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#TECHCULTUREGAP : THREAT TO NATIONAL SECURITY

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JCSP 44

Exercise Solo Flight

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#TECHCULTUREGAP: THREAT TO NATIONAL SECURITY

INTRODUCTION

The unclassified Summary of the 2018 National Defense Strategy of The United States of America describes the current strategic environment as contested in all domains. It identifies “*rapid technological advancement and the changing character of war*” as affecting security, and in order to ensure the United States can win future wars we must have access to technologies including advanced computing, “big data” analytics, artificial intelligence (AI), autonomy, robots, directed energy, hypersonics, and biotechnology.¹ Unlike earlier technology such as nuclear power that was enabled by the military’s research and development of nuclear energy, current technology with big data and AI is being led by the commercial technology sector.

Although the United States military is large, capable, and diverse, it does not have all skillsets available to access advanced technology such as AI with uniformed personnel. Therefore we rely on civilians from both the Department of Defense (DoD) and the commercial sector to fill gaps in expertise to support the mission. As such, one of the Defense objectives is to “[establish] an unmatched twenty-first century National Security Innovation Base that effectively supports Department operations and sustains security and solvency.”² In addition to personnel limitations, the military also has a limited budget, and therefore it relies on the ability to use commercial technology to enhance its mission. This is critical when it comes to advanced technology such as AI.

¹ Office of the Secretary of Defense of the United States, *Summary of the 2018 National Defense Strategy of The United States of America: Sharpening the American Military’s Competitive Edge*, Washington, D.C.: Department of Defense, 2018), 3.

² *Ibid.*, 4.

In FY19, the DoD spent \$1.4 billion on AI related projects, and current projections show FY20 AI projects totaling \$4 billion.³ Although this is a large amount of money, the commercial sector invested much more. Venture capital funding put \$9.3 billion into AI start-up companies,⁴ and this does not include spending by established companies. The DoD needs to be able to leverage this investment in AI to advance its military capabilities, but the culture gap between the DoD and the commercial sector threatens its ability to do so.

This paper argues that the culture gap between the federal government including the DoD and private sector affects our ability to advance AI resulting in a threat to national security. The paper begins with an explanation of AI. Then it provides the current state of AI research and development within the United States DoD followed by the state of military AI of our biggest competitors, China and Russia. It concludes with a discussion of the culture gap between the DoD and commercial sector and the impact of this culture gap on AI resulting in a threat to United States national security.

UNDERSTANDING ARTIFICIAL INTELLIGENCE

Though a commonly accepted definition of artificial intelligence (AI) does not exist in academic research nor in the DoD, one conventional definition is “non-human intelligence that is measured by its ability to replicate human mental skills, such as pattern recognition, understanding natural language (NLP), adaptive learning from

³ Chris Cornillie, “Finding Artificial Intelligence Money in the Fiscal 2020 Budget,” last modified 28 March 2019, <https://about.bgov.com/news/finding-artificial-intelligence-money-fiscal-2020-budget/>.

⁴ Lizette Chapman, “VCs Plowed a Record \$9.3 Billion into AI Startups Last Year,” last modified 8 January 2019. <https://www.bloomberg.com/news/articles/2019-01-08/vcs-plowed-a-record-9-3-billion-into-ai-startups-last-year>.

experience, strategizing, or reasoning about others.”⁵ To correct for the lack of common definition within the DoD, congress, in the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2019, tasked the DoD to develop a departmental definition of AI. For the purposes of the FY19 NDAA, congress also provided a description of what is considered AI. It states that AI includes:

- (1) Any artificial system that performs tasks under varying and unpredictable circumstances without significant human oversight, or that can learn from experience and improve performance when exposed to data sets.
- (2) An artificial system developed in computer software, physical hardware, or other context that solves tasks requiring human-like perception, cognition, planning, learning, communication, or physical action.
- (3) An artificial system designed to think or act like a human, including cognitive architectures and neural networks.
- (4) A set of techniques, including machine learning, that is designed to approximate a cognitive task.^[1]_[SEP]
- (5) An artificial system designed to act rationally, including an intelligent software agent or embodied robot that achieves goals using perception, planning, reasoning, learning, communicating, decision making, and acting.⁶

