of *nothing but* computation. British philosopher Roger Scruton echoes Mary Midgley's[35] critique of reductionist *nothing buttery* of this kind:

> The human person is "nothing but" the human animal; law is "nothing but" relations of social power; sexual love is "nothing but" the urge to procreation; altruism is "nothing but" the dominant genetic strategy described by Maynard Smith; the Mona Lisa is "nothing but" a spread of pigments on a canvas; the Ninth Symphony is "nothing but" a sequence of pitched sounds of varying timbre.[36]

For Scruton, rejection of this kind of reductionism is the very goal of philosophy as well as its beginning in serious contemplation of intentionality, aesthetics, and morality. Insofar as our obligations toward human thinkers differ from those toward machine thinkers, the reductionist world-view at the heart of AI enthusiasts has important ethical implications: When we conceive of mere machines as minds, we conceive of minds as mere machines. This is worse than a case of "metaphor gone mad" as Neil Postman laments the advent of America's *Technopoly*.[37]

These philosophical reflections may seem a distraction but they are important at the outset of any discussion of military applications of AI. The critical distinction between *narrow* and *general* AI, with rejection of the latter's reductionist theories, lets us set aside notions of military AI that are popular but either technically fanciful or epistemologically suspect. We can finally delimit a discussion of military AI to the kinds of capabilities that governments are actually investing in. The Skynet of *The Terminator* franchise is a far cry from the National Security Agency's SKYNET surveillance program. Leaders in the Pentagon are not worried about thermostats evolving to take over the world but their more pragmatic focus has not let

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[34] Scharre, *Army of None*, 231-232.
[35] David Midgley, ed., *The Essential Mary Midgley*, Abingdon, UK: Routledge, 2005, 209.
[36] Roger Scruton, *The Soul of the World*. Princeton, NJ: Princeton University Press, 2016, 39-40; and *On Human Nature*, Princeton, NJ: Princeton University Press, 2017.
[37] Postman, 112.

them craft a singular definition for the kinds of AI that are coming to battlefields. Zachary Kallenborn, a research affiliate with the National Consortium for the Study of Terrorism and Responses to Terrorism believes, "The notion of a killer robot—where you have artificial intelligence fused with weapons—that technology is here, and it's being used."[38] But what does it mean to "fuse" AI with weapons? Are *all* lethal autonomous weapon systems (LAWS) rooted in AI? If not general AI, what do the Defense establishments in the U.S. and China include among its *narrow* AI investments?

Again, both public sector and government attempts to define terms and answer these questions are tremendously inconsistent but consistently poor. The Defense Science Board's Summer Study on Autonomy in 2016 and the DoD's 2018 AI strategy agree that AI consists in the capability "of computer systems to perform tasks that normally require human intelligence."[39] That vague definition might include adjusting the heat. In 2020, the DoD improved but confessed that AI is "a bit of a moving target" and that "Their definition includes decades-old DoD AI, such as aircraft autopilots, missile guidance, and signal processing systems"[40] alongside modern AI techniques. Even the DOD Inspector General has found these definitions inadequate, recommending in a 2020 report that DoD officials "include a standard definition of AI and regularly, at least annually, consider updating the definition; develop a process to accurately account for AI projects, . . .".[41] Still awaiting that official definition, the General Accountability Office (GAO) very recently published several helpful studies in further

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[38] Michael Moran, "'Suicide Drone' That Picks Own Targets Seen in Ukraine in Horror AI Breakthrough," *Dailystar*, 21 March 2022, accessed 21 March 2022, https://www.dailystar.co.uk/tech/news/kamikaze-drone-used-ukraine-horror-26518751.

[39] Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, *Report of the Defense Science Board Summer Study on Autonomy*, Washington, D.C. June 2016, 5.

[40] Greg Allen, "Understanding AI Technology: A concise, practical, and readable overview of Artificial Intelligence and Machine Learning technology designed for non-technical managers, officers, and executives," Joint Artificial Intelligence Center (JAIC), Department of Defense, Washington, DC, April 2020, 5.

[41] DOD Inspector General, *Audit of Governance and Protection of Department of Defense Artificial Intelligence Data and Technology* (June 29, 2020).

trying to understand DoD's approach to AI.[42] *Artificial Intelligence: Status of Developing and Acquiring Capabilities for Weapon Systems*, published in February of 2022, is most helpful: "While there are various definitions of AI, in general, AI refers to computer systems that are able to solve problems and perform tasks that have traditionally required human intelligence and that *continually get better at their assigned tasks*."[43] This is "machine learning," the technique by which software uses algorithms to analyze lakes of data far faster than any human, detect correlations, make predictions and decisions, then evaluate their effectiveness and accordingly alter its own programming. It is at the heart of the DoD's new AI revolution. The phrase "continually getting better" does help differentiate AI from more traditional software technologies but the definition remains incomplete.

Suffice it to say, the definition and promise of AI is somewhere between a thermostat and the Singularity. Perhaps it is unreasonable to expect all the Services and various DoD agencies to agree to a single definition of AI that meaningfully accompanies their initial and partial inventory of over 685 AI projects as of April 2021.[44] Rather than fully disambiguate the phrase, this paper interprets the progress of military applications of AI, as well as some ethical problems, through the imprecise rhetoric of strategic government documents (where available) and relies on exemplars of actual AI investments. That is, we'll consider what the chief developers and users of military AI say is AI. After all, most of the 685 projects the GAO identified are not aligned to specific systems but offer general capabilities applicable to many systems, primarily categorized toward: (1) recognizing targets through intelligence and surveillance analysis, (2) providing

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[42] U.S. Government Accountability Office, *Artificial Intelligence: Status of Developing and Acquiring Capabilities for Weapon Systems: Report to the Committee on Armed Services, U.S. Senate* (Washington, DC: GAO, 2022); U.S. Government Accountability Office, *Artificial Intelligence: DOD Should Improve Strategies, Inventory Process, and Collaboration Guidance: Report to the Committee on Armed Services, U.S. Senate* (Washington, DC: GAO, 2022).
[43] U.S. Government Accountability Office, *Artificial Intelligence: Status* . . ., 3 (italics mine).
[44] U.S. Government Accountability Office, *Artificial Intelligence: Status* . . ., 45; total does not include Classified projects or those funded through Operations and Maintenance budgets.

recommendations to operators on the battlefield . . . , and (3) increasing the autonomy of uncrewed systems."[45] The function and hence the ethicality of autonomous or "uncrewed" weapons might be drastically affected by the growth of AI, but this paper shall try to keep the ethical problems of autonomous weapons systems *per se* -worthy questions about agency, accountability, discrimination, moral injury and other *jus in bello* issues- distinct from the ethicality of the narrow AI application itself.

This is not always easy. As its subtitle suggests, Paul Scharre's *Army of None: Autonomous Weapons and the Future of War* takes on many of these issues; however, he too acknowledges that systems exhibiting autonomy and AI (or autonomy vs. AI) are tough to distinguish. "Without a common lexicon, countries can have heated disagreements about completely different things."[46] The distinction is especially important since 2017 when the world's "AI Superpowers," China and the U.S., recognized something new in AI that transcended decades-old debates about merely autonomous weapons systems --from mines and mousetraps traps to Aegis, torpedoes, and guided missiles-- "Since they've been around for over seventy years!"[47] More specifically, while both countries are looking at *narrow* AI applications (e.g. machine learning, predictive maintenance, autonomous vehicles, etc.), both acknowledge that autonomy, whether enabled by more abstract "sentient" or artificial *general* intelligence (AGI) or not, is not the game-changing concept or technology spurring the "Intelligentization" of warfare.

[45] U.S. Government Accountability Office, *Artificial Intelligence, Status . . .*, 18.
[46] Scharre, *Army of None*, 347.
[47] Ibid.

China's Sputnik Moment and the New AI Arms Race

> "When the Chinese Communist Party spots a piece of entrepreneurial technology, the Chinese Communist Party can seize that. And so, you have this government seizure of intellectual property for military purposes with no accountability checks, and that should terrify us."
>
> - LtGen Michael Groen, USMC,
> Director, U.S. Joint Artificial Intelligence Center (JAIC)[48]

If not terror, our interest in the Chinese Communist Party's (CCP) AI ambitions should begin within the context of their greater nationalist goals; these blur distinctions among military, economic, and cultural AI investments. Under its doctrine of Military Civil Fusion (MCF)[49] and "whole-of-society" measures,[50] China marshals state-sponsored efforts alongside private and semi-private enterprises toward ambitious national aspirations. Unlike Western views of China as an emerging power, the CCP envisions a National Security Strategy not as *emergence* but as a "great *rejuvenation* of the Chinese nation."[51] Although tough to define strictly, this rejuvenation exceeds mere security and aims toward hegemony in Asia (*Tianxia*)[52] as well as global leadership. Military means toward that end have included expansion of bases (e.g., South China Sea and into the Atlantic)[53] and force modernization, including autonomous systems, for a long time but AI is newly critical for the Party's growing vision of power-projection. The threat is growing, too.

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[48] Matthew Hill, (00:37:45).
[49] "China's Military-Civil Fusion Is Incomplete but Dangerous" *Foreign Policy*, 5 February 2021, accessed 08 January 2022, https://foreignpolicy-com.usnwc.idm.oclc.org/2021/02/05/dont-underestimate-chinas-military-civil-fusion-efforts/; Ryan Fedasiuk, et al., "Harnessed Lightning," 5.
[50] Jeffrey Ding, "Deciphering China's AI Dream" Center for the Governance of AI, Future of Humanity Institute, University of Oxford, March 2018, 4.
[51] "At the 27th Collective Study Session of the CCP Political Bureau; Xi Jinping Stresses the Need to Push Forward the System of Global Governance," *Xinhua*, 13 October 2015; cited in: Mazarr et al., "China and the International Order," RAND Corporation. Santa Monica, CA, 2018, 21.
[52] Jeffrey Reeves, "U.S. China (Security) Relations," lecture, U.S. Army War College, Carlisle Barracks, 13 November 2018.
[53] Lolita Baldor, "China's Africa outreach poses threat from Atlantic," *Associated Press News*, 6 May 2021.

