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The U.S., China, and Artificial Intelligence Competition Factors

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Printed in the United States of America
by the China Aerospace Studies Institute
ISBN 9798485544669

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Preface

As technology continues to progress rapidly, so does its impact on modern warfare. As the world moves deeper into the era of great power competition, this becomes an even more important area to watch. The United States and China are both pursuing high technology very rapidly and with substantial resources. We describe this as a race, but it is one without end (hopefully) and will require endurance, stable policies, and steady funding if the U.S. is to continue to stay ahead of China and all the other competitors around the globe. The field of Artificial Intelligence, or AI, exemplifies this requirement. AI is more than just science fiction, it is science fact, and it progresses every single day. And while a ‘generalized AI’ is far off in the future, practical applications of AI continue to grow. From rapidly combing through imagery, deciphering information for pattern recognition, and controlling swarms of UAVs, the applications for AI in the military and security realm abound. That is why CASI is so pleased to present Ryan Sullivan’s work in this field.

Lieutenant Colonel Sullivan is an Army pilot by trade, who lived and studied at the prestigious Fudan University in Shanghai, China, as an Olmsted Scholar. He was one of just five Army officers selected that year. Ryan has taken his experience in and knowledge of China and combined that with graduate-level work in the field of Artificial Intelligence to deliver an in-depth study of the critical elements of U.S.-China competition in Artificial Intelligence.

Already recognized and receiving attention from the technologists within the military, up to the most senior levels, we are excited to make this work available to a broader audience, who are concerned with all manner of issues that AI will affect, now and in the future. We know you will find this study useful, and potentially a little unsettling, which is just what we are aiming for.

Dr. Brendan S. Mulvaney

Director, China Aerospace Studies Institute

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Acronyms

AAAI	Association for Advancement of AI
AOR	Areas of Responsibility
AGI	Artificial General Intelligence
AI	Artificial Intelligence
AI2	Alen Institute for AI
AI4NDM	AI for Natural Disaster Management
AIFH	AI for Health
AIIA	AI Impact Alliance
AIIB	Asia Infrastructure Investment Bank
AIOIP	China's AI Open Innovation Platform
AIOOP	Artificial Intelligence Open Innovation Platform
AnT	Tencent and Alibaba
APEC	Asia-Pacific Economic Cooperation
API	Application Program Interfaces
ASPI	Australia's Strategic policy Institute
BATH	Baidu, Alibaba, Tencent, Huawei
BCI	Brain Computer Interaction
BRI	Belt and Road Initiatives
BSN	Block Chain-Based Service Network
CAC	Cyberspace Administration of China
CAI	Comprehensive Agreement on Investment
CAICT	China Academy of Information and Communication Technology
CASS	China Academy of Social Sciences
CAS	China Academy of Science
CBDC	Central Bank Digital Currencies
CBPR	Cross Border Privacy Rules
CCP	Chinese Government Party
CCSTD	China Comprehensive Science and Technology Dialogue
CLOUDACT	Clarifying Lawful Overseas Use of Data Act
CMI	Civil Military Integration
CNAS	Center for New American Security
CSET	Center for Security and Emerging Technologies
CSG	China Strategy Group
CT	Counter Terrorism

CTO	Chief Technology Officer
DCEP	Digital Currency Electronic Payment
DCS	Dual Circulation Strategy
DL	Deep Learning
DoD	Department of Defense
DSR	Dirt Silk Road
EU	European Union
FG	Focus Groups
FGAI4AD	AI for Autonomous and Assisted Driving
FGAI4EE	AI for Environmental Efficiency
FGML5G	Machine Learning and 5G
FGQIT4N	Autonomous Networks
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GFC	Global Financial Crisis
ICBC	Industrial and Commercial Bank of China
ICCV	International Conference on Computer Vision
ICT	Institute of Computing Technology
ICT	Information Communication Technology
ICU	Intensive Care Unit
IEC	International Electrotechnical Commission
IoT	Internet of Things
IP	Intellectual Property
IPJO	Integrated Platform for Joint Operations
ISO	International Organization for Standards
JAIC	Joint AI Center
MAIRI	Multilateral AI Research Institute
MCF	Military-Civil Fusion
MENA	East Asia, the Middle East & North Africa
MIIT	Ministry of Industry and Information technology
ML	Machine Learning
MLP	Medium-to-Long-Term Plan for the Development of Science and Technology
MOFA	Ministry of Foreign Affairs
MOOC	Massive Online Open Courses
MOST	Chinese Ministry of Science and Technology
MPS	Ministry of Public Security
MVC	Minimal Visible Consortia

NAIRR	National AI Research Resource
NBIoT	Narrow Bandwidth IoT
NDRC	National Development and Reform Commission
NGO	Non-Governmental Organizations
NLP	Natural Language Processing
NPAA	National Defense Authorization Act
NSC	National Security Council
NSS	National Security Strategy
NSTC	National Science and Technology Council
NUDT	National University of Defense Technology
OCEANIS	Open Community for Ethics in Autonomous and Intelligent Systems
OTA	Office of Technology Assessment
PCT	Patent Cooperation Treaty
PLA	People's Liberation Army
PPE	Personal Protective Equipment
QC	Quantum Computing
R&D	Research and Development
RCEP	Regional Comprehensive Economic Partnership
RF	Russian Federation
SCO	Shanghai Cooperation Organization
SDG	Sustainable Development Goals
SME	Small and Medium Sized Enterprises
SMIC	Semiconductor Manufacturing International Corporation
SSO	Standard Setting Organizations
STEM	Science, Technology, Engineering and Math
TB	Terabytes
TIP	Trans-Pacific Partnership
UNPKO	UN Peace Keeping Operation
UNSC	UN Security Council
USD	US Dollars
USSR	Soviet Union
VC	Venture Capital
WAPI	Wireless LAN Authentication and Privacy Infrastructure
WHO	World Health Organization
WTO	World Trade Organization

Executive Summary (摘要)

The purpose of this research is to examine the critical elements of U.S.-China competition over Artificial Intelligence (AI) norms and determine if the resulting contest is inherently zero-sum. The paper explores Sino-American AI competition through the lenses of values, cohesion, influence, and legitimacy to better understand each nation's positional advantages and identify possibilities for cooperation in bilateral or multilateral engagements. Those engagements will be part of the overall Sino-American struggle for influence within international institutions and standard-setting organizations (SSO) over technical standards and, more importantly, values, norms and ethics guiding AI applications.

This research expands contemporary understanding about the significance of AI in the context of Great Power Competition. It adds to the many recently released U.S. and international AI reports and broader conversations by explicitly drawing out most the critical elements of the U.S.-China AI competition and leveraging Chinese-language sources for deeper context.

The paper assesses that the U.S. is well-positioned to maintain competitive advantage with China in the AI domain. However, American advantage hinges on forming flexible and overlapping alliances based on values and committing the required domestic resources to address legitimate national concerns over science-technology-engineering-math (STEM) education, gaps in domestic manufacturing, obstacles to attracting foreign talent, and ethical concerns over data AI application. If the U.S. does not adapt in these areas, China can quickly narrow the AI gap. Moreover, while the U.S. and China remain the two nations best positioned to benefit from increased adoption of AI across society, this paper concludes that their competition is not just binary for it exists within concentric circles of overlapping international partnerships and agreements. Such an environment is as malleable as it is uncertain for the international community today as all governments struggle with challenges over data privacy, the role of AI-empowered multinational companies, and critical choke points in supply chains that impact the AI industry and threaten national security interests. The importance of global trade, the dual-use nature of AI, and the emergence of technology clusters and critical supply components outside of the U.S., illustrate the complex web that both the U.S. and China must navigate to extend influence to pursue desired objectives with AI.

The monograph establishes that without allies and partners, American AI growth, high technology innovation, and productive economic development will stagnate as many nations address the complexities of data sharing in a world where China will cast an enormous shadow. Cooperating with any nation that shares similar values with the U.S. is essential for expanding the scope and scale of coordination on AI in existing multilateral institutions and new organizations very likely to form in response to AI's increasingly important impact throughout society. If liberal democracies do not establish norms and standards for AI, then China will fill the vacuum. While many view techno-democratic alliances as the best solution for enabling durable AI norms and standards, one must not lose sight of the fact that national interests will not always align, even among liberal democratic allies. After the establishment of a firm base of support for agreeable AI procedures among nations with shared values and norms, the next step should be an outreach to nations with "illiberal values," thus incrementally including them by design. Only after these steps toward a robust collective of like-minded nations might greater collaboration and cooperation with China on AI standards, norms and institutions make sense.

Diverging values between the CCP and liberal democracies represent the greatest obstacle to U.S.-China collaboration or cooperation on AI. Today, the gulf between these values is widening. While AI itself does not have values, competition involving technology is not value neutral. Collaboration between the U.S. and China in AI applications now occurs in academia and medical research; however, national security concerns and growing mistrust between our nations puts even these in jeopardy. The way forward will require clear boundaries and

new mechanisms to address values competition and the resolution of disputes over appropriate AI standards will require innovative approaches to diplomacy. While military-to-military cooperation on humanitarian assistance and disaster relief seem the most likely area for the U.S. and China to find common ground and opportunities to collaborate in the security sphere, in the near-term, the U.S. Department of Defense (DoD) should remain focused on building interoperability with allies to promote data sharing and pursue AI's ethical applications in these alliance and partnership military frameworks. With those agreements, processes, and standards in place, then the potential for future military engagements and outreach involving AI applications with China would prove more beneficial.

AI competition requires a long-term view, one that should consider that the Communist Party-centric values of Xi Jinping and the current rulers of China do not reflect the broader societal values of the Chinese people. Xi will not remain in power forever, and while we may not know who will replace him or when that could occur, change in China will come, and the U.S. should prepare for all possibilities from a position of competitive strength. Only such a position guards against unnecessary and unhelpful conflict and remains open to cooperation, but from a position of advantage that comes from standing with nations aligned on the basis of shared democratic values.

Introduction (导论)

After some four decades of largely cooperative interactions, the U.S. and China find themselves embroiled by what the 2017 U.S. National Security Strategy (NSS) refers to as Great Power competition.¹ Almost four years since the 2017 NSS, the outlines of this competitive dyad are being sketched with deeper etchings at the beginning of the administration of American President Joe Biden and in greater detail through the evolution of policies and practices by the nearly decade-long lead of Chinese President Xi Jinping. In this competitive contest of contemporary Great Powers, both states now focus ever more intently on the quest to attain and sustain leadership in innovative technologies. Among the most critical emerging innovative technologies is that of Artificial Intelligence (AI). The United States and China today compete over the future of AI.

This research monograph focuses intently on a key question regarding Sino-American competition for the future of AI: What are the critical elements of U.S.-China competition to establish global AI norms, and is the resulting competition inherently zero-sum? As AI is a field of fields with applications and implications across society, the research framework for this monograph takes a whole-of-society approach to analyzing and evaluating the struggle for global influence in the evolution and adaptation of AI standards and norms. This monograph proceeds from the contention that the essence of Sino-American competition over the future of AI centers on values, cohesion, influence, and the legitimacy for global leadership in the emerging world order.

In the new world order, competition over the establishment of AI norms is not zero-sum; however, the continued deterioration in mutual trust and bilateral relations will test both the U.S. and China to avoid transactional engagements or challenges to core interests which could escalate AI competition into AI conflict. Hal Brands and Zack Cooper argue that “many American conceptions of the competition with China rest on the false premise that this contest will be neatly bipolar – a replay of the East-West standoff in Europe during the Cold War. A much messier world is taking shape.”² This messiness stems from 21st-century competition, which a report from RAND views as mixed sum, as shared interest and objectives converge in an international system that currently displays elements of unipolarity, bipolarity, and multipolarity.³ AI will play an instrumental role in reshaping the world order and the degrees to which each polarity element exists. Neither the U.S. or China can achieve its objectives alone, and both must seek support from other nations to achieve their desired ends. AI and other emerging technology will empower developing nations and middle powers to play a more prominent role in constructing a world order. Those middle powers, or “third countries, such as India, Indonesia and Turkey,” no longer feel the need “to align entirely with the United States, nor with China, when they can gain by playing Washington and Beijing against each other to produce a “multipolar competition, not a bipolar one.”⁴ This paper assumes that the liberal framework remains intact, and that AI competition will occur in an increasingly multipolar world order.

In his book *Sentient Machine*, Amir Husain defines AI as “the overarching science that is concerned with intelligent algorithms, whether or not they learn from data.”⁵ This paper centers on competition within the scope of narrow AI and not artificial general intelligence (AGI).⁶ Rapid breakthroughs in machine learning (ML) resulted from an open ecosystem that encourages collaboration across platforms, unconstrained by national boundaries. The extent to which those collaborations should continue when the transfer of data, algorithms, and other dual-use technologies directly impact national security, is a central question facing AI competition with China. AI (人工智能) allows China to innovate and surpass the capabilities of other nations rapidly, often referred to in Chinese research as “overtake by changing lanes” (换道超车).⁷ Rapid innovation and focusing on emerging technologies without established global leadership is a way to build comprehensive national power to preserve domestic social stability, create economic and military strength, and protect core interests (核心利益).^{7F} China’s core interests extend beyond borders and into cyberspace (网络空间) via the pursuit of AI norms

that promote cyber sovereignty.⁹ Protecting sovereignty for the Chinese Communist Party (CCP) that appears fragile and insecure, increasingly relying on AI as a means of promoting stability and growth within China to bolster the CCP's legitimacy. As prominent Beijing scholar Wang Jisi notes, the CCP's legitimacy to govern is linked to performance and "the current mainstream view in China emphasizes – party, government, military, then the people...and the Party leads everything."¹⁰ Diverging values and competing national interests between democracies and the CCP amplify AI competition and challenge the U.S. and China to compete below the conflict threshold. Despite breakdowns in bilateral relations, zero-sum conflict is not predestined, as Shanghai scholar Wu Xinbo notes, "promoting pragmatic cooperation and constructive competition, effective management, control of risks, and prevention of major conflicts between China and the United States remains the basic direction of China's diplomacy with the United States."¹¹ Several U.S. scholars and leaders such as Elizabeth Economy and Graham Allison also advocate cooperative approaches to competition by promoting cooperation, coevolution, or rivalry partnerships.¹² Such strategies are hard to imagine in a period of increasingly strained bilateral relations and diverging values, and are likely to fail if the leaders of both nations maintain a binary approach to engagement. This paper explores competition through the lens of values, cohesion, influence, and legitimacy to better understand each nation's positional advantages and identify possibilities for cooperation in bilateral or multilateral engagements.

AI strengthens the CCP's ability to preserve power through expansions of its targeted population programs (重点人口)-and increased surveillance of its people.¹³ The People's Liberation Army (PLA) is the Army of the Party and plays an essential role in domestic security. AI's role in surveilling and suppressing society for the benefit of a ruling entity represents a values conflict and the most significant single obstacle to cooperation on AI norms, rules, and procedures between our nations. As China seeks to export surveillance technology and gain access to international data, a sense of urgency emerges over China's efforts to legitimize its authoritarian governance model and to secure its interests through promoting standards and norms in international institutions. The "China Standard 2035" plan was not released in 2020 as expected. However, the focus on protecting core interests, strengthening emerging industries, pursuing leadership positions in international institutions, and extending global influence in the emerging world order by giving voice to developing nations, appear throughout the current 14th five-year plan (2020-2025), seeking to ensure the international order better represents China's interests, including the Party's values. This paper offers that the U.S. leads the overall AI competition with China, but that China retains the edge in both perceived utility and adaption of AI across society, a result of central planning efforts which better organizes China to promote AI applications at scale. China's competitive advantage results from vast amounts of data generated from mobile payments, the pursuit of digital currency, and the widespread installation of cameras that feed predictive algorithms controlled by the CCP.¹⁴ In contrast, Americans remain mostly distrustful of authority, and mobile payments are less widely accepted. The concern over misinformation and the ethics of algorithms that reinforce desired content for users and increased partisanship will bring AI to the forefront of American discussion but will do little to encourage robust AI adoption. Without significant adoption the U.S. should increase investments in research into alternative means of synthetically generating data or techniques allowing deep learning (DL) to train effectively on smaller amounts of data.¹⁵ Achieving such success requires increased investments in basic research and a cohesive approach to policy and strategy that encourages domestic collaboration and R&D spending while strengthening international partnerships to address gaps or inefficiencies within the U.S. AI ecosystem effectively.

China views national strength as the foundation for global AI competition and Chinese scholars put forward the idea that "without national strength, how can we talk about standards."¹⁶ Military-civil fusion (军民融合战略) represents a cohesive approach to organizing talent and resources around a strategy to address domestic deficiencies, build national strength, and close the overall U.S. advantages in AI. The collaborative nature of AI research and reciprocal interaction by university scholars of AI and related techno-subjects present examples of "win-win" competition for both the U.S. and China. However, the Chinese military's close relationship with

many of China's leading universities and AI-focused companies presents significant challenges to the notion of AI cooperation between the U.S. and China. In particular, the PLA's exploration of brain science and pursuit of "brain control" (制脑权), which they consider the "new high ground" (新的高地), results from collaborations with industry and universities.¹⁷ Coupled with the concerns over intellectual property (IP) theft, espionage, visa restrictions, and export controls, the cohesion chapter explores the inherent risks to U.S. national security of pursuing collaboration and cooperation with China. The Chinese military directly benefits from working with national high technology enterprises such as Baidu, Alibaba, Tencent, and Huawei (BATH) and prestigious universities across China. Many U.S. companies and universities also work with those same Chinese universities through research centers and joint laboratories, generating U.S. national security concerns. China understands its second adapter advantages are dwindling.¹⁸ The open-source nature of AI research could likely end, threatening future Chinese AI development nearly as much as their hardware vulnerabilities and reliance on international firms within the global supply chain. The Chinese 19th National Congress in 2017 directed the requirement to strengthen "basic research" (基础研究) and "applied basic research" (使用基础研究), making universities the focal point of this effort.¹⁹ With a large population and a focused government driving investments, quantity is not the issue in China, but quality remains a concern. Quantity superseding quality applies to the number of sciences, technology, engineering, math (STEM) graduates, patents, research papers, and supercomputers. China is closing the gap, but the U.S. is well-positioned to maintain its advantages, provided America recognizes the importance of attracting top foreign talents and reinvest in STEM and research and development (R&D).

China's approach to AI utilization presents nations of the world with an alternative model to the democratic prosperity narrative. AI also allows Beijing to project its alternative views on power abroad and nurture China's influence among developing nations, which will prove critical when the time comes for China to push for acceptance of Chinese standards and norms. However, influence focuses on China's competing models in overseas markets and AI's role in providing security, economic development, and improved livelihoods for nations. Global concerns over Huawei and regional concerns over Belt and Road Initiative (BRI) represent just some of the problems facing China's overseas forays. The use of AI at home and abroad, while attractive to some autocratic leaders, creates a significant cause for concern in other countries regarding ethical concerns or applications of AI. Lack of transparency in BRI projects and handling of COVID does little to demonstrate to other nations that China will act in good faith or adhere to the standards and norms of most countries. Detention camps in Xinjiang and repression of dissidents in Hong Kong continue to impact Xi's global favorability ratings. However, China's core interests, particularly sovereignty and territorial integrity, remain red lines that stoke conflict rather than competition. The U.S. withdrawal from the Trans-Pacific Partnership (TPP) and refusal to participate in Asia Infrastructure Investment Bank (AIIB) or other China-led initiatives leads one to believe that competing for influence is an area of zero-sum competition; however, the lack of international standards and norms concerning data and ethical applications of AI extend beyond the ability of the U.S. or China to unilaterally impose solutions. Competing for influence gives rise to input from other nations. While the U.S. would appear to possess an advantage based on standing alliances and shared liberal democratic values, data privacy concerns among democratic nations differ widely and offer opportunities for both the U.S. and China to collaborate with other nations on a global solution.

With domestic stability and its emergence as a global power, Beijing hopes to parlay increased international influence and legitimacy to pursue global standards that better represent Chinese values and norms. With the publication of the "Beijing AI Principles" and "Global Initiative on Data Security," the competition for AI norms is underway.²⁰ China's antagonism toward the U.S. as a "technological hegemon" (技术霸权) and Beijing's explicit support for multipolarity highlights the CCP belief that "multipolarity is more sustainable than unipolarity, while less divisive and antagonistic than bipolarity" and that "multipolarity could be less predictable than both unipolarity and bipolarity."²¹ Thus, China may continue to pursue AI norms through the existing global framework but will prepare for the prospects of decoupling if Chinese standards fail to gain acceptance.

The idea of “two systems, three worlds” (两大体系, 三大世界) goes beyond 5G, and Chinese initiatives on satellite navigation and digital currency are other examples where decoupling could occur.²² The importance of shared values and the role of soft and hard power will significantly influence the Sino-American competition over AI norms in the standing liberal, multipolar order. Competition, not conflict, is most likely to occur at a variety of levels. China, and the U.S., for that matter, remain dissatisfied with the current liberal world order. The Chinese perceive a decline in the U.S. desire to lead and an opportunity to reform existing organizations from within. All indications are that China views the UN as central to preserving a liberal order. As a nation that benefitted greatly from the current Westphalian order, China seems unlikely to pursue significant revisions in the structure or composition of the current world order for now. Seeking to work within the framework of the UN and World Trade Organization (WTO), China will promote a governance model that emphasizes sovereignty above all else, and minimize significant value conflicts by pursuing leadership positions and relying on support from sympathetic nations to block unfavorable or undesirable resolutions or actions. In an anticipated multipolar world order, Beijing will champion initiatives such as AIIB, BRI, or the Shanghai Cooperation Organization (SCO) as alternative models for collaboration and non-binding alliances that better represent developing nations. These organizations demonstrate an inclusive approach to membership, which Beijing hopes will validate their legitimacy to lead in an increasingly multipolar world.

The U.S. and China remain the two nations best positioned to benefit from the increasing adoption of AI across society. Competition over AI is not zero-sum, in that both nations will derive value from AI growth, but the benefits are not shared equally. China’s substantial advantages in data and the size of its market lead experts to predict that China will account for nearly half of the estimated \$15.7 trillion that AI will add to the global gross domestic product (GDP) by 2030, and almost double the expected growth in North America.²³ AI’s economic benefits are undeniable, but AI competition with China goes beyond GDP growth and centers on the global diffusion of Chinese values, norms, and standards for AI utilization. That environment is very much undecided, as the international community struggles with challenges over data privacy, the role of AI-empowered multinational companies, and critical choke points in supply chains that impact the AI industry and threaten national security interests. This paper seeks to recognize that collaboration occurs between the U.S. and China and identifies efforts to address security concerns, collaborations, and even cooperation in areas of trans-national challenges that benefit all of humankind. The deteriorating bilateral relationships and mistrust likely prohibit bilateral cooperation in many areas. However, in working with like-minded nations with shared values, the U.S. can promote multilateral collaboration and cooperation opportunities for AI. Such engagements should not exclude China by design. However, the criteria for engagement must clarify that the values shared by democratic nations will help address the ethical concerns over AI and the adoption of technical standards. The current political environment and U.S. actions taken against universities and companies with ties to the PLA leave very little room for military-to-military (mil-to-mil) collaboration on AI, nor did research for this paper discover any indications from Chinese sources of a desire for mil-to-mil engagements. Nevertheless, in focusing on our allies and promoting interoperability, the Department of Defense (DoD) entities must remain aware that collaboration opportunities might arise in various areas of responsibility (AOR) and prepare appropriate guidance and safeguards for units based on current policies.

Starting with the research methodology and literature review, this paper organizes around the four competitive elements: **values, cohesion, influence, and the legitimacy for global leadership in the emerging world order**. Each will be addressed in an individual monograph chapter. The **values** chapter explores the divergence of values between the U.S. and China which surfaces as China increasingly applies AI to surveil, target, and control its population and presents the most significant obstacle to cooperation and even collaboration on AI. The **cohesion** chapter contrasts Beijing and Washington’s strategies to pursue coordinated responses to address challenges ranging from overreliance on global supply chains, competition for talent, and R&D needed to bolster basic research to strengthen the position from which to compete over AI. The chapter on **influence** examines the lack of international consensus on AI standards and the competition to gain access to foreign data and markets to

influence other nations in pursuing collaborative research and policymaking within multilateral settings. Finally, the **legitimacy** chapter looks at AI through the increasingly multipolar world order and the ensuing contest for global leadership. Washington attempts to reestablish its role and fend off Beijing's attempts to establish its legitimacy and promote Beijing's alternative governance model. These competition elements are not zero-sum but permit varying degrees of cooperation or collaboration between the U.S. and China so long as a values conflict does not exist. In competing, the ability to form flexible and overlapping agreements with various nations strengthens the ability to compete while increasing the likelihood of finding ways to collaborate on AI issues that concern global challenges.

Values (价值)

In the 2013 leak of the internal CCP memo known as “Document No. 9”, Party leadership defined “Western constitutional democracy” as the belief that “freedom, democracy, and human rights are universal and external” values and warned the cadre of the life-or-death struggle over “false ideological trends” that imperil Party rule. Beyond the concern of universalism, the memo highlighted the CCP’s concerns regarding the West’s “idea of journalism” and “rejecting the accepted conclusions on historical events” such as Tiananmen.²⁴ Such insecurities and fragility conveyed by the Party in both the memo and the evolution of Chinese values to place the Party above all else highlight a seemingly binary existence between autocracy and democracy. Such competition is not innately zero-sum, but when individuals’ rights are not respected, the prospects for cooperation wane.

This chapter attempts to understand AI competition between the U.S. and China, through the lens of the conflicting values of an authoritarian-centered political system as in China, with the more pluralistic and individualistic focus of liberal democracies like the U.S. that embrace “the rule of law, privacy, human rights, civil rights, civil liberties, and political freedoms.”²⁵ While AI presents tremendous opportunities to advance humanity, concerns over data privacy and the intrusive nature of surveillance applications challenge the values of liberal democracies to strike the appropriate balance between protecting individuals while promoting free markets and the emergence of AI technology. Like Xia Huaxia, GM of Meituan AI Platform, this report proposes that “technology and AI itself have no values, no right or wrong.”²⁶ The benevolent or malevolent application of technologies like AI stems from values infused into them throughout an increasingly connected digital world.

This chapter divides into four sections. The first defines Chinese values as the values of the CCP. The second section focuses on the CCP’s utilization of AI as a means to surveil, target, and control the population to provide the Party with security and stability. The third section examines how conflicting values impede cooperation between the U.S. and China on AI concerns. The final section recognizes the importance of allies in AI competition and the competitive advantage that the U.S. possesses with a broader pool of nations whose values align and share concerns over China’s use of AI to violate individuals’ rights. The importance of values in AI competition should resonate throughout this chapter. While competition over AI is not zero-sum, a competition involving values presents the most significant obstacles to cooperation and collaboration between the U.S. and China.

