

The United States of America's Embrace of Artificial Intelligence for Defense Purposes



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Abstract Artificial intelligence (AI) is used across an increasingly wide range of sectors. Given its transformative potential, AI carries profound implications in a national security context, especially as regards increasing countries' military advantage. The key leaders in AI development, and at the same time adversaries and competitors for global supremacy and leadership, such as China, Russia and the United States (US), have recognized this potential inherent in AI and are developing initiatives to adopt AI in pursuit of their national security goals. Thus, AI has become yet another area of great power rivalry. Given the above, this chapter, first, explores the ways in which AI can impact national security in a military context. Then, it presents how China and Russia endeavor to boost their military competitiveness with AI-enabled capabilities. Finally, it juxtaposes the approach adopted by the US to maintain its strategic position in the world and remain the key security provider for its citizens and the US allies with approaches adopted by the US' rivals.

Keywords Artificial intelligence (AI) · The United States of America · National security · Military advantage · National power · Great power rivalry

1 Introduction

AI is a rapidly expanding field of technology, with applications across the full spectrum of human activity. As such, it also carries far-reaching implications for national security. One example of its high-profile application is the United States (US) military's Project Maven in Iraq and Syria (Pellerin, 2017; Seligman, 2018; West & Allen, 2018). Other military functions of AI discussed in the literature include intelligence, logistics, cyberspace operations, information operations, command and control, semiautonomous and autonomous vehicles, and lethal autonomous weapon systems (cf. CRS, 2020, p. 9–15; Sheppard et al., 2018, p. 27–30).

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The potential that AI carries will influence the security environment and, thus, will have a profound impact on the rivalry for global leadership. In 2017, China released its strategy in which it declared its ambition to lead the world in AI by 2030 (China State Council, 2017). Similarly, Russia's President Vladimir Putin stated that the nation leading in the field of AI will become the ruler of the world (Gigova, 2017). Likewise, the 2018 US National Defense Strategy has placed AI among the very technologies that ensure that the US will be able to fight and win the wars of the future (DoD, 2018). What once used to be a technical and academic issue has now become the focus of geopolitical competition (Buchanan, 2020). Claims of an AI arms race appear fully justified.

China's and Russia's actions towards the US are described as adversarial, with both countries pushing the boundaries and attempting to reassert their influence regionally and globally (WH, 2017, p. 27) as well as exerting pressure on the US to compete for innovative military AI applications (CRS, 2020). With both countries undermining the US primacy, its competitive edge and posing a threat to the liberal values and norms the US and its allies live by, it seems imperative that the US leadership in the field should top American national security agenda (Schmidt & Work, 2019), with requisite measures taken to accomplish this goal (cf. Sheppard et al., 2018, p. 4). However, there are concerns that whereas China and Russia are making progress in the field, the US may be lagging behind (Auslin, 2018). Moreover, despite some steps being taken by the US government, there is no comprehensive strategy that would set forth the US policy (New, 2018, p. 1; Sherman, 2019; Groth et al., 2019, p. 7). Considering the above, the objective of this chapter is to examine how the US embraces AI for defense purposes so that it maintains its strategic position and is still capable of advancing security, peace, and stability. The chapter is structured as follows: first, it elaborates on AI's potential impact on national security; next, it presents how China and Russia encompass AI-enabled defense capabilities; then, it discusses the US approach to AI military integration. Conclusions follow.

2 AI and National Security

AI is here to stay. It has been changing the way we live our lives for quite some time now and it continues to develop rapidly, finding its application in more and more everyday technologies as well as across a number of sectors. In addition, under the concept of AI for the social good, it is also employed to deal with major societal challenges (CRS, 2017).

As AI is a game changer across a wide range of businesses and industries, it is believed that it is bound to significantly impact national security in a variety of ways, not only transforming the character of the future battlefield and the pace of threats, but also affecting the balance of power in both the global economy and military competition (Sheppard et al., 2018, p. 1). Technology has always played a key role in achieving supremacy in power over others. It has always been a key factor that

could tip the scales in one side's favor. Security has always been accelerated by technology. And so have threats (cf. WH, 2017, p. 26).

