ARTIFICIAL INTELLIGENCE APPLICATION IN THE MILITARY

THE CASE OF UNITED STATES AND CHINA

GLORIA SHKURTI ÖZDEMIR

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ABSTRACT

> This analysis provides a short introduction on what AI is, how it has evolved until today and how it will change the nature of warfare. It then assesses why states invest in AI to later turn to the case of the U.S. and China.

Considered as the 4th Industrial Revolution, Artificial Intelligence (AI) has become a reality in today's world, especially in the military. Experts and academicians have emphasized the importance of AI for a long time. Furthermore, world leaders, including Obama, Trump, Xi, and Putin, have all made important statements that bring to the fore the significance of AI which can be summarized with what Putin stated on September 2017: whoever becomes the leader in AI, will rule the world.

This analysis provides a short introduction on what AI is, how it has evolved until today and how it will change the nature of warfare. It then assesses why states invest in AI to later turn to the case of the U.S. and China. For both states, the main official documents and statements are analyzed, the bureaucratic structures that work on AI are presented and finally examples of how the U.S. and China are applying AI in the military are provided. The conclusion briefly comments on how the strategies of China and the U.S. differ followed by some recommendation on what states like Turkey should do in the near future.

INTRODUCTION

Artificial Intelligence (AI) has advanced very quickly in recent years and this has resulted in a wide range of applications, both civil and military. It is a fact that the military is driven by the need for change as it is persistently on the pursuit of better, faster and stronger weapons or technologies, and this is exactly what AI provides. As is correctly stated by Svenmarck *et al.,* in the field of military, AI has the potential to impact "all domains (i.e. land, sea, air, space and information) and all levels of warfare (i.e. political, strategic, operational and tactical)."[1] Currently, the use of AI in the military is seen mainly in terms of:

- Autonomous Weapons and Weapons Targeting
- Surveillance
- Cybersecurity
- Homeland Security
- Logistics
- Autonomous Vehicles[2]

For this reason, many state leaders, technology experts, and academicians have considered AI to be revolutionary; yet they differ in terms of their perspectives on AI. Specifically, some consider AI as a positive development as it would help in reducing human causalities -considering that the human force would be replaced by the machines which can be deployed in every kind of mission, including the high risk ones- and at the same time it would provide strategic and tactical advantages. However, others caution on the fact that if not controlled and used properly, AI may result in another world war.

Even though AI is still at its juvenile stage, it is undeniable that it has the capacity to alter the landscape of the security sector and as a result, it will change the current economic and military balances in the international system. Recognizing the potentials of AI, more than 20 countries have announced their national AI strategies, and more states and non-state organization are taking decisive steps in AI research and development (R&D). Yet, the U.S. and China are considered to be the leading states in the field; the U.S. aiming to remain the hegemon in the battlefield, while China is aiming to leapfrog the U.S. and become the leader in AI by 2030. Needless to say, both these states have generated independent national strategies that comply with these aims, but most importantly, the U.S. national strategy takes as its main reference point the Chinese national strategy, and vice versa.

This analysis provides a short introduction on what AI is, how it has evolved until today, and how it will change the nature of warfare. It then assesses why states invest in AI to later turn to the case of the U.S. and China. For both states, the main official documents and statements are analyzed, the bureaucratic structures that work on AI are presented and examples are provided of how the U.S. and China are applying AI in the military.

1 Peter Svenmarck et al., "Possibilities and Challenges for Artificial Intelligence in Military Applications," (n.d.), 1, https://www.sto.nato.int/publications/.../STO-MP-IST-160/MP-IST-160-S1-5.pdf.

2 Marcus Roth, "Artificial Intelligence in the Military – An Overview of Capabilities," Emerj, February 22, 2019, https://emerj.com/ai-sector-overviews/artificial-intelligence-in-the-military-an-overview-of-capabilities/.

In the conclusion section, there is a brief comment on how the strategies of China and the U.S. differ, followed by some recommendations on what states like Turkey should do in the near future.

UNDERSTANDING ARTIFICIAL INTELLIGENCE

Considered as the 4th Industrial Revolution,[3] AI has become a reality in today's world and many experts argue that AI itself should not be considered as a specific weapon but it should be seen as "an enabler, a general-purpose technology with a multitude of applications."[4] So while "AI could potentially enable a number of military innovations, it is not a military innovation itself."[5] Kevin Kelly, a technology expert, compared AI with electricity stating that "just as electricity brings objects all around us to life with power, so too will AI bring them to life with intelligence."[6] However, technology experts are not the only ones that emphasize the importance of AI. World leaders, including Obama, Trump, Xi and Putin, have all made important statements that bring to the fore the significance of AI which can be summarized with what Putin stated on September 2017: whoever becomes the leader in AI, will rule the world.[7]

AI has been developing since 1956, but interest in this field started to increase circa 2010 due to three enabling developments: (i) the availability of "big data" sources, (ii) improvements to machine learning approaches, and (iii) increases in computer processing power.[8] Currently, we can speak about two types of AI: Narrow AI (NAI) and General AI (GAI). While NAI refers to functions like playing games or image recognition, GAI is used to denote systems capable of human-level intelligence which are adequate to conduct a series of different tasks. Currently, all the known AI developments fall within NAI while in terms of GAI, experts are generally skeptical and it is believed that decades are needed until it reaches its full capability.[9] Yet in order to understand better, this classification is not important. An important issue related to AI, regardless of whether it is narrow or general, is that of the autonomy. The next subsection provides a brief outline in terms of the spectrum of autonomy which results from the use of AI.

Types of Autonomy: Human-Machine Relationship

When it comes to the application of AI, especially in the military, the human-machine relationship is one of the main topics discussed. Currently, there are three types of relationships that we can debate about: (i) human in the loop, (ii) human on the loop, and (iii) human out of the loop.

When the human is in the loop it means that the machine is in the control of the environment; however, it is the human that takes the final decision. This is called as a semi-autonomous system. In the second case, that of human on the loop, the machine can act and decide on its own. Neverthe-

3 Paul Scharre, *Army of None: Autonomous Weapons and the Future of War*, Kindle Edition (New York, London: W. W. Norton & Company, 2018), 16; Klaus Schwab, *The Fourth Industrial Revolution* (Davos: World Economic Forum, 2016), 12.

4 Michael C. Horowitz, "Artificial Intelligence, International Competition, and the Balance of Power," *Texas National Security Review* 1, no. 3 (May 2018): 39.

5 Horowitz, 43.

6 Scharre, *Army of None: Autonomous Weapons and the Future of War*, 16.

7 "Whoever Leads in AI Will Rule the World': Putin to Russian Children on Knowledge Day," RT International, accessed April 21, 2019, https://www.rt.com/news/401731-ai-rule-world-putin/.

8 Kelley M. Sayler, "Artificial Intelligence and National Security" (Congressional Research Service, January 30, 2019), 2.