Defining Chinese Values

In 2006, the CCP first proposed constructing a “socialist core value system” (社会主义核心价值观体系) as part of a grand strategy toward building a “socialist harmonious society” (社会主义和谐社会).²⁷ Hu Jintao spoke during his tenure (2002-2012) of this socialist value system. However, it was not until the 18th National Congress in 2013 at the beginning of Xi Jinping’s second year that those “socialist core values” were explicitly defined as prosperity, democracy, civilization, harmony, freedom, equality, justice, and the rule of law, patriotism, dedication, integrity, and friendliness.²⁸ Chinese historian Cao Yaxin explains that “the first four values concern the nation, the next four are quests of the collective society, and the rest concern the individual citizens.”²⁹ This explanation helps clarify the seeming contradiction between the espoused values and actual implementation; however, Cao’s explanation did not specify where the Party lands along that spectrum. A statement from Xi Jinping during the 19th National Congress in 2014 dispelled any doubt, stating that “a common ideological and moral foundation is a fundamental prerequisite for the survival and development of the Party, the country, and the people.”³⁰ While democratic values champion individual rights, Chinese leaders espouse values that prioritize the Party’s survival over the country and individuals. This prioritization of the collective over the individual explains the CCP’s justification of applying AI in ways and means detrimental to individual rights because it serves the desired ends of protecting China’s core interests. What is suitable for the Party is good for the country and thus useful for its citizens.

Security and Stability for the Party

Deng Xiaoping once remarked, “the overwhelming priority is stability. Without a stable environment, nothing can be achieved, and what has been achieved will be lost.”³¹ Stability was a means of achieving and preserving gains in the era of globalization. However, numerous scholars point to the 2008 Olympics, Global Financial Crisis (GFC), and revelations from U.S. expatriate Edward Snowden as seminal events demonstrating socio-economic vulnerabilities which present existential threats to China’s stability.³² Starting in 2014, China passed a series of laws, which established the means to implement targeting and censorship programs to tighten control under the banner of the nation’s interests. Forty years after Deng, Xi declared stability “an absolute principle.”³³ American political scientist Graham Allison once wrote, “the brute fact is that AI is a powerful tool for autocratic control,” and for those who believe in the unalienable rights of individuals, “China’s embrace of AI represents a marriage made in hell.”³⁴ While AI carries the potential to transform China’s “new infrastructure” (新基建) and address challenges such as poverty alleviation and inequality, this section focuses on the core values that inform the Chinese leadership’s approach to utilizing AI, and demonstrates the conflict with U.S. and democratic values that arise as the Party applies AI to protect its core interests at the expense of individual rights.³⁵

Protect the Party

China’s 2013 “Comprehensive Reform Plan” paved the way for new security and intelligence laws, which expelled Party member Cai Xia viewed as Xi “launching the biggest ideological campaign since Mao’s death to revive Maoist rule.”³⁶ A ban on any discussion of constitutional democracy and universal values was promoted under the banner of “governance, management, service, and law.”³⁷ The Cyberspace Administration of China (CAC) is the principal-agent for implementing the Cybersecurity Law and reports directly to the Central Cyberspace Affairs Commission, headed by Xi.³⁸ As Princeton Political scientist and China skeptic Aaron Friedberg notes, “party officials believe that they are all that stands between continued stability, prosperity, progress, and an unstoppable ascent to greatness on the one hand, and a return to chaos and weakness on the other.”³⁹ Thus, direct oversight of internet policy by the Party to preserve its prominence is likely to remain pervasive as AI tools improve both the capacity and capabilities of cyberspace (网络空间).⁴⁰

Protect China’s Core Interests

Sustaining economic and social development is one of China’s core interests, as outlined by Fudan University’s Shen Dingli. Citing the “China’s Peaceful Development” whitepaper issued by the State Council Information Office in 2011, Shen specifies the other core interests as; national sovereignty, national security, territorial integrity, national unification, political and social stability.⁴¹ Protecting those interests in the “Internet + Supervision” system relies on the national team to support cybersecurity initiatives focused on four critical elements:

- Content
- Infrastructure
- Global security, stability, international orders
- Improvement of government capacities to ensure security in cyberspace, ensure effective services to the population (stability)⁴²

The pursuit of stability through “Internet + Supervision” seeks “the ability to discover and identify industry risks and clues of violations of laws and regulations, and realize the integrated supervision of network management, online and offline.”⁴³ The right of individuals is set aside to protect the country’s core interests and the Party, a values system that contrasts liberal democratic values. However, the formula of sustaining economic growth and improved standard of living continues to mute broader opposition from individuals within China.

Control the Country

In a 2020 speech, Xi remarked that “adhering to the party’s overall leadership is foundational for the country’s prosperity and the foundation for the happiness and wellbeing of the people of all ethnic groups.”⁴⁴ The speech exemplifies the Party’s belief that achieving a “harmonious society” only comes through political order and “stability maintenance.” In a Hobbesian view of the world, AI provides the Party with a tool to exert control over competing interests and groups within the population that challenge the political order and the Party’s authority. Xi’s reforms - which tapped-into Party angst about ethnic unrest in Xinjiang and several domestic terrorist attacks blamed on Xinjiang activists - called for intensified societal surveillance and a clampdown on free expression. When examining AI-powered applications across China, research firm iiMedia found that surveillance accounts for 53.8% of use, followed by finance at 15.8%.⁴⁵ With China purporting to have 904 million internet users and 400 million active internet bloggers producing 30 billion posts on an average day, the sheer scope of surveillance, monitoring, and censoring activities online would be untenable without AI.⁴⁶ The need to control reflects a patriarchal authoritarianism belief that “citizens cannot be trusted, so the government needs to control them.”⁴⁷ For a society with fissures along economic and ethnic lines, AI-driven technology such as the “Social Credit Score,” which aggregates 537 variables across 400 central and local government data sets, redefines what it means to be a ‘good’ citizen in China.⁴⁸ Migrant domestic workers, also known as the “floating population” (流动人口), are perceived by the leadership to invite instability and uncertainty both for those elements of a society transitioning from one region to the next, as well as the government who remain concerned about the destabilizing effect on society. AI provides the Party with the means to track populations’ movement and pursue predictive policing measures to maintain security and stability. The “Real Population Platform” (实有人口平台) is one example of the “Police Cloud” utilizing AI to assist police in the southwestern city of Guiyang. The police focus AI-enabled surveillance tools on “urban villages” where 80% of migrants reside and reportedly 70-80% of crimes occur. Huacheng Technology Company, the developer, promises users “total population control.”⁴⁹

Target the People

The CCP relies heavily on commercial solutions to enhance its Targeted Population Program, which originated in the 1950s and continues to expand its reach and capabilities through AI applications. This section focuses on facial recognition, emotion recognition, and communication monitoring.⁵⁰

Facial Recognition - Megvii’s ‘Sharp Eyes’ project (雪亮工程), which claims their algorithms can support networks of 50,000 to 100,000 cameras, is deployed across multiple provinces, including Xinjiang.⁵¹ These cameras work with the Integrated Platform for Joint Operations (IJOP) to allow police officers to rapidly run facial ID information of those on the street across the central database. IJOP documents indicate that “anyone who deviates from what the Party and its algorithm consider ‘normal’ is considered a possible threat.”⁵²

Emotion Recognition –The expanding application of emotion recognition throughout China raises concerns over the potential detrimental impacts to individuals, especially children. Less known than facial recognition, “emotion recognition technologies purport to infer an individual’s inner affective state based on traits such as facial muscle movements, vocal tone, body movements, and other biometric signals. It uses ML to analyze facial expressions and other biometric data to infer a person’s emotional state.”⁵³ Companies such as Shenzhen’s Semptian and Nanjing-based Xinktech offer software and hardware solutions implemented across three security settings: early warning, closer monitoring after the initial identification of a potential threat, and interrogation.⁵⁴

Communication Monitoring – Both voice and digital traffic are subject to monitoring, and commercial companies continue to develop analytical tools. Chinese firm iFlytek focuses on natural language processing (NLP) and works with the Ministry of Public Security (MPS) on voice recognition protocols to create a national speech-pattern and voice database.⁵⁵ Additionally, the iFlytek website highlights their work to develop keyword-spotting technology to aid the national defense.⁵⁶ Womin High Tech is a lesser Chinese company focused on online

opinion monitoring. Womin scrapes, aggregates, and analyzes online content to provide the CCP with analytics and visualizations to inform decision-making processes, such as the report produced for the CCP regarding online sentiment following the death of COVID-19 whistleblower Li Wenliang.⁵⁷ Womin aspires to use AI to become the ears & eyes, consultants, and assistants to military, government, and enterprises from the company's website.

These AI applications to surveil and target the Chinese population raises ethical questions for westerners and the U.S., highlighting the values-based tensions in competing approaches to AI development. Chinese online mega-shopping platform Meituan's Xia Huaxia believes, "it is the people who use AI technology and companies that use AI technology that should bear the social responsibility."⁵⁸ An attempt at moral justification, perhaps, but it provides insight into the mindset of researchers and industry leaders who directly or indirectly support CCP efforts to target the broader population. Concern over companies providing data to the CCP or working to export surveillance technology explains the recent additions to the entity list and ongoing concerns over the international expansion of Chinese companies such as Huawei, ByteDance, and SenseTime.⁵⁹

Impeding Competition

American (and democratic) values diverge significantly from those prized by China's leadership. They include personal freedom, guarantees of human rights, the rule of law, stability in our institutions, rights to privacy, respect for intellectual property, and opportunities to all to pursue their dreams with minimal state interference.⁶⁰ At their core, these values emphasize individuals' rights, which contrasts the CCP-centric values that prioritize the Party and incentivize actions that benefit the nation, often at the expense of individual rights. These are inherently divergent frameworks for understanding how AI should best be developed and applied in all forms of human life. The frameworks establish that China and the U.S. will mainly compete rather than collaborate or cooperate in the AI space.⁶¹ Understanding the nature of competition starts by acknowledging that competition exists. Competition in and of itself is healthy, and Graham Allison goes so far as to call competition a core American value, utilizing the Olympics as an analogy to argue that competition produces superior performance when running a race alongside a competitor.⁶² For the U.S. to gather the resources necessary to compete with China, the U.S. public perception of AI is an essential variable – one nearly as important as how Americans perceive China and its values. To properly compete in the AI space, popular perceptions of AI must comport with the realities of this technology, or the U.S. will insufficiently harness national power to compete. At present, the American public has several important misconceptions about AI. This section seeks to identify existing challenges that impede the U.S.' ability to formulate an effective strategy to compete with China. These challenges include American public mistrust of AI, public misappreciation of how fast China is progressing in AI applications, the negative implications if China outstrips U.S. capabilities in AI, the degree to which progress in critical AI applications requires government investments rather than commercial ones.

Overcoming Public Mistrust

Public mistrust of AI or other technologies could result from deep-seated cultural values, according to Cornell's Baobao Zhang, who finds that "people often misunderstand what AI and ML are, and instead base opinions on cultural or community attitudes and gut instinct."⁶³ American values and the perceived value of AI and automation drive perceptions on AI, which will shape our ability to compete with China. In a 2018 national survey of internet users, 14% of Americans surveyed were very positive about AI, 27% were somewhat optimistic, and 23% were not very positive. When asked how they felt about algorithms' consequences, 12% were very worried, and 27% somewhat worried. Other key findings, 49% felt that AI would reduce personal privacy, and 32% felt that robots and AI represented a threat to humanity.⁶⁴ These results support London School of Economics professor Patrick Sturgis' belief that feelings about specific advancements vary according to media portrayals and previously held beliefs that "science and technology tend to come into conflict with people's core values," and "obviously, religion is one important marker, but they can be kind of humanist values as well."⁶⁵ Sturgis's comments about

religion and values perhaps present a common threat amongst western democracies. A Pew study found that 60% of respondents in Singapore, South Korea, Taiwan, and Japan believe AI and robotics are good for society. Simultaneously, less than half of those surveyed in the U.S., Canada, and much of Western Europe shared that view.⁶⁶ Overcoming such bias or fears is vital to move forward, as change has come and will only continue as technology adoption rates far outpace public understanding and acceptance of AI applications.

In 2018, Robin Li, Baidu's CEO, spoke about data privacy during the China Development Forum. He triggered an uproar online by suggesting that Chinese people are happy giving up their data privacy for online convenience or efficiency in their daily lives. Noting that "80% of useful data lies in the hands of enterprises," he lamented that "if more of that data can be put together, our capacity to achieve more will rise exponentially."⁶⁷ The exchange reminds readers that this paper focuses on value conflicts with the CCP value system and not a broader value conflict with the Chinese people, whose desire for data privacy and individual rights exists; however, limitations exist on how Chinese citizens voice their concerns and to whom they direct their angst prevent a broader discussion on these matters. Tencent and CCTV conducted a survey in which 80% of respondents from across China are worried that AI will threaten their privacy, and 30% report that they felt the threat of AI in their workplace.⁶⁸ For those in the West, the best course of action is to seek greater understanding and not judge the Chinese people's desires and aspirations while they reside behind the Great Firewall. That said, Robin Li's comments touch on the dual-use nature of data to both enrich and surveil consumers, and that is true across all borders. The "Internet+ Service industry" focuses on social capital in seeking to "upgrade network infrastructure and medical care, expand the supply of quality services, and meet the people's multi-level and diverse needs."⁶⁹ In 2019, China accounted for 16.3% of the world's GDP, but final consumption amounted to just 12.1%.⁷⁰ There is room for growth, and driving domestic consumption is central to the Party's 14th FYP and DCS to stimulate consumption through various means, for which AI will play a central role.

Spurring Responsible Adaptation in the United States

The U.S. Government continues to focus its efforts on maintaining its AI advantage with China – one under duress from the rapidly advancing Chinese AI efforts. A vital part of this effort must be to inform the public that AI technologies are understandable, trustworthy, robust, and safe. Concerns over data privacy and distrust of tech companies and algorithms hinder adoption rates and growth potential. Considering data generated by mobile payments, Chinese citizens spend \$50 for every dollar that Americans spend, which illustrates digitization and network theory's basic principles. If the number of users increases the value of a network (*Metcalf's Law*) and positive feedback loops produce highly connected hubs, whose economic power corresponds to the number of transactions that occur over a digital network (*Barabási's Law*), then China has an advantage.⁷¹ Fudan University's Cai Cuihong describes the modernization process as "social informatization" (社会信息化) and notes that in the information society, information becomes a strategic resource and important wealth for social activities, and the information network technology emerges as the dominant technology to promotes social progress.⁷² In 2018, estimates indicate that China produced 152 million TB of IoT data, compared to 69 million in the U.S..⁷³ That wealth of data, transiting on expanding 5G networks, will fuel China's AI Open Innovation Platform (AIOIP) collaborations between companies and governments to improve autonomous driving, manufacturing, education, healthcare, finance, and construct smart cities. How does the U.S. compete with China's sizeable population and lead in user adoption, generate more data, and build a digital infrastructure to strengthen AI adoption and utilization across society? Neural networks driving DL require computing power and data, but "data is core. That is because once computing power and engineering talent reach a certain threshold, the quantity of data becomes decisive in determining the overall power and accuracy of the algorithm."⁷⁴ Gathering, storing, and transmitting that data across borders face challenges across the values spectrum, which this section address in terms of individual, collective, and national concerns.

Conveying the Utility of AI (Individuals) – Will AI improve everyday citizens’ lives enough to discount privacy concerns and the potential loss of jobs? According to Sinovation Venture’s Kai-Fu Lee, the former president of Google China, AI technical applications will replace 40-50% of jobs in the U.S. over the next fifteen years.⁷⁵ In contrast, a 2018 PwC report offers that AI will displace 26% of jobs in China over roughly the same period, but AI’s income effect will produce 38% more jobs; thus, AI nets China 12% more jobs.⁷⁶ While the PwC report does not forecast U.S. jobs and Lee’s analysis does not address positive gains from income effect, one could assume that the U.S. would also experience an income effect to offset if not overcome the displaced jobs through increased adoption rates. Regardless, that is a large segment of the U.S. workforce, who would then need to retrain, reeducate, or relocate. As an illustration, the three largest Detroit companies in 1990 had a \$36 billion market cap, revenues of \$250 billion, and employed 1.2 million people. Twenty-five years later, Silicon Valley’s three largest companies had a \$1.09 trillion market cap with the same revenue but employed ten times fewer employees.⁷⁷ China envisions a future empowered by AI and robots and succeeds in conveying the significance to its citizens so that despite 53% believing their job will no longer exist in ten years, 91% believe AI will create new jobs. That contrasts with 26% of Americans who believe their job will no longer exist, and only 48% feel AI will provide new jobs.⁷⁸ Through the Future of Work at the Human-Technology Frontier, the National Science Foundation is researching this challenge, but greater transparency and shared understanding of both the public concerns and utility of AI would help shape policy discussions.

Challenges to an Open Society (collective) – The values crisis in America is the most urgent challenge. While not religious or moral, the crisis is over the nature of facts and the acceptable thresholds of free speech in public discourse. In assessing AI risks, Graham Allison points to the “Kissinger’s Specter,” which postulates that “AI threatens an unpredictable revolution in our consciousness and our thinking, and an inevitable evolution in our understanding of truth and reality.”⁷⁹ The 2020 election cycle was a remarkable period in our history, one where tech companies utilized AI to target keywords, censor content, suspend accounts, and ultimately ban individuals and entities from platforms. Big tech companies used similar tactics employed by the CAC; however, this was a free market response by companies empowered by AI, not an authoritarian state’s actions. Such actions do not encourage adoption or offer paths to build up digital networks, nor do they dissuade our rivals who revel in the chaos, transparency and open discourse of American democracy. During the first meeting between China and representatives from the new Biden Administration, Chinese Director of the Central Foreign Affairs Commission Yang Jiechi stated, ‘we believe that it is important for the United States to change its image and stop advancing its democracy in the rest of the world. Many people within the United States have little confidence in the democracy of the United States, and they have various views regarding the government of the United States in China.’⁸⁰ To which, Secretary of State Blinken replied:

“And that quest, by definition, acknowledges our imperfections acknowledges that we’re not perfect. We make mistakes. We, we have reversals we take steps back. But what we’ve done throughout our history is to confront those challenges, openly, publicly, transparently. Not trying to ignore them. Not trying to pretend they don’t exist. Not trying to sweep them under the rug. And sometimes it’s painful. Sometimes it’s ugly. But each and every time we’ve come out stronger, better, more united, as a country.”⁸¹

Such an exchange serves as a precursor for future engagements with the Chinese and competition over values and influence in multilateral organizations and over legitimacy to lead within the international order.

Building Trust (Nation) – When considering applications that could improve public health and safety, Americans are evenly split between those “very willing” and those “very unwilling” to share personal data, while in China, the willing outnumber the unwilling five to one.⁸² The disparity over the willingness to share personal data, in many ways, epitomizes the trust conundrum that the U.S. faces. Trust is hard-earned but easily lost. The U.S. Government must gain and maintain trust with the people while creating AI principles that cultivate technology trust. This trust is necessary to counter misinformation and assure citizens of the legitimate use of their

data. It is safe in both government and industry care and will not be used against consumers to raise insurance premiums for those with a predisposition or specific medical conditions. Transparency is perhaps even more critical, as, in a free and open society, the truth usually emerges, and illicit or unknowing application of AI in society will elicit a negative response, regardless of intentions. For example, the development of an AI-driven “Strategic Subject List” in Chicago to rank 400,000 people to assess future perpetrators and predictors of violence sounds eerily similar to China’s Targeted Population Program.⁸³ Such programs risk severing trust, challenging our values, and failing to deliver on policies that respect their rights of the governed, and “when democracies fail to deliver effective governance or live up to their ideals, authoritarian competitors use those deficiencies to discredit them.”⁸⁴

The Importance of Alliances to the U.S..

AI presents unique global challenges over standards and norms that require collaboration and cooperation amongst nations, even rivals. Despite challenges and conflicts in values, there are opportunities to respond and reshape a future through an international order that will be better equipped to forge policies through collective processes that emphasize democratic values and cooperation among nations that share them. This section focuses on opportunities, framed within the context of competition, to highlight where and how the U.S. could gain at this critical juncture, faced with China’s focus on digital infrastructure and promoting alternative values. To be successful, the U.S. should focus on strategic alliances based on values, and strategic messaging that conveys strength but avoids antagonizing China. The narrative should not dismiss China’s actions and conflicting values. Avoiding transactional exchanges and allowing China to play the victim enables allies to play a more prominent role in the delivery and tone of those messages which seek to bring China to task for human rights violations. This secures their position in the alliance and does not allow China to blame and respond to any single nation.

Values-Based Alliances

Democratic values exist on a spectrum and do not perfectly align from nation to nation, nor are they limited to democracies. However, those values form a basis for trust and goodwill to foster cooperation when differences arise. Democratic values provide not just a competitive advantage over China but represent a strategic advantage through the creation of strong bonds and alliances based on values. Sun Tzu refers to this strategic advantage as *shi* (勢), which represents “a most favorable condition to tilt the scales in our favor.”⁸⁵ The OECD AI Principles and non-binding G20 agreement capture a broader coalition of democratic, capitalist, and human rights-based systems. Such a “Community of Democracies” would require “an explicit commitment to human rights, equity, the rule of law, freedom of speech, a free and independent press, and above all else, the good of humanity.”⁸⁶ Bringing together a broad coalition requires a solid core; thus, the EU-U.S. transatlantic partnership, the emerging Quad, and discussed D10 provide stable frameworks to pursue broader membership.⁸⁷

The Art of Communication

The U.S. should rely more on allies and international institutions, such as the UN, to deliver criticism and press the CCP on human rights issues. Such an approach requires not just shared values and desired end states but close coordination to synthesize and produce statements promptly. If the U.S. is always the loudest voice criticizing the regime and if every infraction meets with aggressive overtures, even our staunchest allies could grow weary and struggle to discern significant issues amongst the white noise. The delivery mechanism and the tone of delivery matter. Trusting our allies, those with shared values, to find their voice and offer broader criticism of China is another means of achieving the desired end of holding the regime accountable. The byproduct of such an approach is the perceived messaging to younger Chinese, as the “worldview they’re exposed to is one in which foreign criticism of the Chinese government is often reflexively thought to be backed by the U.S. government” and criticism of the CCP is viewed as anti-Chinese.⁸⁸

Focus on the role of AI in violating human rights. AI offers a tool for predictive analysis and preemption that encroaches on the rule of law. By 2021, the number of surveillance cameras installed worldwide will reach a billion devices, up from 770 million cameras in 2019, half of which belong to China.⁸⁹ The cost of employing unproven technology exposes individuals to errors in both precision and recall, and “the dramatic expansion of information generated by digital technologies will likely expand the number of people trapped in programs of preemptive control.”⁹⁰ Late in 2020, a UN human rights expert spoke out regarding the treatment of human rights lawyers in China, citing the arrest and disappearance of Chang Weiping, who hid for two weeks in Xi’an before cameras tied to Megvii’s “Sharp Eyes” identified him and facilitated his capture.⁹¹ In a transitioning world order, the U.S. must maintain leadership. However, sometimes, leadership allows others to take the lead in areas that matter, and both the UN and the EU can highlight human rights abuse. Recently adopted, the European Magnitsky Act allows the EU to freeze assets, ban entry, and sanction human rights abusers.⁹²

Keep the Focus on the Party. Freedom on the Net’s analysis ranks China dead last for the sixth straight year, highlighting the threat to free speech and privacy.⁹³ The CAC regularly utilizes “rectification” and “clean-up” campaigns, which for 2019 resulted in 11,000 websites and 737,000 social media accounts and chat group closures for “extremely vile impact on society.”⁹⁴ The rights of individuals is set aside to protect the country’s core interests and the Party, a values system that contrasts liberal democratic values. However, the formula of sustaining economic growth and improved standard of living continues to mute broader opposition from individuals in China. In political competition, “authoritarians have largely played an ‘away game,’ exploiting the fissures in democratic societies while enjoying sanctuary at home.”⁹⁵ The Party’s control over the narrative is not absolute and maintaining pressure to encourage realigning their values to serve the Chinese people better should come from multiple angles. More must be done to provide a coordinated messaging campaign that does not threaten the Party with regime change but denies their ability to deflect criticism as just another baseless attack from the U.S..

When Values and Interests Conflict

Identifying “like-minded” nations to form partnerships based on accepted liberal democratic values is relatively easy. Reaching consensus and maintaining that alliance in the face of coercive tactics from the CCP provides the actual test, as often agreements on principles are non-binding. As Sun Tzu wrote, “Victory can be anticipated, but it cannot be forced.”⁹⁶ In expanding the geographical limitations of traditional alliances, the chance for interests and values conflicting rises, compelling global leaders to seek compromise and focus on unifying objectives. Pursuing a single alliance would not provide flexibility for the U.S. to address all facets of competition with China, as “countries that most fear Chinese military power are not always the same countries that fear its authoritarian influence.”⁹⁷ AI is a multifaceted competition in which a values-based alliance provides one approach for partnering to counter China’s coercive economic practices or exporting illiberal values and surveillance technologies. For many nations willing to join into an alliance or initiative such as the Clean Network, maintaining a relationship with China will remain a significant interest.⁹⁸ Developing organizations that exclude China by design may prove off-putting to some nations who support competition but not conflict. A better approach might be to center the partnerships on democratic values and agreed-upon principles, such as the OECD AI Principles and G20 agreements, which set the conditions for membership based on democratic values and transparency that elude China’s ruling party.

Interests – Establishing a coalition of “like-minded” nations, even democratic ones, may require us to act with “a strong core and flexible interpretation of other priorities...to unify nations behind a shared agenda.”⁹⁹ In *Unrestricted Warfare*, PLA Colonels Qiao and Wang proposed that “under the general banner of realpolitik, in which national interests are paramount, any alliance can only be focused more nakedly on interests, and at times they do not even feel like raising the banner of morality...Which is also to say that there will no longer be any alliances where only morality, not interests, are involved.”¹⁰⁰ The alignment of values will not always be enough

to supersede nation-states' interests. Thus, understanding where interests diverge is essential and could lead the U.S. to seek multiple and overlapping coalitions to address various interests and warrant an expanded network of allies. Hal Brands seemingly agrees with Qiao and Wang, noting that “many European countries have no interest or ability to balance China in the SCS, but they can and will push back against Beijing’s human rights abuses and coercive tactics against democracies.”¹⁰¹ The U.S. does not have to cede power or accept a diminished role in our relations, but must alter its approach to partnerships and to better understand their desired ends.

