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THE CASE OF THE U.S. AND CHINA RIVALRY

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ACKNOWLEDGMENTS

We live in a world where change is constant, and much of this change stems from technological advancements that unfold daily. Among these, Artificial Intelligence (AI) has become an integral part of our lives, influencing every aspect, including its burgeoning role in international affairs. AI's influence has expanded so significantly that it now plays a crucial role in shaping global dynamics.

When I embarked on my doctoral studies in 2019, the intersection of AI and international relations was scarcely addressed in academic literature and was predominantly viewed as a technical topic removed from the core discussions of international relations. However, in the following years, AI has emerged as a central theme in the current international order and the intensifying great power competition.

The book you are holding is the culmination of years of doctoral research and effort to bridge AI with international relations and security studies. It not only provides a framework to understand AI's impact on global affairs but also serves as a guide to deciphering the ongoing great power competition between the U.S. and China.

In the formation of this book, I was fortunate to have the support of many. I owe immense gratitude to my advisor, Assist. Prof. Christian Lekon, whose patience, assistance, and encouragement were invaluable. His insightful feedback and steadfast support were instrumental in completing this work. I am also deeply thankful to Prof. Muhittin Ataman, whose guidance transcends the academic realm. His mentorship has been instrumental in my career development and personal growth, serving as an enduring source of inspiration. Without his support, I would not be the person I am today. Concurrently, my sincere appreciation goes to the esteemed members of my PhD committee: Prof. Giray Sadık, Assoc. Prof. Erman Akıllı, and Assoc. Prof. Oğuz Güner, for their invaluable guidance and support.

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LIST OF ABBREVIATIONS

3OS	Third Offset Strategy
A2/AD	Anti-Access/Area-Denial
ABMS	Advanced Battle Management System
ACDP	Advanced Capability and Deterrent Panel
ACE	Air Combat Evolution
ACTUV	ASW Continuous Trail Unmanned Vessel
ADVANA	Office of Advancing Analytics
AGI	Artificial General Intelligence
AI	Artificial Intelligence
AI RMF	Artificial Intelligence Risk Management Framework
AIDP	New Generation Artificial Intelligence Development Plan
AIRC	Artificial Intelligence Research Center
AMASS	Autonomous Multi-Domain Adaptive Swarms-of-Swarms
AMS	Academy of Military Science
APEC	Asia-Pacific Economic Cooperation
ARPA	Advanced Research Projects Agency
ASW	Anti-Submarine Warfare
AUV	Autonomous Underwater Vehicles
AV	Autonomous Vehicles
AWCFT	Algorithmic Warfare Cross-Functional Team
C&ET	Critical and Emerging Technologies
C2	Command and Control
C3I	Command, Control, Communications, and Intelligence
C4ISR	Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance
CAC	Cybersecurity Administration of China
CAE	Chinese Academy of Engineering
CAICT	China Academy of Information and Communications Technology
CAS	Chinese Academy of Sciences
CAT	Country Activity Tracker
CCP	Chinese Communist Party
CDAO	Chief Digital and Artificial Intelligence Officer
CIA	Central Intelligence Agency

CMC	Central Military Commission
CMU	Carnegie Mellon University
CNN	Convolutional Neural Networks
CODE	Collaborative Operations in Denied Environment
CPU	Central Processing Unit
CSTC	Central Science and Technology Commission
CT	Computerized Tomography
DARPA	Defense Advanced Research Projects Agency
DART	Dynamic Analysis and Replanning Tool
DDS	Defense Digital Service
DIB	Defense Innovation Board
DII	Defense Innovation Initiative
DIU	Defense Innovation Unit
DIUx	Defense Innovation Unit-Experimental
DL	Deep Learning
DOD	Department of Defense
DSB	Defense Science Board
ENIAC	Electronic Numerical Integrator and Computer
ESPRIT	European Strategic Programme for Research and Development in Information Technologies
ETC	Emerging Technology Council
FD	Force Development
FDEC	Force Development and Emerging Capabilities
FITAS	Filiation and Insulation Tracking System
GAN	Generative Adversarial Networks
GAO	Government Accountability Office
GDP	Gross Domestic Product
GIDE	Global Information Dominance Experiment
GNP	Gross National Income
GPS	Global Positioning System
HES	Hayat Eve Sığar
HK	Handcrafted Knowledge Systems
IPL	Information Process Language
IBM	International Business Machines Corporation
IC	Intelligence Community
ICBM	Intercontinental Ballistic Missile
IoBT	Internet of Battlefield Things
IPO	Initial Public Offering
ISIS	Islamic State of Iraq and Syria
ISR	Intelligence, Surveillance, and Reconnaissance
IT	Information Technology
JADC2	Joint All Domain Command and Control
JAIC	Joint Artificial Intelligence Center
JCF	Joint Common Foundation