There are numerous studies and scenarios prognosticating AI's impact on national security (Allen & Chan, 2017; CRS, 2020; DIB, 2019; NSCAI, 2019; Nurkin & Rodriguez, 2019). What they all appear to acknowledge is that the capabilities that AI can already provide carry significant potential for national security should be viewed beyond their impact on a particular military task and will have strategic implications. It is even claimed that AI's potential is as transformative and impactful for national security as that of nuclear weapons, aircraft, computers, and biotech, predicting that AI will affect national security by causing changes in the following three areas (Allen & Chan, 2017, p. 1–3):

1. military superiority, as not only will progress in AI enable new capabilities, it will also make the existing ones more affordable to a wider audience, such as a weak state or a non-state actor acquiring a long-range precision strike capability owing to a purchase of a commercially available AI-enabled long-range unmanned vehicle;
2. information superiority, as AI will considerably boost the collection and analysis of data, improving the quality of information available to decision makers, as well as their creation, thus facilitating deception and the distortion of truth, which may lead to undermining trust in many public institutions;
3. economic superiority, as AI might spark off a new industrial revolution, for instance as a result of dwindling demand for labor.

Given AI's capabilities, it can be assumed that its applications can benefit national security in the following ways (Nurkin & Rodriguez, 2019, p. 24):

1. by enabling humans, i.e. enhancing operators, intelligence officers and strategic decisions makers and the like dealing with exponentially growing massive troves of data and information in the performance of their tasks, particularly humdrum and long-duration ones, such as intelligence collection and analysis, this increasing their productivity and endurance;
2. by removing humans, i.e. replacing them, for instance with unmanned systems, in the execution of dirty, mundane or hazardous tasks, such as cleaning contaminated environments or handling explosives;
3. by exceeding humans, i.e. facilitating the development of new capabilities characterized by almost full autonomy and minimal human involvement, incredibly fast reaction times and unparallel processing power, resulting in greater situational awareness, accelerated pace of combat or a force-multiplying effect, such as a swarm of drones being potentially able to overpower a highly-advanced weapon system.

AI-enabled operational capabilities that appear to be contributing in general to the achievement of national security and military objectives, as they are being developed and fielded by a variety of actors, include the following (Nurkin & Rodriguez, 2019, p. 23):

1. Enhancing Processing, Cognition, and Decision-Making: coping with big data and enhancing processing and cognition;
2. Simulation and Training: simulating complex environments and behaviors, evaluation of training outputs, AI as a tutor—improving training efficiency;
3. Autonomous platforms and Systems: autonomous platforms, swarms, teaming mother ships and loyal wingmen, lethal autonomous weapons systems;
4. Human Performance Enhancement: human–machine intelligence fusion, pilot support, exoskeletons and AI;
5. Logistics and Maintenance: predictive maintenance to reduce costs and extend the lifetime of platforms;
6. Sensors, Communications, and Electronic Warfare (EW): cognitive sensing, radios and radars, cognitive EW;
7. Competition in the information Domain: cyberattack and defense, disinformation campaigns and influence operations;
8. Security and Surveillance: border and event security, targeted surveillance, social credit score support.

The above list is not finite and is bound to expand along with progress in AI research, the further development of technology and the wider adoption and incorporation of AI by individual actors.

On the whole, the employment of AI in the national security context is to facilitate and embrace the vast feeds of data and information available from different sources and geographic locations for a range of mission- or task-specific solutions, gradually eliminating the human component. It will allow national security organizations to understand and execute their missions better and faster. The fusion of AI with military systems will increase the accuracy and speed of perception, comprehension, decision-making, and operation beyond the capability of human cognition alone. The impact is expected to be so profound that some are convinced that AI will lead to the inception of so-called “algorithmic warfare”, in which algorithms will fight against algorithms, with the speed and accuracy of knowledge and action carrying more weight than standard factors such as the number of troops or firepower. Those with unparalleled data, compute power and algorithms will gain unprecedented battlefield advantage (NSCAI, 2019, p. 10).