One spur toward this new AI emphasis originates in one of the world's toughest games, the ancient Chinese institution of *go*. DeepMind's AlphaGo victories against 18-time World Champion Lee Sedol in March 2016 were "barely watched" in the West;[54] meanwhile, 60 million of 80 million viewers worldwide were in China where the game is not only popular but sacred to many.[55] Both the popularity of this broadcast and the CCP ban on coverage when their own player, Kie Jie, also lost to AlphaGo in 2017[56] demonstrate China's focus on the importance of AlphaGo in the advent of AI. (AI victories in Chess and Jeopardy for example garnered far less attention in the East.) For venture capitalist Kai-Fu Lee and his colleagues in Zhongguancun, these demonstrations of machine learning were not games but "game changers."[57] Within the year after this "Sputnik moment," the CCP issued a comprehensive "National Artificial Intelligence Plan" to dominate the field by 2030.[58]

While that plan spells out China's intent, the multitude of funding streams -public and private, secret and open- complicate the measurement of specific investments. Already in 2018 the CCP had dispersed over $1 billion in subsidies to start-ups through local city-by-city "government guidance funds" (GGF)[59] -e.g., $450 million in Nanjing alone.[60] Concurrent estimates suggested "China's spending on AI would grow to at least $70 billion by 2020,"[61] starkly contrasting with Pentagon plans of $4 billion.[62] Private money flooded in as well. By

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[54] Matthew Hill, (00:15:35).
[55] Greg Kohs et al., *AlphaGo*, New York, NY: Moxie Pictures, 2017, (00:45:00).
[56] Jefferey Ding, 13.
[57] Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order*. Boston, MA: Houghton Mifflin Harcourt, 2018, 1-6; see also National Security Commission on Artificial Intelligence's (NSCAI), "Final Report: National Security Commission on Artificial Intelligence," October 2021," 1.
[58] Chinese State Council, 146.
[59] Ding, 2.
[60] Lee, 99.
[61] Dan Wood and Bradley Bowman, "America is in an AI fight for its life," *The Hill*, 31 July 2019, accessed 20 January 2022, https://thehill.com/opinion/cybersecurity/455484-america-is-in-an-ai-fight-for-its-life.
[62] Ashwin Acharya and Zachary Arnold, "Chinese Public AI R&D Spending: Provisional Findings," Center for Security and Emerging Technology, December 2019, accessed 22 January 2022, cset.georgetown.edu/research/chinese-public-ai-rd-spending-provisional-findings/.

2018 Chinese venture capital also surpassed the U.S., composing 48% of all AI investment worldwide.[63] Later and soberer estimates suggest the CCP probably isn't dramatically outspending the U.S. government on overall AI Research and Development (R&D)[64] while both nations "spend roughly the same amount on military AI, likely more than $1.6 billion" or currently in the low billions.[65] Though a fraction of overall AI investment, this modest military spending belies rhetoric from both nations that suggest AI heralds a new arms race.

Beyond providing and sustaining direct government investment toward civilian AI, China oversees an AI ecosystem that enjoys several advantages over the U.S. First, the most immediately applicable forms of AI (especially machine learning) rely on data. Industry experts describe this resource as the new electricity or the new oil,[66] and China as the new Saudi Arabia[67] or even OPEC.[68] With no qualms about violating privacy, and ubiquitous surveillance equipment scattered throughout its AI-enabled "smart cities" (300,000 cameras in Chongqing alone!),[69] China is not only scooping up data at an unrivaled pace, it constantly evolves its collection hardware and techniques. Notwithstanding dubious government proclamations, the Chinese are culturally readier to trade privacy for security[70] and the CCP is acquiring as much data as it can.

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[63] Lee, 5.
[64] Ashwin Acharya and Zachary Arnold, "Chinese Public AI R&D Spending: Provisional Findings," Center for Security and Emerging Technology, December 2019, accessed January 22, 2022, https://cset.georgetown.edu/publication/chinese-public-ai-rd-spending-provisional-findings.
[65] Ryan Fedasiuk, "We Spent a Year Investigating What the Chinese Army Is Buying. Here's What We Learned." *POLITICO*, 10 November 2021, accessed 08 January 2022, https://www.politico.com/news/magazine/2021/11/10/chinese-army-ai-defense-contracts-520445; see also, Fedasiuk, et al., "Harnessed Lightning," 11.
[66] Mathew Hill, (00:36:00); Lee, 50.
[67] Lee, 55.
[68] Peter Schweizer, "How Big Tech Elites Are Helping China Achieve Global Supremacy," *New York Post*, 22 January 2022, accessed 22 January 2022, https://nypost.com/2022/01/22/how-tech-elites-are-helping-china-achieve-global-supremacy-new-book/.
[69] Mathew Hill, (00:21:00).
[70] Lee, 124-125.

In addition to quantity, the quality of data benefits from Chinese embrace of the "Internet of Things" (IoT). Ubiquitous applications like WeChat administer not only "on-line" life but, in paying for physical things -like meals out, deliveries, transportation tickets, and bicycle rentals- these data provide a more comprehensive view of life "off-line." 2018 estimates indicate that "China produced 152 million terabytes (TB) of IoT data, compared to 69 million in the U.S."[71] Even how China develops the apps that collect this data (like WeChat) demonstrates an advantage. Kai Fu-Lee's account of the hypercompetitive gladiatorial "colosseum" contrasts sharply with plush Silicon Valley. Hungry Chinese AI entrepreneurs -many one generation from abject poverty- bring cutthroat efficiency and maniacal work ethics to hone algorithms and speed applications of AI to other needs of a CCP eager and willing to steal from any innovators within its borders.[72] The threat of technology transfer is growing[73] as firms like Meta and Google open Chinese franchises that render data and software subject to espionage if not coercive appropriation.[74]

But which AI technologies are attracting China's military attention? CCP investments in specific AI projects have been opaque to most scholars in the West, with one significant exception. Last year, Ryan Fedasiuk and a small team from Georgetown's Center for Security and Emerging Technology (CSET) discovered a trove of over 66,000 actual People's Liberation Army (PLA) procurement records from 2020. From these, they sifted 343 AI-related contracts. Acknowledging that the documentation is far from comprehensive, even for unclassified investments, the study offers nevertheless compelling portraits of PLA progress, suppliers, and immediate AI goals.[75]

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[71] Ryan Sullivan, 33.
[72] Lee, 50.
[73] NSCAI, 177.
[74] Schweizer.
[75] Fedasiuk et al, "Harnessed Lightning," iii.

By far the largest proportion, 35% of these documents relate to intelligent and autonomous vehicles --primarily reconnaissance drones like the Cheng Du Wing Loon alongside more highly classified swarming drone programs.[76] As we'll explore below, swarming drones offer especially potent and popular fears. Nest, with 18% of the records, contracts for development and procurement of Intelligence, Surveillance, and Reconnaissance (ISR) platforms seem second priority for PLA's AI procurement. But proportion of contracts here may mislead with regard to PLA's priorities. After all, ISR is already at the heart of their vision of "intelligentized" warfare and "cognitive confrontation" through which PLA leaders will psychologically dominate opposing commanders "through better and faster decisions."[77]

The remaining contracts spread across several additional categories. "Predictive Maintenance and Logistics" (11%) focusses on mechanical fault diagnosis.[78] "Information and Electronic Warfare" (8%) will offer tools for both "opinion and psychological" warfare on domestic and foreign fronts.[79] Through "Simulation and Training" investments (6%), the PLA is developing sophisticated war-gaming systems that may even surpass the dice-throwing events at American war colleges. Their investments toward better "Command and Control" (C2) (4%) acknowledge a need to support rather than replace human decision-making processes.[80] Toward "Automated Target Recognition" (4%), their commercial data advantages may help with regard to honing deep learning algorithms but they still have far to go in recognizing military targets in video feeds and still-frame images.[81] Unfortunately, these percentages are about the only meaningful quantification this brief analysis can offer. The remaining contracts (~14%), lumped

[76] Ibid., 15.
[77] "How Chinese Strategists Think AI Will Power a Military Leap Ahead." *Defense One*, accessed January 9, 2022, https://www.defenseone.com/ideas/2021/09/how-chinese-strategists-think-ai-will-power-military-leapahead/185409.
[78] Fedasiuk et al., "Harnessed Lightning," 19.
[79] Ibid., 20.
[80] Ibid., 24.
[81] Ibid., 27.

into a vague “Other” category, remind analysts how hard it is to both measure and classify AI investment (let alone return on investment) among discreet categories where both AI capability and applications readily bleed into one another. Nevertheless, gauging China’s progress toward application of AI is the first step toward gauging the effectiveness of the U.S. response; more importantly, the competition it reveals will highlight where both counties are most likely to overlook ethical concerns.

U.S. Strategic Response: Investments and The Joint AI Center

"We need a Manhattan Project scale effort to win the race for artificial intelligence."
- Congressman Seth Moulton (D-MA),
Chair of the U.S. Future of Defense Task Force[82]

However short of a Manhattan Project scale, the U.S. government and Defense enterprises have responded to China's AI enthusiasm with a significant series of reports, policies, memoranda and even some new institutions. In recognition that AI was "poised to change the character of the future battlefield and the pace of threats," the DoD highlighted the importance of AI in its 2018 *National Security Strategy* and established the JAIC as the focal point to "drive the urgency, scale, and unity of effort needed to navigate" AI challenges across the department.[83] As its current head, Lt Gen Groen understands his ambitious mission as "*clearly to transform* [italics mine] the department of Defense through radical acceleration and adoption of AI."[84] The JAIC also preceded a White House executive order the following year[85] as well as the 2019 National Defense Authorization Act (NDAA) in establishing a National Security Commission on Artificial Intelligence's (NSCAI). Headed by former Chief Executive Officer and Chairman of Google, Dr. Eric Schmidt, the NSCAI just published its final report in October 2021.[86] Finally,

[82] Mathew Hill, (00:37:10).
[83] DOD, "SUMMARY OF THE 2018 DEPARTMENT OF DEFENSE ARTIFICIAL INTELLIGENCE STRATEGY: Harnessing AI to Advance our Security and Prosperity," WASHINGTON DC, 1 January 2018, 3, accessed 12 January 2022, https://dod.defense.gov/Portals/1/Documents/pubs/ 2018-National-Defense-Strategy-Summary.pdf.
[84] Mathew Hill, (00:36:45).
[85] Executive Order No. 13859, 84 C.F.R 31 (14 February 2019).
[86] National Security Commission on Artificial Intelligence's (NSCAI), "Final Report: National Security Commission on Artificial Intelligence," October 2021.

