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MASTER OF MILITARY STUDIES

TITLE:

**ARTIFICIAL INTELLIGENCE: DEMYSTIFYING THE CRAZE AND SHARPENING
THE COMPETITIVE EDGE OF AMERICA'S WARFIGHTING FORCE**

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Executive Summary

Title: Artificial Intelligence: Demystifying the Craze and Sharpening the Competitive Edge of America's Warfighting Force

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Thesis: The maturation of artificial intelligence has the potential to change the character of war and alter the global balance of power. The U.S. and China seek to use artificial intelligence as a means to gain a national security competitive advantage. China and the People's Liberation Army intend to leverage AI in intelligentized warfare while generating cost advantages through a strong state-sponsored military-civil fusion. Conversely, the U.S. and the Department of Defense seek near-term AI benefits as part of the Third-Offset centaur model while relying on incentives to increase public-private partnerships. The competing theories of victory primarily stem from organizational biases and cultural differences.

Discussion:

Despite an inordinate amount of hype regarding artificial intelligence, the term is poorly understood. This research begins by exploring the definitions of artificial intelligence and the various subfields of study to establish a baseline for research. Inherent within the discussion is the impact of the artificial intelligence brand. Doomsday scenarios and negative perceptions have the potential to disrupt artificial intelligence applications; therefore, artificial intelligence requires rebranding for the future.

Though many nations are taking note of artificial intelligence's transformative power, the U.S. and China are the first to formulate nascent artificial intelligence strategies. Both seek a competitive advantage. Using Michael Porter's work on competitive advantage in marketing, this research evaluates the U.S. and China's competing theories of victory for artificial intelligence-enabled national security. Throughout, organizational biases and cultural differences help explain notable divergences, thereby illuminating potential opportunities for competition or collaboration.

Building on the study of competitive advantage analysis of the U.S. and China, this research then proposes recommendations for the U.S. and Department of Defense to sharpen the competitive edge as it pertains to artificial intelligence.

Conclusion:

The asymmetries between the U.S. and China's differing AI strategies could result in unexpected, destabilizing dynamics to the global balance of power. The U.S. can sharpen the competitive edge by employing offensive and defensive competitive strategies to better organize for the potential of an artificial intelligence arms race.

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Preface

This body of work represents a compilation of articles submitted for publication as a Gray Scholar, formally known as the Fight Club Advanced Study Program. The articles are reformatted to mirror a traditional thesis to satisfy the requirement for a Master of Military Studies. The inspiration for my work stems from my education and experience as an Intelligence Officer, Technical Information Operations Planner, and Economist. I am continually intrigued by the nexus of technology, information, and innovation within the profession of arms. I believe we may be in the midst of a military revolution thanks to the steady maturation of artificial intelligence (AI). Though the U.S. is leading the exploration and integration of AI across many sectors, I fear potential adversaries are not only catching the U.S. but may surpass her within a decade. I remain a lifelong student and contributor to the marketplace of ideas striving to prompt dialogue on the impact of technology, information, and innovation in my profession.

I am eternally grateful to my Lord and the tribe of mentors he continues to provide. To my wife Ambrail, thank you for reminding me how much more there is to life outside of working, studying, and writing – you are the beacon of my life. Thank you to the entire Marine Corps University faculty, most notably Doctor Benjamin Jensen, Doctor Frank Marlo, Doctor Paul Gelpi, and Lieutenant Colonel Ronald Rega – your mentorship and inspiration helped me pursue my intellectual curiosity and grow immensely as a professional and student. To Major Adam Yang, our wives have long joked we are work spouses, and we continue to prove them right. I am honored to stand next to you as a co-founder of Ender's Galley. It is not the first time we have co-conspired and it certainly will not be the last. To Conference Group Two, I love every one of you dearly and can only hope our mutual interests reunite us in life or on the battlefield. Last, to my brothers, Major Gordon Emmanuel, Major Justin Gray, and Mr. Adam

Franco (“the thread”) there is rarely a piece of my work or a thought you do not shape; thank you for being a consistent sounding board and brothers for life.

Illustrations

Figure 1.....	Page 5
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Table of Contents

	Page
Executive Summary	i
Disclaimer	ii
Preface.....	iii
Illustrations	v
Introduction.....	1
Part 1: Artificial Intelligence – Demystifying the Craze and Branding for the Future.....	3
Artificial Intelligence as an Application	3
Artificial Intelligence as a Field of Study	4
Types of Artificial Intelligence	4
Machine-Learning, Deep Learning, and Artificial Neural Networks	5
The Artificial Intelligence Perceptions and Brand.....	7
Branding for the Future.....	8
Part 2: Envisioning Artificial Intelligence in Warfare – Competing Strategies of Victory	10
Two Basic Types of Competitive Advantage: Cost and Differentiation	10
Competing Theories of Cost Advantage: Military-Civil Fusion versus Public-Private Partnership	11
Competing Theories of Differentiation: Intelligentization Versus the Centaur Model	13
Summary	15
Part 3: Sharpening the Artificial Intelligence Competitive Edge – Recommendations for U.S. Policy and the Department of Defense	17
Rebrand Artificial Intelligence to Algorithmic Warfare.....	18
Formulate a Long-term National Strategy for AI	19
Establish a DoD Joint AI Center.....	19
Fund, Enhance, and Incentivize Public-Private Partnerships	20
Recruit and Preserve AI Talent.....	21
Heighten Ethical and Legal Concerns of Intelligentized Warfare	21
Summary	22
Conclusion	24
Endnotes.....	26
Bibliography	34