JEDI	Joint Enterprise Defense Infrastructure
KLP	Keeping a Low Profile Policy
LAWS	Lethal Autonomous Weapon Systems
LLM	Large Language Models
LOGSA	Logistics Support Activity
LRRDPP	Long-Range Research and Development Planning Program
MCC	Microelectronics and Computer Technology Corporation
MCF	Military Civil Fusion
MDPW	Multi-Domain Precision Warfare
MFN	Most-Favored-Nation
MIC25	Made in China 2025
MIIT	Chinese Ministry of Industry and Information Technology
MIT	Massachusetts Institute of Technology
ML	Machine Learning
NAI	Narrow Artificial Intelligence
MLAI	Machine Learning and Artificial Intelligence Subcommittee
MMSQ	Maintenance of the Military Status Quo
MOF	Chinese Ministry of Finance
MOST	Chinese Ministry of Science and Technology
MPS	Chinese Ministry of Public Security
MUSV	Medium Unmanned Surface Vessel
NAIAC	National Artificial Intelligence Advisory Committee
NAIIA	National Artificial Intelligence Initiative Act of 2020
NAIIO	National Artificial Intelligence Initiative Office
NAIRR	National Artificial Intelligence Research Resource Pilot
NATO	North Atlantic Treaty Organization
NDAA	National Defense Authorization Act
NDRC	National Development and Reform Commission
NDS	National Defense Strategy
NDU	National Defense University
NIH	National Institutes of Health
NIIDT	National Innovation Institute of Defense Technology
NIST	National Institute of Standards and Technology
NITRD	Networking and Information Technology Research and Development
NLP	Natural Language Processing
NOMARS	No Manning Required Ship
NSCAI	National Security Commission on Artificial Intelligence
NSF	National Science Foundation
NSFC	National Natural Science Foundation of China
NSS	National Security Strategy
NSTC	National Science and Technology Council
NUDT	National University of Defense Technology
ÖBS	Death Notification System (Ölüm Bildirim Sistemi)
ONR	Office of Naval Research

OPFOR	Opposing Forces
OSD	Office of the Secretary of Defense
OSTP	Office of Science and Technology Policy
PLA	People's Liberation Army
ASAT	Anti-Satellite
PLAAF	PLA Air Force
PLAN	PLA Air Navy
PRC	People's Republic of China
QIS	Quantum Information Science
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
RFI	Request for Information
RMA	Revolutions in Military Affairs
RNN	Recurrent Neural Networks
ROK	Republic of Korea
S&T	Science and Technology
SASTIND	China's State Administration of Science, Technology and Industry for National Defense
SCO	Strategic Capabilities Office
SFA	Striving for Achievement Approach
SIIO	State Internet Information Office
SNARC	Stochastic Neural-Analog Reinforcement Calculator
SRI	Stanford Research Institute
SSF	Strategic Support Force
STEM	Science, Technology, Engineering, and Mathematics
THAAD	Terminal High Altitude Area Defense
U.S.	United States
UAE	United Arab Emirates
UAV	Unmanned Eerial Vehicles
UN	United Nations
USAF	U.S. Air Force
USRC	Unmanned Systems Research Center
USSR	Union of Soviet Socialist Republics
USV	Unmanned Surface Vessels
UUV	Unmanned Underwater Vehicles
VISTA	Variable In-flight Simulator Test Aircraft
WTO	World Trade Organization
WWII	World War II
XLUUV	Extra-Large Uncrewed Underwater Vehicles

INTRODUCTION

In recent years, remarkable technological advancements have been achieved, and their profound influence permeates every domain of our lives. These technological breakthroughs have left an indelible mark, affecting our daily routines as well as the most critical realm of national security. Among the array of emerging technologies, Artificial Intelligence (AI) stands at the forefront, not only for its revolutionary impact across these domains but also for its pivotal role as a catalyst for the advancement of other technologies.

AI has made rapid and pervasive inroads into numerous domains, largely owing to its beneficial impacts. However, the story unfolds quite differently when it comes to national security and, by extension, international security. Consequently, in recent years, there has been a proliferation of research dedicated to scrutinizing AI's influence, particularly within the context of warfare and global security. This topic becomes all the more significant given the prevailing dynamics in the international system, characterized by an escalating great power rivalry, notably between the United States (U.S.) and China.