The successful adoption of AI and its integration into the military is not unproblematic, however, and does pose certain challenges. Most of them stem from the fact that unlike in the past, when it was the government-directed defense-related programs that inspired new technologies subsequently transferring to the civilian sector, currently commercial companies are essentially at the forefront of AI development. This is largely due to government agencies seriously deficient in adequate expertise and resources, predominantly AI talent. As a result, the military is left with the necessity to eventually acquire and adapt commercially-developed tools for its defense applications. And it is fraught with a range of additional impediments related to complicated and lengthy government acquisition and procurement procedures, reluctance to partner with and collaborate with the military due to, for instance, ethical concerns over the use of AI in surveillance or weapon systems, issues with

intellectual property and data rights (US Government Accountability Office, 2017), or simply different work culture and mutual distrust (CRS, 2020, p. 19).

When it comes to the actual adoption of commercially-developed AI technology, it should be borne in mind that certain applications will require only minor adjustments before they can serve their national security purpose, whereas others will necessitate quite profound modifications. As for the former, take predictive logistics, in the case of which it may suffice to only provide parameters for a particular piece of hardware. As for the latter, the more extensive customization will be required due to the differences between the environment for which the technology has initially been developed and the one for which it should be suited. This will be particularly true for autonomous or semiautonomous vehicles that have been or will be developed for operation in data-rich environments, e.g. with GPS positions or up-to-the-minute traffic information, while their military equivalents will need to be able to operate and navigate in rough, poorly-structured conditions, off-road, with incomplete terrain mapping or no GPS signal due to jamming (CRS, 2020, p. 16).

Another issue concerns standards of safety and performance, which in the case of the military are invariably high, but not necessarily so for the civilian ones. A failure rate regarded acceptable for a civilian deployment of AI technology may be found unacceptable in a military context due to strict requirements imposed on military systems. A particular AI-enabled solution can be adopted by the government only after high levels of trust and reliability have been ensured and any issues of operational control have been worked out (Sheppard et al., 2018, p. 27).

Last but not least, there also concerns regarding the safe operation of the technology itself, as AI algorithms may be unpredictable or susceptible to manipulation, bias and theft (CRS, 2020, p. 8), by being a potential target for any adversary, a state and non-state one alike, or by being trained on corrupt data. Algorithms based on distorted or biased data can yield unexpected or undesirable results (Layton, 2018, p. 13), thus generating various challenges that may be difficult to detect at tactical, operational, or strategic levels. Although AI has already surpassed humans in different contexts, the mistakes made are the ones that a person would never make, hence being hard to predict, prevent or mitigate (Kania, 2017, p. 44). This could be particularly consequential in a military context if such biases were incorporated into autonomous systems with lethal effects (CRS, 2020, p. 31), and if such systems were deployed at scale (Scharre, 2016, p. 23).

To sum up, AI provides numerous opportunities as well as challenges for its application within a national security context, and as such it demonstrates enormous transformative potential. Given its inherent dual-use nature, what impact AI will ultimately have on national security depends on the relationship between the government and the commercial AI community and the extent to which these two can work together, overcoming all obstacles, to maximize the technology's strengths and minimize its vulnerabilities.

3 China and Russia: Strategic Competition for the US

Given the above, it can be concluded that AI demonstrates considerable potential to affect the balance of power. This fact has already been acknowledged by China, Russia and the United States. On July 20, 2017 China's State Council released "A Next Generation Artificial Intelligence Development Plan", in accordance with which China should take the lead in AI by 2020 (China State Council, 2017). Shortly afterwards, Russia's President Vladimir Putin announced that his country is determined to pursue AI technologies, as this is a key to a global leadership position (Gigova, 2017). By the same token, the 2018 US National Defense Strategy included AI among key technologies, allowing America to fight and win the wars of the future (DoD, 2018, p. 3).