9 One of the latest surveys published in 2018, based on the expert's opinion argued that there was "a 50% chance of AI outperforming humans in all tasks in 45 years." Some others doubted GAI is possible and many who did support its chances put the date hundreds of years in the future. See, Katja Grace et al., 'Viewpoint:
When Will AI Exceed Human Performance? Evidence from AI Experts', *Journal of Artificial Intelligence Research*, 62 (2018), 729-754.

less, the human has the possibility to observe the behavior of the machine and intervene if necessary. In this case, we have a supervised autonomous system. The last case is that of a fully autonomous system. Here, while the machine acts and decides by itself, the human does not have any control on the machine, and as a result remains out of the loop. Currently, in the military application we can speak about the application of the first or second case, i.e. drones and precision-guided missiles, while the AI application has not yet reached the third level of full autonomy.

AI Military Application

The rapid development of artificial intelligence has been followed with positive impacts in different fields, including medicine or transportation; however, when it comes to the military application a lot of discussions are raised. It is widely accepted now, that in the future, AI has the capacity to transform military activities such as logistics, intelligence, surveillance and especially weapons design.[10] For the time being, the uncertainties that encircle AI and its use have raised a lot of debates among military strategists. These debates are generally related to the impact of AI on the way in which warfare is conducted and how much autonomy should be given to the weapons that are going to use AI. In particular, the main discussions are with regard to the lethal autonomous weapons systems (LAWS) or "killer robots" as they are dubbed. These systems fall within the third case mentioned earlier, where the human is out of the loop.

Currently, it is argued that in terms of military application, AI can be used (but not limited to) as follows: (i) Based on the image-recognition algorithms, AI can be used to assist in processing and interpreting information. An example for this is the American Project Maven[11] that is being programed to process and interpret the information received from the videos captured by drones. (ii) By using AI, drones, planes, ships, tanks, etc. will not need a human to control or direct their actions. An example of this is the Israeli Harpy drone that has passed to a close to full autonomy (it still needs to be launched by ground troops). Applying a lesser level of autonomy, other aircrafts such as Air Force Global Hawk and Army Gray Eagle drones can be mentioned. For both these drones, it is necessary that the operator directs the aircraft where to go and then the aircraft flies itself. As a result, it is expected that autonomous systems will replace humans in tasks that are considered as "dull, dangerous, or dirty."[12] Such tasks may include long-duration intelligence collection and analysis, clean up environments contaminated by chemical weapons, or sweep routes for improvised explosive devices. (iii) Lastly, as algorithms develop further, AI may be used for command and control, including battle management, by analyzing large sets of data and making forecasts to direct human action.

AI's Impact on the Character of the Warfare

As mentioned earlier, much discussion is concentrated on AI's application in the military. On the one hand stand those scholars that approach the application of AI skeptically, as they bring to the fore the fact that humans can lose control over the machines which would wreak havoc.[13] Furthermore, there is also the possibility that not only

10 Kenneth Payne, "Artificial Intelligence: A Revolution in Strategic Affairs?," *Survival: Global Politics and Strategy* 60, no. 5 (2018): 9.

11 Zachary Fryer-Biggs, "In Project Maven's Wake, the Pentagon Seeks AI Tech Talent," Wired, December 21, 2018, https://www.wired.com/story/inside-the-pentagons-plan-to-win-over-silicon-valleys-ai-experts/.

12 Mick Ryan, "Integrating Humans and Machines," The Strategy Bridge, January 2, 2018, https://thestrategybridge.org/the-bridge/2018/1/2/integrating-humans-and-machines.

13 Paul Scharre, "Autonomous Weapons and Operational Risk" (Center for a New American Security, 2016), 35, https://s3.amazonaws.com/files.cnas.org/documents/CNAS_Autonomous-weapons-operational-risk.pdf?mtime=20160906080515.

states, but also the non-state actors,[14] including here the terrorist organizations, will be able to use the AI systems further deepening the asymmetry of warfare. On the other hand, AI machines are seen as a positive development as they would replace the human soldiers in dangerous combat and as a result the human loses will be less.[15] Moreover, these machines may prove more beneficial in long-duration operations where humans cannot endure.[16]

However, despite the pros-and-cons debate on AI warfare applications, experts have made predictions regarding the impact scale of AI on the future of the character of warfare. In this respect, there are three possible positions: (i) minimal impact, (ii) evolutionary impact, and (iii) revolutionary impact.[17]

Those experts who argue on the minimal impact are mainly concerned with the technical aspect of AI and the military organizations' willingness to use this technology. Accordingly, they contend that the problems that could result from the use of AI will make it incompatible for military applications.[18] Regarding military organizations, some bureaucracies are not open to radical changes such as AI and as a result they would resist the application of AI in the military.[19] The experts that fall within the second group, those who believe in the evolutionary impact of AI, accept the fact that AI will play a crucial role in warfare -even though GAI is unlikely to develop in the near future- yet they call for the importance of the human presence as this would keep the AI from taking control over the warfare.[20] The last group of experts is the one that supports the idea that AI will have a revolutionary impact on warfare. Proponents of this position contend that AI's application in the military has the capability to change the nature and principles of warfare. Accordingly, they speak about a "transition from the industrial era of warfare into the information era, in which gathering, exploiting, and disseminating information will be the most consequential aspect of combat operations."[21] At this point, AI's capability to process a large amount of data in a very short time will be a crucial wartime advantage, allowing quicker and better decisions.[22]

> AI's capability to process a large amount of data in a very short time will be a crucial wartime advantage, allowing quicker and better decisions.

Despite these discussions, no one doubts the fact that the character of warfare will be changed. First of all, warfare will be pushed to the limits in terms of time scale. AI's capacity to react on machine speed will accelerate the

14 Thomas X. Hammes, "Technology Converges; Non-State Actors Benefit," *Governance In An Emerging New World*, no. 319 (February 25, 2019), https://www.hoover.org/research/technology-converges-non-state-actors-benefit.

15 Robert O. Work and Shawn Brimley, "20YY Preparing for War in the Robotic Age" (Washington, DC: Center for a New American Security, 2014), 7, https://fortunascorner.com/wp-content/uploads/2014/05/cnas_20yy_workbrimley.pdf.

16 Office of Technical Intelligence, "Technical Assessment: Autonomy" (Washington, DC: Department of Defense, 2015), 6, https://apps.dtic.mil/dtic/tr/fulltext/u2/a616999.pdf.

17 Sayler, "Artificial Intelligence and National Security," 33–36.

18 Paul Scharre and SSQ, "Highlighting Artificial Intelligence: An Interview with Paul Scharre Director, Technology and National Security Program Center for a New American Security Conducted 26 September 2017," *Strategic Studies Quarterly* 11, no. 4 (2017): 17.

19 Gautam Mukunda, "We Cannot Go On: Disruptive Innovation and the First World War Royal Navy," *Security Studies* 19, no. 1 (2010): 136; Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Cornell: Cornell University Press, 1986).