Data – The U.S. maintains strong protections from government data collection but is weak on consumer privacy. The Europeans focus on controlling business entities and maintain high trust in government data collection practices, exemplified by the General Data Protection Regulation (GDPR), which places significant restrictions on the use of AI and ML.¹⁰² In this way, the EU and China more closely align on data, and China went so far as to use the GDPR as a basis for the draft of its draft data security law.¹⁰³ In 2020 The European Union’s (EU) highest court found that U.S. national security programs violate Europeans’ privacy rights, invalidating one of the world’s most comprehensive data-sharing agreements.¹⁰⁴ To address limited data access, a CSET report noted that “liberal democracies could take a heavy-handed approach of working to eliminate these privacy protections and expand the ease of government and corporate access to training data. This is a high-cost, time-consuming endeavor, in some cases requiring a sacrifice of strongly held democratic values to obtain the benefits of the technology.”¹⁰⁵ Such pursuits or tradeoffs do not benefit values competition with China and could further compromise trust with U.S. allies and, more importantly, the American people. The report suggests that targeted investments in research focused on making ML methods work in data-limited environments could erode China’s extensive data set advantages and reduce friction over data collection and the creation of large real-world data sets. Investing in those techniques while working with allies and the American public to address concerns over data privacy and sharing should remain the primary effort. China should not be the U.S.’s primary concern, as other nations may view U.S. tech giants with access to their markets as more significant threats. Democratic nations must focus on their populations and laws to forward proposals to allies and like-minded nations as possible solutions to both technical and ethical challenges to data collection, storage, and transfer across borders.

Conclusion

Values competition is not zero-sum, but diverging AI values represent the most significant challenge to cooperation and limits the extent to which Sino-American collaboration on AI can continue in some areas. The synergy of economic, political, and technological challenges that AI competition creates demands action. Our nation’s gravest risk is to remain on the sidelines of global leadership and allow the CCP to promote a values system that prioritizes the Party over the nation and its people as a viable alternative to democracy. Failure to address federal data privacy and consumer rights concerns leaves China and Europe as the only two models offering “guardrails against invasive data collection.”¹⁰⁶ Challenges and opportunities in forming alliances and relying on the collective to balance other nations’ interests and needs present opportunities and risks. Regarding China, Graham Allison offers that “while U.S. planners must consider all reasonable contingencies, basing our strategy to meet the China challenge on the expectation that the Chinese economy or political system fails would be a mistake.”¹⁰⁷ Finding ways to cooperate or collaborate would prove beneficial to the collective, but such choices on a state-to-state basis could very well lead to conflict. Attempting to challenge or contain China without allies seems unlikely to succeed in the long term.

This chapter focused on the strategic importance of values in working with other nations to counter China’s malign influence. That influence stems from the CCP’s use of AI to surveil, target, and control their population. Working closely with the PLA and utilizing the National Intelligence Law to call on private companies to provide data on request presents severe challenges to the international community as both the PLA and Chinese companies expand their presence abroad. China’s cohesive approach to innovation seeks to capitalize on dual-use

technologies in building up the economy and its military. That in and of itself would not be a reason for concern if it were not for the values of the CCP and concerns over exporting not only the technology but also the values of the CCP. There are risks of disengagement with China, increasing the likelihood of misperceptions, miscalculation, and confirmation bias in formulating national security strategies. Relying on allies and partnerships to build out an international community to pursue AI global development and mitigate ethical concerns and risks involving data is the best means of competing with China and the way to promote U.S. national interests and build strength through networks of countries who share democratic values.

China does not share those democratic values and, in fact, fears the influence that the spread of western led values might have on its ability to sustain economic growth. AI will play an integral role in China's growth and the rise of the military, whose role as protector of the Party is interwoven with AI applications of surveillance and targeting elements of the Chinese population. The synergistic pursuit of AI that military-civil fusion (MCF) and China's national plans presents an element of cohesion which the following chapter explores in depth. The divergence of values and the interconnected nature of the PLA with China's tech industry and leading research facilities is the greatest obstacle to AI collaboration or cooperation between the governments and militaries of the U.S. and China. Without resolving the value conflict and improving bilateral relations, cooperation even on transnational challenges remains very unlikely outside of multilateral settings where neither the U.S. nor China can afford not to participate for fear of letting down allies or, more importantly, allowing the other to advocate standards, norms, or values.

Cohesion (凝聚力)

The CCP is the central driving force of technological innovation in China. Utilizing mandates and strategic plans for national policy initiatives that generate decentralized execution, the CCP pursues an “all sectors of society approach” (社会各界) to technological innovation and utilization. This approach features cohesion between CCP policies and attendant research and appropriate actions across academia, industry, and the military. Ultimately, this cohesion aims to assure a relatively high return on human and capital investments, strengthening the economy, the military and enhancing the quality of life for all its citizens. The U.S. is likewise wrestling with the role of private and public entities in driving innovation. The U.S. and China face similar challenges which require cohesive efforts to address integration within the AI stack. Most experts appear to agree on the need to coalesce around objectives for R&D investments, STEM education, and the need to address critical supply chain chokepoints. However, for the U.S., the debate over the government’s role in driving innovation within a free-market society is up for debate when dealing with national security concerns over AI competition. Will the market respond to critical component shortages, and if it does, will the response come in time without additional federal funding or incentives? The role of government and, more importantly, the interactions between the defense industrial base and civilian sector companies and universities to improve DoD acquisition processes and improve AI integration within the U.S. military, now trails the cohesion displayed by China’s MCF. That was not always the case, as a CASI report noted that China observed the Soviet Union, Israel, and Japan, but it was “the United States model that they have unquestionably looked to for inspiration.”¹⁰⁸ Perhaps the roles reversed with the advent of AI and software-based technologies which challenge the speed and scale of traditional acquisition models, which the authoritarian model for committing resources around cohesive strategies provides organizational benefits. Additionally, China Academy of Social Sciences (CASS) Zhang Xiaojing credits the 1994 report from the U.S. Office of Technology Assessment (OTA), *Assessing the Potential for Civil-Military Integration*, for taking the lead in developing the concept of civil-military integration (CMI).¹⁰⁹ The OTA report examined the “potential for making greater use of common technologies, processes, labor, equipment, material, and facilities to meet both defense and commercial needs” and notes that CMI “is believed by many observers to be an essential element of a successful U.S. national security strategy.”¹¹⁰ Thus, the significance of MCF is not the role of China’s military in working with the civilian sector, but rather the PLA’s involvement with AI to support the Party’s illicit use of dual-technology to surveil and repress free speech. The military exacerbates the values conflict between the U.S. and China, and that is an important narrative as both nations pursue cohesive approaches to AI competition.

This chapter focuses on the multiple cohesive elements of Chinese society involved in its rapid development of high-end technologies. AI competition is complex, and cohesion addresses a nation’s ability to plan, resource effectively, and execute strategies. China’s top-down driven approach lays out clear agendas through five- and fifteen-year plans, but the execution often falls to regional and local leaders to work with universities and industry to support national policies. Often decentralized execution leads to corruption and inefficiencies, and the 14th FYP indicates a sense of urgency from the CCP to address the previous shortcoming through the development of “secure and controllable” (安全可靠) supply chains and the pursuit of “technology self-reliance” (科技自立自强).¹¹¹ Likewise, the U.S. recognizes the challenges of aligning free market and national security interests to address vulnerabilities in supply chains, recruit global talent and prevent industrial espionage and illicit transfer of critical technology. While many in the West focus on China’s MCF, this paper argues that its AI competitive engine centers on Chinese universities’ role in developing talent, performing basic research, and driving collaboration with domestic and foreign entities. The collaboration enables a whole society approach that is critical for China to reduce its national high technology gap with the U.S. and to enable Chinese leadership in new high technology infrastructure development. Exploring cohesion as a significant element of U.S.-China

high technology competition takes a more in-depth look at what the United States' China Strategy Group (CSG) deems asymmetric competition. The CSG notes that "China plays by a different set of rules that allow it to benefit from corporate espionage, illiberal surveillance, and a blurry line between its public and private sectors."¹¹² That blurry line between its public sectors stems from policies driven by the CCP and creates an allure of cohesion and efficiency for those viewing MCF from the outside. In some cases, the perceived cohesion spurs admiration and even jealousy from nations who desire greater civil-military integration. However, China's system is far from perfect. Fissures appear to exist as the CCP clamps down on China's largest tech companies and their billionaire executives. According to scholars such as Gao Wen from the Chinese Academy of Engineering, China's shortcomings in AI development stem from weakness in basic theoretical research and original algorithms, core AI components, open-source platforms, and high-end talent.¹¹³ At the same time, China possesses advantages in strong policy support, ample data, rich application scenarios, and many young people with potential talent.¹¹⁴ With mistrust or concern over the private sector emerging, the CCP turns to its universities to promote coordinated responses to address basic research deficiencies and achieve breakthroughs in frontier technologies. China's universities appear to play a more central role in MCF, which presents foreign firms and universities in a conundrum over concerns of ties with the PLA and human rights issues stemming from CCP actions. This section uses Gao and other Chinese scholars' thoughts about China's high-tech and AI strengths and weaknesses to understand how China's cohesive approach seeks to overcome disadvantages, build national strength, and close the U.S.'s AI competition gap.

This chapter is broken into three sections. The first section focuses on China's universities to highlight their growing role in educating and recruiting talent, balancing the need to strengthen basic research while working with the commercial sector more interested in applied research opportunities, and then addressing the trade-offs required if the U.S. and China pursue collaboration. The second section focuses on platform competition and China's efforts to promote alternatives to platform leaders from the West to strengthen research efforts between universities and research labs. The final section focuses on the digital pyramid of innovation, bringing together traditional iron triangles to address talent recruitment, R&D, and policies that provide a clear vision and authority to act. Ultimately, this chapter hopes to illustrate that the framework for cohesion in both countries is similar, but how each nation responds to address similar challenges will ultimately determine who succeeds in AI competition.

Universities – The New Center of China's AI Ecosystem

The U.S. NSCAI final report of March 2021 indicates that "China preserves its capital by taking advantage of basic research done by the West so that it can focus more on applications."¹¹⁵ While that was true in the past, all indications from Chinese research demonstrate a deliberate attempt by China to invest in basic research and pursue breakthroughs in "frontier technologies" (科技前沿). Over the last three to five years, the CCP introduced a series of plans and calls for action to place a renewed emphasis on basic research. China's universities are now the focal point for identifying and nurturing the talent necessary to strengthen China's basic research and unifying the industry and military researchers' efforts across shared platforms. This emerging role for universities in China to serve as the nexus for collaboration on emerging technology vastly differs from universities' role in the U.S.. The CSG finds that "while many machine learning tools are widely available and per-unit computing costs have declined, the computing power and data access needed for cutting-edge deep learning research breakthroughs are making it harder for university-based researchers and smaller companies to compete."¹¹⁶ How then can China continue to use universities as a focal point for cutting-edge research? Perhaps it is due to the policy influence of the CCP and commitment to integration within the AI stack. Zhejiang University's Pan Yunhe believes China needs to create two powerful countries within itself: one is an education power and the other a science and technology power.¹¹⁷ He laments that "if China's basic research is lackluster, these two powerful countries will lack important support."¹¹⁸ This section focuses on the importance of universities and education in correcting past basic research deficiencies to support China's aspirations to emerge as an education and S&T power. More importantly, the

section discusses the trade-offs required to enable continued combined research and collaborations, with the risk of directly or indirectly aiding China's military development.

The Power of Education

China's economic growth and rising middle class require a population with a higher education level and job opportunities upon graduation. China produces nearly one-third of the top-tier AI talent, but 56% of those researchers work in the U.S., while 34% remained in China.¹¹⁹ Online education and AI applications play an important role in China's "AI + Education" strategy. They are integral to both the 2018 "Action Plan for AI Innovation in Colleges and Universities" and the 2019 "China Education Modernization 2035."¹²⁰ This section will examine China's emphasis on massive online open courses (MOOC) and STEM education.

Cast a Wider Net. (Quantity) – Kai-fu Lee often talks about the transition from the age of expertise to the age of data. Increased data supply enables China to capitalize on an abundance of AI algorithm engineers to overcome the lack of globally elite AI researchers in pursuing perception intelligence and DL applications.¹²¹ Lee's point highlights that data, paired with an abundance of talent across a spectrum of capabilities, could lead to a competitive advantage for China in AI competition. China may recognize such claims, but research shows a continued emphasis on the need for talent across all AI areas. Zhang Yaqin, President of Baidu, broadly defines talent in three categories; 1) R&D, algorithms, and theory, which are "scarce" or elite talents; 2) making products, including chip design and various systems; and 3) practical talents, which are needed to popularize AI knowledge in universities and even middle schools.¹²² China recognizes the need for elite AI researchers, educators to promote STEM education at all levels, and technical expertise to overcome manufacturing bottlenecks. Research indicates that China experts believe their AI talent deficit exceeds 5 million people, and the current market demand to supply ratio for high-end talent stands at 10:1.¹²³ China recognizes that remedying this deficit requires a two-prong approach to focused investments in higher education STEM programs and broader support to MOOC and vocational training platforms.

- **Improving & Capturing High-Tech Education** – China's universities graduate four times as many STEM students and three times as many computer scientists as the U.S.. Of every ten computer science Ph.D.s graduating in the U.S., three are American, and two are Chinese.¹²⁴ China's success in promoting STEM is offset by the brain drain, where Chinese Ph.D. and elite AI researchers choose to remain overseas following graduation. China wants to focus on its domestic education system, which only enrolls 13.8% of top-tier China AI researchers in Ph.D. programs.¹²⁵ China's 2018 "Action Plan" seeks to significantly improve the independent innovation ability and quality of talent training by 2025. By 2030 guarantee China's rise to the forefront of innovative countries with S&T and talent support from universities.¹²⁶ If successful, this plan would elevate its graduate programs' prestige and broaden the domestic talent pool for high-level AI researchers and future educators.
- **Expanding & Extending High Tech Training Platforms** – On the other hand, Zhou Shupeng, the CEO for Jenvei Technology, an online educational platform for AI and robotics, believes that "talent cultivated by college education doesn't fit the actual needs of industry, the curricula to foster high-end talent is out of touch with real-life practice. The most crucial thing is to cultivate practical talent."¹²⁷ Zhou's contention addresses the need for vocational education to prepare a larger subset of the population for AI impacts on the industrial and agrarian workforces. MOOC provides one solution to retrain and educate the workforce for transitions into new industries and new skillsets in AI. For example, NetEase, a Chinese internet gaming company, started using AI to raise pigs and opened a MOOC to create a population of skilled workers to recruit from.¹²⁸ XAG and Zhonghang Future created another MOOC to capitalize on the need for agricultural drone operations, opening a virtual flight school and 100,000 physical locations across China.¹²⁹

Reverse the Brain Drain (Quality) – China’s action plan for AI in higher education is China’s plan for: optimizing the artificial intelligence technology innovation system in universities, improving the talent training system in artificial intelligence, and promoting the transformation and demonstration of scientific and technological achievements in artificial intelligence in universities.¹³⁰ For China, reversing the brain drain requires producing and retaining talent within its top universities to improve basic research and support Chinese society with applied research for AI applications. Talent recruitment and research improvement go hand in hand with both industry and Chinese government organizations, strengthening national cohesion. In 2020, WIPO ranked China 3rd based on universities’ quality, with Tsinghua, Peking, and Fudan Universities ranking within the top 50 universities worldwide.¹³¹ To improve in this area, the 2018 “Action Plan for Colleges and Universities” focused on two working groups, one for chips and the other for open source and open systems, led by Zheng Nanning from Xi’an Jiaotong University and Zhang Yueting from Zhejiang University.¹³² The universities’ focus on basic theory appears to be paying off in terms of research papers and patent output. In 2021, CS Rankings data on the number of high-level AI papers published scores three Chinese institutions in the top five - Tsinghua (second), Peking (third), and China Academy of Sciences ‘CAS’ (fifth) - with the U.S. placing Carnegie Mellon (first) and Cornell (fourth).¹³³ Additionally, the number of Chinese patent applications surpassed U.S. institutions in 2019, with four Chinese universities in the top ten, among them Shenzhen University and South China University of Technology ranked just behind MIT and ahead of Harvard.¹³⁴ The high placements indicate improvements in basic research and a shifting mindset within China toward the importance of intellectual property (IP) and the development of national standards.¹³⁵ Measuring a patent’s quality is difficult, as the true value of a patent is its ability to protect IP and provide inherent value to an organization. However, Chinese researchers note the wide gap between the U.S. and China in terms of Patent Cooperation Treaty (PCT) applications for AI patents, with the U.S. accounting for 41% to China’s 10% of the international total.¹³⁶

The Everest Plan (珠峰计划) (Solution) – The “Everest Plan for Basic Research in Higher Education Institutions” sets forth the goal of cultivating “the peak of basic research” in order for China to “seize the strategic commanding heights of original innovation.”¹³⁷ The Everest Plan differs from the more broad-based AI action plan in that it explicitly focuses on basic research and tackling the challenges of frontier technologies.¹³⁸ Essential to the success of the plan is the establishment of Frontier Science Centers (前沿科学中心) to promote cross-discipline collaboration and strengthen basic research. Promoting the “double first-class” (双一流) approach refers to developing first-class universities and first-class disciplines. The 19th National Congress emphasized Frontier Science Centers’ role to form special zones for policies and talents.¹³⁹ The Frontier Science Center of Brain Science at Fudan University, the Frontier Science Center for Brain-Brain Computer Fusion at Zhejiang University, and projects to come at Tsinghua and Xi’an Electric are examples of such programs pursuing basic research and “deepening industry-university cooperation and collaborative education” which demonstrates cohesion through policy, funding, and execution of government planning.¹⁴⁰

Striking a Balance Between Applied and Basic Research

China recognizes the gap in basic research with the U.S. and views basic research as the source of technological innovation. The advantages of acting as a late mover enabled China’s AI ecosphere to benefit from both the open research environment and access to a global market that supplies cutting-edge technology. Xi Jinping himself remarked that “core technology is the country’s most important weapon” but that “our current core technology is constrained by others, mainly due to insufficient basic research.”¹⁴¹ Sun Ninhui, Director of the Institute of Computing Technology (ICT) at China Academy of Science (CAS), views the constraints as more self-inflicted than a recent phenomenon resulting from external interference.¹⁴² Sun describes China’s innovation strategies as:

- Re-innovation based on assimilation, absorption, and upgrade of imported technologies.
- Innovation through overtaking on curves.

- Innovation through overtaking via alternative routes.¹⁴³

Sun points out that “alternative routes” are bottom-up but that the government and industry experts favored “re-innovation” and “overtaking on curves,” which reflect top-down, state-backed incremental innovation models.¹⁴⁴ China’s advances in perception AI and pursuit of commercial applications largely overshadowed the deficiencies in basic research and industry competed with academic institutions for talent. This section looks more in-depth at the conflicting interests between Chinese academia and industries, as China strives to address the unbalanced approach to AI research and identify metrics for assessing progress.

Prioritizing Applied Research Over Basic Theory - You Zheng, Tsinghua University’s Vice President, describes applied basic research as focused on primary national needs, especially military needs, and develops core technologies to promote military-civilian integration in AI.¹⁴⁵ Referring to basic research, You Zheng highlights that Tsinghua focuses on two channels: brain science and basic AI theory.¹⁴⁶ Partnering with Chinese tech giant Tencent on perception AI is much more attractive to students and faculty than tackling theory.¹⁴⁷ Jiang Changjun, the Vice Chairman of the Chinese Society of AI, attributes the preference for applied research to the desire to pursue “fast-food research” rather than focus on working hard on “disciplines and theories to form a system and platform that are truly built for intelligence.”¹⁴⁸ China’s struggle to address the basic research challenge stemmed from competing priorities over technology and applied technologies’ commercial appeal. As a result, Chinese tech companies underinvest in R&D, pursuing commercial applications over basic research.¹⁴⁹ In 2019, China increased funding for basic research by 22.5%, but that amounted to just 6% of all Chinese R&D investments.¹⁵⁰ Regarding the competing interests of applied and basic research, Lu Ruqian, an academician at CAS and researcher for the Chinese Academy of Mathematics and Systems Science, believes that Chinese researchers “should open up a road that no one else has walked. Maybe this road is a long walk, but you can’t just stop doing it because others don’t.”¹⁵¹ Lu’s approach requires patience from China. With U.S. sanctions placed on companies such as Huawei and access to critical supply components cut off, it is unlikely that the government or any other element of Chinese society can afford to allow the market time to engage. The preferred approach is for China’s universities, through efforts such as the “Everest Project” and the establishment of Frontier Science Centers, to bear the burden of building China’s basic research capabilities while working with national research centers and national champion companies. As the CSG report noted, the increasing costs of computing power presents challenges to universities, but China’s cohesion allows for government subsidies and focused R&D and shared resource strategies that empower universities to play a central role in MCF.

The Refocused Approach is Working in AI – In 2006, China released its 15-year “Medium-to-Long-Term Plan for the Development of Science and Technology” (MLP), calling for China to become an “innovation-oriented society” by 2020 and a world leader in S&T by 2050.¹⁵² From 2006 to 2015, Chinese contributions to leading AI research papers grew from 23.2% to 42.8%.¹⁵³ In 2017, China published 15,199 AI papers, surpassing the EU (14,776) and the U.S. (10,287).¹⁵⁴ While the EU perennially produced the most papers, the U.S. and now China led in assessed quality of papers produced based on the frequency of citations. Chinese researchers point out that the MLP and AIDP contributed to China’s renewed focus on scientific research related to the AI field and led to 42.1% more output over the past five years than the U.S..¹⁵⁵ Quantity does not always equal quality. In 2019 the Allen Institute for AI (AI2) research assessed that China would surpass the U.S. in producing papers ranked in the top 10% in 2020 and the top 1% of all research papers by 2025.¹⁵⁶ China notes that of the 4130 AI papers in the top 1%, China (1166) and the U.S. (1345) accounted for 60.8% of the total, but quickly add that the U.S. produced 59 of the top 100.¹⁵⁷ Branching out into other categories in 2019, at the Association for Computer Linguistics (ACL) conference on natural language processing (NLP) and International Conference on Computer Vision (ICCV), the U.S. and China far surpassed the submissions for other nations, with China coming in second nearly seven times ahead of the UK. At the 2019 Association for the Advancement of AI (AAAI) Summit, China vastly increased the total number of papers submitted (1,242). However, the acceptance rate of 15.8% came in

second to the U.S. at 20.6%.¹⁵⁸

Collaboration and Investment Dilemma

The March 2021 U.S. NSCAI final report notes that “the relationships between American and Chinese academics, innovators, and markets are deep, often mutually beneficial, and help advance the field of AI. Moreover, it remains in the U.S. national interest to leverage formal diplomatic dialogue about AI and other emerging technologies and to explore areas for cooperative AI projects that will benefit humanity.”¹⁵⁹ The historic openness enables collaboration and sparks competition, a healthy dichotomy among rivals. However, the national security concerns stemming from industrial espionage and illicit IP theft, which could benefit PLA modernization and technological advances, forced the U.S. and allies to reassess the benefits and enhance risk mitigation measures.

In his book *The Sentient Machine*, Amir Husain recounts the U.S. efforts over several weeks in 1945 to use 341 railcars and 16 ships to transfer German V-2 rocket designs out of Europe and back to the U.S.. In contrast to that herculean effort, Husain muses that for Chinese hackers to transfer \$1.4 trillion worth of military advantage today, it would probably only require a malware program and an internet connection.¹⁶⁰ Engagements today are about trade-offs and levels of risk. According to the Chinese Ministry of Science and Technology (MOST) statistics from 2019, the Chinese national key research and development database lists 1260 foreign experts compared to 510 in 2016. Of China’s indigenous national high-tech enterprises, 3.5% had foreign investments.¹⁶¹ China has long relied on access to foreign technology and expertise, but so has much of the world. Should U.S. companies or universities not invest or collaborate on research? What are the limits of those engagements, and who is responsible for safeguarding transactions and protecting digital infrastructure and IP? Those are all difficult questions, which the U.S. CSG examined as “the trade-off between creating risk-tolerant research environments that encourage innovation versus security/espionage risks” to address the “brain drain” challenge. The Zhiyuan Research Institute, Beijing Academy of AI, and joint labs represent three areas where the risk of foreign researchers, businesses, or investors must weigh the trade-offs between collaboration and the potential to support PLA programs indirectly.

Zhiyuan Research Institute (智源研究院) – Established in 2018 by MOST and the Beijing Municipal Government with the objectives of supporting the AIDP, *zhiyuan* refers to the five sources of AI; academic thought, basic theories, top talents, corporate innovation, and development policies.¹⁶² The plan is responsible for:

- Create an innovative AI ecosystem, build Beijing’s open-source platform, and promote open-source algorithms through public data, smart computer programming frameworks, and computing infrastructure.
- Construct a high-level joint lab to address core ethics questions, conduct collaborative research, and promote indigenous innovation.
- Identify and cultivate elite AI talent.
- Establish Beijing as a global hub by strengthening corporate, academic, and institutional cooperation and host global AI summits.

The community plans to identify and induct up to 300 scholars by the end of 2021, with the goal of 100,000 people over the next three years.¹⁶³

Beijing Academy of AI (BAAI) - Established alongside Zhiyuan in 2018, BAAI is a coalition of academic and private sector leaders centered around Beijing and serves as an experimental hub for cooperation working on four research focuses; mathematical foundations of AI, machine learning, intelligent system structures, and chips, and intelligent search and extraction.¹⁶⁴

Joint Labs. The “dual circulation” (DCS) strategy is a new strategy to encourage domestic consumption,

seeks to reduce or eliminate reliance on foreign components, and retains an open market for foreign investments. Continuing to acquire technology and advance research objectives requires the openness long associated with open AI research. The concerns over the relationship between universities and China's military in recent years ended some of those relationships. China makes no secret about universities' importance in addressing basic research deficiencies and the cohesive approach needed to support MCF. A Center for Security and Emerging Technologies (CSET) report identified 42 cases where U.S. companies or subsidiaries trained faculty members at China's "Seven Sons of National Defense," developed curricula, constructed new laboratory facilities, or furnished them with equipment.¹⁶⁵ For example, the report singled out IBM China, which in 2014 partnered with Beijing Institute of Technology (BIT) to build the IBM-BIT Mainframe Excellence Center. In 2018, it added a training program titled "AI for Mainframe Operation and Management." Along the way, IBM added 84 online technical courses for BIT, covering quantum computing (QC), AI, and cognitive computing, among other topics. BIT was just one of eight universities that IBM China partnered with.¹⁶⁶ IBM is not alone, as there are many examples of companies and universities from the U.S., Europe, East Asia, and Australia, for whom access to China's market and elite universities remains a great lure.

Platforms

Platform technologies combine the networking effect of hardware, software, and services to rapidly dominate their sectors.¹⁶⁷ Examples of platform competition between the U.S. and China would be Facebook and WeChat, Amazon and Alibaba, and Google and Baidu. Dominating a sector invites monopolistic behavior, which runs counter to open system pursuits of nations looking to compete and cultivate cohesive AI competition strategies. Both China and the U.S. recognize that platform dominance is a crucial aspect of competition, but experts from both nations point to the other as holding a platform advantage. The central debate over platform competition centers on China's desire for an open platform, vice the American focus on China's entire commercial platform ecosystem. Platforms, as the CSG notes, "rely on network effects to gain momentum and scale, giving Chinese companies a natural advantage as its robust domestic consumer base provides an unrivaled runway for global digital proliferation."¹⁶⁸ Momentum and scale are certainly advantageous for industry leaders in China. However, China also has concerns as Gao Wen points to four distinct shortcomings; technology leadership, system layout, market orientation, and openness.¹⁶⁹ This section examines the two platform strategies within China and the overall challenges to balancing cooperation amidst competition.