DoD's 2020[87] and 2021[88] annual reports on Chinese military and security developments offer some clear if discouraging assessments of where the U.S. stacks up with regard to military AI.

All of these bureaucratic responses recognize the urgency of the AI revolution; however, as the NSCAI concludes, Americans have not yet "grappled with just how profoundly the artificial intelligence (AI) revolution will impact our economy, national security, and welfare."[89] Translating enthusiasm for AI into battlefield applications has been slow in coming. New rules that all new weapon systems must incorporate AI capability[90] alongside existing regulations will demand comprehensive and laborious official reviews[91] that will thwart cooperation with the real engine of AI innovation -private enterprise. The NSCAI concludes, such "bureaucracy hinders partnerships with technology firms . . . The prospect of bureaucratic snarls deters companies from working with DoD; it is economically irrational for many startups to even try."[92] As AI capabilities grow more sophisticated, these reviews multiply and can further hamper the department's famously slothful acquisition process to fuel fears of slow AI progress. During his highly popularized resignation, the Pentagon's former software chief, Nick Chaillan, dismissed chances of U.S. competing with China in AI for the next 15-20 years, singling out American application in AI and cyber warfare as at the "kindergarten level."[93] His familiar frustration laments "hearing the right words without action" from a DoD that fails to "walk the walk."[94]

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[87] Office of the Secretary of Defense., *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China,* 2020.
[88] Office of the Secretary of Defense, *DoD's 2021 China Military Power Report: How Advances in AI and Emerging Technologies Will Shape China's Military,* 2021.
[89] NSCAI, 2.
[90] Mathew Hill, (00:37:00).
[91] Executive Services Directorate (ESD), DoD Directive 3000.09, *Autonomy in Weapon Systems*, 21 November 2012, revised May 8, 2017.
[92] NSCAI, 62.
[93] "Former Pentagon Official Says China Has Won Artificial Intelligence Battle," *The Hill*, accessed 11 January 2022. https://thehill.com/policy/cybersecurity/576213-former-pentagon-official-says-china-has-won-artificial-intelligence.
[94] Nicolas M. Chaillan, "It is time to say Goodbye!," LinkedIn, 02 September 2021, accessed January 14, 2022, https://www.linkedin.com/pulse/time-say-goodbye-nicolas-m chaillan/?trackingId=LwMZoJqFQcqFr5l5cjs baw%3D%3D.

But rather than deploying new systems or capabilities, the JAIC remains focused on AI fundamentals. Their first major (and predictable) steps -new acronyms and huge contracts- focus less on specific systems than in preparing DoD for integration of AI across the department. A new Data Readiness for AI Development (DRAID) acquisition vehicle accompanies major awards to Booze Allen Hamilton and Deloitte Consulting in building what the JAIC calls the Joint Common Foundation (JCF), a "development environment to test, validate and field AI capabilities."[95] To fill that "environment," JAIC leadership acknowledges that "AI projects do not succeed without AI data"[96] and have built a "Roadmap to Getting AI Ready" that encourages all facets of DoD to begin collecting and organizing data -apparently *any* data (e.g. sensors in boots?)- in the hopes that it will enable future deep learning tools.[97] So while CCP strategic investments focus on specific capabilities, the JAIC's earliest large investments are toward department-wide AI-ready infrastructure alongside data generation, organization, and harvesting.

Beyond these vague longer-term goals, the JAIC can also tout a few modest but concrete achievements in applying AI. Within a suite of Medical Evaluation Readiness Information Tools (MERIT), they have deployed a microscope that leverages AI algorithms to detect cancer and created an AI-Enabled Suicide Prevention and Intervention Tool.[98] Machine learning also helps DoD financiers fix payroll errors.[99] In fulfillment of decades-old promises of "Condition Based Maintenance," machine learning also enabled genuine progress toward prediction of UH-60

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[95] "DISA Awards $106 Million Prime Integrator Task Order for JAIC Joint Common Foundation," JAIC and DISA Strategic Communication and Public Affairs, 12 August 2020, accessed 19 January 2022, https://www.ai.mil/news_08_12_20-the_disa_awards_106m_%20prime_integrator_task_order_for_jaic_jcf.html

[96] "Enabling AI Data Readiness in the Department of Defense," JAIC Public Affairs, 01 April 2021, accessed January 19 2022, https://www.ai.mil/blog_04_01_21_enabling_ai_data_readiness_in_the_dod.html.

[97] "A Roadmap to Getting "AI-Ready," JAIC Public Affairs, 18 June 2020, accessed 20 January 2022, https://www.ai.mil/blog_06_18_20-a_roadmap_to_getting_ai_ready.html.

[98] "JAIC, in partnership with DIU, Delivering AI-Enabled Cancer Diagnostics at the Point of Care," JAIC Public Affairs, 21 OCT 2020, accessed 20 January 2022, https://www.ai.mil/blog_10_21_20-JAIC_DIU_delivering_ai-enabled_cancer_diagnostics_at_the_point_of_care.html.

[99] "JAIC Partners with DIU on AI/ML Models to Resolve Complex Financial Errors" JAIC Public Affairs, 01 OCT 2020, accessed 20 January 2022, https://www.ai.mil/blog_10_01_20-jaic_partners_with_diu_on_aiml_models_to_resolve_complex_finanical_errors.html.

helicopter engine failures.[100] In 2020, the JAIC's Salus Project helped integrate supply chain data in support of the response to COVID-19; perhaps more remarkable than the poorly quantified gains is the fact that they were able to design and field the project in just two weeks.[101]

These modest and poorly measured gains are far from a Fourth Industrial Revolution but they are also far from a complete picture of U.S. progress toward AI on the battlefield. Beyond the JAIC efforts, individual projects at Defense Advanced Research Projects Agency (DARPA), as among private sector counterparts, have been progressing toward AI at subsidiary levels that are not necessarily or even likely captured among the nation's strategic AI investments. Most prominently, DARPA's 2020 series of "AlphaDogfight Trials" put AI-enabled computers against experienced Air Force F-16 pilots; consistent computer victories demonstrate DARPA (or perhaps more accurately the participating defense contractors') progress toward the Air Combat Evolution (ACE) component of an overall vision of "Mosaic Warfare" consisting of both manned and unmanned systems working together.[102] The Air Force has its own Skyborg program developing drones not to replace but to accompany F-35s.[103] Meanwhile, the Defense Intelligence Agency (DIA) has also "taken the lead" on AI according to Senator Jack Reed (RI-D) with programs like Machine-assisted Analytic Rapid-repository System (MARS), intended to pair humans with machine learning for cloud-based intelligence analysis.[104] Alongside well-

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[100] "JAIC partners with USSOCOM to deliver AI-enabled predictive maintenance capabilities" JAIC Public Affairs, 17 December 2020, accessed 19 January 2022 https://www.ai.mil/news_12_17_20-jaic_partners_with_ussocom_to_deliver_ai-enabled_predictive_maintenance_capabilities.html.

[101] "JAIC's New Project Salus Links up Supply-Chain Data in Fight against Coronavirus," *FedScoop*, 15 April 2020, accessed 20 May 2022, https://www.fedscoop.com/supply-chain-jaic-project-salus-coronavirus/.

[102] Sue Halpern, "The Rise of A.I. Fighter Pilots: Artificial Intelligence is being taught to fly warplanes. Can the Technology be trusted?" *The New Yorker*, 17 January 2022, accessed 28 January 2022, https://www.newyorker.com/ magazine /2022/01/24/ the-rise-of-ai-fighter-pilots.

[103] Ibid.

[104] "DIA Director testifies before Senate Armed Services Committee," DIA Public Affairs, 04 May 2021, accessed 28 January 2022, https://www.dia.mil/News-Features/Articles/Article-View/Article/2595138/dia-director-testifies-before-senate-armed-services-committee.

publicized but tepid JAIC efforts, such programs demonstrate the difficulties of gauging strategic AI investment as well as progress.

These DoD projects do not get the press that killer robots do. But despite DoD's overall sluggishness and its modest early goals, progress within the private sector leaves the U.S. ahead in AI for now while "China possesses the might, talent, and ambition to surpass the United States as the world's leader in AI in the next decade if current trends do not change."[105] The first risky trend is in hardware. "The overwhelming majority of advanced computer chips at the heart of China's military AI systems are designed by U.S. firms like Intel, NVIDIA and Xilinx, and manufactured in Taiwan."[106] The Chinese are well aware of this vulnerability[107] and though they have made little progress on core AI components over the last several years, in 2019 they established a $28.9 billion national semiconductor fund to boost domestic fabrication through multiple sources of cutting-edge microelectronics.[108] These could threaten current chip and hardware leaders like America's Intel, Korea's Samsung, and Taiwan Semiconductor within just a few years.[109] The second risk is in talent management. China's progress with hardware also complements and partially drives their progress with recruiting and research. Though the U.S. and Europe remain the most attractive places to work as a technician or researcher in AI, China is catching up. Already in 2017, China published 15,199 AI papers to surpass both the EU (14,776) and the U.S. (10,287); however, greater quantity does not mean higher quality. The U.S. still produced "59 of the top 100 papers" in 2020.[110]

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[105] NSCA, 7.
[106] Fedasiuk, "We Spent a Year . . ."
[107] Fedasiuk et al, "Harnessed Lightening . . .," 42.
[108] Yoko Kubota, "China Sets Up New $29 Billion Semiconductor Fund," *Wall Street Journal*, 25 October 2019, accessed 21 January 2022, https://www.wsj.com/articles/china-sets-up-new-29-billion-semiconductor-fund-11572034480.
[109] Ibid.; see also NSCAI, 31.
[110] Ryan Sullivan, 25.