Regarding China, there is no denying that it is America's chief competitor in the international AI market. The abovementioned 2017 Chinese strategy describes AI as a "strategic technology" that has become a "new focus of international competition" (China State Council, 2017, p. 2). In pursuit of the strategic objectives established in the Plan, China is said to be planning to develop its AI's core industry of over 150 bn RMB (approx. \$21 bn) by 2020 to 400 bn RMB (approx. \$58 bn) by 2025 and 10 trillion RMB (approx. \$1.5 trillion) by 2030 (Sheppard et al., 2018, p. 50). This appears to be corresponding to China's overall strategy to achieve global leadership in research and development. Interestingly, China's R&D funding increased 30 times from 1991 to 2015 and it is projected to overshadow the US in this regard within 10 years (NSCAI, 2019, p. 17).

China is conducting research, development and testing for a variety of AI-enabled military and security applications that will be critical to the future of conflict, including, but not limited to: intelligent and autonomous unmanned systems, such as swarm intelligence; AI-enabled data fusion, information processing, and intelligence analysis; applications in simulation, war-gaming, and training; the use of AI for defense, offense, and command in information warfare; and intelligent support to command decision-making (Kania, 2017, p. 21).

There have been reports depicting China's successful trails with the different types of air, land, sea, and undersea autonomous vehicles. For instance, in June 2017, China Electronics and Technology Group Corporation (CETC) demonstrated its advances in swarm intelligence by carrying out a successful test of 119 fixed-wing UAVs (Kania, 2017, p. 23). Another example is a 2018 test of a fleet of fifty-six unmanned vessels that, if equipped with weapons, could be used to attack enemy during sea battles (Barnes, 2018).

It is still an open question whether China will win its AI competition with the US. What might be seen as China's advantage is its unified, whole-of-government effort to develop AI. The Chinese government as well as the military, academic research laboratories, financial institutions, and corporations are aligned and work closely towards the common goal. As a result, the Chinese government can have primacy in setting AI development priorities and principles (Sheppard et al., 2018, p. 48–49), and can exercise central direction and control. Certainly, this can drive

collaboration between the military and the civilian sector fast forward, thus attaining the AI development strategic objectives much faster.

On the other hand, what is recognized as a strength by some is thought to be a weakness by others. Despite the central management of China's AI ecosystem, it has been pointed out that its funding management is inefficient: corrupt, favoring some research institutions with government funding over others or even overinvesting beyond market demand. In addition, China faces the same problem as the US: a shortage of qualified personnel with sufficient experience in the field. Moreover, China also loses academically in AI to the US in terms of the number of AI programs run at Chinese universities and the quality of AI research and academic publications (CRS, 2020).

To judge by its President's words (Gigova, 2017), Russia is also determined to adopt AI, including for military purposes, although at the moment it appears to be behind both the US and China (Markotkin & Chernenko, 2020). In order to catch up with the competitors, in 2019 Russia released the "National Strategy for the Development of Artificial Intelligence Through 2030", detailing the way in which it is planning to enhance Russian AI expertise as well as educational programs, datasets, infrastructure and legal regulatory system. Interestingly, it does not make a direct mention of AI development for national security or defense purposes (Office of the President of the Russian Federation, 2019). This comes on top of Russian effort to modernize its defense forces, including the 30% robotization of its military equipment by 2025 (Simonite, 2017).

Russia's measures taken to close the gap with the United States and China include the establishment of a variety of organizations working on military AI development. In March 2018, a 10-point AI agenda was issued. Among other initiatives it propounds the establishment of an AI and Big Data consortium, a Fund for Analytical Algorithms and Programs, a state-funded AI training and education program, a dedicated AI lab, and a National Center for Artificial Intelligence (Bendett, 2018). What is more, Russia created the Foundation for Advanced Studies: a defense research organization dedicated to autonomy and robotics, and launched an annually-held conference on "Robotization of the Armed Forces of the Russian Federation (Bendett, 2017b). Moreover, in 2018 the ERA Military Innovative Technopolis was designated by the Russian Ministry of Defense its main AI research, development, test and evaluation (RDT&E) hub. In July 2020 it started accepting applications for science research competitions on artificial intelligence (CNA, 2020, p. 11).