Introduction

*“A new and frighteningly complex world of conflict and technology and the inevitable deadly dilemmas we will face in twenty-first-century wars demand that we pay more attention to the issues that will confront us, before it is too late to control them.”*¹

Artificial Intelligence (AI) is at the forefront of strategic competition in the business sector and national security. Rapid technological advances in AI continue to break barriers at an astonishing rate, and it is a generally accepted consensus AI will dramatically affect how we live in the 21st century. The likes of Alan Turing, Ray Kurzweil, and Elon Musk have long fantasized the impact of artificial intelligence but significant technological advances are now making AI a reality in many facets of life, from health care to gaming. Of particular importance, recent studies highlight the strategic and transformative potential of AI with regard to military affairs.² Some scholars are already predicting artificial intelligence is the seventh revolution of military affairs.³ When recently posed a question if AI is changing the character or nature of war, Secretary James Mattis replied, “I’m certainly questioning my original premise that the fundamental nature of war will not change.”⁴

Luckily, the U.S. has considered the integration of AI to support defense for several years. In fact, the “Third Offset Strategy” is built on the premise of AI and automation to assure U.S. military superiority.⁵ The problem is, the U.S. is not the only country incorporating AI and automation to win wars. Near-peer adversaries such as China and Russia are also exploring the application of AI in war, as are several less formidable opponents. Discreetly, evidence of an artificial intelligence arms race between major military powers is beginning to emerge.⁶ The question is no longer *if* AI will dominate warfare but *when*. As stressed by the Marine Corps Operating Concept and the National Defense Strategy, the evolving character of war demands the exploitation of technology to maximize speed and focus, or the nation risks catastrophic

defeat.⁷ As AI revolutionizes national security, scholars and warriors alike must anticipate the conceptual and operational opportunities and challenges of the future operating environment driven by AI.

This thesis explores the impact of artificial intelligence within warfighting and the Department of Defense (DoD). Part one asserts AI is poorly understood and explores the various definitions and fields of study to establish a baseline for research, concluding AI needs a new brand for the future. Part two introduces competing theories of victory for AI integration in warfare by using competitive advantage literature to evaluate U.S. and Chinese strategy. Part three builds on parts one and two by providing recommendations for U.S. policy and the DoD to sharpen the competitive edge.

Artificial Intelligence will undoubtedly transform the battlefield, perhaps generating a revolution of military affairs.⁸ However, specific outcomes are not deterministic.⁹ As is the case with most revolutions or nascent technologies, it is difficult to predict in advance exactly how AI may evolve or impact every domain. This fact should not dissuade the exploration of a broad spectrum of possibilities. The purpose of this study is not to provide definitive implications, but rather highlight the changing character of war and prompt dialogue between professionals, for either implementation or future research. Critiques, pushback, and provocative opinions enrich the discussion and generate tempo for progression.

Part 1: Artificial Intelligence – Demystifying the Craze and Branding for the Future

“A brand is the sum of the good, the bad, the ugly, and the off-strategy.”¹⁰

AI is poorly understood. The complexity and constant evolution of AI befuddle common understanding. Moreover, there is no universal definition of AI because leading scientists and engineers cannot agree on the parameters.¹¹ As a result, the term AI is routinely used interchangeably with descriptors like big data, autonomy, machine learning, human-machine teaming, and deep learning.¹² Such generalizations are not helpful, playing into the fictional portrayal of superhuman robots in the near future. More importantly, the obfuscating language limits the synchronization of research and application. Using different terms as synonyms is incredibly dangerous, particularly in light of budgeting and time constraints in a large bureaucratic institution like the Department of Defense (DoD). Meaningful discussions on AI first require a shared understanding of what AI is and is not.

Artificial Intelligence as an Application

Artificial intelligence is commonly defined as the theory and development of computer systems able to perform tasks that normally require *human intelligence*, such as visual perception, speech recognition, decision-making, and translation between languages.¹³ This definition is inherently oversimplified – what is “human intelligence?”¹⁴ In 2018, there are “intelligent” thermostats, vacuum cleaners, and home security systems, but these technologies pale in comparison to unmanned vehicles capable of discerning and engaging targets with minimal human control. Moreover, the bar by which intelligence is measured changes drastically over time and is open for debate. Additionally, though human intelligence seems like a natural benchmark, “matching human ability is only a sufficient condition, not a necessary one.”¹⁵ Many systems already exceed human intelligence on varying parameters. Thus, measuring AI against a

benchmark of human intelligence may unduly bound the research and application. Conversely, holistic human intelligence or consciousness remains unrivaled by artificial or biological creations regarding the human brains' ability to comprehensively sense, analyze, and synthesize information. Still, the feats of Deep Blue and AlphaGo are no less impressive.

Artificial Intelligence as a Field of Study

In another sense, AI is more than just machines; AI is an entire field of study. An Office of Net Assessment study in 2016 points out many citizens perceive AI as *intelligence exhibited by machines* whereas researchers understand AI to be *a discipline of problems to solve*, much like physics.¹⁶ The subtle difference is noteworthy, and researchers contend the latter explanation is more useful to understand AI. Through this lens, AI is akin to a branch of computer science that focuses on synthesizing intelligence, mostly generalized as a software focus.¹⁷ This notion explains why there are so many budding areas of AI research: machine learning, robotics, internet of things, deep learning, big data, etc. The separation into various sub-fields enables progression along varying fronts but also diversifies the overall understanding and direction due to competing stakeholders.