20 Work and Brimley, "20YY Preparing for War in the Robotic Age," 25; Kareem Ayoub and Kenneth Payne, "Strategy in the Age of Artificial Intelligence," *The Journal of Strategic Studies* 39, no. 5 (2015): 816.

21 Sayler, "Artificial Intelligence and National Security," 35.

22 John R. Allen and Amir Husain, "On Hyperwar," *Proceedings* 143/7/1,373 (2017): 30; "Getting to Grips with Military Robotics - War at Hyperspeed," The Economist, January 25, 2018, https://www.economist.com/special-report/2018/01/25/getting-to-grips-with-military-robotics; Williamson Murray and MacGregor Knox, "The Future Behind Us," in *The Dynamics of Military Revolution, 1300-2050* (Cambridge: Cambridge University Press, 2001), 178.

pace of combat.[23] Whether this development will be beneficial or not is highly contested among analysts.[24] Second, the current military structure and organizations are going to change as new concepts of operations evolve (ex: swarm drones). Third, AI may provide the opportunity to cope with a huge amount of data available for analysis. By addressing this data, AI systems will be able to provide results or solutions that humans may not be able to think about,[25] especially when found in combat. This would then serve as an advantage over the enemy. Lastly, a new debate on the quality-quantity issue is going to emerge considering the feasibility of achieving a specific AI system once the software is created.

All these discussions have not stopped the states from pursuing the application of AI in different aspects of life, including the military. In what has started to seem more like a race, many states have already made public their AI national strategies. In this connection, the next section of this analysis, will deal with the main reason why states are willing to invest in AI.

WHY STATES INVEST IN ARTIFICIAL INTELLIGENCE

Currently, as can be seen in Table 1, approximately 20 states/organizations have announced or are about to announce their AI strategies. Furthermore, according to the European Commission, in 2016 there were investments in AI of approximately €10 billion in Asia and €18 billion in the U.S..[26] This amount may be even larger considering that not all states declare their funding in AI. Yet, according to Scharre, in military robotics alone, the global spending in 2018 is expected to be $7.5 billion per year.[27]

AI is now considered as the leverage that would give advantages to those states which use it, not only in the civil aspects of life but also (and most importantly) in the military. The advent of AI and its application would create great opportunities for the states that use it first, i.e. the U.S. and China, it will particularly help these states to gain economic and military advantages over their competitors.[28] Furthermore, it is expected that it will redefine the current balances of power. However, the repercussions would be detrimental for the states that fail to adopt this technology in their military. Currently, Turkey is among the states that have not taken considerable steps in the area of AI R&D. Yet, considering the current regional dynamics and the fact that states like UAE and Israel have started to focus on AI, it is important that Turkey creates its own AI national strategy and allocates considerable funding to this area.

The main reason behind the power of AI to shift the current balances of power relies on the fact that the application of AI in the military will give the states the upper hand in the battlefield, as the machines will be more accurate and faster than humans in logistics, battlefield and decision making. Furthermore, with the help of AI, the military can perform high risk missions for

23 Greg Allen and Taniel Chan, "Artificial Intelligence and National Security" (Belfer Center for Science and International Affairs, 2017), 24.

24 Scharre, "Autonomous Weapons and Operational Risk"; Peter W. Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century* (New York: Penguin Press, 2009), 128.

25 The AI company DeepMind created a game-playing algorithm called AlphaGo. In March 2016 Alpha Go defeated a world- champion Go player, Lee Sedol, 4-1. Sedol stated that AlphaGo made surprising and innovative moves, and other expert Go players stated that AlphaGo overturned accumulated wisdom on game play.

26 Florin Zubaşcu, "Commission Says €9.2 Billion Needed to Boost Supercomputing and AI," Science|Business, June 6, 2018, https://sciencebusiness.net/news/commission-says-eu92-billion-needed-boost-supercomputing-and-ai.

27 Scharre, *Army of None: Autonomous Weapons and the Future of War*.

28 Paul Scharre, "Killer Apps: The Real Dangers of AI Arms Race," *Foreign Affairs* 98, no. 3 (June 2019): 139.

TABLE 1: LIST OF THE STATES WHICH HAVE/ARE ABOUT TO ANNOUNCE THEIR AI NATIONAL STRATEGY

No.	Date	State	National Strategy Title
1	March 2017	Canada	Pan-Canadian AI Strategy
2	March 2017	Japan	Artificial Intelligence Technology Strategy
3	May 2017	Singapore	AI Singapore
4	July 2017	China	A Next Generation Artificial Intelligence Development Plan
5	October 2017	UAE	UAE Strategy for Artificial Intelligence
6	December 2017	Finland	Finland's Age of Artificial Intelligence
7	January 2018	Kenya	Blockchain & Artificial Intelligence Taskforce
8	January 2018	Taiwan	Taiwan AI Action Plan
9	January 2018	Denmark	Strategy for Denmark's Digital Growth
10	March 2018	Italy	Artificial Intelligence at the Service of Citizens
11	March 2018	France	France's Strategy for AI
12	April 2018	Tunisia	National AI Strategy: Unlocking Tunisia's capabilities potential (Workshop – NS to be announced)
13	April 2018	EU Commission	Communication on Artificial Intelligence for Europe
14	April 2018	UK	Industrial Strategy: Artificial Intelligence Sector Deal
15	May 2018	Australia	Australian Technology and Science Growth Plan
16	May 2018	South Korea	Artificial Intelligence R&D Strategy
17	May 2018	Sweden	National Approach for Artificial Intelligence
18	June 2018	India	National Strategy for Artificial intelligence: #AIforAll
19	June 2018	Mexico	Towards an AI Strategy in Mexico: Harnessing the AI Revolution
20	December 2018	Germany	Key points for a Federal Government Strategy on AI
21	February 2019	U.S.	Accelerating America's Leadership in Artificial Intelligence

a long period of time, something that cannot be done by humans.

Moreover, especially for democracies, AI will make the legitimation of war easier by the governments as it reduces the human participation in the battlefield and as a result minimizes the human causalities. For autocratic regimes, i.e. China, application of AI in the military would help the government to concentrate the power to conduct war in only a small trustable group of people, which would be translated into greater control of the war by the elites.

Lastly, one of the main reasons why the states are eager to integrate AI into their militaries is related to the cost. As mentioned even in the U.S. Army's Robotics and Autonomous Systems Strategy, AI is considered to be cost effective.[29] The possibility to create or buy cheap robots drives the states to consider the quantity over the quality and such a policy, at least in the near future will be translated into an advantage. Yet, it needs to be highlighted that AI cannot remain in the hands of just a couple of states, such as the case with nuclear weapons. Soon enough, a considerable number of states or even non-state organizations will be able to integrate AI into their military. At this point the quantity will not generate any advantage anymore so the states or non-state actors will start to focus on the quality rather than quantity.

29 "The U.S. Army Robotic and Autonomous Systems Strategy" (U.S. Army, March 2017), 3, https://www.tradoc.army.mil/Portals/14/Documents/RAS_Strategy.pdf.