Russia's research and development focus, apart from a variety of AI applications, has also been on semiautonomous and autonomous vehicles. In 2017 the chairman of the Federation Council's Defense and Security Committee stated that owing to AI it would be possible to replace a soldier and a pilot, further predicting equipping vehicles with AI (Bendett, 2017a). At this point it should be remembered that Russia has already conducted a successful test of an uninhabited ground vehicle that supposedly outdid existing [inhabited] combat vehicles. There are plans to deploy the system in combat, intelligence gathering, or logistics roles in the future (Davies, 2017). The Russian military is also developing and possibly already fielding advanced landmines

that utilize some AI-enabled capabilities. It is said that the POM-3 (IIOM-3) “Medal-lion” landmine allegedly had an ability to distinguish between various targets, for instance between a civilian and a soldier (CNA, 2020, p. 22). Like its competitors, Russia also has plans to deploy AI-enabled uninhabited vehicles. It is researching swarming capabilities and exploring other innovative uses of AI, for instance for electronic warfare. It should also be remembered that Russia has already employed AI technologies for propaganda and surveillance and is said to have directed information operations against the United States and its allies (CRS, 2020, p. 25).

The US-Russia competition is different from the one with China. Russia appears to pose a lesser challenge, nevertheless still a persistent one, mainly due to its AI-enabled cyber and information operations capabilities. If skillfully employed, they can serve as a force multiplier and can give Russia a competitive edge over its rival in an asymmetric or hybrid struggle.

Again, despite its major efforts and managing to make its mark in cyber and information operations, it also remains to be seen whether Russia will actually succeed in achieving its plans. Some experts are somewhat skeptical, considering fluctuations in Russian military spending. Moreover, they point out that Russia lacks firm academic base on which to build its progress in AI. It has not created AI applications of the quality comparable to those of the US and China either (CRS, 2020, p. 25). Success in AI-enabled military applications will require Russia’s military to leverage its small but growing domestic AI industry. Russia’s current (unclassified) investment levels in AI are significantly behind the United States and China, at approximately 700 million rubles (\$12.5 million) (Polyakova, 2018).

4 US Policy Approaches to AI

The opportunities for defense purposes offered by AI-enabled technologies and the posture of the American international competitors, which might potentially lead to the erosion of US military advantage or undermining global stability and nuclear deterrence as such, have made it imperative for the US to eventually embrace AI and provide a strategic framework for its adoption that would leverage America’s unique strengths.

It can be argued that AI will be central to American strength. AI-enabled technologies, which are at the center of power competition, are conducive to contesting the US primacy. According to one report published by the US-China Economic and Security Review Commission, advanced weapons systems enabled by AI are a “game-changer” and a “game-leveler” (Nurkin et al., 2018, p. 15). AI-enabled capabilities, more and more frequently employed on the battlefield, will eventually change the nature of conflict, allowing for tipping the scales in America’s competitors’ favor (Kallenborn, 2019).

The significance of US leadership in AI for the defense of the United States and the maintenance of the international order, and a concern that the US might be outpaced by its competitors have been asserted by US Senator Ted Cruz at a Senate hearing,

who stated that allowing countries such as China and Russia to gain control in AI development might in the long run pose a real threat to US national security (US Senate, 2016, p. 2).

In general, it has found that (1) global leadership in AI technology is a national security priority, as it is vital to the future of American economy, society, and security, and (2) the adoption of AI for defense and security is a strategic necessity, as the U.S armed forces must have access to the most advanced AI technologies to protect the American people, allies and interests (NSCAI, 2019, p. 15).

The above has been reflected in the US strategy documents. The 2017 National Security Strategy of the United States of America listed AI among the technologies critical to economic growth and security, allowing the US to maintain its competitive edge (WH, 2017, p. 20). This idea has been slightly elaborated on in the follow-on document: The National Defense Strategy of the United States of America issued by the Department of Defense in 2018 (DoD, 2018). Without offering much guidance, the Strategy recognizes the significance of the technology in the current increasingly complex and volatile global security environment and its impact on national security. Rapid technological progress, partly driven by AI development will ultimately change the character of war (DoD, p. 2–3).