China's Two Platforms.

Baidu's Chief Technology Officer (CTO) Wang Haifeng points out that "as technology becomes more advanced, open-source and open platforms will become more important... compared with the United States and other countries, China's AI open source also has a significant gap."¹⁷⁰ Highlighting leadership from Microsoft, Amazon, Facebook, and IBM, Wang notes that China's state champions are progressing, but a single, open platform like GitHub did not exist in China.¹⁷¹ Gao agrees, noting that Chinese account for 36% of the visitors to GitHub, but only 6% of contributors. Gao rationalizes that the English-based platform, under U.S. jurisdiction, discourages some Chinese researchers from contributing due to a lack of English language proficiency or concerns over U.S. interests and control over the platforms.¹⁷² Establishing an open platform for collaboration and research is one challenge; the other is to ensure that industry leaders such as BATH avoid monopolistic tendencies and work within a system to promote cooperation and benefit enterprises of all sizes. This sub-section explores the broader AI Open Innovation Platform system to promote leadership and cooperation amongst entities of varying size and China's pursuit of an organic innovation platform.

AI Open Innovation Platforms (AIOIP) – The notion of "National New Generation Artificial Intelligence Open Innovation Platforms" (AIOIPs) originated in China during November 2017, when MOST endorsed Baidu (for autonomous driving), Alibaba (smart city), Tencent (medical imaging), and iFlytek (smart audio, i.e., natural

language processing).¹⁷³ A fifth AIOIP, SenseTime (smart vision), was added in 2018. In August 2019, the initiative expanded to include 15 AIOIPs, adding categories for vision computing, smart marketing, software/hardware, inclusive finance, video perception, smart supply chain, image perception, cybersecurity, smart education, and smart home. MOST reviews applicants and further expansion into other distinct areas of AI development are possible. However, companies have “to pre-specify a subdomain of AI platform development, which the entity will focus on opening up to a broader array of companies for further interaction and development.”¹⁷⁴ One of the critical tasks for AIOIP is to support small and medium-sized enterprises (SME) entrepreneurship, a critical element of cultivating cohesion in China’s AI ecosphere, where 96% of national high-tech enterprises classify as small, medium, and micro-enterprises.¹⁷⁵

The Open Platform - Huizhi (汇智) – Addressing the platform challenges, Gao Wen put forward the idea of building an open-source innovation platform through Pengcheng Laboratory’s “Brain Cloud” (云脑).¹⁷⁶ Capitalizing on the AIOIP enterprises and MOST support, Gao advocated integrated hardware, software, and application ecologies into the desired ecosystem utilizing software from the *Qizhi* platform. This platform already hosts core members from Pengcheng Laboratory, Beijing Zhiyuan, Peking University, National University of Defense Technology (NUDT), Huawei, Baidu, and many others divided amongst different fields and communities.¹⁷⁷ It is currently operating as a large-scale cluster system with 100P computing power, it runs off U.S. company NVIDIA and Huawei GPU’s paired with Cambrian AI chips but will upgrade to a 1000P machine in 2021.¹⁷⁸ Located in Shenzhen, the units connect to the Tianhe-2 supercomputer at Sun Yat-sen University and Hefei Brain-inspired Computing Center server clusters. Frequently referencing OpenAI throughout his article, Gao emphasizes using the Chinese language and the desire to mirror GitHub and open-source projects in China. There have been more than 300 projects so far led by computer vision, followed by DL and NLP.¹⁷⁹

Barriers to Entry and Competition Challenges

High Barriers to entry and non-competitive practices have long benefitted industry leaders. Competition is useful and essential to spurring innovation and lowering costs to consumers. In the U.S., this high barrier to entry has aided large private sector efforts concentrated in select regions such as Silicon Valley and hampered AI R&D in academia and small businesses. This sets the conditions for AI technology’s future to be shaped by a limited group of stakeholders.¹⁸⁰ Breaking down the barriers to entry for SMEs and regions of the country is essential to providing a concerted response to China’s authoritarian governance system and development.

Barriers to Entry in AI – China’s pursuit of Huizhi and AIOIP to develop an interconnected system to strengthen the platform models for research and build on existing research centers and organizations such as BAAI and AIAA promote collaboration between industry, academia, and government researchers. The shared approach, a public-private partnership to bridge the “compute divide,” is like the National AI Research Resource (NAIRR) recommendation for the United States found in the NSCAI final report. The report presents an interesting argument that “declining per-unit costs of cloud-based computing and the availability of open-source platforms lowered the barriers for access to core ML.” However, that access enabled more sophisticated modeling that requires extensive data, enormous computing power, and powerful hardware and software engineering. Thus, in the end, the lowered barrier to entry effectively limited the number of researchers who could contribute.¹⁸¹ The decreased access is concerning for American universities and SMEs who lack the prerequisites, whose geographic location or lack of a national cloud-like system prevents them from accessing connecting effectively with other researchers, essential data, or limit computing power. The commission recommended that the

NAIRR should be created as a public-private partnership, leveraging a federation of cloud platforms. This construct would provide verified researchers and students subsidized access to computing resources, co-located with AI-ready government and non-government data sets, educational tools, and user support.¹⁸²

Competition Conundrum – As anti-trust concerns arise in the U.S. and Europe over the size and power of

“Big Tech,” China appears to see an opportunity with the EU and U.S. to address these concerns, presumably to its advantage. In November 2020, China circulated a draft of the “Anti-Monopoly Guidelines on the Platform Economy.” Its twenty-four articles emphasize “principles of creating a fair competition order, strengthening scientific and effective supervision, stimulating innovation and creativity, promoting the healthy development of the industry, and safeguarding the legitimate interests of all parties.”¹⁸³ While AIOIP appears to offer a system to prevent monopolistic tendencies, the novel technologies pursued by these companies conceptually overlap with one another, and protecting IP and promoting technical standards will drive competition. However, with 400-800 companies in the middle, AIOIP is instrumental in connecting them and establishing system-wide standards and interfaces which benefit government policies and objectives.¹⁸⁴ As Yuncong Technology co-founder Yang Zhiqiang sees it, those policies focus on crucial common issues and form the top of the pyramid, where the middle encompasses the leading AI companies, but the “foundation of the pyramid is thousands of AI application-oriented companies that solve smaller and more detailed problems, and China is still lacking in this area.”¹⁸⁵ Researchers for DigiChina find that in the United States, the Computing Community Consortium’s 20-Year Roadmap for Artificial Intelligence released August 2019 perhaps comes closest to the AIOIP vision.¹⁸⁶

A Digital Pyramid of Innovation

To compete with China, the U.S. requires broader partnerships for meaningful innovation. This is not news. The U.S. is already taking steps by creating the Joint AI Center (JAIC) and other innovation-focused government organizations with remits and visions beyond the U.S. government. A digital pyramid of innovation incorporates traditional iron triangles of the defense industry supported by a broader base of private sector companies and allied nations, which offer multiple approaches to achieving desired objectives. The NSCAI report finds that:

U.S. experts warn of the danger of AI being used for techno-authoritarian ends, but Washington has not led any new enduring coalition to create democratic alternatives. Current policies amount to a compilation of disparate AI-related activities underway in the federal government. Nowhere can one find a strategy coupled with the organization and resources to win an AI competition and preserve the United States’ AI leadership.¹⁸⁷

This section focuses on the need for AI talent, which the NSCAI regards as the essential requirement for AI, compares R&D investments, and then examines overall policy environments.

The Importance of Attracting Talent

American companies employ 60% of all top-tier AI researchers. Two-thirds of them completed their undergraduate degrees in another country.¹⁸⁸ That point emphasizes Eric Schmidt’s belief that “continuing to draw the best talent here is a core competency for our country, and we should do everything we can to reinforce it.”¹⁸⁹ The importance of attracting talent is especially true when it comes to talent competition with China. If the U.S. rescinded all visas for those researchers originating from China, the U.S. would lose 29% of its top-tier AI researchers, and China would double its numbers. If the U.S. rescinded only Chinese student visas, the U.S. would lose 32% of its top-tier AI students, and China’s numbers would triple.¹⁹⁰ While 53% of the top-tier AI researcher population does not work in the country where they completed undergraduate, just 10% of those graduating in the U.S. go abroad for work.¹⁹¹ While these cited findings do not specify countries of origin, the analysis of undergraduate degrees is compelling when placed in context with China’s struggles to develop “double first-class” programs that retain graduate and Ph.D. students who study in Chinese universities. While the results indicate the U.S. competitive advantage, China continues to make strides, and China’s researchers account for 29% of top-tier deep learning talent in the world.¹⁹² High tech and AI human talent is increasingly a zero-sum competition and one where today the Chinese emphasize recruiting programs while the U.S. manages immigration policies.

Recruiting Programs - The CCP treats talent recruitment as a technology transfer, claiming its talent recruitment programs attracted as many as 60,000 overseas scientists between 2008-2016.¹⁹³ A study from

Australia's Strategic Policy Institute (ASPI) found that provincial, municipal, and district governments are responsible for more than 80% of talent recruitment.¹⁹⁴ Qingdao city alone claims 1,500 recruits over the last five years.¹⁹⁵ The Thousand Talents Program, the most well-known effort, is no longer referenced on official websites and articles, based on a CCP directive in 2018.¹⁹⁶ The international coverage and negative response to the multi-faceted program designed to help China attract foreign talent and encourage Chinese scholars to return home forced a rebranding and more subtle approach. To address talent deficiencies in chip making, China reportedly offers 2 to 2.5 times the average salary and bonus in Taiwan. China claims that nearly 3,000 engineers, or roughly 10% of their semiconductor R&D workforce, came from Taiwan.¹⁹⁷ China continues to increase the number of talent recruitment stations overseas, adding 115 stations in 2018 alone and bringing the total number to around 600.¹⁹⁸ This approach presents additional challenges for U.S. counter-intelligence officials and those responsible for educating the public on the threat of espionage or recruitment by foreign governments, as practices from cities or businesses appear less threatening than an engagement with a national government official.

U.S. Immigration Policies – A 2018 Deloitte study with the National Associate of Manufacturing forecasted the need for 3.5 million STEM jobs by 2025, with more than 2 million likely to remain unfilled due to a lack of “skilled talent.”¹⁹⁹ While a renewed emphasis on STEM in the U.S. may produce results over time, the simple matter is that to strengthen the U.S. AI ecosystem and compete with China, the U.S. needs to continue to rely on foreign talent. America is a nation of immigrants, as Eric Schmidt finds:

*Multiculturalism is arguably our deepest competitive moat in developing technology, protecting the lead that many U.S. firms have built over global competitors. Just as international talent teams within the U.S. firms have been the biggest driver of commercial breakthroughs in the last generation, the primary determining factor for whether the future of technology will be defined in the United States or China in the coming generation is human capital. The ability to attract and retain top-tier talent worldwide drives a flywheel spinning continuously faster in which the best talent comes to the United States to work at the best institutions on the most cutting-edge intellectual property.*²⁰⁰

The number of U.S.-born students enrolled in AI doctorate programs did not increase over the last thirty years.²⁰¹ From 2000-2014 the number of STEM graduates rose 54% in the U.S., compared to 360% in China.²⁰² A survey of undergraduate students from 2017-2018 revealed over one million international students in the U.S. on student visas, 49.7% of those were studying STEM-related fields, and 16.2% were from China.²⁰³ Focusing on student visas is essential, based on recruiting and retaining that talent, transferring them into different immigration programs. While there is always the risk of espionage which must be addressed and mitigated, excluding whole populations of students and alienating talent over loyalty concerns is broad-brushed and rash. A 2019 CSET report indicates that 90% of AI PhD students remain in the U.S. after graduation to work, and more than 80% stay for at least five years.²⁰⁴ This supports a longer study published in 2017 by CRS that found that 72% of all foreign doctorate recipients remained in the U.S. ten years after graduating, with Chinese graduates registering the highest retention rate of 90%.²⁰⁵ The NSCAI highlights the importance of strengthening the AI talent through immigration, offering recommendations to broaden the scope of O-1 visas to emphasize AI talent, grant green cards to graduating STEM students from accredited universities, and creating an emerging and disruptive technology visa, among others.²⁰⁶

Investing in Research and Development

This section looks at over-relying on corporations for investment in R&D, the need for next-generation chips, and the importance of establishing hubs to foster innovative ecosystems. In his work, “The Pitfalls of a Central Bureaucracy,” Xu Chenggang, the Chinese Director of Center for AI and Institutions, notes that R&D plays a

decisive role in long-term economic growth. However, R&D faces serious incentive problems.”²⁰⁷ Regarding AI development, Xu stated in other work that “a state-run system does not work in AI development” as the government “decides how to allocate resources in all aspects.”²⁰⁸ Could such a single-handed approach prove beneficial to China in the short term but represent a near-sighted strategy for long-term AI competition with the U.S.? On the other side, the NSCAI recommends, “The United States— through government leadership in partnership with industry and academia—must increase the diversity, competitiveness, and accessibility of its AI innovation environment. That begins with a substantial infusion of new R&D dollars.”²⁰⁹

Overreliance on Corporations – Over the last fifty years, the U.S. saw its share of global R&D fall from 69% to 28% while sustaining investments at 3% of GDP.²¹⁰ The decline in global share indicates an increase in spending from other increasingly wealthy nations, notably China. The numbers reveal a decrease in defense spending and an increase in commercial sector investments. In total, China’s R&D investment stands at 2.23% of its 2019 GDP, with corporate R&D expenditures accounting for 76.4% of national expenditures and 68.5% of its growth.²¹¹ In 2018, U.S. companies contributed 70% of R&D funding. Ranking the 2500 worldwide largest R&D investors, the Global Innovation Index, China came in second with 536 companies, trailing only the U.S. with 775.²¹² U.S. software and service companies contributed \$77 billion investment alongside \$16.9 billion from venture capital (VC) and private equities. Chinese companies provided \$12 billion, exceeded by VC and private equity contributions of \$13.5 billion.²¹³ Zhang Xiaojing notes that although VC is “the pioneer of technological innovation,” VC relies on government support and “often enters after government invests and assumes the uncertainty and high risk of innovation. It is industrial policy rather than the free market that promotes innovation” in China.²¹⁴ China’s hand in hand approach to investing and CCP willingness to assume initial risk demonstrates a committed and cohesive approach to innovation through R&D. The NSCAI criticized what it perceived as a U.S. “passive national approach that relies too heavily on the private sector to drive innovation and determine research agendas—and that presumes commercial innovation can simply “spin-in” to become government applications— will not win this strategic competition.”²¹⁵

Next-Generation Chips - The decision to design computer chips in-house and outsource fabrication to Taiwan and South Korea has kept chip costs down but negatively impacts both the U.S. and China. China appears to have recognized the risks earlier and implemented the National Integrated Circuit Plan in 2014.²¹⁶ But since then, China has fallen far short of investing the planned \$150 billion into the semiconductor industry.²¹⁷ The 2021 U.S. National Defense Authorization Act (NDAA) created a subcommittee of the National Science and Technology Council (NSTC) to develop a “National Strategy on Microelectronics Research.” It also proposed the “CHIPS for America Act” and “American Foundries Act of 2020”, but these are not yet appropriated programs. If the U.S. funds either act to the levels recommended by the NSCAI, the total of \$12 billion would still pale compared to Chinese investment goals.²¹⁸ In light of U.S. sanctions, China reenergized its investments and seeks to meet 70% of China’s domestic demand by 2025 and reach industry-leading standard levels by 2030.²¹⁹ Those timelines do little to address current Chinese supply chain issues with computer chips and do not explicitly address breakthrough technologies such as high-temperature semiconductors that conduct electricity with zero resistance and faster speed or biochips that have the potential to leapfrog silicon-based hardware.²²⁰ For the time being, Huawei is forced to replace TSMC 12nm chips with 14nm chips from China’s Semiconductor Manufacturing International Corporation (SMIC) once their current stockpiles run out in 2021.²²¹ While the two may cooperate on the 7nm process, success is not guaranteed. Regardless, the U.S. should pursue a strategy to remain two generations ahead of China in state-of-the-art microelectronics and maintain multiple sources of cutting-edge microelectronics fabrication.²²²

Hubs. The clustering of technology firms in regions like Silicon Valley drives innovation by expediting knowledge sharing and sharpening domestic rivalry. However, this trend benefits some regions and demographics more than others. More than 90 percent of U.S. innovation sector job creation occurred in just five major coastal

cities between 2005 and 2017.²²³ China's policy environment continues to improve, with tax reduction and exemption policies related to R&D investments and expenses fueling corporate investments. China now hosts seventeen of the top 100 S&T clusters globally, and both the clusters along the Shenzhen-Hong Kong-Guangzhou corridor and Beijing rank second and fourth.²²⁴ Additionally, China established AI pilot zones in Beijing and Shanghai and plans to open another 18 by 2023.²²⁵ These focused areas fuel inter-city and inter-region rivalries over talent and industry, which led regions like Beijing-Tianjin-Hebei and Yangtze River Delta to increase R&D investments by 14% and 12.9%, respectively.²²⁶ To enhance U.S. competitiveness, the CSG recommended investing in more affordable R&D hubs outside of Boston and the Bay Area while expanding access to the S&T infrastructure.²²⁷

Clarity of Vision, The Power to Act

China's vision for establishing AI hubs and interconnected centers of excellence benefits from a determined policy environment that provides guidance and allocates resources. The resulting momentum supports establishing frontiers, which American anthropologist Anna Tsing remarks, "are not just discovered at the edge; they are projects in making geographic and temporal experience." Frontiers are places where one goes to see and build the future, and to erase certain pasts.²²⁸ China's frontiers are built upon a new infrastructure and provide cohesive environments for experimental policies, investments, and innovation. The Chinese National Development and Reform Commission (NDRC) described three segments. The first is the information infrastructure represented by 5G, data centers, artificial intelligence, and cloud computing. The second is the integrated infrastructure represented by intelligent transportation and smart energy. The third is the innovative infrastructure such as major technology and industrial technology.²²⁹ The U.S. NSCAI report finds that "To retain its innovation leadership and position in the world, the United States needs a stronger government-led technology strategy that integrates promotion and protection policies and links investments in AI to a larger constellation of related emerging technologies."²³⁰ This seemingly implies that an approach similar to China's model might enhance U.S. competitiveness. This section looks at China's modernization efforts and concerns from Chinese researchers to determine if China's cohesive approach is effective or if the CCP is limiting China's AI potential.

Should the Party Drive? The AIDP, put forward by the State Council in 2017, receives much of the credit for China's perceived ongoing AI progress. Nevertheless, China AI scholars argued that promoting national innovation through "top-level design" more often creates incentives that hinder innovation. Their statements align with Gao's assessment that "China has made little significant improvement in the last two short years when it comes to basic research, algorithms, or core AI components."²³¹ Both Deng Xiaoping and Xi Jinping wrestled with theoretical contradictions concerning the role of the state in technological development, choosing to adapt "scientific policymaking" and integration of science and technology into governance as a means to "imbue political decisions with a sense of objectivity."²³² In speaking about MCF, Xi remarked that "we must use mechanism and policy system reform as a starting point to resolutely remove barriers, break the ice, and break institutional barriers and interests, to build a complete system geared toward military-civilian integration."²³³ This system of integration focuses heavily on Party oversight and influence throughout SOEs and private businesses. A CSIS report found that up to 10% of the CCP Central Committee's alternate members are leaders of the largest SOE such as Sinopec and Industrial and Commercial Bank of China (ICBC), ensuring these companies play vital roles in the national agenda.²³⁴ The politburo also looks to fifty Chinese billionaires, such as Lenovo's CEO Yang Yuanqing, for advice.²³⁵ Such a top-heavy approach and the often-heavy-handed responses to failures by state-owned and private Chinese enterprises often leave regional and municipal governments, along with private enterprises, to interpret Beijing's intent. While Beijing does favor "national champions" and supports its SOEs, there are competition elements, like the military innovation theory of interservice rivalry, where Beijing pits private and regional or local governments against each other, often amplifying corruption and ill-advised investments to secure projects and win Beijing's favor for supporting the national agenda. While such competition

can return spectacular results, in recent years, it more often has led to excess waste and failures. As an example, NDRC spokesman Meng Wei discussed recent efforts to break the reliance on foreign microelectronic chips, which led to “some companies with insufficient knowledge of integrated circuit development blindly entering into projects,” which resulted in “stalled construction of individual projects and vacant factories, resulting in wasted resources.”²³⁶ Separate projects of this kind in Wuhan and Chengdu shut down in 2020, resulting in billions of U.S.D losses.

Modernization – Internet of Everything (Ecosystems). Fudan University’s Cai Cuihong describes the modernization process as “social informatization” (社会信息化) and notes that in the information society, information becomes a strategic resource and substantial wealth for social activities, and the information network technology emerges as the dominant technology to promotes social progress.²³⁷ In 2018, estimates indicate that China produced 152 million terabytes (TB) of internet of things (IoT) data, compared to 69 million in the U.S.²³⁸ That wealth of data, transiting on expanding 5G networks, will fuel the AIOIP collaboration between companies and governments to improve autonomous driving, manufacturing, education, healthcare, finance, and construct smart cities. With the Chinese government investing \$1.4 trillion over six years to rollout 5G nationwide,²³⁹ the Ministry of Industry and Information Technology (MIIT) forecast 600,000 5G base stations at the end of 2020 to service the more than 50 million 5G subscribers as of March 2020.²⁴⁰

- ***Manufacturing*** - “Internet + Production” seeks to harness IoT and big data to enable the real economy to drive development in the digital economy and accelerate intelligent manufacturing adaptation.²⁴¹ A report from the U.S.-based McKinsey Corporation indicated that AI-led automation could increase annual GDP growth by up to 1.4%, depending on the adoption speed.²⁴² With concerns over gender imbalance and an aging population, China’s investments in automation are significant. A report from Stanford-New America DigiChina Project highlights that the Ministry of Industry and Information Technology (MIIT) expected China to adopt more than 1 million industrial robots in 2020, which will create more than 200,000 jobs for new job categories such as robot operators and maintenance personnel.²⁴³ In preparation for this shift toward automation, the number of vocational schools offering industrial robot-related courses increased from two in 2013 to 634 in 2019.²⁴⁴ The CSG also points to automation as a critical component for repatriating \$600 billion in U.S. manufacturing, reducing dependence on China, and adding a more robust base of middle-class American jobs, estimated between 3-4 million.²⁴⁵
- ***Smart Cities.*** China’s focus on smart cities reflects the collaboration between provincial, municipal, and industry leaders to create test beds for new technologies. According to SOSi, China has 800 smart cities pilot programs underway or in development, which would account for more than half the world’s total.²⁴⁶ Capitalizing in 5G infrastructure investments, an area of 1 square km can host 1 million 5G connections across narrow bandwidth IoT (NB-IoT) terminals, which are small in size, low in power consumption, and could be installed in public areas such as street lights, water meters, maintenance hole covers, etc.²⁴⁷ Interestingly, the SOSi report highlights that smart city development in China is primarily top-down driven and no longer decentralized after bureaucratic overlap issues. The report estimates the market at \$1.1 trillion, with a projected 33% compound annual growth rate through 2022.²⁴⁸ China highlights this technology as a strategic opportunity for firms to expand into overseas markets, with 34 firms exporting tech to 106 countries, including the U.S..²⁴⁹

Novel Technologies. The 13th FYP (2015-2020) set out several goals to focus on technological development; China would strive to develop quantum communications and quantum computing, brain science and brain-like research, cyberspace security, and new-generation AI.²⁵⁰ While China achieved success in cyber and AI, this section focuses on the next wave of breakthrough technology which China strives to reach before 2030.

- **Quantum Computing** – Along with seeking to develop general-purpose QC abilities, the 13th FYP laid out several specific QC objectives to develop metropolitan, intercity, and free space QC technologies. Funding from 2016-2019 for QC was \$337 million and continued a series of investments, first provided during the 11th FYP (\$150 million) and 12th FYP (\$490 million).²⁵¹ In 2017, a Chinese satellite sent an ultra-secure, unhackable transmission of intertwined quantum particles from space to ground stations 1,200 km away.²⁵² As of 2019, China had more supercomputers ranked in the top 500 than the U.S. and EU combined.²⁵³ In 2020, China tested the Tianhe-3, an exascale supercomputer prototype 200 times faster and had 100 times more storage than the Tianhe-1 supercomputer, China’s first petaflop supercomputer launched in 2010.²⁵⁴ The U.S. Department of Energy plans to launch its first exascale computer in 2021 and notes that these technologies complement each other more than they compete.²⁵⁵ The Tianhe-3 will provide computing services to users in China and overseas, linking more than 30 organizations and over 50 apps in fields of large aircraft, spacecraft, new generation reactors, electromagnetic simulations, and pharmaceuticals.²⁵⁶
- **AI 2.0** - AI 2.0 searches for breakthroughs in five new areas of AI in hopes of generating ideas not thought of by foreigners. The five intelligence areas: big data, cross-media, swarm, enhanced, and autonomous systems, perhaps are not novel on their own, but the combinations or applications of this intelligence seek to solve China’s deep problems.²⁵⁷ Pan Yunhe offers that natural intelligence (human intelligence) and AI should be combined to form a stronger intelligence, a smart system.²⁵⁸ This enhanced intelligence or brain-computer interaction (BCI) technology is making strides, as researchers at China’s Information Engineering University reportedly used brain waves during an experiment to control drones in flight.^{300F}²⁵⁹ A RAND study also finds that BCI advances could support human-machine decision-making, human-to-human communication, system control, performance enhancement, and monitoring.²⁶⁰ Elsa Kania offers that China is well-positioned in brain research, based on abundant data about brain disease and access to primate research banned in other nations.²⁶¹
- **Autonomous Vehicles** – According to Kai-fu Lee, “Predicting which country takes the lead in autonomous AI largely comes down to one main question: will the primary bottleneck to full deployment be one of technology or policy?”²⁶² Lee is bullish on China technology, but his point is well taken. U.S. companies like Google and Tesla are widely believed to be ahead of Baidu and other Chinese companies pursuing autonomous driving. But that technological advantage could succumb to policy paralysis, giving China an advantage as the authoritarian regime drives policy which resources and enables AI. Competing with coordinated development policies will prove challenging for the U.S. when projects are not federal but require state and local funding and approvals. As such, Google points to 23 different states that introduced 53 pieces of legislation that affect self-driving cars – all lacking standard definitions, licensing structures, and manufacturer responsibilities.²⁶³ Baidu, on the contrary, has 150 test licenses across 24 cities, and test mileage exceeded 6 million in 2019.²⁶⁴ Research in China discovered that smart transportation improves traffic by 9.25%.²⁶⁵ More importantly, as the applied technology improves, Chinese companies and government officials will find a receptive public, as a WEF survey indicates that 75% of Chinese say they are willing to ride in a self-driving car, and 96% of respondents would consider an autonomous vehicle for all transportation, compared to 58% of Americans and Germans.²⁶⁶ Including emotion recognition in vehicles, such as Huawei’s HiCar system, which links the mobile phone to your car or insurance company PingAn Group in-car cameras and software, is an alternative means of detecting fatigued, distracted, or upset drivers who are more likely to get in an accident.²⁶⁷

Conclusion

Both the U.S. and China are pursuing varying degrees of civil-military integration to exploit AI technologies, promote economic growth, develop national standards, and address national security challenges. Federal entities working cohesively should not alone preclude bilateral AI collaboration or even cooperation. Yet, cohesion's impact on AI competition does not occur in isolation and carries with it American and CCP values which conflict. The Chinese approach to cohesion relies heavily on CCP intervention and oversight. This approach might prove short-sighted in a long-term AI competition with the U.S.. While there are similarities in the challenges that both nations face, each comes into competition with varying degrees of strength and weakness across different sectors. Basic research is one area where both countries emphasize domestic capabilities in critical sectors. Both also aim to break their reliance on external supply chains. The NSCAI report calls for a U.S. "government-led process to restore a more balanced equilibrium between government, industry, and academia that ensures a diverse research environment, competitive economy, and the sustainment of a research agenda that supports the needs of the nation. The U.S. government has a long history of mobilizing industry and academia and making huge investments when it is challenged."²⁶⁸ The report does not call for a "state-directed economy, a five-year plan, or China-style "military-civil fusion" but notes that "the government will require a center of power that can exert a gravitational pull on domestic economic, national security, and science and technology policies" and notes that "we have no such organization today."²⁶⁹

China's approach demonstrates an element of mistrust in truly private innovation. The Communist Party maintains firm control of private enterprise interests and the amount of power BATH and others accumulate with access to data and AI applications. The long-term Chinese strategies, five-year plans, and action plans discussed throughout this paper illustrate the relentless stream of Party-inspired directives in nearly every high-technology sector, including AI. Balancing the market's needs and opportunities that arise for businesses may compete with CCP values and place companies or individuals at odds with the Party. As the world saw with the recent CCP handling of Ant and Jack Ma, the Party's grip over even the most influential companies is resolute. Any deviations or challenges to CCP policies will meet with harsh consequences. The CCP's control over the military, contrasted with concerns over power consolidation by AI platform companies, leaves the universities in the middle. It is in the universities where China hopes to address basic research shortcomings and pursue frontier technology breakthroughs through collaborations with Chinese and foreign entities. Universities present the opportunity for continued collaboration and cooperation between the U.S. and China. Still, their AI research ties to the PLA, and often overlapping controlling interests are causes for concerns. If China's universities adhere to CCP values, then AI competition is not feasible in terms of the cohesive element.