Described as the Fourth Industrial Revolution, AI has transitioned from a concept to a tangible force in our contemporary world.[1] Numerous experts assert that AI should not be viewed merely as a weapon, but rather as an enabling force, a general-purpose technology with a multitude of applications.[2] Kevin Kelly, a renowned technology expert, drew a parallel between AI and electricity, likening AI's role to how electricity breathes life into the objects around us by providing power.[3]

[1] Paul Scharre, *Army of None: Autonomous Weapons and the Future of War,* (New York and London: W. W. Norton & Company, 2018), p. 16; Klaus Schwab, "The Fourth Industrial Revolution," *World Economic Forum* (2016).

[2] Michael C. Horowitz, *Artificial Intelligence, International Competition, and the Balance of Power,* (Texas National Security Review, 2018), p. 39.

[3] Scharre, *Army of None: Autonomous Weapons and the Future of War*, p. 16.

In this vein, AI imbues these objects with intelligence. However, the significance of AI is not solely underscored by technology experts. Prominent world leaders, including figures like Obama, Trump, Biden, Xi, and Putin, have all articulated profound views on the future and importance of AI. Putin, for instance, proclaimed in September 2017 that whoever would lead the AI frontier would wield unparalleled global influence and power and, therefore, would rule the world.[4]

While the origins of AI have been the subject of extensive debate, the year 1956 marked a pivotal moment in AI history with the convening of the Dartmouth Conference and the first coinage of the term "AI." However, it is worth noting that the most significant advancements in AI have materialized in the past decade. These strides can be largely attributed to several key factors, including the abundant availability of big data sources, refinements in machine learning techniques, and substantial increases in computational processing power.[5]

The scope of AI applications is extensive, but this book focuses exclusively on AI's utilization for military purposes, where it is poised to revolutionize warfare and various military activities, including logistics, intelligence, surveillance, and weapon design.[6] In the realm of military practice, AI's potential includes, but is not limited to, the following: (i) AI, employing image-recognition algorithms, can significantly aid in processing and interpreting information. For instance, Project Maven was designed to process and interpret data from videos captured by drones; (ii) AI can enable autonomous operation of various military assets such as drones, planes, ships, and tanks, eliminating the need for human control. For example, the Israeli Harpy drone has achieved full autonomy. Additionally, aircraft like the Air Force Global Hawk and Army Gray Eagle drones can operate with varying degrees of autonomy, requiring human operators only to specify their destinations. This shift towards autonomous systems is expected to replace humans in tasks categorized as "dull, dangerous, or dirty," including prolonged intelligence gathering and analysis, decontamination of chemical weapon-contaminated environments,

[4] "Whoever Leads in AI Will Rule the World': Putin to Russian Children on Knowledge Day," *RT International,* (September 1, 2017), retrieved September 2023, from https://www.rt.com/news/401731-ai-rule-world-putin/.

[5] Ajit Nazre and Raul Garg, "A Deep Dive in the Venture Landscape of Artificial Intelligence and Machine Learning," *Slideplayer,* (September 2015), retrieved from http://slideplayer.com/slide/7002258/; Gregory C. Allen and Taniel Chan, *Artificial Intelligence and National Security* (Cambridge: Belfer Center for Science and International Affairs, 2017), p. 7; Kelley M. Sayler, *Artificial Intelligence and National Security* (Washington, DC: Congressional Research Service, 2020), p. 2.

[6] Kenneth Payne, "Artificial Intelligence: A Revolution in Strategic Affairs," *Survival: Global Politics and Strategy,* Vol. 60, No. 5 (2018), pp. 7-32.

and route clearance for improvised explosive devices;[7] (iii) Lastly, as AI algorithms continue to advance, they may be used for command and control, involving tasks like battle management. AI can analyze vast datasets and provide forecasts to guide human decision-making.

These transformative developments in AI are poised to reshape the nature of warfare in several ways. First of all, the speed of warfare will be pushed to its limits, with AI's capacity to react at machine speed accelerating the pace of combat.[8] However, whether this acceleration will have beneficial or detrimental consequences is a matter of intense debate among analysts.[9] Secondly, the current military structures and organizations will undergo significant changes as new operational concepts, such as swarm drones, evolve. Lastly, a new debate will emerge concerning the balance between quality and quantity in achieving specific AI systems once the software is created.