Types of Artificial Intelligence

There are two broad categories of AI – general and narrow (or weak). Artificial general intelligence (AGI) is described as “AI systems that possess a reasonable degree of self-understanding and autonomous self-control, and have the ability to solve a variety of complex problems in a variety of contexts, and to learn to solve new problems that they didn't know about at the time of their creation.”¹⁸ In other words, AGI is the basis for Terminator scenarios where superintelligence and robots soon replace humans. Conversely, narrow AI, also known as weak AI, is a specialized and pragmatic application of AI to perform specific tasks such as algebraic

calculations, self-driving cars, or playing chess.¹⁹ Narrow AI is easily summarized as the automation of traditional human activity. It accounts for the bulk of AI applications and research to date.

Machine-Learning, Deep Learning, and Artificial Neural Networks

The terms AI, machine learning (ML), and deep learning are best thought of as concentric circles, or sub-fields (see figure 1). If AI is the problem set, ML is a way to achieve AI, and deep learning is one of many approaches within ML.

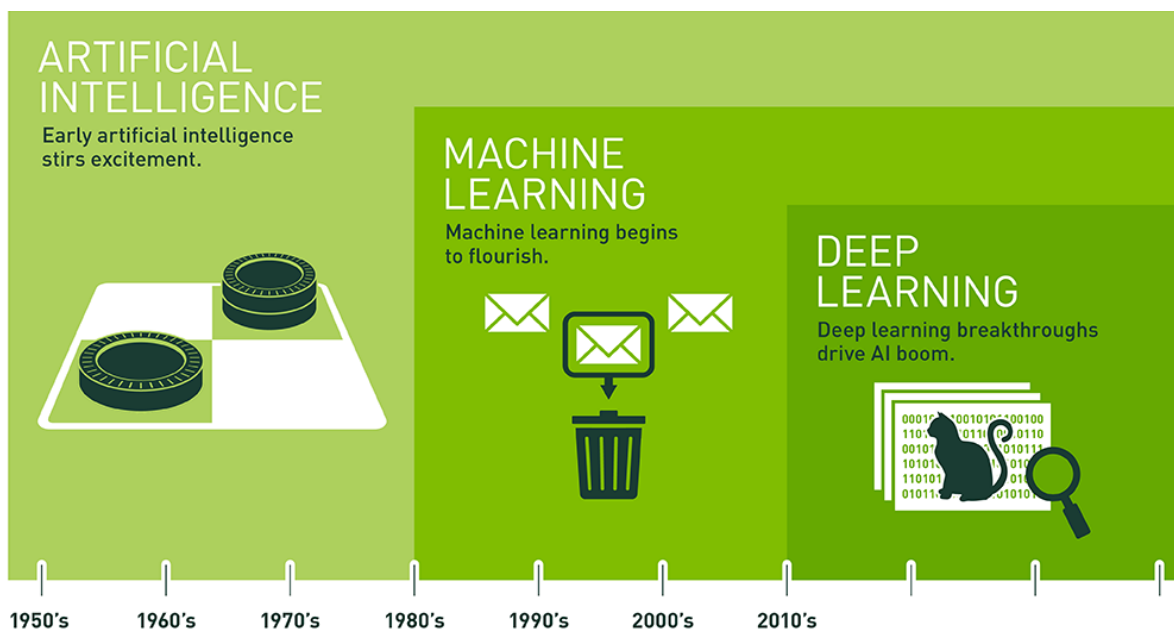


Figure 1: Smaller subsets of artificial intelligence driving the AI revolution.²⁰

Machine learning is the application of mathematical theory and statistics to identify relevant data (data mining), learn from it (algorithmic learning), then make predictions based on the data.²¹ By repetitively combing the data, the machine identifies patterns and “learns” how to perform a task. Complimentary efforts such as decision-trees and Bayesian theory help parse data, thereby enhancing the ability of machine learning applications to learn from patterns. Conceptually, AI is possible without ML, but it would require millions of lines of code and complex rules; therefore, the maturation of machine learning is a considerable accelerant for AI.

One of the most well-known examples of ML is computer vision, or the ability of a machine to recognize an object from an image. Computer vision is what allows Google Photos, Apple Photos, and Facebook to recognize objects or people within a photo and tag it appropriately. The process goes something like this – beginning with millions of pictures, humans train the machine by tagging objects in the pictures and labeling them. Over time, the algorithm builds a model and begins to tag objects on its own while humans validate the tag. Upon reaching a satisfactory level of success, the machine “learns” the task. Recently, the application of computer vision progressed from benign social media photos to aid in potential intelligence gathering in war. Project Maven, the Pentagon’s AI pilot project, is employing computer vision algorithms on unmanned systems to enable intelligence collection.²² Using ML, unmanned aerial vehicles could identify everything from key infrastructure to potential adversary weapon systems, all without the requirement of a trained analyst.