Collaboration through universities, exchanges, private research ventures, and private companies should promote open research, which AI thrives on. That said, the U.S. should increase investments in counter-intelligence efforts and commit to educating U.S. participants on the inherent risks and tactics employed by the Chinese to recruit or illicitly pursue information. The competition over talent is critical to strengthening the U.S. position to compete. The U.S. should not close the door to essential talent pools based solely on their country of origin. Addressing these challenges requires cooperation within all sectors of society. It will require close coordination with allies to support their needs and request their assistance in managing supply chain concerns. Values in many ways represent why we compete, cohesion addresses the strength of our position to compete, and influence determines where and with who we compete.

Influence(影响)

This section focuses on the topic of influence in the balance between competition and cooperation anticipated during the Sino-American AI joust for the coming decade. Influence is the capacity to affect someone’s character, development, beliefs, or behavior, including the willingness to act. AI competition involves more than just geopolitics or geoeconomics. The competition involves struggles within international institutions and standard-setting organizations (SSO) to address technical standards and, more importantly, ethics, norms, and values guiding AI applications. Nations competing over divergent interests and values must exert influence through various means with an array of fellow countries to see their preferred values and interests hold sway. The quest for influence is often viewed through a zero-sum prism. But this is incomplete. States can seek to influence others to enrich those partnerships or agreements while still leaving space for the competitor nation to join-in. As American political analysts Kurt Campbell and Rush Doshi write, “The United States will need to be flexible and innovative as it builds partnerships. Rather than form a grand coalition focused on every issue, the U.S. should pursue bespoke or ad hoc bodies focused on individual problems. These coalitions will be most urgent for questions of trade, technology, supply chains, and standards.”²⁷⁰

Sino-American competition for influence over AI markets, SSO, and the digital entanglement that exist complicates efforts to segregate data and AI applications which pose national security risks. Neither China nor the U.S. desire decoupling, but experts from both nations appear to agree that some semblance of bifurcation or selected decoupling must occur to allow both countries to address critical vulnerabilities in supply chains and the need to safeguard critical infrastructure and critical components. Such desires will not happen in a vacuum, nor are the impacts limited to bilateral engagements or agreements. The U.S. and China’s path in an era of globalization will carry sweeping effects throughout the world. The importance of global trade, the dual-use nature of AI, and the emergence of technology clusters and critical supply nations such as Taiwan and Korea, illustrate the complex web that both the U.S. and China must navigate to extend influence to pursue desired objectives. International SSO and multilateral engagements will play center stage in AI competition, opening the door for collaboration and cooperation among nations to resolve technical standards and ethical challenges that impact global trade, international transactions, and societal values. China and the U.S. will compete for influence over AI standards, norms, and values but must draw in other nations to gather enough support to outmaneuver the other.

This chapter breaks down into three sections. The first section focuses on U.S. concerns over CCP values and China’s implications for gaining access to foreign data markets and exporting AI technology and surveillance applications. The second section addresses competition over AI standards and the need to influence international partners to resolve differences within standard-setting organizations (SSO). The final section explores the digital entanglements of supply chains and growing concerns over critical components’ vulnerability, impacting national security. The competition over influence extends beyond the U.S.-China rivalry. Other nations and regional blocs carry their concerns on data and do not want to see the U.S. and China decouple and force the world to choose U.S. or China standards. Allies, even democratic ones, will not always align with national interests. Engaging them early and working with them to address concerns will prove vital to gaining influence in AI competition.

Global AI Markets

The global deployment of AI will add \$15.7 trillion to the global GDP by 2030, and China stands to gain \$7 trillion.²⁷¹ Much of that growth is likely correlated to China’s new infrastructure development and substantial population advantages. However, international market competition on its periphery is essential for China’s dual circulation strategy. The CCP relies on a strong and cohesive domestic environment to promote a “going out” strategy for Chinese companies and standard setters. The importance of data, especially the diversity of

data, makes gaining access to new markets crucial from both research and commercialization. Chinese security researcher Lu Chuanying believes that market competition is essential for Chinese companies to overcome the U.S. internet companies' monopoly over platform competition with a 3:1 global user base advantage.²⁷² Competing for additional markets is vital for China's emerging technologies. Lu emphasizes that "as long as China's primary market exists, the U.S. government cannot completely defeat Chinese internet and information companies. The Chinese market is difficult for American companies to replace and to avoid retaliation from China, the U.S. needs to leave a certain amount of leeway."²⁷³ The Chinese market's strength serves as leverage, allowing Chinese companies to survive U.S. sanctions. China has long exploited its market size and growth potential to lure foreign investors and facilitate outside-in technology transfers. American billionaire hedge fund investor Ray Dalio offers a unique perspective on China's relative market power, noting that "with four times the U.S. population when its per capita income reaches half the U.S.'s in about 25 years, its economy will be twice as large."²⁷⁴ Recent agreements such as the Regional Comprehensive Economic Partnership (RCEP), the Trans-Pacific Partnership (TPP), and the Comprehensive Agreement on Investment (CAI) serve as reminders of the importance of establishing trade agreements to expand market access with other nations for the U.S. and China to offset the loss of market access during the trade war. For example, RCEP member nations account for 40% of global trade and nearly a third of the worldwide GDP.²⁷⁵

This section explores market competition concerning access to data, cross-border data flow challenges, and the resultant collision of interests where influence in global settings will provide the U.S. or China the opportunity to push forward national agendas with international support. U.S.-China competition is not solely bilateral but forms concentric circles of overlapping partnerships and agreements. Some of these agreements on trade, data privacy, or anti-trust rulings may diverge from U.S. national interests, requiring the U.S. to respect other nations' sovereignty and their right to pursue national interests. An example would be Sweden, which moved to ban Huawei components in the fall of 2020. As a result, Swedish telecom operator Tre filed a lawsuit against banning the Chinese firm, and separately Huawei won a court injunction, which is under appeal from Sweden telecom regulator PTS.²⁷⁶ Respecting the rule of law and promoting shared values provides an opportunity for continued exchange with nations and the means to work through disagreements to influence further engagements towards more favorable outcomes.

Data Access

China's new infrastructure produces vast troves of data on a scale that no other nation can compete with. But much of its present data is relatively homogenous. China knows that it must diversify data sets and improve algorithmic training for global applications of products, which requires China to look to more diverse markets. Accessing those markets is a contest of influence. Competing values over surveillance technology and other sensors empowered by AI, which gather data, will present challenges to China in some regions of the world. Kai-Fu Lee believes that data is the core "because once computing power and engineering talent reach a certain threshold, the quantity of data becomes decisive in determining the overall power and accuracy of the algorithm."²⁷⁷ iFlytek offers voice recognition software for free to more than 370,000 apps, gaining access to 4.5 billion users daily.²⁷⁸ Chinese firm CloudWalk's entrance into the African market and partnership with Zimbabwe to provide facial recognition software gained access to data on millions of African faces.^{320F279} China's data access challenges have two major aspects. First, China must marry AI expertise with local data. Second, that cross-border data flows challenge China as they do all nations.

Marrying Chinese AI Expertise to Global Local Data. On the surface, it might seem hard for many in the west to understand why a nation might compromise its data resources to access Chinese new infrastructure investments. Price points certainly play a part in the decision, but there might be more to the Chinese model for globalizing technology. Pointing to the international success of Didi, Uber's China rival, Kai-Fu Lee believes

that empowering “homegrown startups by marrying worldwide AI expertise to local data, is a model built more on cooperation than conquest, and it may prove better suited to globalizing a technology that required both top-quality engineers and ground-up data collection.”²⁸⁰ This alternate model for AI globalization, Lee explains, was the model for Didi in partnering with Ola in India, Grab in Singapore, Taxify in Estonia, and Careem in the Middle East.²⁸¹ Didi realized that gaining access to the data was more important than establishing a global brand. That data would feed into developing an understanding of local driving patterns and assist in autonomous driving development. For companies, capturing data will pay off in the “second wave of IoT where data captured from the first wave devices will be used by the devices themselves to model the environment, their behavior, and the behavior of other systems to predict the future.”²⁸² Do these nations realize the vulnerabilities of Didi accessing local data? In some cases, like Didi, if the Chinese government is not involved and pressing its influence to expand access, and Chinese companies operate within the free market system, it is not a matter of platform competition between the U.S. and China, and the business model prevails. Yet, if there are security concerns over Didi’s access to local markets, the U.S. can use its influence to counter expansion and access.

Cross Border Data Flow. There is perhaps no more significant challenge than for nations to address concerns over data privacy and data transfer across borders. Such transfers not only serve commerce but will drive future AI research through collaboration. With cross-border data flow projections of 163ZB by 2025, a ten-time increase from 2016, questions over digital tax laws and data sovereignty emerge.²⁸³ Li Fang and Cheng Ruyuan, publishing on Chinese science and technology think tank site Keqing Zhiku (科情智库), point to a need to accelerate the formulation and improvement of digital governance to counter the “winner take all” effect of data platforms and the emergence of technology blockades.²⁸⁴ China’s draft “Personal Information Protection Law” refers to Germany’s General Data Protection Regulation (GDPR) but extends the extraterritorial jurisdiction, as GDPR settles on “place of establishment” and China focuses on “place of data processing.”²⁸⁵ The potential for jurisdiction disputes and opaqueness when security concerns are raised presents opportunities for the U.S. to promote shared values and extend influence to work through challenges. While most view China’s National Security Law as a threat to data sovereignty, Li and Cheng counter that the U.S. long exercised such intelligence practices with the “Clarifying Lawful Overseas Use of Data Act” (CLOUD ACT), which stipulates the U.S. government has the right to retrieve global data controlled by U.S. data controllers (mainly U.S. companies), as well as the U.S.-UK bilateral agreement on “Access to Electronic Data in Communication Services” under the “Clarification of the Law of Extraterritorial Use of Data” and the U.S. support for Asia-Pacific Economic Cooperation’s (APEC) “Cross Border Privacy Rules” (CBPR).²⁸⁶ Even regional agreements such as RCEP establish that cross-border data transfer must not be blocked but allows restrictions if there is a need for “protection of essential security interests.”²⁸⁷ Overcoming concerns regarding data transmission appears to be an area where opportunity exists for global collaboration and cooperation. Competing for influence in this arena would not be zero-sum. It is not a matter of preventing China from accessing data outright, but rather establishing standards, processes, and norms based on democratic values to safeguard privacy and protect free speech and individual rights.

Exporting AI

In addition to gaining invaluable data access, expanding into new markets allows Chinese companies to increase market share and Chinese influence through economic and soft power. With sanctions on some of China’s leading tech companies, these new markets provide opportunities to soften the impact of sanctions and compete in emerging markets where U.S. tech is less dominant and regulatory laws or privacy concerns are less restrictive. British Human Rights organization, Article 19, finds that “In the context of facial recognition, in particular, policymakers were taken aback by how quickly the Chinese companies that developed this technology domestically grew and started to export their products to other countries.”²⁸⁸ Offering both surveillance technology and AI applications to improve energy consumption provides China opportunities to promote mutually beneficial arrangements and greater inclusion across regions of the globe with growing concerns about inequality of access

to high technology.

Surveillance. The NSCAI report notes that over half the world’s advanced democracies use AI-enabled surveillance systems, emphasizing that “technology itself does not possess an ideology, but how it is designed, where it is employed, and which laws govern its use, reflect the priorities and values of those who design and employ it.”²⁸⁹ China’s lead in perception AI and application of facial recognition and emotional recognition provide its companies with opportunities to export systems that accumulate valuable data and empower those who wield the technology with far greater insight and control over the population. For example, the “Safe Philippines Project” announced in 2018 and supported by Huawei planned to install 12,000 CCT cameras and integrated command systems across several cities.²⁹⁰ As a country that hosts U.S. military bases and works closely in counter-terrorism (CT) missions, the Philippines provides a clear example where the U.S. and Chinese competition for influence matters. As the technology proliferates, the main difference between states will have less to do with the quality or sophistication of the technology and more to do with the way it is used—for what purpose, and under what rules.”²⁹¹ Chinese tech companies such as Huawei and Hikvision continue to exploit opportunities to access their products in new markets.²⁹² However, more concern should go to China’s lesser-known companies, such as Semptian, which operate outside of mainstream security discussions. A former member of the OpenPower Foundation and collaborator with U.S. companies such as IBM and Xilinx, Semptian’s role in exporting Aegis, Falcon, and Alpha Hawkeye platforms across East Asia, the Middle East, and North Africa (MENA) provides the CCP and partner nations with sophisticated AI and data collection methods for widespread monitoring and precision targeting of populations. Exporting surveillance technology opens many other doors for China to promote its values and authoritarian-style governance.²⁹³

Energy Market Management. In addition to surveillance, AI accelerated IoT technology applications across the utility sector present a potential \$45 billion market by 2026. Experts forecast 50% growth between 2020-2024, as smart grids replaced older infrastructure and more nations seek technological solutions to meet Paris Accord and UN Sustainable Development Goals.²⁹⁴ The emerging climate preservation-market aligns with China’s goal of building a “Beautiful China” in the 2035 plan.²⁹⁵ Beijing seeks to build momentum from China’s rapid development and digitization to promote green and low-carbon transformation in energy and manufacturing, both domestically and internationally.²⁹⁶ The power consumption requirements for AI and other novel technologies limit adaptation and access across many regions where China invests heavily in new infrastructure. Reducing carbon footprints and power consumption focuses across the telecom industry through AI-empowered products that target efficiency and reduce power requirements. The PowerStar base station operates and gives Huawei an edge across much of the Middle East and North Africa. The base station, developed with South African telecommunications company MTN, reportedly uses between 10-15% less energy and would cut 2,000 tons of CO2 emissions annually across 1000 sites, and allows carriers to operate along with the 2G to 5G spectrum simultaneously.²⁹⁷

Standards

The “China Standards 2035” was not released in 2020 as expected and may never appear as a standalone document, as the project drew significant concern globally as nations pondered China’s intent. The project continues but remains mostly out of public discussions, as China strives to improve its domestic standardization system in parallel with expanding influence in SSO. “China Standard 2035” focuses on critical areas such as blockchain, IoT, new cloud computing, big data, 5G, smart cities, and AI and specifically targeted the ISO, IEC, and ITU for influence.²⁹⁸ The fact that China already occupies leadership positions in ITU and IEC, as well as four of the nine UN agencies is well documented and may explain why China might not formally adopt the plan. The last meeting of project leaders in January 2020 indicated the intent to transition from the “China Standard 2035” project to the “National Standardization Development and Strategy Research” project. Leaders highlighted

progress in research and emphasized the need to prioritize and deepen national standardization strategies.²⁹⁹ This section focuses on the importance of influence competition in establishing technical standards, working within SSO, and collaborating on research with allies that enable the U.S. to counter China’s rising global influence.

Technical Standards

China’s 2018 White Paper on AI Standardization points to similar work in the U.S., Japan, and Germany and emphasizes that “more attention should be paid to the important leading role that AI standardization plays for promoting technological innovation and supporting industrial development” and offers:

- Standardization work is conducive to speeding AI technology innovation and the commercialization of research findings.
- Standardization work helps to improve the quality of AI products and services.
- Standardization helps to protect the safety of users effectively.
- Standardization helps create a fair and open AI industry environment.³⁰⁰

An article posted on the WeChat channel for *Intelligent Manufacturing* views technical standards as “occupying the strategic commanding heights” and points to Huawei as an example that “if you occupy the market first, you can take the lead in the formulation of leading standards.”³⁰¹ Huawei, as the report’s author sees it, accounts for 20% of all 5G “standard-essential patents” and “even if Huawei is squeezed out of 5G, other enterprises still pay for the Huawei patents.”³⁰² This insight emphasizes China’s pursuit of AI standards, as companies receive a market edge by aligning global rules with technical specifications of their IP. The NSCAI report findings highlighted concerns that China’s practice of “over declaring standard-essential patents” further China’s global narrative that it “won the race” to achieving that standard and compelling other nations to accept the China standard.³⁰³ The CSG report found that “Internationally, a head start on technical standards-setting could enable Chinese tech companies to develop interoperable systems and pool data, grow more globally competitive, lead international governance on AI safety and ethics, and obtain the ‘right to speak’ that Chinese representatives felt they lacked when technical standards for the internet were set.”³⁰⁴

Standard Setting Organizations (SSO)

China often points to its failures in promoting Wireless LAN authentication and privacy infrastructure (WAPI) standards in the early 2000s to emphasize that “success of a standard never depends on technology.”³⁰⁵ This belief that structural power and influence over international organizations fuels much of the Chinese desire to influence through increased participation and leadership placement in SSOs. The 2015 “Standardization Reform Plan” and “Five-Year Plan for Standardization” aimed to establish China as a “standards-setting power” by 2020 and want to promote Chinese standards abroad through contracts and exporting equipment to help China’s companies go global. It hoped to accomplish these objectives by:³⁰⁶

- Participating in at least half of all standards drafting and revision efforts in recognized international SSOs.
- Strengthening China’s participation in the governance of international SSOs.
- Increasing the number of Chinese-held leadership positions in technical bodies.

China’s success in these efforts is increasingly evident. In recent years, China’s annual growth rate of new technical proposals to the International Organization for Standards (ISO) and International Electrotechnical Commission (IEC) reached 20%, with a total of 238 proposals submitted in 2019.³⁰⁷ With essential leadership in place at the IEC, ITU, and the 3GPP, China’s ability to set agendas is vital. Chinese-occupied secretariat positions in technical committees at the ISO and IEC increased 73% and 67% respectively over the last decade, while the

110 voting positions for Chinese companies at 3GPP more than double the U.S. positions.³⁰⁸

The ITU is a SSO of particular interest based on the large number of AI and emerging technology focus groups (FG) and initiatives, and as the organizer of the AI for Good Global Summit in partnership with 35 other UN agencies.³⁰⁹ China is extremely engaged throughout the ITU focus groups and initiatives related to AI:

- **AI for Health (AIFH)** pursues a multi-stakeholder, inter-disciplinary approach to establish a standardized assessment framework for the evaluation of AI-based method for health. There are a number of working groups and topics throughout the health fields.³¹⁰ Xu Shan from CAICT co-chairs the Ad-hoc group on digital technologies for COVID health emergency.³¹¹
- **AI for Environmental Efficiency (FG-AI4EE)** stood up in 2019 and is chaired by Paolo Gemma from Huawei and WG3 for implementation guidelines for AI and emerging technologies for environmental efficiency has Shi Ying of China Telecom as a co-chair.³¹²
- **AI for Natural Disaster Management (AI4NDM)** focuses on developing a community of engaged stakeholders and experts to build on past progress made by ITU in this domain. Wang Yan Chuan from China Telecommunications serves as a vice-chair.³¹³
- **AI for Autonomous and Assisted Driving (FG-AI4AD)** focused on AI-enabled safe mobility, has Zhang Yuan from China Telecom serving as the vice-chair.³¹⁴
- **Machine Learning and 5G (FG-ML5G)** was active from 2018-2020 and Qiang Cheng from CAICT served as a Vice-Chairman. Additionally, Sun Qi from China Mobile was the Chairman for Working Group 2 (WG) on Data formats and ML technologies and Meng Wei of ZTE was the Chairman of WG3 for ML-aware network architecture.³¹⁵ Additionally, China's ZTE alongside with U.S. firm Cisco, sponsored the ITU AI/ML in 5G Challenge in 2020.³¹⁶
- **Quantum Information Technology for Networks (FG-OIT4N)** is co-chaired by Russia, U.S. and China. China's representative is Zhang Qiang from the University of Science and Technology of China (U.S.TC).³¹⁷ China also participates in the role of vice-chairs, with Lai Junsen of CAICT and Ma Jiajun of QuantumCTek Co. Ltd.³¹⁸ Additionally, WG3 for Quantum Key Distribution Networks is chaired by Ma Zhongchao from China Academy of Science Quantum Network.³¹⁹
- **Autonomous Networks (FG-AN)** stood up in 2020 and China participates as vice-chairs, Xu Dan from China Telecom and Cao Xi from China Mobile. Additionally, China chairs all three working groups (WG) with Liu Yongsheng of China Unicom leading WG1 for use cases and requirements analysis, Sun Qi of the O-RAN Alliance and Song Xiaojia of China Mobile leading WG2 on architecture and core technical enablers, and Yuan Liya of ZTE leading WG3 on proof of concepts.³²⁰

China's ITU efforts focus on facial recognition, specifically concerning "how the data captured by cameras and surveillance devices are analyzed and stored."³²¹ This applies to smart street light technology from ZTE and China Mobile, which offers an option to add video surveillance features and emphasizes the technical standards on back-end architecture and functionality.³²² Concerns over the privacy of that data and potential applications which violate human rights are obvious to many western observers. However, China's growing influence in parts of MENA and East Asia as part of the Digital Silk Road (DSR) aligns those countries with China more and more.³²³ In a meeting between National Defense University students and ITU members, the panel emphasized that as a SSO, the ITU focus solely on technical standards and allows other UN agencies to address concerns over human rights and foreign policy relations between member states.³²⁴

Allying for Research

Outside of the traditional pursuits of leadership in developing technical standards and advocating adoption in SSO, there will be significant competition in open communities and multilateral initiatives focused on research and developments in areas such as AI ethics and data sharing. Several organizations presently exist, such as the OpenPower Foundation, which includes several Chinese and U.S. companies and universities, as well as the Open Community for Ethics in Autonomous and Intelligent Systems (OCEANIS), which is an open forum to enable collaboration on the development and use of standards for AI.³²⁵ The NSCAI advocates for creating a Multilateral AI Research Institute (MAIRI) in the U.S., similar to the Global Partnership on AI (GPAI), to catalyze international collaborations and talent exchanges.³²⁶ BAAI's Center for Open Data Research led China to pursue open data standards, research core open data technologies, and build an open data shared platform (Huizhi).³²⁷ To ensure effective multilateral collaboration, standards that promote trust and utilization of cloud networks should be prioritized to address varying data protection approaches, such as GDPR, which creates an artificial scarcity of data through protections placed on collecting and sharing data.³²⁸

Creating Trust through Data Standards - A report from McKinsey emphasizes that nations that promote open data sources and data sharing are most likely to benefit from AI advances and highlights that the U.S. ranks 8th in global ratings on openness while China comes in 93rd.³²⁹ The NSCAI recommends launching an International Digital Democracy Initiative (IDDI), and the CSG discusses concerns over data localization in geographically isolated data silos. Both speak to the need to work with our partners to break down barriers, establish responsible practices, and build accepted norms and standards. Global advisory firm Willis Towers Watson proposes data trusts which serve as “fiduciaries for the data providers to govern proper data use,” to ensure the consent of individuals, removing data bias, de-identifying personal data, and adopting cutting edge technologies such as federated machine learning, homomorphic encryption, and distributed ledger technology.³³⁰ Their initial pilot focused on GDPR compliance. Participants formed a “minimal viable consortia” (MVC) to allow data providers and consumers to share data resources and talent to focus on a specific business case.³³¹ The Trust::Data Consortium from MIT is another example of the consortium approach. In a recent conference in Beijing, MIT professor and entrepreneur Alex Pentland reinforced the importance of federated learning “to provide for data applications and deep learning, such as blockchain technology.”³³² During the panel session, Pentland and Kai-Fu Lee highlighted blockchain experiments in Singapore and Switzerland, focusing on interoperability and consistency of different data. Without establishing unified interoperability standards, Pentland says, “countries will not trust each other to cooperate.”³³³

Cloud Networks – To integrate the AI stack, China requires an open platform for coordinating efforts from multiple locations. China's Huizhi approach to domestic collaboration and research into the Blockchain-Based Service Network (BSN) to create the plumbing for people to run decentralized computer systems via a global network provides two examples of China's attempts to promote online collaboration on standards. Huizhi remains primarily domestic-focused, while BSN represents a bifurcated system that separates international and domestic networking. The U.S. and allies must find ways to foster trust through standards and build a platform for cooperation via cloud networks. A Center for New American Security (CNAS) report highlights Australian efforts to create a Track 2 initiative (Quad Tech Network) and foster technology collaboration among think tanks and universities within the emerging Quad alliance of Australia, Japan, India, and the U.S.³³⁴ Relying on 5G, such collaboration could occur in the “Quad Research Cloud” or a similar open knowledge network, as recommended by the NSCAI. Establishing these efforts and promoting others to enhance or support requires a clear vision and the ability to influence partner nations to join multilateral exchanges and work through instances when national interests diverge.