Meanwhile, growing quantity and quality of data continue to fuel China's progress toward a greater share of the economic benefits of AI. "China's substantial advantages in data and the size of its market lead experts to predict that China will account for nearly half of the estimated $15.7 trillion that AI will add to the global gross domestic product (GDP) by 2030, and almost double the expected growth in North America."[111] But this "massive head-start"[112] may not last long; nor does it readily translate to leverage on the battlefield. After all, massive data collection on this scale is relatively new for all of us. Chief Information Officer for the colossal data maintenance firm, Switch, Missy Young estimates that 90% of the world's data have been created in just the last 2 years and adds the sobering perspective that mankind's historical written works (~50 petabytes) are only about half the size of the eBay archive.[113] In short, the struggle for data has just begun.

Though China's early data advantages may speed applications and hone algorithms toward economic dominance and social control, the ultimate *military* uses of AI will require *military* data. Machine recognition of people and their buying habits does not translate to recognition of tanks, trucks, ships, or missiles in the field. Thus, in strictly military terms, China's data advantage may be marginal. The most comprehensive publicly available look at where the People's Liberation Army (PLA) is actually investing suggests few advantages from current data lakes while the U.S. is already focused on filling their own. The PLA's public efforts toward developing autonomous underwater vehicles (AUV) and self-driving land platforms, for example, reveal no significant advantages from Chinese lakes of consumer data. More importantly, the U.S. and other Western countries have huge head starts. None of the top 10 producers of AUVs[114] are Chinese while Alphabet/Google subsidiary, Waymo, is years ahead

[111] Ryan Sullivan, 9.
[112] Lee, 125.
[113] Mathew Hill, (00:36:45).
[114] Lee, 16.

of any competitor in the race for self-driving cars and their easily adapted capabilities for battlefield logistics.[115] The bigger question is how long this advantage will last if the CCP can seduce Alphabet/Google/Waymo and other private sector developers to come to China and its famously unethical "copycat" tech culture.[116]

[115] Gabrielle Coppola and Mark Bergen, "Waymo's Self-Driving Cars Are 99% of the Way There. The Last 1% Is the Hardest," *Bloomberg*, 17 August 2021, accessed 21 January 2022, https://www.bloomberg.com/news/articles/2021-08-17/waymo-s-self-driving-cars-are-99-of-the-way-there-the-last-1-is-the-hardest.
[116] Schweizer.

Competing Visions for AI Ethics?

> "We're going to compete to win, but we're going to do it the right way. . . We're not going to cut corners on safety, security, or ethics."
> -Secretary of Defense (SECDEF) Lloyd J. Austin III[117]

However modest, the JAIC has progressed toward institutionalizing AI in conformity with the Defense Department's insistence on AI ethics. In February 2020, SECDEF Mark Esper signed off on a document that culminated a fifteen-month study by the Defense Innovation Board and NSCAI; it lays out five ethical principles to which all DoD AI technology will conform.[118] In May the following year, just three months after taking office, Deputy SECDEF Kathleen Hicks published a supplemental memorandum toward implementing the principles in support of "Responsible AI (RAI) development globally." And names JAIC as the "coordinator for development and implementation of RAI strategy, guidance, and policy."[119] For many, the U.S focus on ethics contrasts sharply with a CCP that can develop AI unencumbered by conscience.[120] But several Chinese agencies had already published AI ethics documents of their own two years earlier.

The Beijing Academy of Artificial Intelligence (BAAI) offered its "Beijing AI Principles," and China's Artificial Intelligence Industry Alliance (AIIA) proposed a "joint pledge" on self-discipline in developing and using AI in May 2019. The following month, the

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[117] "Secretary of Defense Austin Remarks at the Global Emerging Technology Summit of The Nation," U.S. Department of Defense, accessed 21 April 2022, https://www.defense.gov/News/Transcripts/Transcript/Article/2692943/secretary-of-defense-austin-remarks-at-the-global-emerging-technology-summit-of/.
[118] "DoD Unveils How It Will Keep AI in Check with Ethics Principles," *Federal News Network*, 25 February 2020, accessed 20 February 2022, https://federalnewsnetwork.com/defense-main/2020/02/dod-unveils-how-it-will-keep-ai-in-check-with-ethics-principles/.
[119] Hicks, Kathleen, Deputy Secretary of Defense, "MEMORANDUM FOR SENIOR PENTAGON LEADERSHIP COMMANDERS OF THE COMBATANT COMMANDS, DEFENSE AGENCY AND DOD FIELD ACTIVITY DIRECTORS." 26 May 2021.
[120] Forrest E. Morgan et al., "Military Applications of Artificial Intelligence: Ethical Concerns in an Uncertain World" RAND Corporation, Santa Monica, CA, 2020, xvii.

Ministry of Science and Technology (MOST) published its own "vision for responsible AI."[121] Though not published by the PLA, or even explicitly directed toward military applications, the *Governance Principles for a New Generation of Artificial Intelligence: Develop Responsible Artificial Intelligence*[122] is eerily similar to the DoD RAI document. The two policies suggest AI Superpowers may transcend competition beyond technical toward ethical mastery –that is, if either government actually transcends the merely rhetorical.

Against the MOST's eight principles, (Harmony and friendliness; Fairness and justice; Inclusivity and sharing; Respect privacy; Secure/safe and controllable; Shared responsibility; Open collaboration; and Agile governance), [123] the DoD's offers five:

> **1. Responsible:** DoD personnel will exercise appropriate levels of judgment and care, while remaining responsible for the development, deployment, and use of AI capabilities.
>
> **2. Equitable:** The Department will take deliberate steps to minimize unintended bias in AI capabilities.
>
> **3. Traceable:** The Department' s AI capabilities will be developed and deployed such that relevant personnel possess an appropriate understanding of technology, development processes, and operational methods applicable to AI capabilities, including transparent and auditable methodologies, data sources, and design procedure and documentation.
>
> **4. Reliable:** The Department's AI capabilities will have explicit, well-defined uses, and the safety, security, and effectiveness of such capabilities will be subject to testing and assurance within those defined uses across Al capabilities' entire life-cycle.
>
> **5. Governable:** The Department will design and engineer AI capabilities to fulfill their intended functions while possessing the ability to detect and avoid unintended consequences, and the ability to disengage or deactivate deployed systems that demonstrate unintended behavior.

For those who believe that the essence of ethics consists in the practice of debating and otherwise talking about moral choices, this is a very encouraging set of principles and a great injection of

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[121] Lorand Laskai and Graham Webster, "Translation: Chinese Expert Group Offers 'Governance Principles' for 'Responsible AI.'" *New America*. 17 June 2019, accessed 21 April 2022, https://perma.cc/V9FL-H6J7.
[122] National New Generation Artificial Intelligence Governance Expert Committee, *Governance Principles for a New Generation of Artificial Intelligence: Develop Responsible Artificial Intelligence*, 17 June 2019.
[123] Lorand Laskai and Graham Webster, "Translation: Chinese Expert Group Offers 'Governance Principles' for 'Responsible AI.'" *New America*, 17 June 2019, accessed 21 April 2022, https://perma.cc/V9FL-H6J7.

ethics into our thinking about AI. Those who look to ethics to for stronger criteria by which to actually make choices -what to develop and to deploy vs. not- will be less enthusiastic. For however admirable the sentiments and worthy the goals, a brief survey of just a few technologies that the U.S. and China are competing to develop will reveal that each principle lacks clarity and strength enough to serve as a clear guidepost in some imminent ethical challenges.

Responsible: Project Maven and the Virtues of Government Work

> **1. Responsible:** DoD personnel will exercise appropriate levels of judgment and care, while remaining responsible for the development, deployment, and use of AI capabilities.

1. Cancel this project immediately
2. Draft, publicize, and enforce a clear policy stating that neither Google nor its contractors will ever build warfare technology.

-Petition from over 3,100 Google Employees to Chief Executive, Sundar Pichai[124]

As the first principle, and namesake of the "Responsible AI" enterprise, this admonition toward "appropriate levels of judgement and care" is the bedrock of the DoD guidance that will face toughest challenges as competition heats up. The narrow U.S. lead in AI technology is in commercial not military or even government hands. Because cooperation with industry will be key in developing, maintaining, and applying that lead toward military applications, the experience with Project Maven is an important case study. Maven began in April 2017 as the Algorithmic Warfare Cross-Functional Team, an effort to develop software that could apply facial recognition and other deep learning techniques to quickly process and analyze the hours-upon-hours of Intelligence Surveillance and Reconnaissance (ISR) data and captured video our forces were generating and finding every day during the counterinsurgency operations in Iraq, Afghanistan, and elsewhere.[125] This is a classic use of AI to accomplish quickly a narrow task that would take humans far longer. It was not a killer robot; it was not a direct targeting system; nor was it an autonomous weapon by any of the traditional measures that usually raise hackles among critics of military AI applications.

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[124] Quoted in Scott Shane et al., "'The Business of War': Google Employees Protest Work for the Pentagon." *The New York Times*, 4 April 2018, accessed 10 April 2022, http://www.nytimes.com/2018/04/04/technology/google-letter-ceo-pentagon-project.html.

[125] Adam Frisk, "What Is Project Maven? The Pentagon AI Project Google Employees Want Out Of," *Global News*, 5 April, 2018.

The reaction from Google's employees, demanding immediate cancellation of the project along with a vague promise to never build "warfare technology" is all the more surprising. First, even Google's then-Chairman Eric Schmidt was supportive of the project as a "net positive for national security and a good partnership for Google."[126] That at least suggests room for such cooperation under the spirit of Google's famous motto, "Don't be Evil." Since the Maven controversy, Schmidt has taken an even more active role in military application of AI. Most significantly, he chaired the Defense Innovation Board that drafted the DoD Principles, headed up the NSCAI in 2019 and is funding its private successor, The Special Competitive Studies Project, since Congress ceased funding.[127] If not Google's culture, its central founding member is amenable to Maven's aims.