THE UNITED STATES AND ARTIFICIAL INTELLIGENCE

The United States considers AI as a part of its Third Offset Strategy[30] which was launched in 2014 by the then Secretary of Defense Chuck Hagel with the aim of reviving America's military technological advantage.[31] Within this regard, the main focus of the Third Offset Strategy is robotics and autonomy where AI plays a crucial role.[32] Following this, both the Obama and Trump Administrations have expressed their intentions for the U.S. to be the global leader in AI. On May 2018, the Trump Administration stated that in order to achieve this goal "to the greatest degree possible, we will allow scientists and technologists to freely develop their next great inventions right here in the United States." [33] Nevertheless, despite these intentions it can be said that the U.S. faces both domestic and external constraints on its way to becoming the world leader in AI.

First of all, the domestic constraints result from the fact that AI, unlike nuclear weapons, is being developed by non-governmental institutions, such as Google or Microsoft, not by the government itself. As will be discussed below, these institutions are not always willing to cooperate with the government, which impedes the application of AI in the military. Moreover, the government itself has been moving very slowly in terms of an AI national strategy. It is necessary to emphasize the fact that the U.S. was among the later states to announce a formal AI national strategy while Canada was the first state to do so in 2017.[34] External constraints can be seen in terms of the challenges that other states, mainly China and Russia, pose to the American leadership in AI. Both of these states aim at challenging the U.S. military superiority by using AI to generate weapons superior to those used by the U.S.[35] Therefore, this section will briefly analyze the main national governmental initiatives by the Obama and Trump Administrations, the organizations responsible for the research and delivery of the AI and the main application of AI in military until now.

The first declaration regarding AI was made in 2016 when the Obama Administration released a road map through which the importance of U.S. leadership in AI was acknowledged. However, this roadmap was mainly focused on regulatory policy questions.[36] Within the same year, the White House Office of Science and Technology Policy organized different workshops[37] and created the Subcommittee on Machine Learning and Artificial Intelligence (MLAI).[38] The main goal was to help in

30 The First Offset Strategy was launched in 1950s and is related to the U.S.' investments to nuclear weapons. The Second Offset Strategy is focused on precision-guided weapons and was developed in 1970s.

31 Hagel Chuck, "Secretary of Defense Speech: Reagan National Defense Forum Keynote," U.S. Department of Defense, November 15, 2014, https://dod.defense.gov/News/Speeches/Speech-View/Article/606635/reagan-national-defense-forum-keynote/.

32 Jesse Ellman, Lisa Samp, and Gabriell Coll, "Assessing the Third Offset Strategy" (Washington, DC: Center for Strategic and International Studies (CSIS), March 2017), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/170302_Ellman_ThirdOffsetStrategySummary_Web.pdf.

33 David Shepardson, "Trump Administration Will Allow AI to 'freely Develop' in U.S.:...," *Reuters*, May 10, 2018, https://www.reuters.com/article/us-usa-artificialintelligence-idUSKBN1IB30F.

34 Jessica Baron, "Will Trump's New Artificial Intelligence Initiative Make The U.S. The World Leader In AI?," Forbes, February 11, 2019, https://www.forbes.com/sites/jessicabaron/2019/02/11/will-trumps-new-artificial-intelligence-initiative-make-the-u-s-the-world-leader-in-ai/.

35 William Carter, Emma Kinnucan, and Josh Elliot, "A National Machine Intelligence Strategy or the United States" (Washington, DC: Center for Strategic and International Studies (CSIS), 2018), 17; Sayler, "Artificial Intelligence and National Security," i.

36 Barack Obama, "The Administration's Report on the Future of Artificial Intelligence," Obama White House, October 12, 2016, https://obamawhitehouse.archives.gov/blog/2016/10/12/administrations-report-future-artificial-intelligence.

37 "Preparing for the Future of Artificial Intelligence," Obama White House, May 3, 2016, https://obamawhitehouse.archives.gov/blog/2016/05/03/preparing-future-artificial-intelligence.

38 Executive Office of the President of the United States, "Charter of the Subcommittee on Machine Learning and Artificial Intelligence, Committee of Technology, National Science and Technology Council" (Obama White House, n.d.), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/NSTC/ai_charter_-_signed_final.pdf.

the coordination of the national AI activity and as a result of these developments three main reports emerged under the Obama Administration: (i) Preparing for the Future of Artificial Intelligence,[39] (ii) The National Artificial Intelligence Research and Development Strategic Plan,[40] and (iii) Artificial Intelligence, Automation, and the Economy.[41] The first report recommended possible strategies related to AI regulations, public research and development (R&D), ethics, and security. The National Artificial Intelligence Research and Development Strategic Plan was focused mainly on the R&D strategy, while the last report pondered over the necessary policies that would intensify the benefits of AI and alleviate its costs.

Another important step was taken by the Department of the Homeland Security in 2017 with the publication of a narrative analysis on AI.[42] This report focused on how to better understand the perception of benefits and threats from the adoption of AI. Within the same year AI was mentioned for the first time in the National Security Strategy (2017). The main focus here was on the role of AI in information statecraft, weaponization, and surveillance.[43] Later on in 2018, the National Defense Strategy stated that AI is among the "very technologies that ensure we [the U.S.] will be able to fight and win the wars of the future…. New commercial technology will change society and, ultimately, the character of war."[44] In a similar way, in its AI strategy report, the Department of Defense calls for the immediate need for the adoption of a national AI strategy because "[other] nations, particularly China and Russia, are making significant investments in AI for military purposes, including in applications that raise questions regarding international norms and human rights. These investments threaten to erode our technological and operational advantages and destabilize the free and open international order."[45]

> Both the Obama and Trump Administrations have expressed their intentions for the U.S. to be the global leader in AI.

In May 2018, the Deputy Assistant to the President for Technology Policy, Michael Kratsios, during the 2018 White House Summit on Artificial Intelligence for American Industry recapped the Trump Administration's AI goals as such: (i) prioritizing funding for AI R&D; (ii) removing barriers to innovation; (iii) training the future American workforce; (iv) achieving strategic military advantage to lead in AI; (v) leveraging AI for government services; and (vi) leading international AI negotiations.[46] In order to achieve all these goals, Kratsios during the summit announced the creation of a new Select Committee on Artificial Intelligence to "improve the coordination

39 "Preparing for the Future of Artificial Intelligence" (Washington, DC: Executive Office of the President of the United States, 2016).

40 National Science and Technology Council, "The National Artificial Intelligence Research and Development Strategic Plan" (Executive Office of the President of the United States, 2016).

41 "Artificial Intelligence, Automation, and the Economy" (Washington, DC: Executive Office of the President of the United States, 2016).

42 "Narrative Analysis: Artificial Intelligence" (Washington, DC: Department of Homeland Security, 2017).

43 Donald J. Trump, "National Security Strategy of the United States 2017" (The White House, 2017).

44 "Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge" (Washington, DC: Department of Defense, 2018), 3.