Digital Entanglements

Throughout 2020, the idea of economic decoupling from China received a great deal of coverage as the U.S. and China faced the reality that interdependence did not reduce the risk of conflict but rather exposed an overreliance on external supply chains vulnerable to disruption and manipulation. Cyberspace, driven by concerns over data access and diverging values, is one area where separate systems could emerge if the U.S. and China cannot resolve their differences and establish trust-building mechanisms.³³⁵ Tsinghua University's Yan Xuetong looked at the possibility of an international structure divided into "two systems and three worlds," competition over technology standards results in the distinct U.S. and Chinese systems, and the rest of the world falls into the categories of "technology innovation nation, technology commercialization nation, and technology user nation."³³⁶ The CSG found that the "creation of two distinct digital worlds is suboptimal for global productivity and growth, and the United States should continue to try and find areas of common ground where possible, with China."³³⁷ This section approaches competition for influence through the lens of exposed vulnerabilities in global supply chains considers the impacts of export controls. It looks to our allies as a means of effectively responding to China's efforts to coerce and disrupt emerging digital partnerships.

Supply Chain Exposure

Computing chips remain a critical component to high technology and AI supply chains for both the U.S. and China. Over the years, both have become increasingly reliant on overseas foundries. For the U.S., roughly 90% of all "high-volume, leading-edge integrated circuit production" comes from foundries in Taiwan and South Korea.³³⁸ In addition to East Asian foundries, China has a deep reliance on western chip companies, making the trade war with the U.S. and sanctions on leading companies daunting. China Academy of Sciences (CAS) expert Tan Tieniu warned that China's AI industry could face its "ZTE moment" if it did not build its foundational technology.³³⁹ Relying on other nations vulnerable to coercion or disruption threatens national security and represents unacceptable choke points. Chinese experts point to deep learning processors that Chinese companies rely on. Deep learning frameworks such as Google's TensorFlow and Facebook's PyTorch are examples of "framework traps" that could suffocate China's AI development.³⁴⁰ Baidu's PaddlePaddle framework is an alternative but has yet to gain traction and trails both U.S. frameworks by a measure of 3 to 10 in an industry fueled by open collaboration ecosystems that gather the top talent in focused spaces.³⁴¹ The CSG report on high technology emphasizes that "disentangling key supply chains from China involves more than focus on the end products. Safeguarding key technologies requires the U.S. to define and secure the entire ecosystem of production, from fabrication to supply to talent to cutting edge innovation."³⁴² In 2019, Zhao Gang from CAS wrote that the U.S., Britain, France, Israel, and Russia would be the "five strategic fulcrums" that China needs to accelerate its development; however, China should look beyond the U.S. to strengthen scientific and technological relations with other Western nations, but to prepare for those nations to "maintain a certain degree of diplomatic consistency on matters related to China's S&T diplomacy."³⁴³ Zhao emphasizes the importance of emerging countries and seeks "points of interest" to reduce American technology reliance.³⁴⁴ Looking to other nations and recognizing the importance of middle powers requires influence beyond traditional alliances or trade agreements. The CSG recommends pursuing a strategy the designates "secure locations for supply chains beyond U.S. borders" or the establishment of "multilateral trust zones" to prioritize joint R&D and remove significant regulatory barriers to create the flexibility needed to incentivize collective innovation against China in AI, QC, 5G, etc."³⁴⁵

Export Controls

One area where experts in both the U.S. and China agree is that the complex interdependence presents severe challenges to decoupling, bifurcating, or disentangling from each other. They further concur that even if extremely sensitive areas must move toward disentangling, some degree of modification to standard practices

is necessary to eliminate disruptions and enable healthier transactions in less vulnerable areas. Lu Chuanying, a cyberspace and governance researcher in Shanghai, describes the U.S. strategy to counter the rise of China's cyberspace industry through a series of laws and policy measures aimed at restricting China's access to American technology.³⁴⁶ Lu views the "whole-of-government" approach as wishful thinking, noting that the "complex interdependence between China and the U.S., the resilience of emerging technologies, and the flexibility of cyber-information companies make it difficult for the U.S. to suppress China's success."³⁴⁷ Any U.S. approach that looks to break off from China threatens to bring serious harm to the U.S. own technological development and the global technological ecosystem.³⁴⁸ The CSG report acknowledges that policies to cut off exports may hurt China. However, export controls require caution to not "undermine U.S. innovation by severing ties and closing off the U.S. to the ideas, people, technologies, and supply chains necessary to compete effectively."³⁴⁹ Furthermore, China's Export Control Law could enable Beijing to impose new restrictions on rare earth exports to the U.S. in retaliation for U.S. actions and carries the potential to constrain Chinese companies from exporting proprietary algorithms, in the case of TikTok negotiations.³⁵⁰ The U.S. and China's actions as global high technology leaders could reverberate across multiple regions and motivate other countries to follow suit. Japan, as an example, imposed export controls on crucial semiconductor materials to South Korea, citing dual-use concerns. While these countries have a complicated relationship, restricting the export of dual-use technology could negatively impact U.S. security arrangements.³⁵¹

In 2020, U.S. imports from China reached \$393 billion while exports topped \$110 billion, a trade imbalance of \$283.6 billion.³⁵² While this imbalance was well politicized, the truth is that the U.S. maintains a trade imbalance with most nations, and China represents the largest export market for the U.S. outside of North America. China imports the third most products from the U.S.³⁵³ There is room for improvement, but few alternative markets exist to absorb disruptions in a trade dispute between the two largest global economies. Both sides would suffer in periods of sustained trade disputes or attempts to decouple from one another. The lure of the China market and the potential which private companies and nations see there makes policies that drastically limit access or exposure to China unpalatable to those willing to accept tradeoffs on areas such as human rights or national security. In those cases, government intervention is warranted, and boundaries are drawn to encourage freedom of maneuver within markets while protecting the nation, its values, and our way of life. As new U.S. National Security Council (NSC) Director Jake Sullivan recently stated, "we've reached a point where foreign policy is domestic policy, and domestic policy is foreign policy....and the work that we do abroad fundamentally has to connect to making the lives of working people better, safer and fairer."³⁵⁴ This statement aligns with recommendations from CNAS that "export controls would be more effective if wielded as part of comprehensive national security and economic statecraft that safeguards U.S. technological advantages, rather than as a traditional non-proliferation tool. End-use controls, such as for human rights violations, remain an important exception and should continue."³⁵⁵

Respond to Coercion and Disruptions

Supply chain vulnerabilities and export controls often reflect a lack of influence or capacity to produce the desired effect on someone or something. Resorting to hard power tactics or focusing solely on domestic production or limitations neglects our allies' valuable relationships, shared interests, and shared values. All forms of competition with China, including AI, will achieve their greatest effect with the leverage provided by coordinated, mutually supporting actions with allies and partners. The U.S. is not alone, as allies such as Australia and many in Europe felt the wrath of Beijing's "wolf warrior diplomats," as countries delivered unwanted messages concerning human rights violations in Xinjiang, spoke out about the handling of COVID, or recommended an international award to someone considered a dissident in China. As Gui Congyou, China's ambassador to Sweden, summarized the approach in late 2020: "We treat our friends with fine wine. But for our enemies, we have shotguns."³⁵⁶

The Biden administration appears that it will pursue a multilateral approach to China. NSA Director Sullivan said,

“The United States has gone it alone in its trade fight with China, rather than rallying other like-minded democracies, other market economies that collectively comprise 50[%] to 60% of the world’s economy, where if we got all of them lined up and went to China with a common agenda to say, ‘We won’t accept these subsidies, this intellectual property theft, this dumping,’ we would be in a position to get China to either change its behavior, or we could collectively impose costs on China for not doing so.”³⁵⁷

If 2020 is any indicator, Beijing is not ready for global leadership, and any attempt to consolidate gains following COVID quickly resulted in backlash over missteps in Hong Kong and Xinjiang. As Oxford University professor and China expert Rana Mitter points out, “the biggest obstacle China will face is not the hostility of the United States or other adversaries. It is instead China’s authoritarian turn. Beijing’s commitment to that aspect of China’s core identity will make it far harder for the other three nucleotides—consumerism, global ambitions, and technology—of its DNA to recombine successfully, stoking hostility abroad and raising barriers between China and the world it strives to remake.”³⁵⁸

Structural Power – Chinese scholars place a great deal of emphasis on structural power, which Wu Xinbo defines as “the ability to shape preference about global rules, standards, norms, and systemic outcomes.”³⁵⁹ This power stems not from coercion but by creating or accumulating systemically vital resources that “convey influence through the global system of deep interdependence.”³⁶⁰ Both Wu and former president of the Export-Import Bank of China, Li Ruogu, point to the dollar’s role as the premier global currency.³⁶¹ Li warned that the dollar’s power is a danger to China and asserted that “only by eliminating the U.S. dollars monopolistic position would it be possible to reform the international monetary system.”³⁶² While this paper focuses on AI, the importance of financial system reforms and the pursuit of digital currencies such as China’s Digital Currency/Electronic Payment (DCEP) continue to surface time and time again in research alongside China’s blockchain aspirations and pursuit of encryption standards. Reforming the monetary system previously focused on elevating the Yuan’s status, but increasingly the focus is on DCEP, which the CSG notes “can enable Chinese entities or other countries to transact internationally without the U.S.D, circumventing and weakening U.S. financial sanctions. 55% of trade between Russia and China is no longer denominated in U.S.D, indicating both countries’ desire to circumvent U.S.D settlement and the U.S. banking system.”³⁶³ Russia and China are not the only countries pursuing central bank digital currencies (CBDC). Even allies in Europe and Asia are exploring digital currencies as alternatives to fiat, and AI-powered financial tools will play a role alongside digital ledgers.

New Alliance – There are numerous suggestions out there to address how best to respond to China. From like-minded partners or an economical version of NATO, the general theme is that values matter. Our approach to forming partnerships should center on establishing core values to align us. Recognizing that interests may diverge from time to time, these alliances should remain flexible, striving to stay as inclusive as possible and not draw hard lines when common ground can often be achieved. The present proposal from the CSG makes the most sense, as they advocate for a “T12” or plurilateral coalition of “techno-democracies” to:³⁶⁴

- Strengthen cooperation among like-minded countries.
- Promote collective norms and values around the use of emerging technologies.
- Protect and preserve key areas of competitive technological advantage.³⁶⁵

An initial shortlist of countries included the United States, Japan, Germany, France, Britain and Canada, the Netherlands, South Korea, Finland, Sweden, India, Israel, and Australia. This proposal is like others, such as the “D10,” which includes the G7 plus Australia, India, and South Korea. Both options provide diverse collections

of democracies and are not tied to any geographic region of particular interest. That said, cooperation and collaboration with these technologically advanced nations will be essential in addressing supply chain concerns, but more importantly, assuring them that efforts to “reshore manufacturing” or pursue “managed decoupling” from China will create opportunities for other local economies and regional growth as supply chains shift from China to more trusted partners.³⁶⁶

Deterrence – Coercive tactics and grey zone operations challenge alliances along the seams and below agreed-upon thresholds for collective defense triggers. That must change and current, or future partnerships must clarify how cyber-attacks, misinformation campaigns, or economic coercion will be countered. Deterring such actions should remain the priority. Both deterrence by punishment and deterrence by denial of aims “demonstrate that the defender has the capabilities it needs to prevail in a specific war, while punishment communicates that the prospective war will be too costly for the attacker to bear.”³⁶⁷ Mira Rapp-Hooper goes on to mention the potential to update how Article V guarantees apply to cyberspace, “setting thresholds for scenarios that warrant kinetic and nonmilitary reprisals.”³⁶⁸ However, her reference to BRI and Japan’s private sector efforts and trilateral partnerships to provide alternative funding to offset China’s infrastructure projects is intriguing. Such an approach, offering higher standards and increased transparency, appears to align with CSG recommendation to establish an International Technology Finance Corporation to counter the DSR and provide loans for projects consistent with liberal values, but more importantly, offer low- and middle-income countries the chance to participate in “trusted supply chains;” establish innovation hubs with multinationals to cultivate local talent, partner with local universities; seed entrepreneurs and invest in domestic businesses to build goodwill.³⁶⁹

Conclusion

Competition over data and standards in a multipolar world elevates the importance of a nation in extending influence. As China wields a carrot and stick approach, a nation’s power plays a vital role in influencing others, which blends coercion and hard power tools with soft power approaches to developing countries. This strategy exists throughout the BRI, where China offers loans and infrastructure investments in exchange for access to resources. Those resources could be rare earth, oil, economic markets, or data. The ability to export AI technology in the form of surveillance equipment and offer nations access to digital infrastructure along the DSR and the means to surveil, target, and control a population will entice some autocratic leaders. This presents challenges for the U.S. and others who share the same values. This competition is not zero-sum, but as values are involved, cooperation and collaboration opportunities remain scarce.

Competition over influence is most likely to produce collaboration within international institutions where the fight over standards and norms will allow even the U.S. and China to address common interest areas such as cybersecurity, misinformation, and international finance. However, national interests and, more importantly, differing values will present obstacles and force tough negotiations that can only be won with other nations’ support. From China’s perspective, the U.S. relies on structural power, and frequently resorts to unilateral sanctions and the U.S. dollar’s (U.S.D) strength to unfairly treat countries with different values and interests. China will press that belief with other nations, so the U.S. must tread cautiously and not repeatedly rely on hard power tactics such as sanctions and export controls, which could hurt the U.S. economy and our allies. As a longtime advocate of global interdependence, American political scientist Joseph Nye sees it,

*...power in interdependent relations depends upon asymmetric vulnerability, and there are too many symmetries in U.S.-China interdependence at this point, though that might change if there is a much more radical decoupling. Although the dollar cannot remain pre-eminent forever, and American overuse of financial sanctions creates incentives for other countries to look for other financial instruments, the Yuan is unlikely to displace the dollar in the near term.*³⁷⁰

To address supply chain challenges and when considering export controls, the U.S. must explicitly define the technology components, software, and data representing critical vulnerabilities to national security. Working with partner countries to offset losses in the Chinese market and potential coercion from China fosters a system of trust and mutual support. Reshoring manufacturing to the U.S. could come in time through a more cohesive domestic policy and investment approach. Finding alternative markets in trusted nations is a more pressing concern, especially in semiconductors. The importance of allies amidst the common threat that China's coercive tactics present with the CCP's treatment of its citizens or actions abroad present opportunities for the U.S. to influence global AI competition. That requires leadership and legitimacy to lead through words and deeds which align with shared democratic values. The AI competition over influence in markets and standard-setting organizations is unlikely conducive for cooperation, but it is far from zero-sum. The need for standards and norms to address the challenges of data and applications of AI technology across society leaves room for collaboration between the U.S. and China to reach agreements that facilitate global trade and on issues related to global challenges. No country can go it alone, and influencing others to align on more contentious issues, will require significant efforts and a cohesive approach to utilizing all elements of national power.

Legitimacy (正当性)

Henry Kissinger once wrote that “the stability of any international system ultimately relies on what he termed ‘generally accepted legitimacy.’”³⁷¹ Any international framework needs buy-in from the powers within it”, and the U.S. must play a central role in shaping the AI world order.³⁷² This chapter focuses on AI competition between the U.S. and China for legitimacy to lead efforts “conforming to recognized principles or accepted rules and standards.”³⁷³ The international contest over global leadership occurs when China’s rise challenges U.S. hegemony in a liberal world order created without participation from the CCP. AI and other emerging technologies will disrupt traditional measures of power. While the U.S. and China will remain the strongest poles, the emerging world order will be more multipolar than bipolar in design, as AI enables regional powers to seek greater input over norms and standards.³⁷⁴ China perceives and desires multipolarity to limit U.S. power and influence to the degree that the U.S.’s preferred values and political institutions are not dictated to others. While some rush to make comparisons to the Cold War or the space race, a CNAS report suggests that “competition in the AI arena could be even more intense. The space race was fundamentally a bipolar competition – a subset of the broader Cold War... Competition in AI, on the other hand, may be much more intense because it will be much more multipolar and multisector.”³⁷⁵ This chapter focuses on AI competition in an increasingly multipolar world structure where values and influence with rising middle powers and developing nations “lend authority or respectability” to a nation’s leadership position on AI.³⁷⁶ However, for China, there is a domestic element of legitimacy competition related to Sino-American values competition in the first chapter of this monograph. For China, legitimacy also addresses the CCP’s concern over maintaining domestic legitimacy as the sole power in a single-party system. The CCP’s domestic problems reflect legitimacy in terms of “popular acceptance of a government, political regime or system of governance.”³⁷⁷ This definition highlights an area where competition over legitimacy and values overlap and should be understood by readers when viewing China’s actions in the global setting. There are two audiences for the CCP, the international community, and its domestic base, who want to see an emergent China take on a larger leadership role.

This global leadership focus aligns with one of the NSCAI’s National Technology Strategy’s key pillars, which calls for the U.S. to lead a “favorable international AI order.”³⁷⁸ China views actions over norms and standards as those of a technological hegemon. Fudan’s Cai Cuihong believes that the U.S.’ excessive pursuit of technological hegemony will result in a weakened superpower that cannot effectively compete, disrupted global markets and supply chains, a loss of “trust and soft power as a source of legitimacy,” and weakened efforts to form technical alliances of support.³⁷⁹ Written in 2019, Cai’s article addresses many of the emerging challenges that face both the U.S. and China, and she claims that China will never pursue technological hegemony. Nevertheless, leadership in developing AI norms, rules, and strategies for the new world order is more likely to occur in a multi-participant setting where the U.S. and China lead factions but must rely on the support of other nations to achieved desired ends. As the CSG points out, “The successful adoption of AI in adjacent fields and technologies will drive economies, shape societies, and determine which states exert influence and exercise power in the world. Many countries have national AI strategies. However, only the United States and China have the resources, commercial might, talent pool, and innovation ecosystem to lead the world in AI.”³⁸⁰ AI will serve as a great enabler, and this paper aligns with the CSG in putting forth the argument that AI will emerge as a tool for other states to have a voice and punch above their weight in both regional and global settings. Influencing those nations and relying on a shared values approach is essential for the U.S. to gain a competitive edge over China.

This chapter divides into four sections. The first section attempts to relate the significance of domestic legitimacy for the CCP related to AI competition and the legitimacy contest over global leadership. The second section examines the legitimacy within the context of the current world order. Understanding how China sees the

world is fundamental to competing. Studying existing China-led organizations might provide insight into China's preferences and leadership style when contrasted against the U.S. and the emerging AI empowered nations. The third section looks to the new world order and how AI competition might shape the U.S.-China dyad, and what role other countries might play in shaping competition. The final section looks at how to avoid zero-sum competition and explores China's use of AI to tackle domestic issues which correlate to broader transnational challenges. Within these areas, there exists the potential for collaboration and cooperation between the U.S. and China. Competing for legitimacy is not zero-sum, as both the U.S. and China will attempt to lead in the liberal world order. Effective leadership requires compromise at times. So long as the U.S. does not have to compromise its values and China does not have to compromise its core interests, the opportunities for collaboration within multilateral institutions exist.

The Importance of Domestic Legitimacy for the CCP

Within the competition construct over international legitimacy, there is an aspect of domestic legitimacy which drives foreign policy for both the U.S. and China. What differs is that U.S. political parties vying for power run on platforms and must answer for their ability to deliver throughout several elections' cycles. The CCP utilizes five- and fifteen-year plans to lay out policy agendas and benchmarks for growth and development. The CCP does not have to worry about election cycles, but the consequences for failed overseas or domestic policies are much more severe. The Party's fragility and insecurity stem from China's long history of dynasties ending at the hand of popular uprisings. In his book *A Contest for Supremacy*, American professor, and China expert Aaron Friedberg references comments from American professor Minxin Pei, arguing:³⁸¹

“that while the Communist Party regime may be tough and adaptable enough to hang on to power for decades yet to come, its corruption and inefficiency will inevitably lead to slower growth. As time passes, political and economic stagnation will reinforce one another, eroding what remains of the Party's legitimacy and yielding further increases in ‘lawlessness, corruption, and social disorder.’ Stuck in what Pei terms an ‘incomplete transition,’ China may simply be incapable of becoming a peer-competitor of the United States, still less of “mounting a real challenge of global preeminence.”³⁸²

Economic and political stability are core interests for China, and AI provides the CCP with a means to break through stagnation. However, Beijing wants to ensure the external environment remains as stable as the society it controls. Such stability requires an international order that better represents CCP values and norms and protects China's interests of sovereignty, territorial integrity, and is accommodating on more sensitive issues such as national unification. In the face of global backlash over the pandemic and external pressures on human rights and a slowing economy, rising debt, and growing demographic challenges within China, pursuing more aggressive foreign policies could alleviate or offer distractions to rising domestic discontent. Friedberg notes, “anxiety over their lack of legitimacy at home can cause non-democratic governments to try and deflect popular frustration and discontent toward their external enemies, real or imagined.”³⁸³ The rise of misinformation and disinformation campaigns, fueled by algorithms, is increasingly used by the CCP to target citizens and opponents abroad. The emergence of China's “wolf warrior diplomats” signals a more assertive China that dispensed with the “hide and bide tactics” at a time when Beijing perceives the U.S. is no longer interested or capable in leading the world order effectively. The overt criticism and coercive economic tactics against countries such as Australia are not ideal for establishing legitimacy as a global leader. Still, the actions play well to domestic audiences and rising nationalism within China.

The Chinese people are patient, and the CCP is careful to lay out benchmarks over longer time horizons, but delivering results is important. The Chinese population must see tangible results. Innovation and AI are a central focus for China to continue to drive economic and military growth. China's increased military spending and focus on emerging technologies have many worried, as China's ultimate global leadership aspirations are unknown. Xi

Jinping recently reintroduced the term “天下一家” which means the world is one family.³⁸⁴ First associated with the BRI initiation, the term reappeared in numerous statements made by Xi throughout the pandemic. However, “天下” refers to all things under heaven and alludes to both China’s political sovereignty and connections to tributary systems installed by various Chinese dynasties. Such concerns worry many, as the contest for global legitimacy plays out, understanding the link to the CCPs domestic challenges is important. Friedberg notes that “a regime beset by rising internal troubles could respond violently to perceived external challenges to shore up its sagging legitimacy. Weak leaders might even seek confrontation with foreign enemies to rally domestic support and fend off pressures for political change.”³⁸⁵ This consideration is even more important in light of continued escalations by Beijing in the Taiwan Strait.

Legitimacy and The Current World Order

The liberal international order constructed by the U.S. and its allies after World War II and extended globally after the collapse of the Soviet Union greatly benefitted China over the last forty years. This fact is not lost on Chinese leaders. However, as China’s power grows, this U.S.-led order, which China did not help design, feels less and less equitable to China and other developing nations. In this sense, Beijing does not oppose the current framework of the liberal international order. Still, it challenges the U.S. legitimacy to lead a system that does not represent China’s interests and the values of the CCP. Fudan scholar Wu Xinbo sees China as “both conservative and progressive, but not revolutionary” in its thinking about the current international order. Wu believes that China engages standing international institutions in a manner that “plays multiple roles at the same time as a supporter, reformer, and competitor.” Wu states that China encourages multipolarity in the context of state power, will not seek international hegemony, and is interested in accelerating the evolution of the international order, but that China “will not fundamentally or drastically transform it.”³⁸⁶ The emergence of AI is a challenge for the international community to address within the current construct. The current international norms and standards do not effectively account for AI, nor do the governing bodies appear agile enough to respond capably. This section examines the existing international system through the lens of China scholars, focuses on the importance of multilateral engagements and the impact of an asymmetric power structure in AI competition over legitimacy.

Existing Structure

Very few countries benefitted more from the current international system than China. Many in the West worry about China’s efforts to undermine or replace the current system with one that better represents Chinese values and interests. Those concerns are warranted, though it is important to highlight that China purportedly does not seek to replace the current liberal world order or promote an alternative structure. Reviewing Chinese declarations about the standing world order indicates that the CCP reportedly finds its key elements more than acceptable, desiring to emphasize some key features that traditionally have been underplayed by the U.S. and other western countries. However, these claims or reports should not be accepted at face value, given the CCP and Xi’s history of backtracking on promises not to militarize the SCS. Rather, a prudent approach would be to assume that China is unwilling to disrupt the current world order at this point in history; however, as China strengthens its economy and pursues legitimacy on the global leadership stage, China could pursue a restructuring of the present world order from a position of greater strength.

Chinese Foreign Minister Wang Yi acknowledged the legitimacy and value of the current international system, which “is like a well-designed building with multilateralism as its cornerstone and the UN and other international organizations as important pillars” which plays “an irreplaceable role in promoting world peace and development.”³⁸⁷ Wu Xinbo adds that “China has been a strong supporter of Westphalian norms,” which he defined as “respect for sovereignty and territorial integrity of the nation-state, sovereign equality among states, non-aggression, and non-interference in internal affairs.”³⁸⁸ Wang, like other Chinese leaders, finds value in the aspects of the system that constrain world dominance by the United States or any single dominant state. China

does value the system but feels it is suffering under U.S. leadership, as CASS researcher Xu Xiujun wrote in the lead-up to the National People’s Congress’s recent two sessions. Xu wrote,

“With the emergence of global problems and the rise of emerging economies, this system is increasingly difficult to meet the needs of the international community, and it seriously lacks in representativeness, fairness, legitimacy, and effectiveness. Under the obstruction of the United States and other Western powers, it is difficult for the World Trade Organization, International Monetary Fund, World Bank, and other traditional global multilateral mechanisms to make substantial progress in reforming and cannot adapt to the emerging fields of digital trade, digital finance, digital currency, and digital development.”³⁸⁹

Xu adds the need for improved global governance mechanisms to effectively enable the G20 to play a constructive role and overcome “a small number of Western powers who ignore rules...and shirk their responsibilities” by promoting unilateralism and rely on small groups to resolve global problems.³⁹⁰ China’s willingness to co-opt certain aspects of international norms and laws while selectively ignoring others that run counter to their interests is a common practice. As China expert Elizabeth Economy points out, “Xi’s objective in promoting a China model and calling for reform of global governance institutions are both defensive – to protect China from international criticism – and offensive – to ensure that international norms and values align with and serve Chinese values and political and economic priorities.”³⁹¹ However, China will not rush into reform and is very strategic where and when they apply their influence and pursue their values and interests. As Wu Xinbo notes, China wants to be a “rule-maker, not a rule-taker,” prioritizing “international economy and finance, regional cooperation, and emerging areas” such as AI, to further its international organization voting rights, to promote various forms of regional economic and security cooperation, and to establish mechanisms that serve Chinese interests and preferences.³⁹² China’s desire to make the rules on AI demonstrates its clear desire to establish legitimacy beyond economics, pursuing political and technological power through influencing norms and standards globally.