Second, the Google staff objection is neither clear nor consistent. Programmers like Laura Nolan objected to a "kind of automated surveillance of a whole district, a whole town, to pick out suspicious behavior" that could later be used for targeting.[128] As codified in the complaint, the "technology is being built for the military, and once it's delivered it could easily be used to assist in these tasks."[129] This is a pretty low standard for rejecting the project, especially for Google. After all, Google Earth was developed with cash infusions from the Central Intelligence Agency, the National Geospatial-Intelligence Agency and National Reconnaissance Office (NRO) without objection.[130] These organizations are hardly *less* prone to use software for lethal targeting -let alone the terrorists and other enemy forces already

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[126] Mathew Hill, (00:39:35).
[127] "As National AI Panel Shuts Down, New Think Tank Emerges to Continue Its Work," *Air Force Magazine*, October 18, 2021, accessed 21 April 2022, https://www.airforcemag.com/as-national-ai-panel-shuts-down-new-think-tank-emerges-to-continue-its-work/.
[128] Mathew Hill, (00:39:50).
[129] Google Employee Letter, quoted from Shane et al.
[130] "The Genesis of Google Earth," *Trajectory Magazine*, 1 November 2017, accessed 10 April 2022, https://trajectorymagazine.com/genesis-google-earth/.

leveraging Google-developed systems. Why single out Maven as a project or DoD as a customer?

As an in-depth study of the Maven controversy by Penny Crofts and Honni Rijswijk is quick to point out, "sceptics assert that Google has been heavily complicit in turning the internet into a digital panopticon, one that has made privacy obsolete by treating information as a commodity and by turning access to knowledge into a profit-making venture."[131] Gleaning information from keystrokes is not quite the same as gleaning from ISR feeds; nor is targeting to drop irritating advertisements the same as targeting to drop bombs. However, having developed the technology for both, Google's products "could easily be used to assist in these tasks" too, regardless of whether it was specifically built for the military or for the many terrorists and insurgents who also exploit Google's products. Google's statement in response to the Maven protest reveals just how ubiquitous the technology is as well as how small a part the firm played in a military project "specifically scoped to be for non-offensive purposes and using open-source object-recognition software *available to any Google Cloud customer*."[132] In short, the notion of crafting, let alone enforcing, "a clear policy" that will the ensure the company had not already nor would ever "build warfare technology"[133] is naïve at best.

However dubious Google's claim to virtue, others have taken more principled stands against cooperation with the government and the taint of military co-option of their work. Peter Singer's *Wired for War* recounts the stand of several "Refuseniks" who reject work for the Pentagon, often with real financial consequences that are unlikely at Google. The case of Illah

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[131] Penny Crofts and Honni Rijswijk, "Negotiating 'Evil': Google, Project Maven and the Corporate Form," Law, Technology and Humans, Volume 2 (1), 2020.
[132] Quoted in Janet Burns, "Google Employees Denounce Company's Military Drone Work In Letter To CEO." *Forbes*, accessed 5 April 2022, https://www.forbes.com/sites/janetwburns/2018/04/10/google-employees-denounce-companys-military-drone-work-in-letter-to-ceo/ (italics mine).
[133] Google Employee Letter, quoted from Shane et al.

Nourbakhsh, Associate Professor of Robotics at Carnegie Mellon, stands out among examples in the way he "talks about the novels of Walker Percy."[134] Not only is the citation of a Catholic novelist rare among roboticists, Nourbaksh (at least in Singer's account) does not point to the Catholic faith that inspires Walker but rather to the more incidental theme of suicide inundating his novels as well as his life. Both his grandfather, John Walker Percy, in 1917 and his father, Leroy Pratt Percy, in 1929 committed suicide. Many of his characters attempt it as well, Kate Cutrer in *The Moviegoer* (1961), Dr. Tom More in *Love in the Ruins* (1971) Will Barrett's father succeeds in *The Last Gentleman* (1966) and Barrett himself tries in *The Second Coming* (1980). For Nourbakhsh, contemplation of suicide in Percy strangely inspires rejection of military work because of the opportunity cost: "The point isn't what not to do but what can you do best. That is, whatever you choose, choose what is most important to you." [135]

I hesitate to reduce Nourbakhsh's moral reasoning to Singer's interpretation; nevertheless, if one seeks to draw ethical lessons on technology from Walker Percy's work, this kind of *carpe diem* attitude is not it. Percy's last novel, *The Thantos Syndrome*, devotes a large section to the memories of an alcoholic Catholic priest, Father Rinaldo Smith, who spent years among Weimar Germany's finest medical and technological minds. Smith's famous peroration, "Tenderness leads to the gas chambers,"[136] assesses the fate of Nazi technocrats. It also borrows the phrase from a minor essay by Flannery O'Connor that laments the decline of the clearer moral principles of the Catholic faith she and Percy share. "In the absence of this faith now, we govern by tenderness . . . When tenderness is detached from the source of tenderness, its logical outcome is terror. It ends in forced-labor camps and in the fumes of the gas chamber."[137] As

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[134] Singer, 171.
[135] Ibid.
[136] Walker Percy, *The Thanatos Syndrome*, New York, NY: Farrar Straus & Giroux, 1987, 360.
[137] Flannery O'Connor, (From the introduction to "*A Memoir of Mary Ann," Mystery and Manners: Occasional Prose,* New York, NY: Farrar Straus & Giroux, 1970, 15.

Percy clarified in later interviews, his purpose was not merely to evangelize an explicitly Christian or even Catholic ethics; rather, to highlight that "The nihilism of some scientists in the name of ideology or sentimentality and the consequent devaluation of individual human life lead straight to the gas chamber."[138] Nor does my own argument put religious faith of any kind into military ethical reasoning about AI; however, it does recommend that the ethical challenges of AI demand something more solid than a promise for "appropriate levels of judgment and care," as the DoD memo describes its commitment to "Responsible" AI. What differentiates this vague notion of judgment and care from mere "ideology or sentimentality"?

As Secretary Austin continued his address, "Responsible AI is the place where cutting-edge tech meets timeless values. And again, you see, we don't believe that we need to choose between them." [139] Of course he meant that we need not choose between the technology itself and our values. Which values exactly? And if the technology is merely a tool whose use, for good or ill, would be governed by values, how is this even a relevant choice? Such empty rhetoric would have been equally useful after the Trinity test. More generously, even if Austin's sentiment is true, it is largely irrelevant. The thorniest ethical problems arise not in the tech itself, nor in a tech vs. our values dilemma, but when choices about the tech confronts us with *conflicting values* -and we must indeed choose among them. For the military, national security is perhaps the chief value against which we decide to act or refrain from action. That value conflicts with others all the time. Every military action puts that value of security against the values of our blood and treasure. Military surveillance programs put security against privacy, interrogation programs against human rights, recruitment quotas against quality, training programs against safety, classification standards against transparency, combatant safety against

[138] Walker Percy, *Signposts in a Strange Land: Essays*, New York, NY: Farrar Straus & Giroux, 2000, 309-312.
[139] "Secretary of Defense Austin Remarks . . ."

collateral damage avoidance, lethality against precision, long-term veteran care against costs. The toughest military choices are not about abandoning our values but choosing which value has precedence over another in a given context. Just a few choices of the last several decades — from the Patriot Act and NSA's PRISM Program to the Abu Ghraib scandal and proliferation of drone strikes— demonstrate just how readily the government and military will recalibrate value trade-offs during a crisis. The controversies around these choices also demonstrate how reasonable actors will disagree. In short, advocates for "responsible" AI need more specific and stable guideposts than "our values" even if they name five principles.

To its credit, the JAIC tried to elaborate and inculcate the DoD's vision through an extensive "Responsible AI Champions Pilot" in April 2021.[140] No official report is available but the 10-week series of training sessions and workshops did aim to create a cohort of "ambassadors who will advise, educate, and inform" stakeholders throughout DoD dealing with AI. The press release is long on vague outcomes but short on specific ethical guidance. Alka Patel, short-term head of ethics and "Chief of Responsible AI" who oversaw the "Champions" effort, departed the JAIC in October 2021. Interestingly, advertisement for a replacement lists solely experience in the Federal Operational Specialty for Engineering (0802) among necessary qualifications -nothing about philosophical or ethical training. Despite the laudable public statements of principle, it is difficult to see just how serious the DoD will be about ethical governance of AI when real conflicts among values arise.

The Google signers believed Maven was in "direct opposition to our core values." Notice they never named those values. "Don't be Evil"? You'll find as few exponents of "Be Evil" as you will find advocates for "Irresponsible AI." Nourbakhsh's admonition to "choose

[140] "JAIC Completes Responsible AI Champions Pilot," JAIC Public Affairs, 08 July 2020, accessed 19 January 2022, https://www.ai.mil/blog_07_08_20-jaic_completes_responsible_ai_champions_pilot.html.

what is most important to you" is no less whimsical a guide to ethical decision making. Even if China's AI researchers are serious about their eight principles and commitments to "Responsible" AI, it has done little to ensure "harmony and friendliness" (nor any of the virtues it claims) among the Uighurs. The ethical principles espoused by all of these parties is not nihilism but there is not much of substance there to distinguish them among classic ethical schools. After all, Utilitarianism and Deontology, like Virtue and Care Ethics, each have their own and very different values and standards for what constitutes "appropriate levels of judgement and care." Call it tenderness or what you will, AI governance in the absence of more solid ethical principles and reasoning -a basis for choosing between competing values- may not lead to the gas chamber but it will not guide the hard choices that increasing competition, let alone combat, will foist on those developing and deploying military AI in accord with the principle of responsibility.