45 "Summary of the 2018 Department of Defense Artificial Intellgence Strategy: Harnessing AI to Advance Our Security and Prosperity" (Washington, DC: Department of Defense, 2018), 5.

46 "2018 White House Summit on Artificial Intelligence for American Industry" (The White House Office of Science and Technology Policy, October 5, 2018).

of Federal efforts related to AI and ensure continued U.S. leadership in AI."[47]

Just a few months later, in July 2018, the Executive Office of the President released a memo on FY2020 Administration Research and Development Budget Priorities. The memo considered AI as one of the highest R&D priorities for FY2020 and emphasized the importance of AI leadership (alongside the quantum information sciences and strategic computing).[48] Within a similar framework, this memo was followed by an Executive Order signed in February 2019, in which it was stated that the U.S. is the world leader in AI research and maintaining this leadership is of paramount importance for the U.S.[49] Lastly it is necessary to highlight the fact that the first time that AI was considered as a governmental priority was in the FY2019 budget request of the Trump Administration where it was stated that the "budget's key areas of focus include artificial intelligence, autonomous systems, and hypersonics."[50]

Despite the considerable number of official statements and documents released by both the Obama and Trump Administrations, they lack a clear funding and bureaucratic structure. This aspect of the American stance is highly criticized by experts who warn of the Chinese rivalry and the challenges it is posing to the American leadership.[51]

Bureaucratic Structure

While it is not easy to talk about the funding structure of AI due to the lack of information, we can to some extent list some governmental institutions responsible for the AI R&D in the U.S. The main responsible institution is the Department of Defense. In June 2018, the Pentagon formed the Joint Artificial Intelligence Center (JAIC). According to the director of JAIC, Lt. Gen. Jack Shanahan, JAIC is crucial in transitioning from research and development to operational-fielded capabilities.[52] In the last FY2020 proposal prepared by the Trump Administration, the JAIC is allocated $208 million.[53] Another agency responsible for AI projects within the Department of Defense is the Defense Advanced Research Projects Agency (DARPA) which has taken the lead in terms of AI R&D. DARPA requested a $3.17bn budget in 2018, and $3.44bn in 2019.[54] Furthermore, in 2018 DARPA declared a multi-year investment of more than $2bn in new and existing programs known as the "AI Next" campaign.[55]

Lastly, the Trump White House has established the Select Committee on Artificial Intelligence under the National Science and Technology Council on May 10, 2018.[56] This committee serves as the main advisor to the White House regarding the AI R&D priorities and at the same

47 "2018 White House Summit on Artificial Intelligence for American Industry," 7.

48 Executive Office of the President of the United States, "Memorandum for the Heads of Executive Departments and Agencies: FY 2020 Administration Research and Development Budget Priorities" (Washington, DC: The White House, July 31, 2019), https://www.whitehouse.gov/wp-content/uploads/2018/07/M-18-22.pdf.

49 Executive Office of the President of the United States, "Executive Order on Maintaining American Leadership in Artificial Intelligence," The White House, accessed May 5, 2019, https://www.whitehouse.gov/presidential-actions/executive-order-maintaining-american-leadership-artificial-intelligence/.

50 "An American Budget: Fiscal Year 2019" (Washington, DC: Office of Management and Budget, 2019), 36.

51 Thomas H. Davenport, "China Is Catching up to the US on Artificial Intelligence Research," The Conversation, February 27, 2019, http://theconversation.com/china-is-catching-up-to-the-us-on-artificial-intelligence-research-112119.

52 Billy Mitchell, "Pentagon Unveils Strategy for Military Adoption of Artificial Intelligence," FedScoop, February 12, 2019, https://www.fedscoop.com/artificial-intelligence-pentagon-military-unclassified/.

53 "Budget of the United States Government, Fiscal Year 2020" (Washington, DC: The White House, November 3, 2019), 24, https://www.govinfo.gov/content/pkg/BUDGET-2020-BUD/pdf/BUDGET-2020-BUD.pdf.

54 Sebastian Moss, "Understanding the United States' National AI Strategy," February 12, 2019, https://www.datacenterdynamics.com/analysis/understanding-united-states-national-ai-strategy/.

55 "DARPA Announces $2 Billion Campaign to Develop Next Wave of AI Technologies," DARPA, July 9, 2019, https://www.darpa.mil/news-events/2018-09-07.

56 "2018 White House Summit on Artificial Intelligence for American Industry," 7.

time is responsible for the collaboration of the government with industry and academia regarding AI research and development.

AI Military Applications in the U.S.

AI is a field of technology which has consequential implications for the national security. As such, the U.S. and other nations are developing AI applications for military functions. Many different experiments have been conducted in this field and it can be said that until now no other state, including here China or Russia, have reached the level where the U.S. is currently. To demonstrate this, this subsection will detail some of the main test/experiments undertaken by the U.S., especially within the scope of the Department of Defense.

In 2013, the X-47B prototype drone of the U.S. Navy landed autonomously.[57] The same drone in 2015 conducted autonomous aerial refueling.[58] In both of the cases, the only human input was the order to land or refuel while in flight respectively and the action was carried out by the software.

As mentioned previously the military organization is going to change as AI is applied in the military and new concepts of operation evolve. An example for this was the swarm drones. In 2016, the U.S. demonstrated 103 drones flying together autonomously.[59] Pentagon described this as "a collective organism, sharing one distributed brain for decision-making and adapting to each other like swarms in nature."[60] A similar experiment was done in November 2016 by the Navy. A swarm of five uninhabited boats patrolled a specific section in Chesapeake Bay and stopped an "intruder" vessel. Other experiments with swarms of underwater drones are expected to be conducted in the near future.

One of the most well-known and discussed cases, in which the U.S. government is involved, is the Project Maven which incorporates AI in intelligence, surveillance, and reconnaissance applications. Until now Project Maven has been used to support the war against ISIS in Iraq and Syria.[61]

> It can be said that until now no other state, including here China or Russia, have reached the level where the U.S. is currently.

Furthermore, the U.S. military services are focusing on the incorporation of the AI into semi-autonomous and autonomous vehicles, including fighter aircraft, drones, ground vehicles, and naval vessels. The Loyal Wingman program is an example of this. On the basis of this program, an older-generation uninhabited fighter jet (F-16 or B-1) or a low-cost uninhabited aircraft (XQ-58A Valkyrie) were paired with an inhabited fighter jet (F-35 or F-22).[62] In this case, the uninhabited aircraft by acting autonomously and without preprograming has the duty to protect the inhabited jet. Similar

57 Raya Jalabi and Spencer Ackerman, "US Navy Makes History by Landing Unmanned Drone on Aircraft Carrier," The Guardian, October 7, 2013, https://www.theguardian.com/world/2013/jul/10/us-navy-x47b-drone-aircraft-carrier.