The Importance of Multilateralism in a Multipolar World

China favors a state-led multilateralism model over a multi-stakeholder model, which advocates for a limited government role.³⁹³ This section looks at global and regional models to better understand China’s leadership preferences and aspirations for multilateral institutions, which China might pursue in seeking legitimacy to lead within an AI world order. As the longstanding structure of the liberal order evolves, discerning what changes might occur is essential. AI competition between the U.S. and China could lead some to argue for the return of a bipolar structure. Still, Russia and innovative nations such as Israel, South Korea, Japan, and Sweden reflect a more multipolar structure shaped by AI’s multisector influence. The emergence of middle powers and the importance of non-military sources of power, such as technology, will give more nations a voice in existing and future institutions. As China rises and seeks to increase its voting power, the emergence of swing states produces what Brookings Institute Senior Fellow Thomas Wright calls “competitive multilateralism,” where democracies contest illiberal values within a “free world framework.”³⁹⁴ However, the U.S. should not constrain itself to work solely with democracies but rather seek more agile and flexible alliances regarding specific issues and values contests. Wright admits to the difficulty of pursuing partnerships solely with other democracies, highlighting countries like Hungary, India, and Brazil as unpredictable partners and recommending a G7 plus South Korea, Australia, and India approach, like other techno-democratic alliances recommended by others. Rather than “competitive multilateralism,” Wu Xinbo describes a liberal partnership order characterized by “contested multilateralism” where contestation leads to “regime shift – creating an alternative multilateral forum with more favorable mandates or decision rules” or “regime creation – creating a new multilateral forum with a

set of different and preferred rules and practices,” and ultimately “leads to fundamental changes in institutional practices or changes the distribution of power.”³⁹⁵ Wu’s arguments dance around the assertions that China does not seek to undermine or alter the current international order, but terminology such as regime shift or regime creation implies changes within, but not necessarily to the liberal order in his vision. Such changes could directly apply to emerging technologies such as AI and the impact on the global financial sector and standards bodies, which the current institutions or construct are unable or unwilling to address directly or to China’s satisfaction.

Global Model – In the global setting, the UN best represents the institution with which China desires to address AI norms and standards. In a call with the UN Secretary-General in September 2020, Xi Jinping made clear his thoughts on the global governance system and emphatically laid down his support for the UN and improving, not overthrowing the current system. Xi stated that “there is one system in the world: the international system with the UN at its core; there is only one set of rules, that is, the basic norms of international relations based on the UN Charter. China never engages in ideological confrontation, never advocates decoupling, and never wants to seek hegemony.”³⁹⁶ Xi then added, “however, we will not sit back and watch the damage to national sovereignty, national dignity, and development. We will firmly safeguard our legitimate rights and interests.”³⁹⁷ Xi’s rhetoric is not uncommon and mirrors prior Chinese statements regarding the UN’s central role and China’s claims to pursue inclusiveness, equality, and fairness in the international system.³⁹⁸ Focusing on development, rights, and interests, Xi’s statement aligns with “China’s assertion that socio-economic development is the ultimate human right (rather than liberal freedoms)” and aligns with the views of many developing nations in the UN.³⁹⁹ Those beliefs become more prominent as China gains legitimacy and extends its influence within the UN, and pursues leadership positions and Chinese standards within organizations.

The U.S. remains the top provider of UN assessed contributions and its peacekeeping budget. However, China contributes more troops to UN Peace Keeping Operation (UNPKO) than the other permanent security council members (P5) combined.⁴⁰⁰ There are certainly financial incentives for China and other developing nations to contribute to UNPKO and operational experience, which benefits the PLA. Still, for China, the perceived value is the increased legitimacy gained through soft power means. Along with leadership roles in four of the top fifteen UN agencies, Chinese diplomat Huang Xia became the first Chinese national to lead a UNPKO in 2019. To China, the UN represents a multilateral system where influence over nations on the periphery can work together to block unpalatable resolutions from the U.S. and other states informed by the western liberal tradition. China has exercised its UN Security Council (UNSC) veto only 16 times over 50 years. Only three of these were unilateral and not alongside a Russian veto. Compare this to 100 solo votes from the Soviet Union (U.S.S.R) or Russian Federation (RF) and more than 50 from the U.S.⁴⁰¹ That is not to say that China has not opposed action from other members or has not worked to block passage through other means. Instead, this example highlights that China does not overtly play its hand in the Security Council and prefers to gain support from other nations, primarily relying on the three rotating African nations (A3) or other rotational members (E10) on the Council. China’s subtle approach to pursue its objectives through working the votes with other nations allows China to gain legitimacy as a global power in promoting inclusion and fairness while dampening other states’ concerns that China might leverage its UNSC seat to pursue hegemonic aspirations. Along with the RF and A3, China needs only find one more member from the E10 to block any UN resolution passage. Thus, when one considers the challenges over AI norms and standards and how voting might play out in multilateral settings, understanding China’s strategy and influence with developing nations will prove essential for anticipating proposals and voting blocs.

Regional Models - The growing trend toward regionalization in trade agreements and organizations leads some analysts to worry that China will continue to pursue the creation of regional or global organizations that seek to undermine or replace those featured in the standing liberal international order. China will argue that new organizations are more agile and responsive to regional needs, and “though there are differences between mechanisms favored by China and the United States, they can still co-exist.” Contemporary examples of such

alternative organizations favored by China include the Regional Comprehensive Economic Partnership (RCEP) and the Shanghai Cooperation Organization (SCO).⁴⁰² The Asia Infrastructure Investment Bank (AIIB) and BRI are other examples. Several U.S. allies have joined one or more of them. These alternatives provide critical features that China – and its Communist Party leadership - believes will enhance the legitimacy of international norms, rules, and institutions.

- **Belt and Road Initiative (BRI)** – While the BRI is a global, strategic initiative by China, the BRI, in many ways, represents several interconnected regional models. How China handles BRI relationships and pursues projects in Africa differs widely from incursions into Europe or Australia. The BRI provides the CCP with “ample opportunity to create new auxiliary rules and institutions, such as the BRI dispute tribunal system, which is, in essence, an extension of Chinese law.”⁴⁰³ This increased influence and market access becomes more concerning with the export of Chinese surveillance hardware, AI, and 5G technologies as these empower autocrats and threaten to compromise overseas networks.
- **Asia Infrastructure Investment Bank (AIIB)** – This Chinese investment instrument for BRI projects is estimated by the standing regional multilateral bank it challenges, the Asia Development Bank (ADB), to be a way for China to address the \$750 billion annually for infrastructure investment, with available financing only reaching \$400 billion annually. AIIB sees itself partnering with ADB and the World Bank to provide a more inclusive regional development solution and a unique capital share structure. China’s capital share went from 50% to 27.55% in 2017 but retained veto power since AIIB requires a 75% majority.
- **Shanghai Cooperation Organization (SCO)** – The SCO governance model is designed around the tenets of mutual respect, sovereignty, and the equality of all member states. The SCO is unique and could serve as a model for future technology-based forums led by China. The member states make decisions by agreement without a vote, and if no member objects to the vote, they reach a consensus.⁴⁰⁴

These relatively new Chinese-led initiatives, institutions, and organizations help foreshadow what a China-led international order might entail. They also help one divine how China is comfortable with possible shifts away from globalism and toward regionalization.

Asymmetric Power Structure – China perceives that the world is in transition and currently views itself at a structural power disadvantage; thus, China “has to push for reform within the system and will continue to be subject to the built-in disadvantages vis-à-vis the United States,” which results not in a “power shift and hegemonic succession” but rather “power and leadership sharing.”⁴⁰⁵ Wu Xinbo describes the emerging multipolar structure as asymmetric, one where “the United States remains a comprehensive global giant, while the other poles are partial global players.”⁴⁰⁶ Writing in 2020 and perhaps returning to the “hide and bide” tactics of old, Wu labels China an economic and political power, neglecting China’s emerging military prowess. Wu then highlights the EU as an economic and normative power, Russia as a military power, Japan as an economic power, and India as an emerging and political power.⁴⁰⁷ It is important to note that Wu chooses not to address technology as a source of power. However, the importance of emerging technologies, such as AI, in boosting economic, military, normative, and political forces should not be lost on readers. With such a wide cast of nations emerging with various power instruments, China perceives that Washington “feels both overstretched and even somewhat tired of preserving the current order. Nonetheless, the existing order will not collapse or be overthrown, but rather evolve and transform.”⁴⁰⁸

U.S. scholars, including Hal Brands and Peter Feaver, note that,

*“international institutions have always faced geopolitical challenges and criticism for their failings. Nevertheless, they adapted and endured, and that could happen again. What may emerge is a shift to a two-tiered order: one level involves the world’s democracies and has a higher level of cohesion and ambition, and the second level is a broader order that involves a larger number of countries and a lower level of cohesion and ambition, reserved only for transnational issues such as a pandemic and climate change.”*⁴⁰⁹

While techno-democratic alliances appear to have caught the fancy of numerous scholars and world leaders, a better approach to AI competition would focus on values and not political ideology. The U.S. and China are not at odds because of China’s one-party system, but rather the values espoused by the CCP, which diverge from liberal democratic values. Singapore is not a democracy, but they are an innovative society whose values align with the U.S.

Vision for a New World Order

The Cold War is not returning. While great power competition increasingly focuses on the U.S.-China dyad, the presence of Russia and technology-infused middle powers capable of leveraging AI across geo-economic and political contests leads to an increasingly multipolar international order. The likelihood of a purely bipolar competition between the U.S. and China is increasingly unlikely, as competition over standards and norms increasingly requires collaboration with like-minded nations to form coalitions and voting factions. The importance of AI and technology within the context of elements of national power amplifies the importance of multilateral institutions, where emerging poles of varying size and strength compete alongside the larger U.S.-China competition. Wu Xinbo still sees the liberal international order remaining, in such a way that “power is the primary agent, determining who is to establish the order, norms determining how the order will be created, and rules and institutions determining what shape the order will take.”⁴¹⁰ The CSG, formed in mid-2020 to look at the U.S.-China technology competition now and into the future, found that “at one time, it might have been possible to imagine an uneasy truce between the two countries when various dependencies would lead to a kind of equilibrium. However, the possibility of an equilibrium is now quixotic.”⁴¹¹ The economic interdependence between the two nations is similar to AI competition involving dual-use technologies, making decoupling or bifurcating difficult due to the globally interconnected aspects of data and cloud-based technologies. The U.S. should prepare for new world order, which in many ways could be characterized as the AI world order. The competition over norms and rules within institutions will shape AI competition. This section examines China’s pursuit of AI governance and an openness strategy that likely provides the best means of competing and winning in AI competition.

AI Governance

The evolution of cutting-edge technologies and the increasing importance of big data and AI alter the strategic landscape, because “the fourth industrial revolution may lead to a ‘winner takes all’ situation among countries,” and is the reason why “China hopes to seize the opportunity in this unstable state.”⁴¹² China increasingly views information network technology and cyberspace as an important strategic goal.⁴¹³ Cai Cuihong and others feel that China has the advantage in pursuing cyberspace governance, based on its successful experience in cyberspace governance domestically, their increasing willingness to participate in cyberspace governance, and a rising sense of international stature where China perceives other nations expect that China should participate.⁴¹⁴ China’s participation in the production of AI norms will result in a pushback against multi-stakeholder models preferred by the U.S.. Fudan University professor Shen Yi emphasizes that Beijing does not trust the multi-stakeholder

approach, as “China is concerned that the U.S. will abuse its advantages in the information communication technology (ICT) field to extend sovereignty into the global space.”⁴¹⁵ According to Shen, the ideal structure for internet governance accounts for the different values of each nation:⁴¹⁶

- Provides an equal voice for all sovereign states (not just the U.S.)
- Great powers have a responsibility to promote order to ensure the security and stability of cyberspace.
- Great powers and other main actors need to reach a consensus in cyberspace to ensure security and strategic stability.

China Academy of Information and Communication Technology (CAICT) White Paper.⁴¹⁷ During the 2020 AI Impact Alliance (AIIA) AI Developer Conference, CAICT released a white paper analyzing the current global AI governance mechanisms and focusing on governance measures for an “ethically oriented society” in the form of restraint and risk prevention and looked forward to future developments in governance that would benefit all of society.⁴¹⁸ Its findings centered on a governance system of AI that requires “the joint construction of ‘flexible ethics’ and ‘hard laws’” which obtain its values and standards from society to guide or restrict the AI development and application.⁴¹⁹

- ***Need for governance*** - AI fuels a technological revolution which is the engine for economic development and improved quality of life. However, there are risks associated with general-purpose AI, the black box of algorithms, and data dependency, making results uncontrollable. Those risks could negatively impact society through instability, enterprises through compliance challenges, and individuals’ violations of fundamental rights. These challenges drive the need for specialized, diverse, agile, and global governance.
- ***Global Construction of AI Governance Mechanism*** – Global AI governance’s goal should be to promote science and technology that benefits humanity through balanced innovation and effective governance. This goal requires a continuous release of technological dividends and value produced by AI, to offset the risks. Such a model requires the participation of all subjects and collaborative governance, but the national government is the core for implementing governance rules. Intergovernmental relationships, non-governmental organizations (NGOs), and industry are essential for guiding governance. However, enterprises are the “backbone of self-discipline and autonomy” in the industry. The public participates by monitoring governance’s effectiveness, as measured by ethical constraints, technical response, and regulatory legislation.
- ***Forming an ethically oriented social norm system*** – AI ethics move from ethical principles to ethical systems in two stages. The first stage requires reaching a consensus on ethical principles and the second stage gradually explores the construction of a moral system. To reach the first stage, international organizations and nations pursue global ethical initiatives while each government identifies its ethical concerns.⁴²⁰
- ***Risk Prevention and Control Systems Guaranteed by Law*** – Data and algorithm regulation is the primary proposition of AI legislation. That legislation is becoming more rational concerning technological laws and legal stability. Universally, the legislation reflects a hierarchical approach to risk orientation and governance. Examples of scenario-based legislation include facilitating autonomous driving, preventing deep fakes, standardizing smart financial products, and promoting smart healthcare.
- ***Prospects for AI Governance*** – Continue to adhere to the inclusive and flexible governance concept and focus on constructing governance paths at different stages of AI development. Soon, the focus should remain on accelerating products and services while seeking to resolve data governance issues. Over the mid to long term, changes to the legal system will need to address the convergence of laws and ethics.

Cyber Sovereignty. The CAICT white paper touches on some vital challenges, the first being cyber-sovereignty. While not explicitly addressed, the white paper emphasizes national governments' role as the "core" and that each nation will have to identify its ethical concerns. This circles back to the importance of values and standards, which "guide or restrict the development and application of AI." For China, the principle of sovereignty extends beyond the physical world and into cyberspace. The emphasis on sovereignty can be attributed to the "century of humiliation" from 1850-1949 and modern-day "pressure from the West on China's political system and human rights behavior."⁴²¹ Shen Yi cites both the 2013 Tallinn Manual on the International Law Applicable to Cyber Operations, which finds "a state within its sovereign territory can implement control on the information infrastructure and activities" and the 1928 Island of Palmas International Law in making a case for cyber-sovereignty. Published in 2013 and updated in 2017, the Tallinn Manual analyzes cyberspace activities related to fighting wars through cyberspace.⁴²² The 1928 Palmas ruled that "a country's internal affairs is independent without interference from other countries."⁴²³ The consequences of which, according to the Ministry of Foreign Affairs (MOFA) and Cyberspace Administration of China (CAC) statement in the 2017 release of the "International Strategy of Cooperation on Cyberspace," is that "information infrastructures, regardless of their specific owners or users, are under the sovereignty of a country's judicial and administrative jurisdiction, which is protected by sovereignty."⁴²⁴ China is not alone in expressing concerns over cyber-sovereignty. India in 2019 shut down the internet nearly 100 times, mostly in conjunction with the blowback to its decision to end autonomy for its section of the disputed region of Jammu-Kashmir and PM Modi "proposed regulations to curtail the activity of Western technology companies and potentially infringe upon Indians' privacy and freedom of speech."⁴²⁵ India is not the only democracy or U.S. partner to take action against U.S.-based tech companies. Such challenges or diverging interests with allies over sovereignty concerns over data or anti-trust is what makes AI governance so challenging; however, much like with the world of finance and trade, tradeoffs and agreements can and will come about through finding common ground. Hal Brands and Zack Cooper believe that if the CCP "cannot feel secure in a world where universal values and a democratic superpower are preponderant," and China desires "a system in which authoritarian rule is protected," then a governance coalition "would underscore to audiences around the world that this is not simply a struggle for power between China and the U.S.. Rather, it is a struggle over the future of the international system and over how people will be governed."⁴²⁶

Data Initiative. The second issue which the CAICT white paper highlights is the need for data governance. The belief that data dependency makes results uncontrollable underscores the importance the CCP places on security and stability. The challenge of explainability in AI unsettles CCP leaders hoping that massive amounts of data fed into algorithms will improve decision-making speed and efficiency without losing control. For the Party, AI is a vital means for exercising authority, and any instability created by algorithms producing unwanted findings or results makes the CCP extremely uncomfortable. Managing cross-border data flows has several components, running the line from individual privacy concerns over personal data to national security concerns. The areas between these two endpoints are where the common ground on AI norms and rules might be sought. China released the "Global Initiative on Data Security" in 2020. It was shaped by China's participation in the multilateral discussion on data security at the UN, G20, BRICS, and ASEAN Regional Forum. China's initiative focused on eight areas:

- Maintaining an open and rational approach to data security ensures an open, secure, and stable global supply chain.
- They are opposing any use of ICT to impair the infrastructure of other nations or steal crucial data.
- Taking action to prevent and end activities that infringe upon personal information, oppose the abuse of mass surveillance against other States or engage in the unauthorized collection of personal data of other States.

- Asking companies to respect host nations' laws and desist from coercing domestic companies into storing data generated and obtained overseas in one's territory.
- Respecting the sovereignty, jurisdiction, and governance of data from other States, and avoid requesting companies or individuals to provide data located in different States without the latter's permission.
- Meeting law enforcement needs for overseas data through a judicial process and appropriate legal channels.
- Assuring ICT products and service providers do not install backdoors to obtain user data illegally.
- Assuring ICT companies do not seek illegitimate interests by taking advantage of users' dependencies on their products.

The basis for action in this document would be the digital governance structure built on rules, norms, and laws. Several phrases jump out at the reader, such as steal “important” data, oppose “abuse” of mass surveillance of “other states” or “unauthorized” collection of personal information, “should not” install backdoors to “illegally” obtain user data. These ambiguously phrased proposals provide loopholes or back doors for continued illicit activities, justified based on protecting China's core interests and defending its sovereignty in cyberspace. China's proposal reiterates the importance of values competition in establishing AI standards and norms. The U.S. has yet to propose data security recommendations, making the GDPR the only other proposal to China's initiative. While similar to the GDRP, China's proposal should not be taken at face value based on CCP values that conflict with the democratic world. China's proposal retains flexibility for China to maneuver based on the principle of cyber-sovereignty, the catch-all which allows China to play the sovereignty card whenever conflicts arise.

Openness Strategy

Pursuing a strategy of openness “anticipates a world in which the U.S. does not monopolize the ability to construct new rules and regimes; rather it expects other powerful actors to proffer new institutions, even as Washington and its partners try to preserve existing bodies and to establish new openness-based rules of their own.”⁴²⁷ Whether “openness” applies to all aspects of GPC with China is up for debate. However, the applicability to AI competition seems appropriate, based on the open structure approach to research, collaboration, and cooperation between various entities, personalities, and organizations spanning the globe. Wu Xinbo, writing with Thomas Larson and David Skidmore, argues that a “strategy for building U.S. competitiveness should leverage open standards and open systems and an open economy as a basis for shared global prosperity. All other alternatives lead to greater conflict, fragmented systems, lower growth, and disrupted innovation.”⁴²⁸ Openness embraces multilateralism and leverages “middle powers” to address asymmetric balances of power and collectively pursue results. This section focused on the importance of middle powers and reviews frameworks and policies under discussion.

Importance of Allies and Partners. A shift toward AI multipolarity and an open structure provides a global configuration that may prove “beneficial to the U.S. if it can marshal its allies toward a common strategy. It also suggests the potency of middle powers, such as European and Asian allies, or traditionally nonaligned powers like India and Vietnam, which will help to determine the balances of power with their alignments.”⁴²⁹ Competition outside of military lanes will emphasize the role of middle powers in economic, technological, and political power, where much of the AI competition over standards and norms will occur. China prefers partnerships to formal alliances, which would first seem to advantage the U.S.; however, “the world is unlikely to support blocs or camps along neat ideological lines... this geopolitical dynamism heightens the premiums on allies that are invested in shared strategy; furthermore, it indicates that case-by-case coalitions will be more diplomatically taxing than either Cold War bipolarity or post-Cold War unipolarity.”⁴³⁰ Bilateral and multilateral engagements will shape AI competition and likely spur changes to the current international structure to reflect the rise of middle powers and

their desire for a vote or voice that better reflects their position. By 2030, India will be the 3rd largest economy and fifth-highest defense budget, and Indonesia will be the 5th largest economy. By 2050, Asia will be home to four of the top ten economies in the world, as well as two of the fastest-growing economies, and “smaller southeastern Asian nations will have alternatives to purely bandwagoning with Beijing, although their underdeveloped defense capabilities will still leave them vulnerable to military coercion.”⁴³¹ China’s stated desire to champion equality and inclusiveness within international governance structures is likely disingenuous given their propensity to flex their economic muscle and employ coercive tactics. For China, promoting equality and inclusion is a platform to offset U.S. advantages and capture swing votes, which could lead to changes within organizations such as the UN. Expanding the UNSC is one example where China’s interests may align with the desires of middle powers such as the “Group of Four” (India, Japan, Germany, and Brazil).⁴³² A call for reform in 2020 to expand membership to twenty-six and nine new permanent member seats and the remaining seats distributed among regional groups for two-year terms. China appears to support the L.69 group of developing states. At the same time, the UK and Russia signaled a desire to expand the UNSC to twenty, and France seems to support adding an African State alongside Germany, Brazil, India, and Japan. For its part, the U.S. representative said the delegation was open to modest expansion, so long as there was no diminishing impact to the Council’s veto power.⁴³³ It remains unclear if an expansion would occur. Still, China’s support for such an initiative backs their public statements on inclusion and equality. While many of those in developing regions are already in China’s target demographic, others are firmly U.S. allies. Such reform and restructuring reinforce Lisner and Rapp-Hooper’s findings in *An Open World* that “the non-unitary nature of the twenty-first-century order means governance will not divide neatly between authoritarian and democratic blocs...the U.S. must work with mixed regimes whose interests align with America’s distinct issues...and occasionally cooperate with illiberal rivals.”⁴³⁴ In a struggle for influence and legitimacy, such a maneuver complicates AI competition with China, as the UN appears increasingly to be an arena for contests over AI standards and norms, and China’s increased participation and pursuit of leadership positions would complicate values competition should China gain more influence within the UNHRC.

Framework. This paper emphasizes that the U.S. cannot compete effectively with China in AI competition without our allies’ support, input, and contributions. Forming partnerships with like-minded nations focused on the values that unite us is imperative for success and essential for sustaining legitimacy as a global leader and champion of human rights and free speech. In state-to-state relations, China prefers partnerships that emphasize equality, inclusiveness, and cooperation, in contrast to alliances which China views as hierarchical, exclusive, and antagonistic.⁴³⁵ China’s preference for partnerships could prove attractive to those nations whose interests align with China’s on a case-by-case basis, provided they do not take the singular view advocated by H.R. McMaster that the “CCP aims to accomplish its objectives at other nations’ expenses.”⁴³⁶ More must be done to demonstrate the values of our partners, and a new multilateral framework, as recommended by the CSG report on U.S. technological competitiveness, must do the following:

1. Enable collective action among global technological leaders.
2. Prioritize economic competitiveness as opposed to political or military dominance.
3. Build allegiances, particularly with the Global South.
4. Facilitate norm-setting and values-based consensus among like-minded countries, particularly in the absence of binding legal regimes.⁴³⁷

The CSG report goes on to advocate for a strategy of microlateralism and establishing a global body for standard-setting, potentially emerging from the T-12 construct, to “identify important new standards and support capacity-building around laws, regulations, and bureaucratic infrastructure.”⁴³⁸ Microlateralism is an intriguing proposal with specific applicability to AI competition. Microlateralism refers to “any ad hoc, multilateral effort that includes at least one G20 country and is led by a smaller country,” which elects to participate in pilot projects or

technology roll-out, capitalizing on the smaller countries agility, unique expertise, or capabilities which establish them as a “credible leader.” Perhaps more importantly, when facing a “pressing global issue where great power rivalry comes with too much baggage,” smaller countries might serve as “honest brokers” to bring together the capacities of larger countries. This strategy enlists other nations as partners, establishing a decentralized network to proliferate technology, address standards, and pursues the creation of “multilateral trust zones” to promote cooperation through shared values.⁴³⁹ The idea of microlateralism aligns with an openness strategy, serving as a novel structure for “international interactions and outcomes, not domestic policy,” as openness “does not require participating states to sacrifice their borders and sovereignty, it does not encompass individual liberties, and it accepts the necessity of domestic as well as multilateral actions to mitigate the negative externalities of openness where they occur.”⁴⁴⁰ Such a strategy is not easy and will require deliberate engagement both internationally and domestically to address the competing interests and requirements which often conflict within societies, demanding tradeoffs and compromise with our partners, as much as ourselves.

Avoiding Zero-Sum Competition.

AI Competition between the U.S. and China is not irredeemably zero-sum; in fact, collaboration and cooperation are not only necessary, but it is beneficial to both nations and carries the potential of helping all of humanity. In helping humanity address transnational issues, “power becomes a positive-sum game” as the U.S., according to Joseph Nye, approaches “power in terms of the ability to accomplish joint goals” where “empowering others can help us accomplish our own goals.”⁴⁴¹ Competition does equate to conflict. Finding commonalities in this “inevitable and inescapable rivalry” allows our nations to accept our differences and search out commonalities or areas where values may align, much like companies such as Apple and Samsung.⁴⁴² The idea of “rivalry partners” put forward by Graham Allison, or “coopetition” or “coevolution” by Elizabeth Economy, are alternative perspectives for the U.S.-China relationship, which with certain assumptions, retains competition as the centerpiece of the relationship while opening up opportunities for cooperation in areas that benefit all of humankind. The risk, however, is if cooperation becomes the objective, not the means, thus it “encourages the actor more committed to cooperation to excuse or even ignore the other’s missteps or malign actions out of fear that cooperation otherwise will not ultimately be realized.”⁴⁴³ A better approach to cooperation focuses on allies and partners, where values naturally align and working through the difficult challenges that AI presents may yield results more quickly. While China has a long history of pursuing bilateral agreements, especially on trade, they remain flexible in adapting to changing environments where their participation offers an opportunity for leadership roles or offsets U.S. interests in regional agreements. In the current geopolitical climate, China is unlikely to accept bilateral agreements or arrangements with the U.S. on AI, preferring multilateral engagements to further their platform for multipolarity and reserving bilateral agreements for economic trade or when opportunities appear to entice developing nations to the BRI or other China-led efforts. The U.S. should not avoid bilateral engagements with Beijing on critical security issues but prioritizing the needs of allies and recruiting nations with shared values presents a path to a more inclusive and diverse alliance. Such an arrangement should not exclude non-democratic countries such as Vietnam or Singapore, nor should it exclude China by design. The U.S. gains legitimacy through leadership that focuses not on division or conflict but by relying on clear values and norms to attract like-minded nations across geographical boundaries and political ideologies. Values more than any other element of competition impede cooperation with China and demonstrating to the world that the U.S. will stand up to China on human rights, while not closing the door on collaboration or cooperation on issues such as climate change, keeps the door open for China to participate, without giving them the power to block, delay or disrupt efforts.