Equitable: The Perils of Facial Recognition

> **2. Equitable:** The Department will take deliberate steps to minimize unintended bias in AI capabilities.
>
> " . . . if you want to surveil everyone on a street; if you want to see everyone who shows up at a demonstration; you can put AI to work. And we're seeing that in certain parts of the world."
>
> -Brad Smith, President, Microsoft[141]

U.S. Defense officials are rightly concerned to "minimize unintended bias" over gender and race among the AI systems they deploy for human resources and financial decisions. But the real debate over when and how to develop and deploy facial recognition based on AI will be about its use in the field. Not surprisingly, Brad Smith is talking about China but his fear is not just about deploying AI against demonstrators. In July 2018 a series of patent applications "submitted by Huawei and the Chinese Academy of Sciences describes the face recognition product that's capable of identifying people on the basis of their ethnicity. And specifically, if they're part of the Uyghur minority."[142] Allegedly, the software claims to determine not only a passerby's ethnicity but even his or her emotions[143] and enables detaining persons on that basis.[144] In response to Western criticism of such "chilling" domestic uses,[145] the CCP sometimes denies the existence of such technology[146] or insists these measures are rooted in anti-terrorism and safety rather than control or suppression of any population. Regardless of whether you take the CCP's denials seriously, these very reasons already have been cited by U.S. officials for our own biometric and facial recognition efforts -even Project Maven. And American use of AI in facial recognition technology (FRT) is growing.

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[141] Mathew Hill, (00:19:35).
[142] Mathew Hill, (00:27:05).
[143] Morgan et al., 14.
[144] Mathew Hill, (00:28:00).
[145] NSCAI, 2.
[146] Mathew Hill, (00:29:00).

In August 2021, the GAO published a study that revealed 18 of the 24 agencies they polled are already using FRT for both physical security and domestic law-enforcement purposes.[147] DoD was among those, with Homeland Security (DHS), Justice (DOJ), Health and Human Services (HHS), Interior, and Treasury, that expanded use of FRT through AI beyond data in federal records to include services like "Clearview AI, a commercially owned facial recognition system that compares a submitted photo against a database of publicly available images from open sources, such as social media, and returns matching images for review."[148] Clearview has also gotten the attention of the *New York Times* who wonders if Clearview "might end privacy as we know it" and even quotes a backer of the company that it "might lead to a dystopian future or something."[149] A Clearview competitor, PimEyes, already played a public but murky role in identifying protestors (insurgents?) involved in the January 6, 2022 Capitol insurrection.[150]

In some views, DoD has already gone too far. Senators Edward Markey (D-MA) and Jeffrey Merkley (D-OR) joined Representatives Pramila Jayapal (D-WA) and Ayanna Presley (D-MA) in warning of more specific dangers and in sponsoring a Facial Recognition and Biometric Technology Moratorium Act.[151] Their reason for caution? A 2018 study from Stanford and Massachusetts Institute of Technology highlighted failure of three AI systems to

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[147] U.S. Government Accountability Office. *FACIAL RECOGNITION TECHNOLOGY Current and Planned Uses by Federal Agencies.* Washington, DC: GAO, August 2021, 11.
[148] Ibid., 13, 28.
[149] Kashmir Hill, "The Secretive Company That Might End Privacy as We Know It." *The New York Times*, January 18, 2020, accessed 18 May 2022, http://www.nytimes.com/2020/01/18/technology/clearview-privacy-facial-recognition.html.
[150] Alice Hines, "How Normal People Deployed Facial Recognition on Capitol Hill Protesters," *Vice.* 2 February 2021, accessed 20 May 2022, https://www.vice.com/en/article/4ad5k3/how-normal-people-deployed-facial-recognition-on-capitol-hill-protesters.
[151] Thomas Brewster, "A 'Threat To Black Communities': Senators Call On Immigration Cops And FBI To Quit Using Clearview Facial Recognition." *Forbes*. Accessed 14 May 2022. https://www.forbes.com/sites/thomasbrewster/2022/02/09/a-threat-to-black-communities-senators-call-on-immigration-cops-and-fbi-to-quit-using-clearview-facial-recognition/.

"identify the gender of women with dark skin."[152] Citing this and another handful of cases wherein minorities had been misidentified, their recent letter to SECDEF Lloyd Austin concludes that "the proliferation of biometric surveillance tools is, therefore, likely to disproportionately infringe upon the privacy of individuals in Black, Brown and immigrant communities" and thus urges abandonment of Clearview AI's services.[153] Persuasive to activists,[154] the criterion for racial bias based on disproportionality of effect to minority communities is not always persuasive to juries or bureaucrats; however, that this issue has already run up against a significant challenge to DoD use of AI signals a problem. In resolution, balancing the need for security against the desire for racial fairness (or eventually accurate discrimination among potential targets on a battlefield), the department will need something more solid than its promise to "take deliberate steps to minimize unintended bias in AI capabilities." In collusion with Clearpoint, DoD may already have crossed the line toward unintended bias, however faintly this principle might delineate it.

And DoD will need more solid ethical standards when it faces other emerging FRT dilemmas, not related to AI errors. The racial issue is already at play in China where FRT is being used to identify members of the ethnic Uyghur minority; it is also being used to read their emotions, however imperfectly. As Activist Caitlin Seeley George of Fight for the Future contends, "Emotion AI is a severely flawed theoretical technology, based in racist pseudoscience, and companies trying to market it for sales, schools, or workplaces should just not."[155] The final line of the ominous "Target Profile" in the Future of Life Institute 's fictional but predictive *Slaughterbots* scenario lists "Ethnicity" as the last option for selection on a list of

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[152] Halpern.
[153] Letter from Markey, Merkley, Jayapal and Presley to SECDEF 9 February 2022.
[154] Ina Fried, "Tempers Flare over Emotion-Sensing AI," *Axios*, 25 April 2022, assessed 25 April 2022, https://www.axios.com/mood-emotion-sensing-ai-tempers-flare-a01efe11-362d-4fab-9d86-cee64ff839f1.html.
[155] Quoted in Fried.

attributes that killer robots could seek out.[156] Ukraine has already given in to another temptation, "using facial recognition to identify killed and captured Russian soldiers, even contacting their families and posting their photos on Telegram channels."[157] But the capability need not improve too much before even creepier dangers arise. Regardless of ethnicity, Israeli futurist Yuval Noah Harari predicts that, "If Kindle is upgraded with face recognition and biometric sensors, it can know what made you laugh, what made you sad and what made you angry. Soon, books will read you while you are reading them."[158] That will be a powerful technology in the hands of defense and law enforcement officials in search of terrorist threats and plots before they detonate. How many detonations before DoD overrides its concern for bias and reevaluates the practicality of equitable and unbiased AI?

[156] Stewart Sugg, *Slaughterbots*, Manchester, UK: Space Digital, 12 November 2017, accessed 21 January 2022, https://www.youtube.com/watch?v=9CO6M2HsoIA.
[157] Andy Kessler, "Ukraine's Asymmetric War," *Wall Street Journal*, March 27, 2022, accessed 27 March 2022, https://www.wsj.com/ articles/ukraine-asymmetric-war-technology-starlink-mariupol-theater-collapse-russia-explosives-internet-drones-weapons-11648400672.
[158] Yuval Harari, *Homo Deus: A Brief History of Tomorrow*, New York, NY: Harper, 2017.

Traceable: "Move 37" and Automation Bias

> **3. Traceable:** The Department's AI capabilities will be developed and deployed such that relevant personnel possess an appropriate understanding of technology, development processes, and operational methods applicable to AI capabilities, including transparent and auditable methodologies, data sources, and design procedure and documentation.

> "You don't want to examine the basis of your computer's morality any more than you want to see sausage being made."
>
> — John McCarthy, co-founder of the field of Artificial Intelligence[159]

We recoil at the image of sausage-making because we understand it. From the awful sights, sounds and smells of production to the offal itself, both the ingredients and the process make sense and we prefer not to think about them. Charcuterie's "natural casing" is as fine a euphemism as combat's "collateral damage." We are far less sure what to think about AI, let alone what an AI's morality might mean, but we are not less willing to consume and appreciate the final product. Like Admiral King wants logistics, we want AI to inform and accelerate our decision cycles -and we want it to do so in the field as well as in the lab. Criteria delineating an "appropriate understanding" are different in each. How familiar do our combatants need to be with automated regression analysis, Montecarlo simulation, neural nets, and Bayesian programming? Do they need to be more familiar with the software telling them to make a life and death decision or "just follow orders" coming from the black box attached to their weapons system?

Confronted by the famous "Move 37" in game 2 of his match with AlphaGo, Lee Sedol, 18-time Go World Champion, says "I thought it was a mistake."[160] He was one of two flummoxed parties that ought to have understood the algorithm-driven decision. The other party

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[159] "John McCarthy." Computer History Museum, Accessed March 21, 2022. https://computerhistory.org/profile/john-mccarthy/.

[160] Cade Metz, "In Two Moves, AlphaGo and Lee Sedol Redefined the Future," *Wired*, accessed 6 April 2022, https://www.wired.com/2016/03/two-moves-alphago-lee-sedol-redefined-future/.

was the team that created Sedol's opponent. But even for them, "Move 37 was beyond what any of us could fathom."[161] As a move that helped AlphaGo to victory, this episode exemplifies the wonder and purpose of AI. Self-educating algorithms calculate odds, evaluate options, and develop solutions faster and better than any human can. Humans, as a consequence, do not always or immediately understand it. Move 37 was brilliant but what if it had been wrong?

The stakes on a battlefield are higher than on the *go* board. On one such battlefield in July 1988, The USS Vincennes responded to warnings from its Aegis radar warning system that an approaching contact was likely an Iranian fighter jet. They had time to double check, validating its course and noting the aircraft's broadcast on distinctly civilian frequencies. They fired. Two radar-guided missiles shot down an Iranian airliner, killing all 290 people on board. Of course, the U.S. and Iranian governments dispute both the chronology and the intent of the actors during this incident. More recent commentators on the role of automation and AI dispute the lessons to be learned as well. Paul Scharre, for example, suggests more automation may have helped[162] while for Peter Singer, this was a clear case of Automation Bias: "Even though the hard data was telling the crew that the plane wasn't a fighter jet, they trusted what the computer was telling them more."[163]

The lesson here is not from another dissection of the events, let alone a resolution of them. Rather, the warning for ethics in AI and the challenge to DoD's principle of traceability should be taken from a few other points. First, the Aegis system was not highly autonomous (in fact, not even operating in its most autonomous mode during the incident)[164] in comparison to later systems like the Patriot Missile batteries that shot down friendly assets under similar circumstances during the later Gulf War because, as Army investigators determined, they were

[161] Ibid.
[162] Scharre, *Army of None*, 170.
[163] Singer, 125.
[164] Scharre, *Army of None*, 169.