Beyond the definition, AI systems can be categorized based on their ability compared to humans. When AI is capable of specific human tasks it is known as artificial narrow intelligence. The next level of AI is artificial general intelligence, which is when a machine is capable of performing equivalent to a human across the spectrum of human tasks. Lastly, a level of intelligence that surpasses that of humans is categorized as artificial superintelligence.⁷

⁵ Stephan De Spiegeleire, Matthijs Maas, and Tim Sweijs, *Artificial Intelligence and the Future of Defense: Strategic Implications for Small- and Medium-Sized Force Providers* (The Hague, The Netherlands: The Hague Centre for Strategic Studies, 2017), 2.

⁶ H.R.5515, John S. McCain National Defense Authorization Act for Fiscal Year 2019, 115th Congress (2017-2018).

⁷ De Spiegeleire, *Artificial Intelligence and the Future of Defense...*, 12-13.

Of these types of AI, only artificial narrow intelligence exists today. Examples include smart speakers with digital assistants, language translation applications, game players, and self-driving vehicles. Though AI is improving quickly, it is incremental improvements that still fall within artificial narrow intelligence rather than the more advanced levels. Most experts believe that the next level of AI, artificial general intelligence, is still far in the horizon. The average for when AI experts estimated a 50% chance of having artificial general intelligence was 2099.⁸ Artificial superintelligence would come even later.

Another way to categorize AI, independent of its capability compared to humans, is by the function that it performs. AI programs or systems can perform analytical, predictive, and/or operational roles. In the analytic role, AI performs simple, repetitive tasks such as monitoring sensors to identify a well-known event. In the predictive role set, AI programs would predict future end states. And lastly, in the operational role, AI systems can take action or perform physical tasks.⁹

ARTIFICIAL INTELLIGENCE IN UNITED STATES

The United States is a leader within the field of AI in both academia and the commercial sector, and President Trump intends to maintain that leadership role with regards to AI. The President's Executive Order on Maintaining American Leadership in Artificial Intelligence lays out the policies and principles for AI in the United States. Further it states, "Continued American leadership in AI is of paramount importance to

⁸ James Vincent, "This is when AI's top researchers think artificial general intelligence will be achieved," last modified 27 November 2018, <https://www.theverge.com/2018/11/27/18114362/ai-artificial-general-intelligence-when-achieved-martin-ford-book>.

⁹ M. L. Cummings, Heather M. Roff, Kenneth Cukier, Jacob Parakilas and Hannah Bryce, *Artificial Intelligence and International Affairs Disruption Anticipated*, (London: Chatham House, 2018), v.

maintaining the economic and national security of the United States and to shaping the global evolution of AI in a manner consistent with our Nation's values, policies, and priorities.”¹⁰

The DoD published an Artificial Intelligence Strategy in 2018, and it “directs the DoD to accelerate the adoption of AI and the creation of a force fit for our time.”¹¹ It further directs the DoD to use AI to protect the United States and its citizens, improve DoD inefficiencies, and pioneer AI globally across the defense enterprise.¹²

Currently, the United States DoD is performing research and development on AI performing analytical and predictive roles. The operational role, since it involves taking action without human intervention, is akin to full autonomy, which does not exist within the US military, though it is being considered. The DoD AI efforts span across many functions including intelligence, surveillance, and reconnaissance (ISR), cyberspace operations, logistics, semiautonomous and autonomous vehicles, and lethal autonomous weapon systems.