Deep learning is a subset of machine learning, stemming largely from the study of biology and a general understanding of how the brain functions. Much like the interconnections of neurons stimulates signals throughout the body, artificial neural networks (ANN) are algorithms mimicking the structure of the brain.²³ Deep learning is nothing more than using ANNs to model complex relationships of data.²⁴ ANNs utilize machine learning at a much deeper level on abstract problem sets to assign increased confidence in the prediction. Much like the brain, ANN can weight neurons based on correct predictions and eventually form enduring pathways with specific data, thereby fine-tuning the machine to be very accurate, often more accurate than the human brain.²⁵ Until recently, ANNs were largely theoretical because it was computationally infeasible to sort through millions of data points repetitively to form mature neural networks. However, the abundance of data and substantial increases in processing power

is leading to routine breakthroughs. For example, self-driving cars utilize deep learning to sense millions of data points over thousands of hours of driving time to drive safer than humans.²⁶ In a military application, Project Maven can use ANNs and deep learning to not only improve intelligence collection but also assist in lethal targeting. Much like self-driving cars, unmanned aerial vehicles would benefit from the same techniques and improved accuracy to minimize unintentional casualties and damage during lethal targeting strikes.

The Artificial Intelligence Perceptions and Brand

The lack of a clear definition for artificial intelligence and the existence of many subfields under the AI umbrella generates considerable confusion among the public, decision-makers, and even within the scientific community. While AI has the prospect of changing the world, all of it is mute if the AI brand is confusing and misunderstood. During a town hall session at the Digiday AI Marketing Summit in April 2018, many voiced frustrations about the ambiguity of AI and the difficulty acknowledging the role in their businesses. One marketer highlighted, “I think we’ve been using ‘artificial intelligence’ in different variants for a while, but there’s a fuzziness around what it can and cannot do.”²⁷ Another stated, “there’s a lot of skepticism.”²⁸ AI has a brand image problem, and that spells bad news for DoD as it strives to incorporate AI into warfare.

Business literature emphasizes people do not necessarily buy (or accept) products, services, and applications based on physical attributes or functions.²⁹ Instead, people care more about the social and psychological implications.³⁰ They care about the brand image, which includes things like perception and reputation, whether reasoned or emotional.³¹ Best case, AI researchers continue to mature the technology and seemingly artificial projects are recognized more for their potential vice negative consequences. In a worst-case scenario, policy-makers and

the public may potentially reject AI due to their lack of knowledge and suppositions that AI super bots will soon replace humans. One's enthusiasm regarding AI is largely reflective of their belief of the worst-case scenario.³² Perceptions guide the future, not AI technology itself.

Branding for the Future

At the very least, an improved working definition of artificial intelligence is necessary. Better yet, AI should be rebranded entirely to disassociate from fear-driven narratives and their cargo.³³ Though a vague AI definition may grant intellectual space for creativity and experimentation, policy makers and those responsible for implementation remain uninformed. The conflation of varying fields of studies, innovations, and technologies confuses the necessary dialogue to prepare human social systems for AI integration. The resultant is fear of the unknown, giving way to a growing concern AI is “summoning the demon” with extreme ethical and legal implications.³⁴ An improved definition of artificial intelligence and subsequent lines of inquiry for each subfield would mitigate AI alarmists and common apprehensions of the relatively unknown field of study while also synchronizing resources and improving accountability mechanisms.

The necessity to rebrand AI for the future is even more exaggerated for the Department of Defense. AI applications in warfare are likely to draw a multitude of critics, as evidenced by recent Google employees protesting the company's affiliation with Project Maven.³⁵ Similarly, in the fall of 2017, nearly a hundred chief executive officers of AI companies signed an open letter to the United Nations urging them to consider banning AI in weapons.³⁶ The growing concerns have the potential to undermine impactful AI applications in war. To prevent a strategic communications nightmare moving forward, the DoD would benefit from rebranding AI to something more concrete and perceptually more appetizing such as algorithmic warfare. Tying

the brand to mathematics is less abstract than the currently nebulous moniker of artificial intelligence. By doing so, the brand will be perceived as more transparent and well-defined, thereby making it more palatable in national security applications.

Part 2: Envisioning Artificial Intelligence in Warfare – Competing Strategies of Victory

“A military that is slow to exploit technological advances and adapt new ways of fighting opens itself to catastrophic defeat...we must capture the full potential.”³⁷

Many nations are taking note of the transformative potential of AI. In 2016, the United States released three critical reports sketching a roadmap for AI strategy.³⁸ China released two foundational documents in 2016 and a national AI development plan in 2017.³⁹ In September of 2017, Russian President Vladimir Putin noted, “whoever becomes the leader in this sphere [artificial intelligence] will become the ruler of the world.”⁴⁰ As AI increasingly becomes the “focus of international competition,” security professionals seek a competitive advantage.⁴¹ To date, the U.S. and China are publicly driving most of the AI technology development and theory, as well as the discussion on its’ integration in warfare. Therefore, this study focuses on the competing theories of victory between the Department of Defense (DoD) and the People’s Liberation Army (PLA) strategy to incorporate AI, explicitly highlighting their asymmetries through the lens of business literature on competitive advantage.