According to the strategy, the attainment of the US strategic defense objectives and the maintenance of US global influence will, among other things, require adopting a strategic approach, part of which will include rebuilding its force posture. The US forces should possess decisive advantages for any likely conflict, while remaining proficient across the entire spectrum of conflict. To that end, the strategy makes it imperative to modernize American forces' key capabilities. This will entail specific investments in critical areas, one of the eight modernization programs listed in the strategy being advanced autonomous systems. The DoD is planning to substantially invest in the military application of autonomy, artificial intelligence, and machine learning in order to gain competitive military advantages (DoD, 2018, p. 7).

The first key government document devoted specifically to AI, acknowledging its prominence for national security, was the Executive Order on Maintaining American Leadership in Artificial Intelligence issued by US President Trump on February 11, 2019. The document, being a declaration of US intent to expand and formalize its efforts to support AI development, sets forth the policy priorities, principles, objectives for the US to promote and protect its AI R&D for economic and societal development as well as national security objectives. It establishes six strategic goals for executive departments and agencies (WH, 2019, Sec. 2):

1. promotion of investment in AI R&D with industry, academia as well as international partners and allies;
2. improvement of access to high-quality and fully traceable federal data;
3. gradual removal of the barriers to wider AI application;
4. provision of technical standards to minimize vulnerability to cyberattacks;
5. training of future US AI researchers and users;
6. development of an action plan to protect the American advantage in AI.

5 Adoption of AI at DoD's Level

The following day, the Department of Defense published the summary of its 2018 classified artificial intelligence strategy: *Harnessing AI to Advance Our Security and Prosperity*. The strategy is a follow-on to the National Defense Strategy and complements DoD's efforts to modernize information technology to support the warfighter, defend against cyberattacks and leverage emerging technologies. As AI is actually ubiquitous, the strategy sees it necessary to employ its full potential to achieve national security goals. Hence, the aim of the document is twofold: to address the different challenges posed by AI as well as seize the opportunities offered by AI to advance security, preserve peace and stability in the long run.

The strategy provides a clear explanation of how the adoption of AI will benefit the DoD and the United States (DoD, 2019, p. 6). First, it will support and protect US service members and civilians around the world, for instance by employing AI employment for decisions-making processes, thereby reducing risk to ongoing operations and helping to lower the risk of civilian casualties and other collateral damage. It is also assumed that AI will help better maintain equipment, effect operational costs reduction or enhance readiness. Second, it will protect the United States and safeguard American citizens by providing increased protection and defense of American territory and/or US critical infrastructure from attack and disruption. Third, it will create an efficient and streamlined organization by making workflows simpler and more efficient, and certain tasks completed with greater speed and accuracy. Fourth, it will allow the US to become a pioneer in scaling AI across a global enterprise, as the DoD wants to be at the forefront of AI implementation for a variety of capabilities for other departments and agencies of the US government, but also coalition partners and allies. It hopes to establish the right approaches, standards and procedures as well as operational models.

The DoD's strategic approach for AI rests on the following five pillars (DoD, 2019, p. 7–8):

1. Delivering AI-enabled capabilities that address key missions;
2. Scaling AI's impact across DoD through a common foundation that enables decentralized development and experimentation;
3. Cultivating a leading AI workforce;
4. Engaging with commercial, academic, and international allies and partners;
5. Leading in military ethics and AI safety.

The DoD envisions the application of AI-enabled capabilities to enhance the decision-making process and key mission areas. It is expected that it will help to improve situational awareness and decision-making processes, increase the safety of operating equipment, make predicting maintenance needs of some pieces of equipment and supply demands more accurate and efficient, or, in general, streamline certain processes allowing one to reduce time spent on time-consuming, repetitive and somewhat unsophisticated tasks. AI systems that will be implemented should enhance military personnel capabilities by unburdening them of menial cognitive or physical tasks and making their work more effective (DoD, 2019, p. 11).

The DoD wants to encourage a bottom-up approach to accelerate the delivery and adoption of AI. This will mean fostering the development of AI solutions out in a decentralized manner, through experiments at the forward edge. For this to happen, the DoD plans to roll out a common infrastructure, consisting of platforms, procedures, standards, tools, services, etc., which will all make it possible to adapt and apply the solutions that have been worked out, speed up the experimentation and delivery of AI applications and help to promote successful AI prototypes (DoD, 2019, p. 7).