"trusting the system without question."[165] Second, all of these systems were *merely* autonomous; that is, they did not even make use of the kinds of AI that will inform deadlier but less transparent systems of the future. Third, as AI-informed systems bring Move 37-like successes to the battlefield, operators will trust them more, increasing dangers.

Finally, they also will trust them for less observable reasons. Unlike a physical weapons system where the operator has some physical contact or at least some observable kinetic relationship to what is happening on the battlefield, "the essence in autonomy is software, not hardware, making transparency very difficult."[166] A military decision analogous to Move 37 will be even more abstracted as AI informs the decision support tools more than the actual deployment of a weapon. In other words, as both autonomy and AI advantages increase, combatants will have less understanding and yet more trust of the technology. The point is that an admonition to ensure "relevant personnel possess an appropriate understanding" offers little to no guidance that is pertinent to military actors, especially those in the field and the fog of war who are faced with a "move" that the AI recommends but they do not quite fathom. After all, who are the "relevant personnel," combatants or software engineers? What constitutes "appropriate understanding" of an algorithm that is telling one person to kill another?

The same trust that makes the human-algorithm relationship work renders human volition in the decision to kill little more than a rubber stamp. The banality of citing Nazi-era atrocities in support of contemporary ethical arguments is always a risk but Hannah Arendt's phrase "superfluous people" from the *Origins of Totalitarianism* has special relevance here as combatants, providing half-understood oversight to the AI telling them to kill, grow superfluous themselves. They lose human agency to technology in much the same way both Eichmann's

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[165] John K. Hawley, "Looking Back at 20 Years of MANPRINT on Patriot: Observations and Lessons," *Army Research Laboratory*, ARL-SR-0158, September 2007, cited in Morgan et al., 37; Scharre, *Army of None*, 144, 170.
[166] Scharre, *Army of None*, 353.

henchmen and prisoners in the camps lose it to laws of "history," as the Communists would have it, or laws of "nature" as the National Socialists would have. Michael Sacasas, who has been writing about the relationships among technology, culture, and ethics for over 13 years in his weblog, *The Frailest Thing*, specifically suggests just this sort of substitution.[167] In this way, the technology "applies the law directly to mankind without bothering with the behavior of men."[168] But for the combatant, a loss of agency is not merely a question of "just following orders" -be them from a chain of command, an algorithm or a merely vague "black box" as most combatants and the public understand AI decision making.

Some of the most moving passages from Michel Walzer's seminal work on *Just and Unjust Wars* recall passages from other classics by Wilfred Owen, George Orwell, and Robert Graves that recount decisions not to kill (sometimes literally, sometimes figuratively) "naked soldiers," [169] even when the rules of war and engagement permit. Each instance depicts a hesitation on the part of a Soldier ready to shoot who, for whatever common behavior of his target -bathing shaving, smoking etc.- recognizes the other's humanity. No "transparent and auditable methodologies" inform this conclusion, simply a passive recognition that this is not *right*. Such is not a luxury of an algorithm; nor of a newly superfluous combatant who dutifully but uncritically pulls a trigger or sends a missile according to instructions he or she barely understands. In such glimpses of humanity, to kill or not to kill is a question at the heart of a warrior culture as well as any ethical culture. Outsourcing that decision to an algorithm carries risks on both ends of the barrel.

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[167] L. M. Sacasas, "Superfluous People, the Ideology of Silicon Valley, and The Origins of Totalitarianism." *L.M. Sacasas*, 3 January 2018, accessed 01 June 2022, https://thefrailestthing.com/2018/01/03/ superfluous-people-the-ideology-of-silicon-valley-and-the-origins-of-totalitarianism/.
[168] Hannah Arendt, *The Origins of Totalitarianism.* New York: Harcourt Brace Jovanovich, 1973, 462.
[169] Michael Walzer, *Just and Unjust Wars: A Moral Argument with Historical Illustrations*, New York: Basic Books, 1977, 138-143.

Reliable: AI, Safety, and the Warrior Culture

> **4. Reliable:** The Department's AI capabilities will have explicit, well-defined uses, and the safety, security, and effectiveness of such capabilities will be subject to testing and assurance within those defined uses across Al capabilities' entire life-cycle.

> "Some war --us against some Third World country! Pushing buttons and smart-bombing chimneys. So, tough guy, what did you train on, huh? Nintendo?
> -*The Last Supper*, 1995 (feckless graduate student to racist Gulf War veteran) [170]

Even before the proliferation of armed drones and other unmanned systems on the battlefield, Americans were ill-at-ease with some of their military technologies. We rely on weapons to be effective as well as to keep combatants safe. Perhaps we have sought too much reliability. Precision satellite-guided munitions that could be launched at a great distance by operators far from the blood and smoke of their weapons challenged some fundamental notions of what it means to be a warrior. Such complaints are not new. Victor Davis Hanson recounts an old Spartan veteran lamenting the passage of hoplite virtues "when an enemy showered his phalanx with arrows and missiles, killing the brave and cowards alike."[171] From the advent of crossbows and firearms to artillery and strategic bombs, every advance in military technology seems to bring new complaints of this sort.

In our own era, few military communities are facing the prospect of battlefield distancing -both physically and psychologically- as pilots. Timothy Schultz, Professor at the Naval War College and former U-2 pilot, explored this concept in his book, *The Problem with Pilots*. His history of aviation presents a history of trying to accommodate the human as the machines

[170] Stacy Title, *The Last Supper*, Culver City, CA: Columbia Pictures, 1995.
[171] Victor Davis Hanson, *A War Like no Other: How the Athenians and Spartans Fought the Peloponnesian War*, New York: Random House, 2005, 305.

developed in what is really a cybernetic relationship, a "human-machine complex,"[172] rather than a simple vehicle. The problems are many. Pilots' size and weight limit payloads. The need for life support exacerbates these problems even as a pilot's physical fragility still limits the maneuvers an aircraft can make -from altitude and g-force toleration to range and mission duration. Then there is the risk of simply putting pilots into the air where combat missions jeopardize not just men and machines but, in both, very expensive assets that are tough to create (by training or manufacture) and to replace. As technology let pilots control remotely, it has made sense to pull them out of the aircraft and to expand the use of unmanned vehicles.

Employment of remotely piloted or even semi-autonomous aircraft as slow observers and missile platforms is not new; nor does their widespread use in the wars since 2001 need elaboration here. What is new are prospects of AI advances migrating fighter pilots out of cockpits. By 2015, even Navy Secretary Ray Mabus suggested the F-35C "should be, and almost certainly will be, the last manned strike fighter aircraft the Department of the Navy will ever buy or fly."[173] The Air Force may be following suit. In 2020, machine learning AI consistently outflew and shot down Air Force fighter pilots during the AlphaDogfight Trials -in simulators. DARPA and the Air Force have moved to the next phase of their Air Combat Evolution (ACE) with AI trials among real aircraft, even dogfights by 2024.[174] Like China, the U.S. has put these AI-driven airframes near the top of their AI priorities. Both nations are a long way from completely pulling fighter pilots out of the "Observe, Orient, Decide, Act" (OODA) loops they made famous.

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[172] Timothy Paul Schultz, *The Problem with Pilot: How Physicians, Engineers, and Airpower Enthusiasts Redefined Flight*. Baltimore, Maryland: Johns Hopkins University Press, 2018, 9.
[173] Meghann Myers, "SECNAV: F-35C Should Be Navy's Last Manned Strike Jet." *Navy Times*, 16 April 2015, accessed 15 May 2022, https://www.navytimes.com/news/your-navy/2015/04/16/secnav-f-35c-should-be-navy-s-last-manned-strike-jet/.
[174] Halpern.

This is certainly by cautious design. The Pentagon lays out very specific guidelines for what it means to have a human "in," "on," or completely "outside the loop;" nevertheless, their main guidance is less than helpful. DoD Directive 3000.09 mandates that "autonomous and semi-autonomous weapon systems shall be designed to allow commanders and operators to exercise *appropriate levels of human judgment* over the use of force"[175] but fails to specify any criteria for what might be appropriate. More importantly, according to the RAND study, the most frequently cited advantage of military AI is great speed;[176] in order to reap the benefits of that speed, it is tough to keep a human in or even on the loop when life and death decisions in an AI dogfight arrive at a split-second pace where humans cannot keep up. Peter Hancock, a psychology professor at the University of Central Florida, names this discrepancy "temporal dissonance" and compares a human "in the loop" to an automotive air bag, "As soon as you put me in that loop, you've defeated the whole purpose of the air bag, which is to inflate almost instantaneously."[177] Finally, whatever DoD imagines is an "appropriate level" of human involvement, the public at least "supports further development of military AI and understands the need to match enemy escalation to avoid defeat."[178] A "suicide drone" in the Ukraine is already credited with using AI to pick its own target and engage without a human in the loop.[179] Realistically, our commitment to keeping humans in the loop is only as good as our adversary's.