ISR is a good use of AI because it has large data sets, which are necessary to train AI systems. ISR will likely benefit from AI because identification of objects or activity is a tedious task that is very time-consuming when performed by humans. AI can take over the tedious task until human intelligence is required. Project Maven, an AI capability demonstration project, is incorporating AI into ISR by automating the identification of hostile activity in video. The goal is to remove the tedious task of viewing hours upon

¹⁰ President of the United States, *Executive Order on Maintaining American Leadership in Artificial Intelligence* (Washington, DC: The White House, February 11, 2019), last modified 11 February 2019, <https://www.whitehouse.gov/presidential-actions/executive-order-maintaining-american-leadership-artificial-intelligence/>.

¹¹ Office of the Secretary of Defense of the United States, *Summary of the 2018 Department of Defense Artificial Intelligence Strategy*, Washington, D.C.: Department of Defense, 2018), 4.

¹² *Ibid.*, 6.

hours of video so that intelligence analysts can spend their time on more complicated tasks such as analysis and decision-making.¹³

Similar to ISR, defensive cyberspace operations also have large data sets. The volume of data is too large for humans to review all of it, and AI can help with that task. After analyzing the data, it can perform an operational function by patching vulnerabilities.¹⁴ This use of AI takes advantage of a machine's ability to process large amounts of data more quickly than humans, and it enables a mitigation to be put in place before an adversary is able to act.

AI in the logistics setting has the potential to be predictive. Sensor data from aircraft and ground vehicles can be used to determine when maintenance is needed rather than using standard schedules. The Air Force is using this for the F-35 Automated Logistics Information System (ALIS), and the Army is using it for its Stryker fleet.¹⁵ This can save both time and money by performing maintenance more efficiently.

Another area where the DoD is studying AI includes semiautonomous and autonomous vehicles in the air, on land, and at sea. The Air Force has the Loyal Wingman program, the Marine Corps is looking to improve on its Multi-Utility Tactical Transport vehicle by adding some autonomy, the Army has Robotic Combat Vehicles, and the Navy has the Anti-Submarine Warfare Continuous Unmanned Vessel prototype also known as "Sea Hunter". These military vehicles currently have varying levels of autonomy with the Loyal Wingman and "Sea Hunter" being the most advanced.¹⁶

¹³ Kelley M. Saylor, *Artificial Intelligence and National Security*, Congressional Research Service Report No. R45178, Version 5, last modified 30 January 2019, <https://crsreports.congress.gov/product/pdf/R/R45178>, 9-10.

¹⁴ *Ibid.*, 10-11.

¹⁵ *Ibid.*, 10.

¹⁶ *Ibid.*, 12-13.

The last area of study within the United States DoD that this paper will cover is Lethal Autonomous Weapon Systems (LAWS). The United States does not have LAWS currently, but they are developing policies for them.¹⁷ The DoD's directive on autonomy in weapon systems covers both semi-autonomous and autonomous weapon systems. Semi-autonomous weapon systems require a human to select targets whereas the autonomous weapon systems do not require human selection of targets, though a human can override the selection.¹⁸ These systems must abide by strict criteria that ensure human judgment can be applied, systems must pass rigorous testing before use and upon any updates, authorization and operation must obey the law of war and other typical restrictions on weapon system use, and they must be approved at varying levels depending on their intended use.¹⁹

COMPETITORS IN ARTIFICIAL INTELLIGENCE

China is the United States' biggest competitor in AI. China's New Generation Artificial Intelligence Development Plan identifies that AI is key to protecting national security, and it has three steps in its strategic objectives to enhance its AI capability. By 2020, China's goal is to enhance their capability to be in line with top competitors. Next, by 2025, they aim to be a world leader for some applications of AI, and by 2030, their goal is to be an all-around world leader in AI.²⁰

A study of published articles on AI shows that China is making strides toward these goals. The study ranked papers published through the end of 2018 based on the number

¹⁷ *Ibid.*, 14.

¹⁸ Department of Defense, *Autonomy in Weapon Systems*, DoDD 300.09 (Washington, DC: Department of Defense, 2017), 13-14.

¹⁹ *Ibid.*, 2-3.