58 "X-47B UCAS Makes Aviation History…Again!," Northrop Grumman, April 22, 2015, https://www.northropgrumman.com/Capabilities/X47BUCAS/Pages/default.aspx.

59 Chris Baraniuk, "US Military Tests Swarm of Mini-Drones Launched from Jets," BBC, January 10, 2017, https://www.bbc.com/news/technology-38569027.

60 Thomas Gibbons-Neff, "Watch the Pentagon's New Hive-Mind-Controlled Drone Swarm in Action," Washington Post, October 1, 2017, https://www.washingtonpost.com/news/checkpoint/wp/2017/01/10/watch-the-pentagons-new-hive-mind-controlled-drone-swarm-in-action/.

61 Mark Prigg, "Pentagon to Use AI to Defeat ISIS in Iraq and Syria | Daily Mail Online," Daily Mail, May 15, 2017, https://www.dailymail.co.uk/sciencetech/article-4508874/Pentagon-use-AI-defeat-ISIS.html.

62 Andrew Liptak, "The US Air Force's Jet-Powered Robotic Wingman Is like Something out of a Video Game," The Verge, March 9, 2019, https://www.theverge.com/2019/3/9/18255358/us-air-force-xq58-a-valkyrie-prototype-robotic-loyal-wingman-drone-successful-test-flight.

tests have been conducted by the Army and the Marine where prototype vehicles have followed and protected soldiers or vehicles in the battlefield. Sea Hunter is another prototype vessel (Anti-Submarine Warfare Continuous Trail Unmanned Vessel prototype) which was first developed by DARPA to be later transferred to the Office of Naval Research. Sea Hunter is the first drone ship which has traveled autonomously from California to Hawaii and then back to California.[63]

> For China, the military AI R&D is seen as a possible and easy way to challenge the American military hegemony.

Lastly, the incorporation of AI into LAWS remains of crucial importance. However, the U.S. has not declared any tests or experiments in this regard until now.

CHINA AND ARTIFICIAL INTELLIGENCE

China is following in the steps of the U.S. when it comes to the research and application of AI technology. Not only is it using AI in domestic surveillance, but China has already stated that it aims to overtake the West in AI R&D by 2025 and more importantly to be the world leader in AI by 2030.[64] The Chinese leadership, including here Xi Jinping, on many occasions has clearly stated that the leadership in AI technology is "critical to the future of global military and economic power competition."[65] It can be said that for China, the military AI R&D is seen as a possible and easy way to challenge the American military hegemony.

The Chinese government has increased their AI R&D spending by 350% between 2005 and 2015 and it is considered to be very close to the U.S. currently. Furthermore, in 2017, 48% of the world's total AI start-up funding was covered by Chinese companies and between 2013 and 2018 China's AI industry attracted 60% of global funding for AI.[66] As a result, it is believed among the Chinese leadership and industry that the gap between China and the U.S. in AI is very narrow now and China sees "AI as 'a race of two giants,' between itself and the United States."[67]

While there may be a lot of skepticism regarding China's challenge to the American hegemony, it can be said that the systemic and strategic advantages can act in favor of China and help it achieve its goal of becoming a world leader in AI. This would include the potential human talent resources and the large amount of data that China possesses but most importantly the relation of the government and AI private sector.[68] In this context, in contrast to the U.S., one of China's strongest strategies is the civil-military integration[69] (CMI) and the development of advanced dual-use tech-

63 Joseph Trevithick, "Navy's Sea Hunter Drone Ship Has Sailed Autonomously To Hawaii And Back Amid Talk Of New Roles," The Drive, April 2, 2019, https://www.thedrive.com/the-war-zone/26319/usns-sea-hunter-drone-ship-has-sailed-autonomously-to-hawaii-and-back-amid-talk-of-new-roles.

64 Pablo Robles, "China Plans to Be a World Leader in Artificial Intelligence by 2030," South China Morning Post, October 1, 2018, https://multimedia.scmp.com/news/china/article/2166148/china-2025-artificial-intelligence/index.html; Cade Metz, "As China Marches Forward on A.I., the White House Is Silent," *The New York Times*, February 12, 2018, sec. Technology, https://www.nytimes.com/2018/02/12/technology/china-trump-artificial-intelligence.html.

65 Gregory C. Allen, "Understanding China's AI Strategy: Clues to Chinese Strategic Thinking on Artificial Intelligence and National Security" (Washington, DC: Center for a New American Security, 2019).

66 Meia Nouwens, "China's Pursuit of Advanced Dual-Use Technologies," IISS, December 18, 2018, https://www.iiss.org/blogs/analysis/2018/12/emerging-technology-dominance.

67 Allen, "Understanding China's AI Strategy: Clues to Chinese Strategic Thinking on Artificial Intelligence and National Security," 9.

68 Baidu, Alibaba and Tencent (called also as BAT) are the main companies that lead the Chinese AI industry.

69 Civil-military integration (or sometimes even called as civil-military fusion) means that the technologies which are civilian in application can be used also for defense purposes. AI is an example of these technologies.

nologies.[70] These complementary strategies are related to the fact that the Chinese government and AI private sector are working closely together and this makes the application of AI technologies to the military easier. The main goal behind such a policy is to create a strong military and help the People's Liberation Army (PLA) to dominate the warfare domains and as a result 'leapfrog' the U.S.[71]

One turning point for China's perception and stance towards the AI R&D was in 2016 when Google DeepMind's AlphaGo beat the world champion Lee Sedol by 4-1 in a Go game. Many have called this the Sputnik moment for China as the government started to put more importance on the AI national strategy and its implementation in the military. Unlike the U.S. the AI national strategies in China are released mainly by China's State Council. The plans and programs released can be summarized as below:

- Made in China 2025 (May 2015): This 10-year action plan focused on promoting manufacturing, among others in the field of artificial intelligence and robotics.[72]
- "Internet Plus" Artificial Intelligence Three-Year Action Plan (2016-2018) (May 2016): This plan was focused specifically on AI and called for the creation of infrastructure and platforms for AI. Furthermore, it established a goal to increase the AI industry to a level totaling billions of RMB by 2018.[73]
- 13th Five Year Plan for Developing National Strategic and Emerging Industries (2016-2020) (August 2016): Based on this plan, the State Council contended that AI was among the main tasks to be pursued by the central government (6 out of 69 major tasks) and at the same time it announced five agencies that would be responsible for the development of AI.[74]
- Next Generation Artificial Intelligence Development Plan (July 2017): This can be considered as one of the main documents regarding the Chinese AI strategy. This is the plan in which China explicitly declares the goal to become a world leader in AI by 2030. Furthermore, the plan identifies a specific path that needs to be followed in order to achieve the proposed goal. The document argues that AI embodies a "major strategic opportunity" and suggests a coordinated strategy to "build China's first mover advantage."[75]
- 13th Five-Year Science and Technology Military-Civil Fusion Special Plan (August 2017): In contrast to the others, this plan was issued by the Ministry of Science and Technology and the CMC Science and Technology Commission. As the title suggests this plan focuses directly on the military-civil fusion and the dual use of AI technology and reflects on the importance of this strategy.[76]

70 Meia Nouwens, "China's Pursuit of Advanced Dual-Use Technologies."

71 Elsa B. Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power" (Washington, DC: Center for a New American Security, 2017); Carter, Kinnucan, and Elliot, "A National Machine Intelligence Strategy or the United States."