All in all, it is now widely acknowledged that AI has become a prominent factor in the realm of international relations, especially military affairs. However, the uncertainties that surround AI and *how* it will be used by states have the potential to change the balance of power and trigger an AI arms race between the states.[10] Furthermore, according to some scholars, the diffusion rate plays a crucial role: if the new military technology diffuses slowly, the first country that implements it will have an edge over the other states, but if the technology diffuses rapidly, then the relative advantages of being first diminish.[11]

Regarding AI's future, the second scenario appears to hold more relevance. Nonetheless, in both scenarios, AI is poised to give rise to a security dilemma. This

[7] Mick Ryan, "Integrating Humans and Machines," *The Strategy Bridge,* (January 2, 2018), retrieved September 2023, from https://thestrategybridge.org/the-bridge/2018/1/2/integrating-humans-and-machines.

[8] Allen and Chan, *Artificial Intelligence and National Security*, p. 24.

[9] Paul Scharre, "Autonomous Weapons and Operational Risk," *Center for a New American Security,* (February 2016), retrieved May 2020 from https://s3.amazonaws.com/files.cnas.org/documents/CNAS_Autonomous-weapons-operational-risk.pdf?mtime=20160906080515.

[10] Herbert Raymond McMaster, "Continuity and Change: The Army Operating Concept and Clear Thinking about Future War," *Military Review,* Vol. 95, No. 2 (2015); Dima Adamsky, *The Culture of Military Innovation: The Impact of Cultural Factors on the Revolution in Military Affairs in Russia, the US, and Israel,* (Stanford: Stanford University Press, 2010).

[11] Marvin B. Lieberman and David B. Montgomery, "First-Mover (Dis) Advantages: Retrospective and Link with the Resource-Based View," *Strategic Management Journal,* Vol. 19, No. 12 (1998), pp. 1111-1125; Marvin B. Lieberman and David B. Montgomery, "First-Mover Advantages," *Strategic Management Journal,* Vol. 9, No. 1 (1988), pp. 41-58; Gerard J. Tellis and Peter N. Golder, *Will and Vision: How Latecomers Grow to Dominate Markets,* (New York: McGraw-Hill, 2002).

arises from the inherent challenge of accurately gauging a competitor's progress in AI development, compelling each state to assume the worst about their rival's capabilities. This concept of a security dilemma is intricately linked to the notion of an arms race. In our context, within the backdrop of a political environment characterized by anarchy, the pervasive uncertainty regarding who leads in AI, coupled with uncertainties about a rival's AI prowess, inexorably propels nations into the kind of arms race exemplified by the current competition between the U.S. and China.

There are two primary reasons for the exclusive focus of this book on the case of the U.S. and China. First, as argued by Liff and Ikenberry, the dynamic created by China's remarkable economic growth, increased military expenditure, and modernization efforts has generated a volatile environment that hints at the possibility of an arms race, with the U.S. and China at its core.[12] Despite China's assertions of peaceful and defensive intentions, the U.S. views the situation differently. China's clear objective to counterbalance American military superiority, as explicitly stated in the realm of AI, along with its 110% surge in defense spending in the period between 2008 and 2022 (in contrast to a 14% decrease in U.S. defense spending during the same period), positioning it as the world's second-largest military spender after the U.S., has given rise to what the Obama Administration labeled as the 'Asia Pacific rebalance.'[13]

In contrast, China contends that the U.S. is attempting to thwart its 'peaceful rise.'[14] These policies have culminated in an observable rivalry between the two nations, particularly evident in the realm of AI, where each state's AI security strategy directly targets the other's AI advancements. The second rationale for concentrating solely on the U.S. and China pertains to the significant lead these two nations have established in the field of AI, with other countries trailing far behind.[15]

[12] Adam P. Liff and G. John Ikenberry, "Racing toward Tragedy? China's Rise, Military Competition in the Asia Pacific, and the Security Dilemma," *International Security*, Vol. 39, No. 2 (2014), pp. 52-91.

[13] The State Council, "Full Translation: New Generation Artificial Intelligence Development Plan," *New America* (August, 1, 2017), retrieved from https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/; "SIPRI Fact Sheet: Trends in World Military Expenditure, 2017," *SIPRI* (2018); Michael Green, Kathleen Hicks, Mark Cancian, Ernest Bower, and Victor Cha, *Asia-Pacific Rebalance 2025: Capabilities, Presence, and Partnerships: An Independent Review of U.S. Defense Strategy in the Asia-Pacific,* (Washington, D.C.: Center for Strategic and International Studies, 2016).

[14] Adam P. Liff and G. John Ikenberry, "Racing toward Tragedy? China's Rise, Military Competition in the Asia Pacific, and the Security Dilemma," *International Security*, Vol. 39, No. 2 (2014), p. 53.