Two Basic Types of Competitive Advantage: Cost and Differentiation

Few theories in business are as influential as Michael Porter’s work on competitive advantage. His books, *Competitive Advantage* and *Competitive Strategy*, continue to serve as a foundational basis for business strategy over three decades after being published. The *Economist* succinctly summarizes Porter’s oeuvre on how to achieve competitive advantage: “You win either by being cheaper or by being different (which means being perceived by the customer as better or more relevant). There are no other ways.”⁴² In business, firms seek to create cost advantages by making products at lower cost *or* creating unique products; then they formulate offensive and defensive strategies to offset competitors.⁴³ The same logic applies to national strategy and warfighting. As some note, national strategy and war are not the same as business,

but they are all fundamentally human endeavors with many similarities.⁴⁴ Consequently, there is utility using the vast sample size of business competitions to inform defense strategy.⁴⁵

Using the two means to achieve a competitive advantage, cost and differentiation, this essay progresses by outlining the differences between the U.S. and Chinese AI strategy, first by cost advantage, then by differentiation. It is important to note both countries are pursuing a competitive advantage through both cost and differentiation; however, their strategies are very different. While the DoD likely maintains an AI competitive advantage currently, the PLA strategy and structural advantages may enable China to surpass the U.S. in short order.

Competing Theories of Cost Advantage: Military-Civil Fusion versus Public-Private Partnership

The keystone of China's AI research and development strategy is a strong military-civil fusion with formal state-sponsored mechanisms to enable deep collaboration between military and civilian organizations. By pursuing collaborative research and development, China seeks significant cost advantages. China's New Generation AI Development Planning Notice (2017) also emphasizes "the application of military-civilian scientific and technological achievements in two-way transformation...to form a new pattern of deep integration of military and civilian development."⁴⁶ Elsa Kania, a leading scholar on China's AI strategy, notes China will need to continue establishing and normalizing mechanisms to actualize their objective.⁴⁷ However, many examples of recent high-level commissions and civilian partnerships suggest China is progressing quite fast.⁴⁸ As Greg Levesque and Mark Stokes conclude, China's "military-civil fusion in the defense industrial context goes beyond traditional notions of civil-military integration," thus blurring the lines of typical state partnerships.⁴⁹ Though it remains to be determined if PLA will realize power-altering returns on their military-civil fusion, China's pursuit of dual-use research and development has the potential to enable monumental cost

advantages and generate synergies across a diverse ecosystem.

Similarly, the DoD also aspires to maximize cost advantages through what it calls public-private partnerships.⁵⁰ The primary difference is whereas China guides military-civil fusion through state-sponsored guidance, the U.S. public (government) relies on incentives to entice partnerships, thereby incurring additional costs. Still, the renewed focus to increase public-private partnerships is commendable. Organizations like Defense Innovation Unit Experimental (DIUx) and the Strategic Capabilities Office (SCO) are making great strides cultivating partnerships and redefining traditional boundaries.⁵¹

Arguably, these organizations are not much different than Chinese initiatives; however, the DoD faces culture challenges which impede the relationship with research hubs like Silicon Valley. For one, politics remain a prevalent part of U.S. society. Some experts assert technologists are pushing lawmakers further to the left, often diverging from a DoD culture that is largely characterized as leaning more towards the right.⁵² Furthermore, recent tensions such as the Apple and Federal Bureau of Investigation (FBI) encryption debate threaten to widen the divide thanks to strong rebukes from both camps, to include some FBI officials characterizing Apple employees as jerks and questioning their patriotism.⁵³ Further straining “the current adversarial nature,” some technologists are beginning to question the impact of their work as it pertains to the social fabric of society, some even denouncing affiliation of their work with the government.⁵⁴ In turn, civil-military partnerships face strong headwinds, and some researchers fear even greater challenges lie ahead.⁵⁵ Even more troubling, the DoD’s cumbersome acquisition and approval process for new technology currently “impedes preeminence,” according to recent comments by Under Secretary of Defense for Research and Engineering.⁵⁶ Ultimately, it leaves the DoD on a quest for more public-private partnerships by providing

incentives, bridging a cultural divide, and revising an outmoded acquisition process – all of which require money, and a lot of it.

In summary, the PLA AI strategy, which relies on a state-driven military-civil fusion, likely has a greater potential realizing a cost advantage over DoD public-private partnerships. As innovation in AI continues to slant more towards the private sector globally, China is better positioned to reap the benefits from military-civil “shared construction, shared enjoyment, and shared use.”⁵⁷ Conversely, the DoD is working hard to improve public-private partnerships, but it faces remarkable challenges and costs. Though the U.S. may serve as the AI capital of the world currently, China’s plan to become the “premier global AI innovation center” by 2030 must be respected, due in large part to their focus on military-civil fusion which may generate a substantial cost advantage in AI research and development.⁵⁸

Competing Theories of Differentiation: Intelligentization Versus the Centaur Model

The PLA and DoD also envision the integration of AI in warfare quite differently. Chinese strategists contend AI is trending towards a military revolution and they plan to capitalize on an expansive approach to “intelligentized” warfare.⁵⁹ Specifically, China seeks an intelligentized decision-making cycle with a long-term vision vice short-term application. A critical component of the intelligentized model is the acknowledgment that AI may accelerate the tempo of operations so much that commanders will no longer have the capacity to remain “in the loop,” instead of operating “on the loop.”⁶⁰ Given this premise, the PLA seems poised to investigate the integration of AI to support a wide range of applications.

Though the PLA is still interested in traditional AI research in support of unmanned platforms and data processing, the PLA is likely more interested in using AI to support ultimate decision-making through advanced applications like operational planning and battle simulation.