72 "'Made in China 2025' Plan Issued," The State Council, May 19, 2015, http://english.gov.cn/policies/latest_releases/2015/05/19/content_281475110703534.htm; James McBride and Andrew Chatzky, "Is 'Made in China 2025' a Threat to Global Trade?," Council on Foreign Relations, March 7, 2019, https://www.cfr.org/backgrounder/made-china-2025-threat-global-trade.

73 Xiaomin Zhao, "Development Strategy Analysis of 'Internet Plus' Artificial Intelligence Technology," *Advances in Intelligent Systems Research* 147 (2018).

74 Compilation and Translation Bureau, trans., "13th Five Year Plan for Developing National Strategic and Emerging Industries (2016-2020)" (Central Committee of the Communist Party of China, 2016), http://en.ndrc.gov.cn/newsrelease/201612/P020161207645765233498.pdf.

75 China's State Council, "Full Translation: New Generation Artificial Intelligence Development Plan (2017)," trans. Graham Webster et al., New America, accessed April 23, 2019, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/.

76 Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power."

- Robotic Industry Development Plan (2016-2020) (April 2016): was issued by three institutions, namely National Development and Reform Commission (NDRC), Ministry of Industry and Information Technology (MIIT) and Ministry of Finance (MOF). The importance of this plan rests on the fact that it set concrete goals and strategies in terms of the robotics industry. More specifically, this plan states that China is planning to produce 100,000 robots by 2020.[77]
- Three Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018-2020) (December 2017): This plan was issued by the Chinese Ministry of Industry and Information Technology and provides further details on those published in the Next Generation Artificial Intelligence Development Plan. This plan identifies the way to stimulate the development of AI in the 2018-2020 period and also the key areas of AI application, including vehicles, service robots, drones, etc.[78]

Bureaucratic Structure

Considering that China is a one-party state, the Chinese Communist Party Central Committee controls all the activities including the technological developments. The policy making and coordination regarding technology is conducted through two main institutions: National Science, Technology and Education Leading Small Group and Chinese Communist Party Central Military Commission; while the first one is mainly responsible for the civilian application of technology, the latter is responsible for its military applications. This division also reflects China's civil-military integration national strategy mentioned previously.

The Leading Small Group is composed of the main figures of the State Council -China's top administrative body- and is led by the leader of the State Council, the Chinese Premier. Based on the 13th Five-Year Plan for Developing National Strategic and Emerging Industries there are five main institutions responsible for the development of AI: National Development and Reform Commission (NDRC), State Internet Information Office (SIIO), Ministry of Industry and Information Technology (MIIT), Ministry of Science and Technology (MOST) and Ministry of Finance (MOF). Nevertheless, there are other institutions, which fall under the State Council, that are also responsible for the AI R&D. These may include the Ministry of Education, the Chinese Academy of Sciences (CAS), the Chinese Academy of Engineering (CAE), the National Natural Science Foundation of China (NSFC).

On the other hand, the military aspect of technology development is under the control of the Central Military Commission – which commands and controls the People's Liberation Army (PLA), the People's Armed Police and the Militia. Within this framework, AI R&D is carried out mainly by military universities and research institutes. The PLA, which is the main agency in terms of AI R&D, expects AI to have a fundamental impact on the character of warfare. Accordingly, we will see a shift from the 'informatized warfare' that is currently applied to the 'intelligentized warfare.'[79] Furthermore, China's

77 Yujia He, "How China Is Preparing for an AI-Powered Future" (Washington, DC: Wilson Center, June 2017), https://www.wilsoncenter.org/sites/default/files/how_china_is_preparing_for_ai_powered_future_0.pdf.

78 Ministry of Industry and Information Technology, "Translation: Three Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018-2020)," trans. Paul Triolo, Elsa B. Kania, and Graham Webster, New America, January 2018, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/translation-chinese-government-outlines-ai-ambitions-through-2020/.

79 Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power," 5.

main focus remains in the application of AI in the decision-making, military deduction, unmanned military weapons, and defense equipment; yet, it is possible to say that the Chinese military application of AI is at its early stage. The main reason for this is that, unlike the U.S., China does not have actual experience in the battlefield. So, the main focus of the PLA appears to be the application of the AI in simulations and war-gaming.

AI Military Applications in China

Even though it is dissimilar from the U.S., China is taking considerable steps regarding the incorporation of AI into its defense systems, mainly the military. In 2015, Baidu – one of China's leading AI companies – created a language recognition software that surpassed the human levels. It is important to emphasize the fact that Microsoft was not able to create a similar software until a year later. The language recognition software, accompanied by the computer vision systems that are developed in China are currently being used for domestic surveillance in order to monitor civilians.

If we would focus on the military application of AI in China, it is important to mention that because of the lack of combat experience, China is more focused on war-games and simulations on the basis of augmented reality.[80] One of the most well-known examples is the Artificial Intelligence and War-Gaming National Finals organized in 2017 by the China Institute of Command and Control. In this competition humans were confronted with machines which acted without any human control, known as CASIA-Prophet 1.0. The result of this competition was 7 to 1 in favor of the machine.

The war-gaming is seen from the PLA as a way to help it in the application of AI in military applications which would help China win in future warfare. However, this is only a small part of the AI military applications that China has achieved until now. The lack of real combat experience has not stopped China from researching and testing the application of AI in autonomous unmanned systems, its use for defense and offense, and also the support of the command decision-making by AI.

> Focusing on the autonomous unmanned systems, similar to the U.S., China has been researching air, ground, surface and undersea autonomous unmanned vehicles (AUV).

Focusing on the autonomous unmanned systems, similar to the U.S., China has been researching air, ground, surface and undersea autonomous unmanned vehicles (AUV). In terms of the air AUVs, China has been quite successful especially when it comes to swarm drones. In June 2017, China managed to fly a swarm of 119 drones – so breaking the American record of 103 drones- all of which were equipped with systems that allowed the drones to communicate with each other.[81]

TYW-1 and ASN-216 are two examples of the Chinese unmanned aerial vehicle (UAV) which with the help of AI can now operate autonomously, though not fully. Currently, both ASN-216 and TYW-1 can take off and land without human intervention and TYW-1 with

80 Elsa Kania, "Learning Without Fighting: New Developments in PLA Artificial Intelligence War-Gaming," *China Brief* 19, no. 7 (April 9, 2019), https://jamestown.org/program/learning-without-fighting-new-developments-in-pla-artificial-intelligence-war-gaming/.