[15] James Vincent, "China and the US Are Battling to Become the World's First AI Superpower," *The Verge*, (August 3, 2017), retrieved September 15, 2023, from https://www.theverge.com/2017/8/3/16007736/china-us-ai-artificial-intelligence.

For a better understanding of this great power rivalry, this book leverages Buzan's three models to comprehensively comprehend and analyze the AI arms dynamics between the U.S. and China. Prominent scholars have made various endeavors to elucidate the mechanisms and motivations underpinning arms races,[16] offer historical perspectives on such dynamics,[17] and delve into specific case studies, notably the U.S.-Soviet Union Cold War context.[18] Nonetheless, in line with Buzan's contention, the majority of these attempts have revolved around models elucidating the processes driving states to augment their military capabilities.[19] At this point, Buzan uses two models that dominate the literature (Action-Reaction Model and Domestic Structure Model) and he adds a third model, the Technological Imperative. Buzan posits that these three models should be regarded as complementary, representing "a step towards explanatory theories about the arms dynamic."[20]

RESEARCH QUESTION AND STUDY CONTRIBUTION

As previously touched upon, AI is poised to exert a profound influence on the military landscape, shaping strategies and ultimately redefining warfare itself. It is a well-established fact that major advancements in military technology have consistently amplified the security dilemma; for example, consider the case of nuclear weapons, which introduced uncertainty surrounding military capabilities, the potency of new technology, and its potential applications. Presently, the uncertainties surrounding AI and its military applications have ignited intense debates among military strategists. These debates center on the impact of AI on the conduct of warfare and the level of autonomy entrusted to AI-driven weaponry.

[16] William H. Baugh, *The Politics of the Nuclear Balance*, (New York: Longman, 1984); Colin S. Gray, "The Arms Race Phenomenon," *World Politics*, Vol. 24, No. 1 (1971), pp. 39-79; Samuel P. Huntington "Arms Races: Prerequisites and Results," *Public Policy*, (1958), pp. 41-86; Bruce Russett, *The Prisoners of Insecurity*, (San Francisco: Freeman, 1983).

[17] Paul M. Kennedy, *Strategy and Diplomacy 1870-1945*, (London: George Allen and Unwin, 1983); Grant Tedrick Hammond, *Plowshares into Swords: Arms Races in International Politics 1840-1991*, (Columbia: University of South Carolina Press, 1993).

[18] Colin S. Gray, *The Soviet-American Arms Race,* (Westmead: Saxon House, 1976); Ladd Holist, "An Analysis of Arms Processes in the United States and the Soviet Union," *International Studies Quarterly*, Vol. 21 (1977), pp. 503-528; James Kurth, "Why We Buy the Weapons We Do," *Foreign Policy*, Vol. 11 (1973), pp. 33-56.

[19] Barry Buzan, *An Introduction to Strategic Studies: Military Technology and International Relations*, (London: The MacMillian Press LTD., 1987), p. 74.

[20] Buzan, *An Introduction to Strategic Studies*, p. 74.

However, a noticeable gap exists in the existing literature concerning the repercussions of technological imperative – in our case the AI development – on the international system as a whole, which, as a result, has a direct impact on states' actions. Little attention has been devoted to investigating whether an AI arms race is unfolding and, more importantly, whether it will engender stability or instability within the international system.

Furthermore, the AI field is still in its infancy, and it is not properly incorporated into the security studies. For this reason, this book aims at filling this gap in the literature and bringing new discussions regarding the latest military technologies, which indubitably will have a great impact on warfare and, as a result, on security studies. Within this overarching context, this book endeavors to address the fundamental question: "Is there an ongoing AI arms race between the U.S. and China?" While delving into this central inquiry, the book will diligently explore two additional sub-questions: "What are the driving forces propelling the AI rivalry between the U.S. and China?" and "What is the broader impact of this AI rivalry on these respective states and, by extension, the international system at large?"

THEORETICAL BACKGROUND

As mentioned above, in this book, the primary focus will be on Buzan's three models to gain deeper insights into the rivalry between the U.S. and China. Before delving into a brief explanation of these three models, it is crucial to recognize that Buzan introduces a novel perspective on the concept of an "arms race." In his analysis, Buzan challenges the traditional understanding of an "arms race" as an abnormal state of intense rivalry and fear between nations. Instead, he argues that within an anarchic international system marked by technological progress, investing in military technology is a normal behavior for states seeking self-defense. Buzan questions the dichotomy between normal and abnormal state conduct regarding military technology.