The absolutely crucial aspect to the implementation of the strategy is personnel. Since at present the DoD experiences a general shortage of qualified AI specialists, the DoD sees it imperative to develop the existing as well as acquire the new workforce with critical AI skills. The existing staff should be offered comprehensive skills development and career progression opportunities through dedicated programs allowing them to stay abreast of the developments in the field and acquire the necessary skills as well as knowledge. Equally significant will be to acquire world-class specialists as well as knowledge from outside to complement the existing personnel and to make sure that the AI development team is able to address the most pressing challenges (DoD, 2019, p. 14).

The authors of the strategy are cognizant of the fact that AI development on a global scale will not materialize solely within the confines of the US government, and as AI advances de facto have their origins outside the military, it is imperative to bridge the gap between the civilian and defense sectors with regard to AI. That is why, the document stresses the indispensability of forging strong partnerships across the whole process with academic institutions and commercial entities, which are at the forefront of modern AI advancement, as well as international partners and allies to create a community jointly facing the challenges. This approach should make sure the academia engages in research responding to national security goals and educate the next generation of AI workforce, leaders in the civilian AI industry understand and can contribute to tackling security challenges, and new individuals and novel ideas can be attracted to the DoD-driven AI ecosystem (DoD, 2019, p. 12–13).

Lastly, the strategy emphasizes the significance of AI development and employment in an ethical, humanitarian and safe manner. Hence, the US aspires to not only provide and follow guidelines in that regard, compliant with domestic law and upholding international standards, and work on reducing the risk of collateral damage, but also encourage that they are applied by other countries. The specific actions to be taken include developing AI principles for defense, investing in research and development for resilient, robust, reliable, and secure AI, promoting transparency in AI research, advocating for a global set of military AI guidelines, and using AI to reduce the risk of civilian casualties and other collateral damage (DoD, 2019, p. 15–16).

In order to expedite and streamline the development of AI-enabled capabilities across the DoD and beyond, the strategy has also made provision for the establishment of the Joint Artificial Intelligence Center (JAIC), which was brought into being in 2018. As might be expected the JAIC's specific tasks correspond to the strategy's pillars and include the delivery of AI-enabled solutions to address key missions,

the establishment of a common foundation for scaling AI's impact across the DoD, the furtherance of AI planning, policy, governance, ethics, safety, cybersecurity, and multilateral coordination, and the gathering of the necessary talent (DoD, 2019, p. 9). The JAIC will be involved throughout the development of AI applications, becoming more focused on near-term execution and adoption. The center's work will complement the efforts of the Defense Advanced Research Projects Agency (DARPA), DoD laboratories, and other institutions involved in AI R&D.

The JAIC will provide AI capabilities within two distinct categories: National Mission Initiatives (NMIs) and Component Mission Initiatives (CMIs). The former are broad, joint projects run with a cross-functional team approach. The latter are component-specific projects solving a particular problem. They are run by other research organizations with the JAIC's support. The first NMIs initiated by the JAIC in early 2019 include Predictive Maintenance and Humanitarian Assistance and Disaster Relief (Joint Artificial Intelligence Center, n.d.). It should be mentioned at this point that DoD components can engage in AI R&D at their own discretion; nonetheless, they are obliged to coordinate with the JAIC any planned AI initiatives of \$15 million or more annually (CRS, 2020, p. 9).

The actions to embrace AI for defense purposes have not been limited to the above only. Other efforts included (CRS, 2020, p. 5):

1. the publication of a strategic roadmap for AI development and delivery as well as the publication by the Defense Innovation Board of "AI Principles: Recommendations on the Ethical Use of Artificial Intelligence by the Department of Defense";
2. the establishment of the National Security Commission on Artificial Intelligence to conduct a comprehensive assessment of methods and means required to advance AI development for national security and defense purposes;

In addition, members of the US Congress have filed a number of bills addressing AI. They also organized the Congressional Artificial Intelligence Caucus to brief policymakers of the impacts of AI development and ensure that the US fully benefits from AI innovation (NSCAI, 2019, 21).