²⁰ China, *New Generation Artificial Intelligence Development Plan*, trans. Graham Webster, Rogier Creemers, Paul Triolo, and Elsa Kania, last modified Aug. 1, 2017, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/>.

of citations they received. The study shows that the United States' share of the top 10% of papers is declining while China's share is growing. As of 2018 the United States had 29% and China had 26.5%. Continuing the trend from the last five years estimates that China will catch up to the United States share of top 10% papers by 2020. By 2025, China is expected to equal the United States contribution to the top 1% of papers on AI.²¹ In addition to academic achievements, China has succeeded in operational uses of AI for language processing, and they have won successive international competitions related to computer vision.²²

China's advantage in regards to military AI applications is the close relationships between companies, universities, the military, and government. This gives them easy access to commercially developed AI, and it allows the government and military to direct research into needed areas.²³

Although currently not as capable as China or the United States, Russia is also building AI capabilities for military purposes. In a 2017 speech Vladimir Putin stated, "Artificial intelligence is the future, not only for Russia, but for all humankind. It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes the leader in this sphere will become the ruler of the world."²⁴ Russia is focused on semiautonomous and autonomous vehicles including ground, aerial, and naval vehicles.²⁵

In light of these competitors in AI, it is very important that the United States maintain its investments in AI. "Ceding leadership in developing artificial intelligence to

²¹ Field Cady and Oren Etzioni, "China to Overtake US in AI Research," last modified 13 March 2019, <https://medium.com/ai2-blog/china-to-overtake-us-in-ai-research-8b6b1fe30595>.

²² Saylor, *Artificial Intelligence and National Security*, 19-20.

²³ Saylor, *Artificial Intelligence and National Security*, 20-21.

²⁴ James Vincent, "Putin says the nation that leads in AI 'will be the ruler of the world'," last modified 4 September 2017, <https://www.theverge.com/2017/9/4/16251226/russia-ai-putin-rule-the-world>.

²⁵ Saylor, *Artificial Intelligence and National Security*, 23-24.

China, Russia, and other foreign governments will not only place the United States at a technological disadvantage, but it could have grave implications for national security.”²⁶

THE CULTURE GAP & ITS IMPACT

The culture gap that exists between the commercial technology sector and the federal government, including the DoD and the military services, has several causes. First, the percentage of veterans in the United States is declining due to the decreasing size of the military. A Pew Research study cites that in 2016 less than 1% of adults in the United States were currently serving in the military, and only 7% of adults in the United States were veterans. This is a decrease of over 50% from the 18% of adult veterans in 1980.²⁷ People with no experience with the military often have a misperception that the military’s purpose is to kill other people, and this leads them to have concerns with supporting the military, especially on projects that have the potential to be used to target others.

This aspect of the culture gap led to Google employees circulating a letter of protest to its CEO imploring the company to no longer support the DoD in Project Maven, a pilot AI project previously discussed in this paper. The letter began, “We believe that Google should not be in the business of war. Therefore we ask that Project Maven be cancelled, and that Google draft, publicize and enforce a clear policy stating that neither Google nor its contractors will ever build warfare technology.”²⁸ The letter also voiced concern about Google’s brand, and the negative impact that supporting the

²⁶ United States Senate Hearing, *The Dawn of Artificial Intelligence* (Washington, DC: U.S. Government Printing Office, November 30, 2016), <https://www.govinfo.gov/content/pkg/CHRG-114shrg24175/html/CHRG-114shrg24175.htm>.

²⁷ Kristen Bialik, “The changing face of America’s veteran population,” last modified 10 November 2017, <https://www.pewresearch.org/fact-tank/2017/11/10/the-changing-face-of-americas-veteran-population/>.