In other words, they may be more open to and interested in applications which resemble AGI opposed to narrow AI – a significant differentiator. Complimenting the intelligentization theory of victory, China recognizes their timeline for realization is not immediate; they plan to be on par with the U.S. around 2020 and may not become the world’s AI “Innovation Center” until 2030.⁶¹ As such, the critical components of the Chinese AI strategy are long-term investments in education, talent recruitment, and a massive funding plan anchored in military-civil fusion.⁶² Even though the PLA may not be originators of AI-enabled warfighting technologies shortly, they are clearly planning on a different horizon and intend to differentiate through intelligentization.

In a stark difference, the U.S.’s AI strategy is best characterized by near-term relevancy and adherence to the “centaur model,” emphasizing the criticality of humans. Since the advent of the Third Offset strategy, the U.S. vision to incorporate AI on the battlefield focuses primarily on Manned Unmanned Operations (MUMO), commonly referred to as the centaur model – half human, half machine.⁶³ The approach presumes humans remain “in the loop,” always the ultimate authority of lethal force and mission oversight. Such a stipulation likely stems in large part from the U.S. cultural view of law and ethics as constraints. U.S. policy stresses designing AI applications to “align with ethical, legal, and social principles.”⁶⁴ The overall U.S. policy then extends across the DoD through Directive 3000.09, *Autonomy in Weapons Systems*, which limits the design of autonomous and semi-autonomous weapon systems to “appropriate levels of human judgment over the use of force.”⁶⁵ In contrast, some nations such as China broadly view law and ethics as a consideration, even acknowledging the concept of legal warfare.⁶⁶ Moreover, China has long approached technology as a means to determine tactics, not the other way around like the United States.⁶⁷ Such differentiation implies the DoD may be more narrow-sighted in the

development of AI applications.

Finally, DoD largely focuses on leveraging AI for defined mission sets in the very near future, within a five-year Program Objective Memorandum (POM) cycle.⁶⁸ Whereas China seeks to surpass the U.S. over the course of a decade-plus, the current DoD focal point is modernization in 2019 and 2020.⁶⁹ However, critics should not discount the U.S. and the DoD near-term focus, as is often the case.⁷⁰ The DoD will learn invaluable lessons over the next few years through attempts to implement cutting-edge AI technology, lessons which the PLA may only be able to extract through open-source journalism and espionage. Those lessons also generate reinforcing loops, helping DoD refine AI research and development immensely, perhaps distancing itself even more from China and the PLA. In sum, the U.S. is capitalizing on current AI dominance by seeking near-term centaur-like warfighting applications (differentiation). It remains to be determined if the benefits of the centaur model will also yield long-term returns, or if the U.S. will need to develop a fourth offset to maintain dominance.

China and the U.S.'s strategy for AI integration are competing theories of victory: long-term intelligentization and short-term centaur application. China's differentiation strategy is not by chance; China seeks a distinct competitive advantage. As Elsa Kania notes, "the PLA is unlikely to pursue a linear trajectory or follow the track of U.S. military modernization, but rather take a different path."⁷¹ China seeks differentiation with the intent to develop a "trump card" and thus "leapfrog" the United States.⁷² The U.S. seeks to extend military superiority and maintain dominance as the global superpower.⁷³

Summary

Many scholars describe the pursuit of Artificial Intelligence supremacy as winner-takes-all, in both business and a global arms race.⁷⁴ The great powers of the world agree; China,

France, Russia, the United Kingdom, and the United States have all recently publicized keynote documents guiding their AI strategy. To date, China and the U.S. remain pacesetters thanks to technological superiority.⁷⁵ Both seek a competitive advantage moving forward.

China and the PLA plan to utilize AI to usher in intelligentized warfare while generating cost advantages through a strong state-sponsored military-civil fusion. Conversely, the U.S. and the DoD intend to reap near-term AI benefits as part of the Third-Offset centaur model, aided by incentives to increase public-private partnerships. A variety of biases inform their differing theories of victory, as highlighted throughout – type of government; strategic culture; and assessments of strengths, weaknesses, opportunities, and threats. Although in-depth analysis and the root of competing theories of victory is outside the scope of this piece, they are critical to analyzing the divergences in strategy. While it is difficult to discern which nation is better prepared for AI integration in the future, the application of time-tested theoretical models such as Michael Porter’s study of competitive advantage help illuminate the fundamental differences. Building on those differences, strategists must then craft a strategy to exploit or defend perceived advantages and disadvantages. The next piece will do just that by presenting recommendations for the U.S. and the DoD to sharpen the competitive edge.⁷⁶

Part 3: Sharpening the Artificial Intelligence Competitive Edge – Recommendations for U.S. Policy and the Department of Defense

China's national AI strategy has strategic implications for the United States. The U.S. military enjoyed an uncontested advantage in technology for over three-quarters of a century, but the competitive edge is "eroding," according to the U.S. Secretary of Defense.⁷⁷ The rapid advancement of AI-enabled technology threatens to change the character of war dramatically, perhaps in the immediate future.⁷⁸ Moreover, many scholars believe an inflection point in AI either already exists or is rapidly approaching.⁷⁹ As such, AI has the potential to excite an arms race and a possible shift in the global balance of power.⁸⁰

Part two of this thesis evaluated China and the U.S.'s competing theories of victory for AI integration using Michael Porter's work on *Competitive Advantage* as a theoretical model. China and the U.S. are pursuing a competitive advantage through both cost and differentiation. China seeks to use AI to inform intelligitized warfare while generating cost advantages through a strong state-sponsored military-civil fusion. Conversely, the U.S. intends to capture near-term AI benefits to support the Third-Offset centaur model, aided by incentives-driven public-private partnerships. Though the U.S. currently enjoys an advantage in AI research and development, China intends to surpass the U.S. within the next decade on its way to becoming the "global AI Innovation Center" by 2030.⁸¹

Building on Porter's initial work on competitive advantage, he also introduces a host of broad principles for offensive and defensive strategy formulation.⁸² Informed by those principles and the body of work presented in this thesis, part 3 introduces recommendations for U.S. policy and the Department of Defense to sharpen the AI competitive edge.