The US has been steadily increasing its AI funding. The DoD's unclassified expenditure grew more than fourfold, from \$600 million in FY2016 to \$2.5 billion in FY2021. The DoD has reported over 600 active AI projects (CRS, 2020, p. 2). Regarding the DoD's FY 2021 research and development budget, it is said to be the largest ever requested. Selected efforts include (Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, 2020, p. 1–9):

1. Autonomy—Enhances speed of maneuver and lethality in contested environments; develops human/machine teaming (FY 2021, \$1.7 billion);
2. Artificial Intelligence (AI)—Continues the AI pathfinders, Joint Artificial Intelligence Center (JAIC) and Project Maven (FY 2021, \$0.8 billion).

True, the DoD's investment in AI has increased, but it has also been argued that additional outlays will be indispensable to keep step with America's competitors and avoid "innovation deficit" in military technology (NSCAI, 2019, p. 25).

Although the strategy documents, initiatives and measures have been adopted and implemented relatively recently, AI-related projects are already underway, and AI is being incorporated into a number of applications. The most notable example for intelligence, surveillance and reconnaissance purposes was Project Maven, used to identify hostile activity for targeting in Iraq and Syria. It used computer vision and machine learning algorithms to autonomously spot objects of interest in the footage obtained by UAVs (Vanian, 2018). In military logistics, AI has been employed for predictive maintenance, which makes it possible to tailor maintenance needs of a piece of hardware based on data analytics in lieu of standardized routine maintenance schedules. This solution has already been employed by the US Air Force in the F-35's Autonomic Logistics Information System and by the US Army in the Logistics Support Activity for its fleet of the Stryker combat vehicle (CRS, 2020, p. 10).

The US military is also exploring and testing AI's potential for cyberspace operations, information operations, command and control and its incorporation into the DoD's Joint All Domain Command and Control (JADC2) to create a common operating picture, as well as semiautonomous and autonomous vehicles under such programs as the Loyal Wingman (US Air Force), the Multi-Utility Tactical Transport (the Marine Corps), the Robotic Combat Vehicle (US Army), the Anti-Submarine Warfare Continuous Trail Unmanned Vessel (DARPA). The DoD is also researching other AI-facilitated capabilities to enable cooperative behavior, or swarming (cf. CRS, 2020, p. 9–15).

6 Conclusions

The research has endorsed the fact that AI provides numerous opportunities and challenges in a national security context. Its transformative potential has wide-ranging implications for the attainment of strategic security goals and global competition as such. There is a direct link between national security and technological development. Losing that technological edge may be detrimental to national interest. This reality has been recognized by many countries, including America's rivals, who have been investing heavily in AI research and development in for military use with a view to improving the combat readiness and decision-making of their forces, and delivering novel capabilities, further enhancing their dominance. At the same time, they are aggressively proclaiming their intention of becoming the global leader in AI. America faces true global competitors for military superiority.

With the situation being as it is, US policymakers have to prepare for the impacts of AI-related technologies. The question thus is: how does the US embrace AI for defense purposes so that it maintains its strategic position and is still capable of advancing security, peace and stability? It has been shown in the chapter that the US follows the same path as its competitors. It experiences the same challenges and problems. Even if somewhat belatedly, the US government has provided enhanced policy and guidance, stepping up investments in AI and autonomy to ensure that the US maintains the competitive military advantage over adversaries, and, more

importantly, attempting to build a robust AI ecosystem. The success in AI adoption will then be largely determined by the integration of the individual components of that ecosystem, as, for instance, AI capabilities will be developed mostly by third parties and contractors. All of them have to click into place. It should not be forgotten that, all in all, the US has a few sure advantages in terms of AI technology, industry, and talents which can afford it an opportunity to maintain its lead and win the competition with its rivals for US security, stability, and prosperity (cf. Allison & Schmidt, 2020, p. 22–24; Castro et al., 2019, p. 2).

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