He emphasizes that technological advancements create a necessity for states to continually adapt and enhance their military capabilities. Buzan suggests that viewing the pursuit of military technology as inherently destabilizing is misguided and proposes a new framework called "arms dynamics." This concept encompasses both intense military rivalry (termed an "arms race") and the normal state behavior of improving military technologies to maintain the status quo. Within "arms dynamics," there is a middle ground known as "arms competition," where states modify their military technology and respond to changes made by others

but without the intensity seen in a full-blown "arms race" that could lead to war. To sum up, Buzan's perspective highlights the complexity of state behavior in an anarchic system influenced by technological imperatives.[21]

Focusing on the models proposed by Buzan, the Action-Reaction Model focuses on external factors that drive the arms dynamics. According to this model, states bolster their military capabilities in response to perceived threats from other states. This concept is intricately linked to the security dilemma stemming from the anarchical nature of the international system, where states pose threats to one another, necessitating measures for self-preservation. Within this model, Buzan identifies several crucial variables: magnitude, timing, and awareness. Additionally, Buzan delves into the motives behind state actions, asserting that these three variables are significantly influenced by the underlying motives within a rivalry. However, Buzan contends that this model, on its own, falls short of providing a comprehensive explanation for the arms dynamics. Thus, he emphasizes the need to consider the second model: the domestic structure model.

In contrast to the Action-Reaction Model, the Domestic Structure model posits that internal forces within a state are the primary drivers of the arms race. This perspective does not diminish the relevance of superpower rivalries but underscores the deep institutionalization of the arms race, where domestic factors play a pivotal role. Under this model, Buzan and Herring argue that variables such as the institutionalization of military research and development (R&D), institutionalization of military production, economic management, and the military-industrial complex should be taken into account when analyzing the arms race dynamics.

While each of these models merits individual examination for comprehending the dynamics of arms competition between two states, Buzan introduces a third model that might be more appropriately viewed as the overarching framework within which the other two models are situated rather than as a distinct model itself.

Specifically, Buzan's unique perspective emphasizes the profound impact of technological imperatives on international relations. Buzan asserts that the traditional division between civil and military technology is not always clear-cut. Civil advancements often find military applications, and vice versa, creating a complex interplay between these domains. This underscores that technological progress is not solely driven by the military but carries significant military im-

[21] Buzan, *An Introduction to Strategic Studies*, pp. 70-71; Barry Buzan and Eric Herring, *The Arms Dynamic in World Politics,* (Colorado and London: Lynne Rienner Publishers Inc., 1998), pp. 80-81.

plications. Consequently, states must stay technologically current, a process that sparks further innovations. The Technological Imperative Model, introduced by Buzan, contextualizes this relationship, highlighting that technological advancements create a permanent and deeply structured condition. It sets the technological context within which the other two models operate, akin to how anarchy shapes the political context.

In the context of the Action-Reaction Model, the constant evolution of technology adds uncertainty to the anarchical international system. States worry about their weapon effectiveness and their rivals gaining a technological edge. This compels them to modernize and develop their military capabilities, leading to a cycle of technological competition and, potentially, arms races.

Within the Domestic Structure Model, the ever-changing technology landscape pressures decision-makers to institutionalize military technology development. Arms-producing states prioritize research, development, and production, while non-producing states seek to import modern military technologies. With that said, it is important to state that while many scholars tend to use either the action-reaction model or the domestic structure model, Buzan's argues that these three models should not be considered separately as they do not contradict each other but are best seen as complementary to each other.

These models have primarily been applied to the first three industrial revolutions and the U.S.-Soviet Union (Union of Soviet Socialist Republics, USSR) rivalry of the 1980s and 1990s. However, the emergence of a new industrial revolution and the competition between the U.S. and China, particularly in AI, bring the relevance of Buzan's framework back into focus. This book aims to analyze the ongoing arms dynamics in the context of AI technological development, utilizing the comprehensive framework of Buzan's models to understand the motivations, potential for an arms race, and broader implications of this rivalry.

At this point, it is crucial to emphasize that, currently, various studies predominantly center on a broad examination of the AI arms race between the U.S. and China. These analyses typically adhere to the general concept of the arms race and, at the same time, overlook the critical element of the technological imperative. However, this book introduces a fresh and innovative perspective, aiming to re-evaluate the ongoing rivalry between these two superpowers.