Moving forward, the United States must incorporate both offensive and defensive competitive strategies to offset China's AI strategy. Offensively, the U.S. must seek to

strengthen its relative competitive advantage by rebranding AI to change the Terminator, fear of the unknown narrative, to a brand associated with math and precision. Doing so will enable DoD to dominate the AI narrative and advocate for AI applications on the battlefield as a means to reduce collateral damage and increase success – a notable competitive advantage. Additionally, the U.S. must go on the offensive to orient and energize the joint force on the AI problem-set while simultaneously incentivizing robust public-private partnerships. Defensively, the U.S. must counter China’s attempts to threaten competitive strength by protecting and attracting the world’s top AI talent, while also heightening ethical and legal concerns of intelligentized warfare to deter China from pursuing supreme forms of AI applications. The following serve as recommendations for consideration, organized by complexity and beginning with near-term improvements first:

Rebrand Artificial Intelligence to Algorithmic Warfare

The globally acknowledged definition of AI is ambiguous and outdated. While the ambiguity may permit intellectual freedom to innovate and shape the future of AI research, it is not conducive to Planning, Programming, and Budgeting Execution (PPBE) cycles within the DoD. In the absence of an agreed-upon definition, it is difficult to allocate funds appropriately and design accountability mechanisms to avoid frivolous spending. More importantly, AI alarmists continue to theorize doomsday scenarios and jade the discussion of near-term narrow-AI integration. DoD must dominate the AI narrative to maximize the potential utility of AI-enabled technologies in warfighting. Otherwise, the public will not accept future integration. The current AI brand must disassociate from fear-driven narratives. The best way to disentangle AI-enabled technologies from terminator scenarios is to rebrand AI entirely as algorithmic warfare. The premise of algorithmic warfare is not novel; it already has name value thanks to the

Algorithmic Warfare Cross-Function Team, commonly known as Project Maven.⁸³ The positive association between math and algorithms implies a prescriptive process and set of rules, opposed to the potential of rogue programs. Moreover, it sets the stage for AI to be linked to increased precision on the battlefield, thereby reducing collateral damage – an added boost to the U.S. warfighting brand.

Formulate a Long-term National Strategy for AI

A strategy requires linkages to the mission, defined objectives, and a vision for the future – all of which are not clear currently. A whole-of-government approach to AI is necessary.⁸⁴ The National AI Research and Development Strategic Plan is a good starting point, but more is needed to synchronize the vast ecosystem of AI research and development. The U.S. and the DoD should identify strategic goals, outline plans, and allocate resources to achieve those goals. Last, the U.S. and the DoD must extend the planning horizon for AI integration to include a range of short-, medium-, and long-term applications. Though short-term application remains important, the capability and capacity of AI will soon extend far beyond MUMO; the DoD should hedge towards an aggressive strategy of challenging the premise humans must remain in the loop.

Establish a DoD Joint AI Center

The Defense Innovation Board recently recommended DoD should create an office to supervise the current “innovation archipelago” of many offices engaged in AI innovation, each on an island and disconnected from the rest.⁸⁵ A joint AI center would facilitate centralized planning and direction, as well as prepare the force for new methods of operation. Numerous senior leaders assert every future fight will be a joint effort; joint interoperability is imperative.⁸⁶ Opposed to allowing each service to pursue unique approaches of AI integration, a joint AI

center would streamline planning, acquisitions, and operations through centralized direction and synergistic investments across the force. As Secretary Mattis recently noted, coordination is necessary to ensure there are not “a bunch of different organizations all feeling their way forward.”⁸⁷ Additionally, a joint AI center can ready the force for new concepts of operations by improving things like recruitment, personnel management, and training.

Recently, the Pentagon’s Research and Development Chief announced a Joint AI Center (JAIC) is likely, but the discussion is “still a work in progress.”⁸⁸ The Defense Department plans to deliver a report to Congress by summer detailing the establishment of the JAIC.⁸⁹ Expect friction; the JAIC will require adequate resourcing and staffing, all of which will likely meet resistance. There will be a multitude of discussions regarding the physical location of a potential JAIC, how large the staff should be, the size of the JAIC budget, and what mechanism is responsible for prioritizing investments. Though the discussions are important, they are also inherently political. Moreover, each day spent discussing a potential JAIC or writing another point paper is a day lost. It is time to move out on establishing a Joint AI Center to concentrate DoD’s AI efforts.⁹⁰

Fund, Enhance, and Incentivize Public-Private Partnerships

The current risk of an “innovation deficit” further erodes the U.S. strategic advantage for the future.⁹¹ The fact much of the AI research and development are informed and funded by the private-sector introduces significant risk for the DoD. First and foremost, DoD competitors and non-state actors enjoy the same access to developing technologies. Smaller forces are likely able to mainstream new technologies well ahead of the U.S., thus undermining potential AI-enabled technologies crossing from private to public. Additionally, many private companies and experts have already demonstrated a reluctance to permit their research from being used for military

purposes.⁹² The DoD must buy down risk by funding more private research, enhancing public-private partnerships, and incentivizing companies to develop *and protect* AI-enabled technologies.⁹³ The DoD efforts such as the Defense Innovation Unit Experimental (DIUx) are significant, but they must be multiplied to forge more intimate partnerships across the potential AI ecosystem.⁹⁴ AI systems are not likely to be optimized for warfighting unless the DoD is a part of the process and can provide lucrative incentives.