81 Emily Feng and Charles Clover, "Drone Swarms vs Conventional Arms: China's Military Debate," Financial Times, August 24, 2017, https://www.ft.com/content/302fc14a-66ef-11e7-8526-7b38dcaef614.

a minimal human intervention can even identify and attack a target.[82]

When it comes to the unmanned surface vehicles, SeaFly is an example that needs to be mentioned. Currently, SeaFly can learn how to avoid obstacles without human intervention and at the same time it is able to recover UAV by using algorithms that allow SeaFly to arrange its actions on the basis of its assessment of sea conditions.[83]

Lastly, in terms of the implementation of AI into LAWS, in 2018, China's delegation to the UN Group of Governmental Experts on LAWS contended that they accept the conclusion of a new protocol based on which the *usage* of fully autonomous lethal weapons systems would be banned; however, for China, this does not mean that the *development* of fully autonomous lethal weapons systems would be banned.[84]

CONCLUSION

The capacity of AI to alter the landscape of security and change the current balance of power is obvious and accepted by both bureaucrats and academicians. For this reason, the rise in the development of AI, and its application in the military, has been accompanied by a competition between states, most notably the U.S. and China. Many other states at the same time are trying not to lag behind and advance their own AI applications.

The outcome of the U.S.-China competition is not clear as yet; however, it can be said that the threat posed to the U.S. by China should not be underestimated. There is a possibility that the U.S. keeps the advantage for now, but in the long run China possesses great capabilities to challenge this position. As mentioned above, the U.S. announced it national strategy approximately one year after China did. Yet many experts have argued that detailed information of funding is lacking in this strategy.

At this point, it is crucial that the U.S. does not take its military superiority for granted and belittle the steps undertaken by China. More specifically, while clearly the U.S. was superior in the Second Offset strategy which was focused on the precision-guided weapons, the same position may not be preserved with the Third Offset strategy, of which AI is a part. The reasons for this are many.

First of all, unlike the U.S., China applies a 'whole-of-government' approach, meaning that it applies a top-down process where the government plays a vital role and has a direct impact on AI R&D. This allows the Chinese government to control the process more easily. Furthermore, the main private companies responsible for AI R&D, Baidu, Alibaba and Tencent, have already announced that they will work closely with the Chinese government in terms of AI R&D. However, the same thing cannot be said for the U.S. As the U.S. government does not have direct control over the companies responsible for AI R&D, i.e. Google, Microsoft, etc., it makes it more difficult to advance AI for the U.S. An example of this is the case of Project Maven, which was a collaboration between the Department of Defense and Google. But the latter had to withdraw from the project as thousands of its employees signed a petition to end the use of their work by the military.

82 Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power," 22.

83 Mark Episkopos, "Underwater Stealth Swarms?: Introducing China's SeaFly Unmanned Stealth Vessel," Text, The National Interest, December 26, 2018, https://nationalinterest.org/blog/buzz/underwater-stealth-swarms-introducing-chinas-seafly-unmanned-stealth-vessel-39882.

84 Elsa Kania, "China's Strategic Ambiguity and Shifting Approach to Lethal Autonomous Weapons Systems," Lawfare, April 17, 2018, https://www.lawfareblog.com/chinas-strategic-ambiguity-and-shifting-approach-lethal-autonomous-weapons-systems; Kirsten Gronlund, "State of AI: Artificial Intelligence, the Military and Increasingly Autonomous Weapons," Future of Life Institute, May 9, 2019, https://futureoflife.org/2019/05/09/state-of-ai/.

Secondly, China possesses robust human capital potential and a massive data resource base which could help them gain the upper-hand in AI R&D. It is estimated that China is on track to possess 20% of the world's share of data by 2020, with the potential to have over 30% by 2030.[85]

Furthermore, China is more prone, than the U.S., to not take into consideration the human-factor challenges associated with full autonomy and the application of AI in LAWS. While the United States has clearly announced that it does not intend to keep humans out of the loop, the same thing does not stand for China. If China succeeds in applying full autonomy and applies AI in LAWS this would result in a warfare asymmetry in China's favor.

Yet, there is a drawback for China in terms of battlefield experience. Considering that China has not been in a war in recent decades it is difficult for it to apply the AI directly in the battlefield. For this reason, China has been focusing mainly on war games and simulations. However, the U.S. which has continuously been at war has been more concentrated on more tactical-level application and as such it has the advantage of applying AI in the battlefield and so developing it according to the needs of combat.

The U.S. and China are not the only two states that have turned AI into a policy priority. As mentioned earlier, there are at least 20 states that have already announced their AI national strategies and most of them have undertaken important steps in AI R&D. Yet, Turkey has neither announced any AI national strategy nor taken steps in AI R&D or its application in the military. Considering the fact that Turkey is among the few states that has developed a national UAV, it is crucial that it advances in AI R&D and its application in the military sector. There is an urgent need for an AI national strategy and the reasons for this are twofold. First of all, the risk of lagging behind in the AI competition may prove detrimental for Turkey. The application of AI in the military provides first-movers advantages and those states that do not apply the AI in the short run, will face greater threats in the long run when it will be very difficult to keep-up with the pace. As a result, the successes that Turkey has achieved until now in terms of national defense, especially regarding the UAV, will be undermined considering that other regional states, such as UAE have already taken important steps in terms of AI R&D. Secondly, in recent years, Turkey has been surrounded by different threats, including here PKK, YPG, ISIS, etc. AI is very difficult to develop, however, once the software is created copying and applying it is very easy. This means that it would not be difficult for terrorist organizations, such as PKK, YPG or ISIS, to use AI in order to achieve their goals and at the same time threaten the national security of Turkey. However, if Turkey starts to focus on AI and make it a policy priority, as many other states have done, it would be easier for the country to protect itself from any future threat that would come from the possession of AI technology by such terrorist organizations.

> The outcome of the U.S.-China competition is not clear as yet; however, it can be said that the threat posed to the U.S. by China should not be underestimated.

85 Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power," 12.

ARTIFICIAL INTELLIGENCE APPLICATION IN THE MILITARY

THE CASE OF UNITED STATES AND CHINA

GLORIA SHKURTI ÖZDEMIR

SETA | ANALYSIS

Considered as the 4th Industrial Revolution, Artificial Intelligence (AI) has become a reality in today's world, especially in the military. Experts and academicians have emphasized the importance of AI for a long time. Furthermore, world leaders, including Obama, Trump, Xi, and Putin, have all made important statements that bring to the fore the significance of AI which can be summarized with what Putin stated on September 2017: whoever becomes the leader in AI, will rule the world.

This analysis provides a short introduction on what AI is, how it has evolved until today and how it will change the nature of warfare. It then assesses why states invest in AI to later turn to the case of the U.S. and China. For both states, the main official documents and statements are analyzed, the bureaucratic structures that work on AI are presented and finally examples of how the U.S. and China are applying AI in the military are provided. The conclusion briefly comments on how the strategies of China and the U.S. differ followed by some recommendation on what states like Turkey should do in the near future.

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