Another important contribution of this book is that it significantly extends the application of Buzan's models beyond their original context of the U.S.-Soviet Union rivalry, marking the first time they have been applied to another ma-

jor great power conflict. This adaptation not only broadens our understanding of these models' applicability across different international rivalries but also highlights the book's novel approach by focusing on unconventional warfare through the lens of AI, diverging from the models' traditional emphasis on conventional warfare. Moreover, the book enhances the existing literature and Buzan's theoretical framework by introducing new analytical metrics, notably the influence of private companies within the Domestic Structure Model. This addition is particularly insightful, as it underscores the pivotal role these entities play in driving technological advancements in today's world, thereby reshaping the dynamics of state interactions and proving crucial for a deeper comprehension of state relations.

CHAPTER OUTLINE

This book is structured into five chapters, accompanied by an introduction and conclusion. The introduction serves to delineate the central research question and articulate the study's contribution. Recognizing the nascent state of AI and the imperative for clarity, the first chapter offers a comprehensive conceptual framework for AI and its diverse applications. This chapter delves extensively into the intricacies of AI, encompassing definitions, historical evolution, and typologies. Additionally, it explores the rationales underlying state investments in AI and their ramifications for modern warfare, which constitutes the overarching theme of this book.

The second chapter meticulously lays out the theoretical underpinnings upon which this book is predicated, affording an in-depth analysis of the three models elucidated by Buzan. Subsequently, the following two chapters (chapter three and chapter four) individually examine the strides made in AI advancements by the U.S. and China, respectively. Employing a similar structure for both chapters, they scrutinize the AI policies and initiatives undertaken by these states, with particular emphasis on the realm of defense. Furthermore, these chapters elucidate the present and prospective AI applications within their respective armed forces.

In the synthesis of the aforementioned components, Chapter 5 scrutinizes the arms dynamics between the U.S. and China through the lens of Buzan's theoretical models. This chapter interlaces the various strands of inquiry undertaken in this study, synthesizing the broader insights and conclusions drawn. Finally, the conclusion serves to recapitulate the principal arguments advanced in the book, drawing upon the cumulative findings. Additionally, it proffers several recommendations and explores the future implications of the ongoing rivalry between the U.S. and China in the domain of AI.

CHAPTER 1

A CONCEPTUAL FRAMEWORK: ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS

Approximately 70 years ago, in the proposal for the Dartmouth Conference, it was boldly stated that the aim of the research was to "proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."[22] Just one year later, during the Dartmouth Conference, John McCarthy coined the term 'Artificial Intelligence' for this modern field, and this started to be widely recognized as the origin of AI. Yet, the Dartmouth Conference did not agree on a specific methodology or theory in terms of AI; it just resulted in a shared vision among the participants that computers can perform intelligent tasks.[23] Despite the fact that this conference was crucial for AI, it took more than half a century for AI to bloom. Currently, AI is impossible to disregard and has been considered to be the Fourth Industrial Revolution[24] and a power force multiplier[25] as it has the potential to transform every realm of human life, i.e., the economy, health, military, etc. Many experts contend that AI is a dramatic game changer and should be considered alongside combustion engine or electricity. More specifically, Kevin Kelly, a technology expert, compared AI with electricity, stating that "just as elec-

[22] John McCarthy, Marvin L. Minsky, Nathaniel Rochester, and Claude E. Shannon, "A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence," *Stanford University,* (August 31, 1955), retrieved December 1, 2019, from http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html.

[23] James Moor, "The Dartmouth College Artificial Intelligence Conference: The Next Fifty Years," *AI Magazine*, Vol. 27, No. 4 (2016), p. 87.

[24] Scharre, *Army of None: Autonomous Weapons and the Future of War,* (New York and London: W. W. Norton & Company, 2018), p. 16; Schwab, "The Fourth Industrial Revolution," p. 12.

[25] James Johnson, "Artificial Intelligence and Future Warfare: Implications for International Security," *Defense & Security Analysis* (2019), p. 2.

tricity brings objects all around us to life with power, so too will AI bring them to life with intelligence."[26] Similarly, Ulrike Franke argues that AI "is not only 'dual-use,' in the sense that it can be used for both civilian and military applications, but 'omni-use,' potentially able to influence all elements of life."[27] However, technology experts are not the only ones who 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 by what Putin stated in September 2017: "whoever becomes the leader in AI, will rule the world."[28]

In the last few years, we have witnessed AI perform activities that only humans can. Furthermore, while human intelligence has been used as a yardstick when trying to understand AI, it can be said that in many cases, AI has outperformed and outcompeted human capacity.[29] Some of the cases that can be mentioned are: driving, image and face recognition, recognizing human emotions, direct translation, speech transcription, writing news or movie screenplays, or even beating the world champions in games such as Go and Chess.