²⁸ Letter from Google employees, <https://static01.nyt.com/files/2018/technology/googleletter.pdf>

DoD's Project Maven would have on their ability to recruit future employees.²⁹

Following the protest from employees, Google announced that it would not compete for the follow on contract supporting Project Maven.³⁰

The second gap is the difference in technological education and understanding between the leadership of the United States Congress and the commercial technology sector. Congress, which is making critical decisions on the use of AI, is primarily composed of members with legal degrees, and there are only 8 members in all of Congress with engineering degrees.³¹ The lack of technical education leads to a lack of understanding of the technology that is affecting our country. An example of this is the congressional hearings with Facebook. The questions asked by the senators highlighted their lack of understanding of much simpler technologies than AI. Additionally, the policy makers learned that Facebook did not truly understand the threats to our nation as they are driven by profit, and they rarely think of nation state adversaries and defense of the United States.³²

The third contribution to the culture divide is that the policy makers and the tech sector elite come from different generations. The best and brightest that understand new technology are very young while the policy makers have years of experience.³³ This generational gap can lead to misunderstandings.

²⁹ *Ibid.*

³⁰ Daisuke Wakabayashi and Scott Shane, "Google Will Not Renew Pentagon Contract That Upset Employees," last modified 1 June 2018, <https://www.nytimes.com/2018/06/01/technology/google-pentagon-project-maven.html>.

³¹ Amy Zegart and Kevin Childs, "The Divide Between Silicon Valley and Washington is a National-Security Threat," last modified 13 December 2019, <https://www.theatlantic.com/ideas/archive/2018/12/growing-gulf-between-silicon-valley-and-washington/577963/>.

³² *Ibid.*

³³ *Ibid.*

In part, the culture divide leads to the federal government and DoD having a very different view of China than the commercial technology sector. The federal government and DoD are concerned with national security and see China as a threat. As identified in the National Defense Strategy, China seeks “displacement of the United States to achieve global pre-eminence in the future.”³⁴ Contrary to this, the commercial technology sector, which is driven by profit, sees China positively. The commercial sector views China as “a ‘supplier,’ ‘investor,’ and especially ‘potential market.’”³⁵ This positive view of China has led companies including Google to partner with China even when they do not wish to partner with the United States government.

In 2017 Google opened an AI lab in China, and other United States technology companies, namely Amazon and Microsoft, also are planning AI labs in China in order to take advantage of the Chinese talent.³⁶ While Google, Amazon, and Microsoft may not view this as a potential threat to national security, the DoD sees it as a red flag due to the Chinese government’s close relationship with academia and industry.

CONCLUSION

The DoD must continue to be a leader in adopting technology in order to deter, or if needed, defeat our adversaries. A primary technology of concern is AI, and the 2018 DoD Artificial Intelligence Strategy describes how the department plans to leverage AI to remain competitive. Current uses of AI within the DoD span the ISR, logistics,

³⁴ Office of the Secretary of Defense of the United States, *Summary of the 2018 National Defense Strategy...*, 2.

³⁵ Amy Zegart and Kevin Childs, “The Divide Between Silicon Valley and Washington Is a National-Security Threat,” *The Atlantic*, December 13, 2018, <https://www.theatlantic.com/ideas/archive/2018/12/growing-gulf-between-silicon-valley-and-washington/577963/>.

³⁶ Mark Bergen, “Google’s AI Work in China Spurs CEO Sitdown With Pentagon Brass,” last modified 26 March 2019, <https://www.bloomberg.com/news/articles/2019-03-26/google-ceo-is-said-to-meet-general-dunford-on-wednesday>.

cyberspace operations, and command and control communities. Semiautonomous vehicles are under development for the air, land, and sea.

Our adversaries also desire to be leaders within the AI field. Similar to the United States, China and Russia also identify AI as critical to national security. China is aggressively closing the gap with the United States in this field, and Russia is still lagging behind. One advantage that China has over the United States is their close relationship between government, academia, and their commercial sector.

The culture gap between the United States federal government and its commercial technology sector limits the DoD's ability to leverage commercial technology for military purposes. The unwillingness of employees at Google to work with military led the company to not renew its contract on a key AI initiative with the Air Force. Lastly, although the federal government views China as a threat, the commercial sector sees it as an opportunity, and they have continued to partner in the area of AI.

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