For some, fighter jets (or whatever we name their various unmanned descendants) making instantaneous life-and-death decisions without human oversight constitute the kind of Lethal Autonomous Weapon Systems (LAWS) that risk mankind's greatest and most popular fears of AI running amok. But suppose their advent heralds a subtler kind of threat? After all,

[175] Executive Services Directorate (ESD), 2.
[176] Morgan et al., 16.
[177] Quoted in Halpern.
[178] Morgan et al., xviii, 13.
[179] Moran.

we look to reliability of these systems not only to carry out missions but to keep our pilots and other combatants safe. Can AI make them too safe? According to many "Just War" theorists, exposure to risk is part of what provides permission to kill and highlights the critical distinction between combatants and non-combatants. Michael Walzer[180] and Paul Christopher, for example, argue that "risking one's life is part of what it means to be a soldier."[181] In their eyes, making war a distant risk-free affair not only undermines its justness but may tempt decision makers to make war more frivolously. The killing becomes easier to start and harder to stop. Some theorists even suggest that unmanned systems and other technologies that eliminate risk for combatants require a new phrase, *jus ad vim* (loosely translated and interpreted as force short of war or "limited force"),[182] join the traditional categories of *jus ad bellum* and *jus in bello* among "Just War Thinking" (JWT) traditions.

But, as the early quote from an obscure 1990s film demonstrates, we do not need Latin phrases or esoteric theories of just war to recognize that the virtues we ascribe to warriors are not earned by stroking keyboards or joysticks thousands of miles from a battlefield. Nor are they rooted in simply carrying out half-understood instructions from a series of algorithms. As Marta Kepe, Senior Defense Analyst with the RAND Corporation, summarizes: With a reduced decision-making role in the military, and with people no longer putting their lives at risk in war and crises, humans may no longer be perceived as individuals who exemplify the values of service, duty, courage, and honor."[183] Yale Law Professor, Paul Kahn elaborates on this "paradox of riskless warfare," suggesting that the disconnection from the battlefield and its risks

[180] Walzer, 156.
[181] Cited in Helen Frowe, *The Ethics of War and Peace: An Introduction*, New York: Routledge, 2011, 112.
[182] See Jai Galliott's collection, *Force Short of War in Modern Conflict: Jus Ad Vim*, Edinburgh: Edinburgh University Press, 2019.
[183] Marta Kepe, "Considering Military Culture and Values When Adopting AI." RAND Corporation, Santa Monica, CA, 22 June 2020. https://www.rand.org/blog/2020/06/considering-military-culture-and-values-when-adopting.html.

not only undermines the foundation of a warrior culture set apart by its willingness for self-sacrifice but, “propels us beyond the ethics of warfare.”[184]

Those who believe unmanned aerial systems have already pushed us across that border should reflect on the experience of actual remote pilots. As the 2015 film *Eye in the Sky* illustrates,[185] physical distance reduces the risk of physical injury but can heighten the prospects of moral injury. Dwelling on potential targets for hours a time, remote pilots get a good look at people on the ground. Watching their weapons detonate, they see what those weapons can do. Loitering to assess the damage, they have a good view of exactly what their actions do in a way that fighter jocks, artillery men, and even some infantry do not -all in real time and in High Definition. Beyond the consequences of their own actions, "They're exposed to the most gruesome things that you can think about that could happen on a battlefield," notes Col. Jason Brown, Commander of the 480th ISR Wing at Langley. "They find mass graves; they witness executions.”[186] Questioning the impact of AI and remote killing on warrior culture in no way questions the suffering and legitimate moral injury of remote pilots. Rape, torture, lifeless bodies, and limbs your own actions have torn, these are not images any warriors digest easily, even those allegedly trained on Nintendo.

[184] Quoted in Singer, 432.
[185] Gavin Hood, *Eye in the Sky*, Toronto: Entertainment One, 2015.
[186] Interviewed by Sarah McCammon, “The Warfare May Be Remote but the Trauma Is Real.” *NPR*, 24 April 24, accessed 15 May 2022, https://www.npr.org/2017/04/24/525413427/for-drone-pilots-warfare-may-be-remote-but-the-trauma-is-real.

Governable: Slaughterbots and the Kalashnikovs of Tomorrow

> **5. Governable:** The Department will design and engineer AI capabilities to fulfill their intended functions while possessing the ability to detect and avoid unintended consequences, and the ability to disengage or deactivate deployed systems that demonstrate unintended behavior.

> "If any major military power pushes ahead with AI weapon development, a global arms race is virtually inevitable, and the endpoint of this technological trajectory is obvious: autonomous weapons will become the Kalashnikovs of tomorrow."
>
> -Open Letter from AI & Robotics Researchers of the Future of Life Institute[187]

The Future of Life Institute is probably best known for its vision of Slaughterbots,[188] the fictional video portraying a terrorist attack in the form of swarms of small AI-controlled suicide drones executing political enemies according to pre-programmed instructions and using facial recognition. The video is chilling. The basic technologies are here, and already commercially available.[189] It's only a matter of combining and perfecting it. As such, the prospect of keeping it out of the hands of criminals and terrorists is slim. Proliferation of this kind is the biggest challenge to DoD's effort to keep its AI systems governable. It is tough to manage unintended consequences when technology you develop falls into unintended hands.

The U.S. is already developing technology that looks suspiciously like Slaughterbots. In April 2022, the Army in cooperation with DARPA tested its largest swarm of drones yet. Though primarily oriented toward more traditional ISR roles, some among the mixture of 30 ALTIUS 600 and Raytheon-built "Coyote" drones were indeed employed as suicide drones to

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[187] "Autonomous Weapons Open Letter: AI & Robotics Researchers," Future of Life Institute, 9 February 2016, accessed 16 May 2022, https://futureoflife.org/2016/02/09/open-letter-autonomous-weapons-ai-robotics/.
[188] Sugg.
[189] Morgan et al., 39.

strike targets."[190] These are larger than the Slaughterbots but, like their fiction counterparts they were launched by aircraft (among other platforms) while the effect of their bigger payloads is much the same. The test showed no capability for each drone to use AI in identifying and autonomously engaging individual targets but, given progress with FRT elsewhere, that is not an obstacle likely to last long. Nor are objections to such an application likely to linger in the face of competition.

China's latest set of autonomous drones are smaller in size but larger in capability and worry. Experiments carried out in October 2021 generated footage and an article only published in early May 2022. Despite some sensationalistic headlines that suggest drones are "hunting" humans,[191] the team of Chinese researchers insist that their palm-sized drones have been created to better assist with things like disaster relief and Mars exploration than any military application.[192] This explains the importance of their design for "fully autonomous navigation in real-world unstructured fields" where a swarm of over forty platforms were able to navigate a dense bamboo forest without even reliance on global positioning systems (GPS). [193] It is suited to truly remote and independent work.

Ironically, the authors do name the human objective a "Target" but this could certainly mean target of a search only. As for destroy, it's important to remember the Slaughterbots carried only 3 grams of shaped explosive to kill each of their targets. In short, the reality is definitely approaching the fiction. And the price point is approaching zero. Perhaps even more

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[190] Dan Parsons, "Army To Test Its Biggest Interactive Drone Swarm Ever Over Utah" *The Drive*, 22 April 2022, accessed 22 April 2022, https://www.thedrive.com/the-war-zone/army-to-test-its-biggest-interactive-drone-swarm-ever-over-utah.
[191] "Video Shows Chinese Drones Hunting Humans in PACKS & They Could Be Primed to KILL" *The U.S. Sun.* 6 May 2022, accessed 6 MAY 2022, https://www.the-sun.com/news/5278366/video-shows-chinese-super-drones-hunting-humans/.
[192] Xin Zhou et al., "Swarm of Micro Flying Robots in the Wild." *Science Robotics*, 7 (66), 4 May 2022, accessed 16 May 2022, https://www.science.org/doi/10.1126/scirobotics.abm5954, 1.
[193] Zhou et al., 10.

chilling than footage of the drone's autonomously tracking its target is the reminder that each drone, a DJI's Mavic Air 2 with just a few extras, is available on the open market and only costs about $135.[194] That is less than a quarter of the cost of a Kalashnikov, even in Afghanistan.[195]

Finally, this troubling application of drone technology makes it easy to focus on the availability of the drones themselves. But this is not a feat of hardware; this is a feat of AI-enabled software. However easily reproduced are the components of Mavic Air 2, the AI governing it will be even more easily copied and distributed. Just ask any software company trying to tackle piracy. If DoD's desire to compete with China forces it to take a role in further developing that software, they will find it tough to balance their desire to govern "unintended consequences" against almost certain proliferation to unintended users.

[194] Zhou et al., 1.
[195] Niall McCarthy, "The Cost Of An AK-47 On The Black Market Around The World," *Forbes,* 30 March 2017, accessed 16 May 2022, https://www.forbes.com/sites/niallmccarthy/2017/03/30/the-cost-of-an-ak-47-on-the-black-market-across-the-world-infographic/.

CONCLUSION

"Technology is neither good nor bad; nor is it neutral."
— Melvin Kranzberg[196]

In defense, AI-enabled systems can do a lot of good; in attack, they can do a lot of bad. The DoD's recognition of this and its efforts to implement its five ethical principles are laudable but inadequate to the ethical challenges that AI is already bringing. And future challenges are far from neutral. As the U.S. competes with China to make our machines more like warriors, we risk making our warriors more like machines –with unpredictable effects well beyond the battlefields. Duties to these warriors, like duties to all humans, are rooted in an appreciation of what we are. Some enthusiasms for AI, with attendant reductionism of human to machine "intelligence," erode distinctions that are critical to a profession of arms that appreciates honor and sacrifice. "Or," as Roger Scruton asks, "is the 'honorable sacrifice' explanation just a story that we tell ourselves, in order to pin medals on the chest of the ruined "survival machine" that died in obedience to its genes?"[197] Our fallen, past and future, deserve better than that sentiment. They therefore deserve more than sentiment and the vague ethical principles that are already failing to realistically govern our mounting competition with China for military AI. However admirably stated, our ambiguous commitment to "responsible" AI may be no more useful or enduring than our commitment against unrestricted submarine warfare or strategic bombing of civilian populations. Without more solid ethical principles and more realistic consideration of the technologies we are already developing, DoD principles will float in and out with the tide of whatever horrors our rivals are willing to deploy.

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[196] Melvin Kranzberg, "Technology and History: Kranzberg's Laws," *Technology and Culture* 27.3 (1986), 547.
[197] Roger Scruton, "My Brain and I," *The New Atlantis*, Spring 2014, accessed 9 April 2022, https://www. thenewatlantis .com/ publications/my-brain-and-i.

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