Recruit and Preserve AI Talent

Human capital remains the most precious resource of the United States and the DoD. Arguably, the AI global “arms race” is largely a race for AI talent at the moment.⁹⁵ Sharpening the competitive edge requires attracting the top global AI talent and ensuring they are appropriately incentivized to remain in the U.S. as a valued member of the national security team. The best way to recruit is through a superior education and training pipeline, which also provides the benefit of reinforcing intellectual capital within the system. However, the best trained AI talent require competitive and lucrative job offers if the U.S. seeks for them to remain in the states. In addition to recruiting the best AI talent, the DoD and interagency must also look within to capitalize on internal talent. Therefore, the DoD should drastically increase the number of fellowships, scholarships, and subsidies in AI-related fields, while also expanding AI opportunities at DoD sponsored education facilities.

Heighten Ethical and Legal Concerns of Intelligentized Warfare

One of China’s primary differentiation strategies from the U.S. is with the pursuit of more advanced AI applications to inform intelligentized warfare. Whereas most AI researchers from the western world are signatories to the 2015 open letter calling for a “ban on offensive autonomous weapons beyond meaningful human control,” there are no indications Chinese

researchers are experiencing similar concerns.⁹⁶ Furthermore, Chinese efforts to sponsor a strong military-civil fusion may subjugate ethical discussions in the name of national security.

Therefore, the U.S. should heighten ethical and legal concerns of intelligentized warfare on the international stage through mechanisms such as the United Nations in an attempt to bound China's offset strategy to leapfrog the United States.⁹⁷

Summary

The 2018 National Defense Strategy states the U.S., “must anticipate how competitors and adversaries will employ new operational concepts and technologies to attempt to defeat us, while developing operational concepts to sharpen our competitive advantages and enhance our lethality.”⁹⁸ The U.S. must employ a mix of both offensive and defensive competitive strategies to offset China's plans to achieve AI dominance. Offensively, the U.S. should seek to strengthen competitive advantages by rebranding AI to algorithmic warfare, formulating a long-term AI vision and rallying the joint force to prepare appropriately, and incentivizing robust public-private partnerships. Defensively, the U.S. should counter China's AI strategy by protecting and attracting the world's top AI talent to the U.S., while also heightening ethical and legal concerns of intelligentized warfare.

Andrew Marshall is famous for his work on competitive strategies during the nuclear arms race between the U.S. and Soviet Union. In many respects, the quest for an AI competitive advantage is similar to the pursuit of nuclear arms, albeit in a more peaceful setting.⁹⁹ Marshall argued the key to offsetting great power conflict was through a long-term strategic approach founded on what he called net assessment – the identification of U.S. strengths and weaknesses to leverage competitive advantages against potential adversaries.¹⁰⁰ Although it is debatable if the U.S. and China are in the midst of an AI arms race, there is no denying AI has the potential to

revolutionize warfare.¹⁰¹ The U.S. can ill afford to neglect AI's potential impact on the balance of power; it must sharpen its competitive advantage.

Conclusion

Artificial intelligence is seemingly pervading most aspects of life, and the outlook for the future suggests AI will soon be everywhere and in everything. The term artificial intelligence, however, is not indicative of the transformative potential of AI. Intelligence, whether it be in a machine or human, is not artificial at all. Humans have relied on the intelligence and labor of machines for millennia, shifting tasks to machines to focus on other tasks demanding higher cognition and skill.¹⁰² Due to the ambiguous definition and understanding of AI, many alarmists have skewed the discussion of AI integration towards apprehension and fear. AI must be rebranded for the future, focusing instead on the transformative potential of AI to improve every aspect of life from entertainment to national security.

As some security scholars note, “the first nation that adapts [to the changing character of war] and integrates artificial intelligence across the force will have a generational advantage on the battlefield.”¹⁰³ The U.S. and China are leading the world on the development and integration of AI, for now. After review of both nations guiding AI documents, it is apparent both seek to use AI as a strategic competitive advantage; however, their approaches are nuanced by organizational biases and cultural differences. China and the PLA intend to leverage AI in intelligentized warfare while generating cost advantages through a strong state-sponsored military-civil fusion. Conversely, the U.S. and the DoD seek near-term AI benefits as part of the Third-Offset centaur model while relying on incentives to increase public-private partnerships.

The asymmetries between the U.S. and China’s differing AI strategies could result in unexpected, destabilizing dynamics to the global balance of power.¹⁰⁴ Therefore, it is imperative for the United States to sharpen the competitive edge by organizing for the potential of an artificial intelligence arms race. This work recommends the U.S. should rebrand AI to

algorithmic warfare; develop a long-term AI strategy; establish a DoD Joint AI Center; fund, enhance, and incentivize public-private partnerships; recruit and preserve AI talent; and heighten ethical and legal concerns of intelligentized warfare.

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