The advances in AI have a pervasive character that has the potential to transform our society, for better or for worse. While it can improve human conditions, AI without any doubt poses a threat to our social structures, economy, and defenses.[30] National security is one of the most affected areas, as AI has emerged as an element of geopolitical competition. Indeed, currently, "AI has applications in cybersecurity, surveillance, defense, border security, disinformation, and economic warfare, yielding major geopolitical advantages to whoever best harnesses these tools."[31] For this reason, especially in the last few years, states have been vigilant about AI and its capability to change warfare. In light of this, more than 60 coun-

[26] Scharre, *Army of None: Autonomous Weapons and the Future of War*, p. 16.

[27] Ulrike Franke, "Harnessing Artificial Intelligence," *European Council on Foreign Relations,* (June 25, 2019), p. 1.

[28] "Whoever Leads in AI Will Rule the World': Putin to Russian Children on Knowledge Day," *RT* (September 1, 2017), retrieved September 2023, from https://www.rt.com/news/401731-ai-rule-world-putin/.

[29] 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 Netherlands: The Hague Centre for Strategic Studies, 2017), p. 30.

[30] Anne Bowser, Michael Sloan, Pietro Michelucci, and Eleonore Pauwels, *Artificial Intelligence: A Policy-Oriented Introduction,* (Washington, DC: Wilson Center, 2017), p. 30.

[31] Paul Scharre, *Four Battlegrounds: Power in the Age of Artificial Intelligence,* (New York: W. W. Norton & Company, 2023)

tries have announced their national AI strategies, and more states and non-state organizations 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 as they have pursued ambitious policies, which are also reflected in their nationalist agendas; the U.S. aims to remain the hegemon on the battlefield, while China aims to leapfrog the U.S. and become the leader in AI by 2030. Russia, on the other hand, seems to be trying to keep up with these two, while the other states are lagging behind. Within this framework, the U.S., China, and Russia (especially the first two) see themselves as competitors and, as a result, have generated national strategies that comply with their aims, but it is important to emphasize that the U.S. national strategy takes as a reference point mainly the Chinese national strategy, and vice versa. For example, in 1963, the Defense Advanced Research Projects Agency (DARPA), the agency of the U.S. Department of Defense (DOD) responsible for the development of emerging technologies for military use, gave a grant of $2.2 million to the Massachusetts Institute of Technology so they could continue their research on AI. This step was taken first and foremost to ensure that the U.S. would stay ahead of the Soviet Union in technological advancements. In a similar way, in its 2018 AI strategy report, the U.S. DOD calls for the immediate need for the adoption of a national AI strategy because "[o]ther 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."[32]

As mentioned in the introduction, this book aims to analyze the AI arms rivalry between the U.S. and China. For this purpose, this chapter will provide the conceptual framework on which this book will be built. First, there will be a detailed analysis of the AI definition, history/evolution, and typology. Later, as this book will focus specifically on the AI application in the military, a brief analysis of how AI is currently used in the military and the challenges that this poses to modern warfare will be provided.

1.1. UNDERSTANDING ARTIFICIAL INTELLIGENCE

Artificial Intelligence as an academic discipline is relatively new; however, just in the past decade, major milestones have been achieved in terms of AI, and currently

[32] "Summary of the 2018 Department of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity," *U.S. Department of Defense,* (2019), p. 5.

Artificial Intelligence (AI) has undergone rapid evolution, not only by penetrating every aspect of our life but also by transitioning from theoretical concepts to foundational components of modern military strategy. This book focuses into the heart of this evolution, focusing on the escalating AI arms rivalry between the U.S. and China. Drawing upon Barry Buzan's theoretical frameworks, this book aims to analyze if there is an AI arms race between the U.S. and China as a part of the ongoing great power competition.

Findings from the study indicate that both countries perceive AI as a pivotal element of future warfare and national security, leading to significant investments in research and development. The U.S., with its historically dominant military-technological edge, seeks to maintain its superiority through innovation and strategic partnerships. Conversely, China's ambitious AI strategy aims to establish its leadership in AI technology by 2030, challenging U.S. dominance and reshaping the global security landscape.

The analysis reveals that rather than an AI arms race where the possibility for warfare should be high, the rivalry between U.S.-China is more an "AI arms competition" with both states not willing to start a direct war with each other, at least for the short term. Furthermore, the study finds out that the AI arms competition between both states is driven by both external threats and internal motivations, however, the technological imperative -which is considered as an independent variable- is the main driving force behind this rivalry. In conclusion, the research suggests that the AI arms competition between the U.S. and China is a defining feature of contemporary international security dynamics, with profound implications for global stability.

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