As the CSG finds,

*“getting there will require a more sophisticated approach that bolsters U.S. competitiveness without inviting escalatory cycles of confrontation, retaliation, or unintended conflict with China. Even as competition is the dominant frame, we should consider where cooperation, collaboration, and exchange with China is in our interest.”*⁴⁴⁴

Pursuing cooperation, rather than escalation, requires trust and confidence, which only accumulate over time.

Humanity’s Challenges

In the NSCAI final report, the commission recommended that by “focusing on solving real human problems that impact the lives of millions of people, the United States can build a new *raison d’être* for the triangular alliance of government, academia, and industry; sustain public support for ambitious AI research, and extend America’s AI innovation leadership.”⁴⁴⁵ The report highlights:

- Enable long-term quality of life.
- Revolutionize education and life-long learning.
- Transform energy management.
- Effectively predict, model, prepare for and respond to disasters.
- Reach new frontiers in space.

While not explicitly designating these challenges as potential areas to cooperate with China, they do represent problems facing China and many other nations. Chinese and American scholars frequently reference “global” or “trans-national” challenges as areas where cooperation could occur between the U.S. and China.

A good place to start a discussion on AI cooperation would be to return to the ITU’s AI for Good series which seeks to unlock the promise of AI to capitalize on unprecedented quantities of data across health, commerce, communications, and migration to accelerate the achievement of UN sustainable development goals (SDG) by 2030.

- ***AI for Environmental Efficiency.*** China leads the U.S. in achieving UN SDG, though both trail behind the EU and Japan in terms of companies’ performance.⁴⁴⁶ As the U.S. and China produce 42% of the world’s total carbon emissions, climate change and AI for Environmental Efficiency is perhaps the most obvious area where AI empowered products could tackle energy management.
- ***AI and Data Commons.*** Cooperation requires data sharing to enable nations to learn, collaborate and act through forums such as the Paris Accord or UN Global Standards Initiative.⁴⁴⁷ This is a tough problem and the initiative focuses on transparency, consensus for decision making, and impact and scalability to disseminate existing data resources to the maximum extent. China’s pursuit of leadership positions within the ITU offers opportunity for exchange, but threatens U.S. objectives if the U.S. does not participate and promote democratic values in managing and transferring data.
- ***AI for Natural Disaster Management.*** Natural disasters are another area where access to more data and enhanced interoperability in the INDOPACOM area of responsibility could benefit from cooperation between the U.S. and China. Projects such as the First Five Consortium,⁴⁴⁸ AI enabled capability to respond to HA/DR with enhanced imagery for first responders or IBM’s Project Salus, which uses WATSON Learning to analyze open-source data to predict intensive care units (ICU) bed status, personal protective equipment (PPE) shortages, supply chain chokepoints, population displacement, and partners

with IBM Weather for natural disasters, could prove more accurate in the INDO-PACOM AOR with broader cooperation.

- **AI for Health.** The ITU and World Health Organization (WHO) partnership seeks to establish a standardized framework for the evaluation of AI-based methods of health, diagnosis, triage or treatment decisions. Topic areas include dermatology, falls among the elderly, ophthalmology, psychiatry, symptom assessment, tuberculosis, cardiovascular disease risk prediction, neuro-cognitive diseases, outbreak detection and radiotherapy. China leading the working group of digital technologies for COVID response demonstrates their commitment to shaping the narrative and influencing SSO going forward.⁴⁴⁹
- **AI for Autonomous and Assisted Driving.** The ITU notes that as of 2019, road injuries are the leading cause of death for children and young adults and AI can play a significant role in reducing 1.3 million road deaths and 25 million injuries each year.⁴⁵⁰ A separate report from the WHO found that those injuries and deaths result in insurance payouts of over \$260 billion and over \$365 billion in medical costs.⁴⁵¹ In the U.S. the number of auto-related deaths is estimated at 35,000 people, while in China, that number is closer to 260,000.⁴⁵²

The UN will serve as the focal point for influence over AI competition both through the adoption of technical standards as well as policy acceptance. China's participation and pursuit of leadership positions within key technical working groups and initiatives, demonstrates their commitment to utilizing the existing world order to further their objectives and promote their values. These forums present challenges for the U.S. to maintain influence and legitimacy, but also offer opportunities to engage with the Chinese and seek pathways for cooperation and continued collaboration on AI.

China's Utilization of AI

AI competition is not zero-sum, and there are areas where collaboration occurs and will continue in private sectors. The section builds off the AI initiatives and attempts to separate global challenges into areas where cooperation might prove acceptable and areas where collaboration is a better avenue to pursue. The real question regarding cooperation and collaboration concerns government entities and public sector components involving taxpayer funds. The NSCAI highlights several global challenges, which parallel the AI for Good services. The section focuses on examples of how China utilizes AI in response to its domestic difficulties, proving applicable to international cooperation or collaboration.

Food Insecurity – China represents 22% of the world's population, living on just 7% of the world's arable land.^{494F453} Scarcity of resources and food safety concerns combine to produce food insecurity. China struggles with food safety because "social trust cannot scale."⁴⁵⁴ Enter technology, as both AI and blockchain technologies, seeks to improve agricultural efficiency and reassure consumers on food safety. Alibaba developed its ET Agricultural Brain on the Alibaba Cloud and partnered with Tequ Group to apply AI in the pig industry.^{496F455} The program requires three months of data to function, and each pig is tracked with a QR code, and all aspects of its life are tracked and managed by AI. The program hoped to produce pork yields of 10 million pigs in 2020.⁴⁵⁶ Blockchain provides another means to prevent food falsification by operating on the "Food Safety Cloud," and companies such as ZhongAn Insurance work with BuBuji to blockchain chickens.⁴⁵⁷ Working with China and other nations to address global food insecurity could open opportunities for agricultural and technology export from the U.S. and provide insight and lessons on ways to use AI to address zoonotic diseases and droughts that impact other nations.

Addressing Inequality and Poverty Alleviation– To put things in perspective, nearly 40% of China's population, amounting to 8% of the world's population, lives in rural China.⁴⁵⁸ The 13th FYP promoted the "China Dream" and aimed to raise the entire population out of poverty, which was a "solemn commitment and a

great undertaking” by the Chinese government to “the human rights cause of mankind.”⁴⁵⁹ This would represent quite an accomplishment considering the per capita GDP in 1978 was \$227. As of 2019, the Party reported a per capita GDP of \$9,000 and per capita disposable income increases of urban and rural residents 106.1 and 100.2-fold.⁴⁶⁰ While the CCP championed the growth in disposable income in urban and rural households, they did not report the per capita GDP figures for urban and rural residents. Beyond poverty alleviation, the inequality between urban and rural residents and the coastal and inland regions is concerning. Through the 14th FYP, China hopes to promote a rural revitalization to foster a “new type of urban-rural relationship” through AIOIP and new infrastructure programs to modernize agriculture and rural areas.⁴⁶¹ China scholar Cheng Yinghong’s social commentary on social-Darwinism and treatment of the “low-end population” (低端人口) reflects an ominous sign for the “disregard to basic humanitarian principles” for those “disadvantaged groups at the bottom.”⁴⁶² China’s government seems to recognize the challenge, but their autocratic and decentralized approach reflects “fragmented authoritarianism” in decentralized efforts at the local level to implement national-level policies.⁴⁶³ China is a nation with inequality and poverty challenges. While AI can exacerbate global inequality, effective application and policies could offer opportunities to solve many global challenges through international cooperation.

The following areas represent opportunities for collaboration on AI applications. The sensitivity of data sharing and health or financial privacy concerns may discourage collaboration. However, if there are no values conflicts, each of these areas represents transnational issues that, if solved collaboratively, would benefit the greater good.

Healthcare – From 2002 to 2018, China’s government spending on healthcare spiked from \$11 billion to \$247.9 billion.⁴⁶⁴ Those costs will only continue to rise, as, by 2025, China’s aging rate will exceed 20%, and the number of older adults will surpass 300 million.⁴⁶⁵ China is not alone in facing an aging population and rising healthcare costs. As part of the AIOIP, Tencent’s Miying platform partnered with Shenzhen Hospital Center to offer AI-based remote screening for retina problems associated with diabetes to reduce workloads in the healthcare system.⁴⁶⁶

Financial System – Adaptation of mobile payments in China is a significant advantage in generating data and facilitating ease of transaction in the O2O environment. In 2019, a PwC survey found that 85% of people in China used mobile payment platforms for purchases.⁴⁶⁷ Those platforms developed by Tencent and Alibaba (Ant) integrate social-economic functions that cemented them in users’ daily lives. The CCP hopes to bootstrap on their success with DCEP, a more inclusive platform that does not require a bank account or internet connection. In 2017, 20% of Chinese adults (225 million people) did not own a bank account, requiring Alipay platforms. So not only can the government attract more consumers to the \$2.1 trillion e-commerce market, but the digital renminbi also provides the CCP insight into the financial transactions, movements, and activities of its citizens in real-time.⁴⁶⁸

Education – China’s economic growth and rising middle class require a population with a higher education level and job opportunities upon graduation. Online education and AI applications play an essential role in China’s “AI + Education” strategy. They are integral to both the 2018 “Action Plan for AI Innovation in Colleges and Universities” and “China Education Modernization 2035.” AI plays a role in both online and classroom learning in China. In a positive light, live streaming classes from top schools to rural areas is a means of tackling poverty through education and bridging the urban-rural divide. iFlytek works with provinces to provide voice recognition technology for oral examinations, and other national team members provide education material and establish AI curricula.⁴⁶⁹ However, facial and emotion recognition in the classroom and online sessions deviate from the accepted norms and values in most societies. The most famous example is Hangzhou #11 Middle School, where Hikvision installed a “Smart Classroom Behavior Management System” to monitor and assess students’ attention. The tests drew significant pushback in China, but many Chinese private education and tutoring companies continue to employ these systems today.⁴⁷⁰

Transportation – Research in China discovered that smart transportation improves traffic by 9.25%.⁴⁷¹ Smart cities across China, like Baidu’s Haidian City Brain and Alibaba’s ET City Brain, focus on the comprehensive utilization of AI, big data, 5G, and other technologies to fully perceive, respond to and apply data flow throughout a city. Baidu’s Beijing project incorporates 48 smart scenarios, including public transportation, public restrooms, community management visualization, and industrial pollution traceability.⁴⁷² More importantly, as the applied technology improves, Chinese companies and government officials will find a receptive public, as a WEF survey indicates that 75% of Chinese say they are willing to ride in a self-driving car, and 96% of respondents would consider an autonomous vehicle for all transportation, compared to 58% of Americans and Germans.⁴⁷³ Including emotion recognition in vehicles, such as Huawei’s HiCar system, which links the mobile phone to your car or insurance company Ping An Group in-car cameras and software are alternative means of detecting tired, distracted, or upset drivers who are more likely to get in an accident.⁴⁷⁴ Collaboration on autonomous driving research and applications runs into challenges on data sharing. Still, the life-saving benefits and benefits across the globe could warrant increased collaboration and cooperation if national security concerns and data privacy are not at risk.

National Security Concerns

Rebalancing power within the international system presents challenges to alliances, deterrence strategies, and national security. The emergence of AI further complicates the rise of China and ensuing great power competition. AI will embolden regional powers and could accelerate the pace and scope of military conflicts. As John R. Allen and Amir Husain write in *Hyperwar*,

“When one considers the changing world order – the strong drift toward multipolarity and new power centers vehemently acting out on the world stage – together with the rapid advances in autonomous systems development, the clear implication is that certain kinds of campaigns may become “easier” for the political and military leadership to justify.”⁴⁷⁵

A successful national security strategy for the U.S., “must begin with the recognition that our size and superpower status mean we have to lead the cooperation effort,” as emerging technologies are “global, not just in their distribution, but also their consequences.”⁴⁷⁶ Such leadership requires ensuring that China and other middle powers are not allowed the opportunity to “free ride” in a system that benefits them but asks little in return. As China scholars see competition intensifying, Wu Xinbo offers three suggestions for both nations to manage their overarching strategic competition; delineate the boundary of competition, exercise self-restraint in bilateral and regional contexts, and address crisis avoidance management, which he characterizes as the most urgent issue for security-relations.⁴⁷⁷ A lack of dialogue and engagement mechanisms between the U.S. and China is concerning. Wu points to relations between Beijing and Washington going from “cooler to freezing,” primarily due to a “notable shortage of communication and exchanges between the two national security teams and senior defense personnel, while crisis mechanisms are not well coordinated.”⁴⁷⁸ Wang Jisi highlights the “antagonism of Sino-U.S. values” which will have a greater impact on bilateral cooperation for the foreseeable future, noting the long-term potential for “partial confrontation,” but states China “cannot relax the bond of interests that maintains the relationship between the two countries because of the obstacles of values.”⁴⁷⁹ Wang even goes so far as to call for managing political differences by accelerating reforms and opening up. Engaging with China requires mechanisms to build relationships to gain a shared understanding, if not forging trust.

The NSCAI recommends establishing a high-level U.S.-China Comprehensive Science & Technology Dialogue (CSTD) for “regular, high-level diplomatic dialogue with China that benefits the American people, remains faithful to our allies, and presses China to abide by international norms.”⁴⁸⁰ This forum serves as a means to “air a discrete set of concerns around specific use of emerging technologies” while establishing processes, building relationships, and identifying “targeted areas of cooperation.”⁴⁸¹ The CSG offers recommendations in the form of technical restrictions such as end-to-end encryption, operating system controls, and application program

interfaces (API) access to social graphs, alongside technical transparency initiatives like open-sourcing, code audits, and black-box tests.⁴⁸² These more technical recommendations support an openness strategy that combines the “realists’ respect for material power and its structural implications with liberals’ insistence on the value of interdependence and confidence in the cooperation engendered by international institutions and regimes.”⁴⁸³

Conclusion

During his confirmation hearing testimony before the United States Senate in January 2021, future Secretary of State Blinken labeled Beijing both a competitor and necessary partner, adding that “it’s not a secret that the relationship between the United States and China is arguably the most important relationship that we have in the world going forward” and “increasingly, that relationship has some adversarial aspects to it.”⁴⁸⁴ Competition between the U.S. and China over legitimacy is not zero-sum, as the power struggle among the two nations is not over hegemony. Neither is China likely to pursue a bipolar global structure at point in time. That may change in the future, but presently the interconnected relationships and shared common interests lead to competition rather than conflict. In a speech to the UN in September 2020, Xi Jinping said that:

*...promoting international cooperation is the original intention of establishing the United Nations and an important purpose of the UN Charter. Relying on the Cold War mentality, drawing lines with ideology, and playing a zero-sum game can neither solve domestic problems nor cope with humanity’s common challenges. What we must do is to replace conflict with dialogue, coercion with negotiation, zero-sum with win-win, combine our interests with the common interests of all countries, strive to expand the convergence of common interests of all countries, and build a harmonious and cooperative international family.*⁴⁸⁵

As Wu Xinbo puts it, “there is also a discernible tint of idealism in Chinese rhetoric, and Beijing’s promotion of some lofty ideas may have a self-serving purpose, namely enhancing China’s international image and positioning it on the moral high ground in the world arena.”⁴⁸⁶ While the rhetoric and language may not resonate with many audiences, multipolar competition forces us to focus our efforts to offset those nations that align with CCP values or those swing states that see opportunity through aligned interests. The U.S.-China relationship continues to shift from a “coexistence of cooperation and competition to a competitive-led model,” and that is ok, as the CCP’s concern with instability and legitimacy as a ruling party will lead it to take fewer chances.⁴⁸⁷ At the same time, China prioritizes continued economic growth and development. That may not always be the case. The decision to “selectively decouple” or “bifurcate” from the international economy carries significance not just in bilateral relations. Still, it will echo across global institutions and impact our allies, partners, and those we will want to influence in an increasingly multipolar world.

The world is not divided into two blocs. National interests drive countries to align, and the rise of economic, military, and technology powers will create spheres of influence and swing votes on various issues. Allies are not banning Huawei because the U.S. told them to, rather because they are wary of China’s access and growing influence. The competition over legitimacy will not be won with hard power or through unilateral actions. In working with allies, opportunities will arise for the U.S. and China to work together, otherwise choosing to abstain from participating might alienate those allies and provide the other with a competitive advantage. Measuring tradeoffs and establishing boundaries for cooperation is essential. AI presents remarkable opportunities to humanity. To realize the full benefits of AI, cooperation and collaboration must occur among nations to resolve data and ethics issues. The government that leads those initiatives will take the pole position in AI competition and find itself able to influence other countries on AI norms and standards.

Conclusion (结论)

United States Secretary of State Blinken remarked at the beginning of his first official meeting with his Chinese counterpart at a mid-March 2021 summit in Anchorage, Alaska, “The United States relationship with China will be competitive where it should be, collaborative where it can be, adversarial where it must be.”⁴⁸⁸ AI is one of those areas where the U.S. and China will compete, collaborate, and potentially find themselves in conflict.

The U.S. is well-positioned to maintain competitive advantages with China in the AI domain. However, that advantage hinges on forming flexible and overlapping alliances based on values and committing the required resources to address concerns over science-technology-engineering-math (STEM) education, gaps in domestic manufacturing, obstacles to attracting foreign talent, and ethical concerns over data AI application. Addressing concerns over data collection, bias, and transmission must become a priority within our government and in coordination with those nations with whom we share a set of shared values and interests. AI competition is not zero-sum across the board. Collaboration between the U.S. and China occurs in academia and medical research; however, national security concerns and growing mistrust between our nations require clear boundaries to competitive principles, paving the way for more fruitful targeted engagements involving AI cooperation. That said, additional dialogue and the creation of new mechanisms to address divergent Sino-American values and resolve disputes require innovative approaches to diplomacy. This paper identified the following major points within each of the four critical elements influencing the future of AI for the United States and China.

Values

- While AI itself does not have values, competition involving technology is not value neutral. If liberal democracies do not establish norms and standards for AI, then China will fill the vacuum.
- Democratic values do not align with the CCP’s values, prioritizing the Party over the nation and its people. This divergence in values is the greatest obstacle to cooperation but provides the U.S. with a competitive advantage by working with countries with similar concerns over the CCP values.
- Forming digital alliances with other democracies is an imperative, which allows the U.S. to extend influence through multilateral institutions shaped by our values and allows the U.S. to regain its leadership position in the world.
- Ethical AI applications stem from our values, and the U.S. must work hard not to compromise our values to compete with China. Relying on allies who share liberal values will best contain China’s quest to shape global AI standards and norms.

Cohesion

- Cohesion in technological innovation requires a clearly communicated state vision to enable decentralized efforts which effectively employ limited resources in response to collective challenges. Within a market economy, striking the appropriate balance between government investment and intervention is difficult when AI competition carries national security implications.
- The U.S. needs to establish a center of gravity that works with various innovation clusters or hubs to breakdown silos of excellence and improve R&D investment efficiencies in a way that enables more cohesive national public-private investment from multiple regions to promote economic growth.
- The government’s role is to create an environment that attracts talent, encourages collaboration, and provides countermeasures of protection. China’s top-down approach in driving innovation is not infallible

or a model for others to emulate in seeking cohesive responses.

- Governments need to promote and develop agile and responsive policies to new technologies, and that cannot occur without greater coordination and assistance from the private sector.

Influence

- While domestic cohesion strengthens a nation's competitive position abroad, no government can expect to compete successfully without the support of other nations.
- A combination of hard and soft power will play a central role in extending influence in all areas short of conflict. AI plays a role in defending the CCP at home and enables China to influence open societies through misinformation and disinformation campaigns. Often, these campaigns can destabilize liberal democracies and inhibit their ability to fully compete.
- The ability to set technical standards on AI and influence standard setting organizations (SSO) will drive adoption and extend the influence of nations competing over AI and other emerging technologies. China's participation and pursuit of influence in recent years present a challenge to the U.S. who must increase engagement and pursue a return to a global leadership role.
- Emerging technological markets where competition over data and standards will occur amplifies AI competition between the U.S. and China. China will seek access to data and promote the CCP's values and standards which enable AI enhanced surveillance and targeting of select populations. The U.S. and allies will object to expansion Chinese backed surveillance technology and counter with standards on data and AI which protect universal human rights. Although challenging, this need not be solely a zero-sum contest.
- The U.S. possesses structural power through the dollar (U.S.D) and substantive influence extended through the international financial system. The role of AI in financial technology and the growing acceptance of central bank digital currencies (CBDC) and blockchain applications requires further investment by the U.S. to sustain its legitimacy and leadership within the global financial sector.

Legitimacy

- Legitimacy ties in values, cohesion, influence to align policies that enable continued U.S. leadership in the global political-economic system in an increasingly multipolar world.
- Values conflict will not necessarily impede China's pursuit of legitimacy, as their influence in developing nations and relationship with techno-authoritarian governments emboldens their claims regarding a superior model of governance and economic growth.
- Outlining boundaries for competition and creating safe areas for cooperation in areas that benefit humanity is in both nations' interest. There is evidence that scholars and leaders on both sides could agree on these issues.
- In competition over influence and legitimacy, the UN matters and Beijing's investments across multiple agencies demonstrate their commitment to promoting CCP values and standards within institutions of the existing world order. This provides an arena for competition, but also opportunities for collaboration and cooperation on issues which impact humankind. The ITU's AI for Good focus groups provide both China and the U.S. with opportunities to demonstrate that AI competition is not zero-sum.

If association with the People's Liberation Army (PLA) is a criterion for the U.S. to place Chinese companies on the U.S. Bureau of Industry and Security's entity list or designation as a Communist Chinese Military Company, then there is little hope for bilateral military-to-military cooperation in AI. Such actions amplify mistrust over data

privacy and cyber-security, critical areas of concern surrounding mil-to-mil interactions and escalate transactional engagements between the U.S. and China and. While mil-to-mil cooperation on humanitarian assistance and disaster relief seem the most likely area for the U.S. and China to find common ground and opportunities to collaborate, the U.S. DoD should remain focused on building interoperability with allies to promote data sharing and pursue AI's ethical applications in these alliance and partnership military frameworks. With those agreements, processes, and standards in place, then the potential for military engagements and outreach with China would prove more beneficial. More must occur to address the bilateral relationships which continue to diminish. While concerns over autonomous applications in warfare are rising, China's unwillingness to participate in the Treaty on Measures for Further Reduction and Limitation of Strategic Offensive Arms (New START Treaty) and its unwavering resistance to trilateral agreements on nuclear weapons negotiations seems indicative of how challenging discussions about autonomous weapons and AI might be for the U.S. and Beijing. The dual-use nature of mobile land-based missiles such as the Dong Feng series (DF-21, DF-26) is similar to AI's dual-use challenges.⁴⁸⁹ China employs a nuclear weapon "launch on warning" posture, emphasizing increased readiness and reportedly aligns with Chinese advances in AI and its wider pursuit of "intelligentization" (智能化) of warfare. China's concerns over allowing foreigners into their country to inspect their nuclear arsenal leads to the assumption that efforts to audit or validate AI data sources or algorithms remain out of reach for the time being.

Both China and the United States must take steps to address critical vulnerabilities in their supply chains that threaten national security. While some level of interconnectedness stabilizes the U.S.-China relationship, the global pandemic again illustrated the risks associated with relying on other nations for production and delivery of products in a just-in-time (JIT) logistical model. Eliminating the risk to disruption in supply chains requires stronger domestic bases for manufacturing, which both the U.S. and China intend to pursue through a blend of market economy and government investments. As a single party government leading a state planned economy, China's leadership possesses an advantage in cohesion of policies and investments, but that does not mean the U.S. should seek to emulate China. China's system is flush with capital and streamlined processes for policymaking, but a lack of oversight on spending and a rush to invest in areas promoted by Beijing, runs the risk that capital is not invested efficiently. In an effort to strengthening the domestic foundation for future high technology competition, the CCP has begun calling for cohesion of governance and more deliberate R&D investing. With the most conspicuous interdependence insecurities removed from the bilateral relationship equation, the U.S. and China find themselves better poised to compete for influence over global markets and standards. In this less interdependent setting, competition for influence converges with the legitimacy to lead, offering Washington and Beijing to think anew about opportunities for cooperating over trans-national challenges which benefit humankind.

For the U.S., drawing on a wider pool of allies with shared values is a certain advantage in AI competition. Without allies and partners, American AI growth, high technology innovation, and productive economic development will stagnate as many nations struggle to address data sharing in a world where China will cast an enormous shadow. Cooperating with any nation that shares similar values with the U.S. is essential for expanding the scope and scale of coordination on AI in existing multilateral institutions and new organizations very likely to form in response to AI's increasingly important impact throughout society. After the establishment of a firm base of support among nations with shared values and norms, the next step would be an outreach to nations with "illiberal values," thus incrementally including them by design but denying them access if they fail to adhere to required norms, standards, and values prescribed by members. AI competition requires a long-term view, one that should consider that the Communist Party-centric values of Xi Jinping and the current rulers of China do not reflect the broader societal values of the Chinese people. Xi will not remain in power forever, and while we may not know who will replace him or when that could occur, change in China will come, and the U.S. should prepare for all possibilities from a position of competitive strength. Only such a position guards against unnecessary and unhelpful conflict and remains open to cooperation, but from a position of advantage that comes from standing with nations aligned on the basis of shared democratic values.

Endnotes

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4 Ibid

5 Amir Husain, *The Sentient Machine: The Coming of Age of Artificial Intelligence* (New York: Scribner, 2017), 21

6 Narrow AI is intelligent systems for one particular thing, e.g., speech or facial recognition. Human-level AI, or Artificial General Intelligence (AGI), seeks broadly intelligent, context-aware machines. It is needed for effective social chatbots or human-robot interaction. (Stanford University, Human Centered AI – HAI) <https://hai.stanford.edu/>

7 Machine Learning (ML) is the part of AI studying how computer agents can improve their perception, knowledge, thinking, or actions based on experience or data. ML draws from computer science, statistics, psychology, neuroscience, economics, and control theory. (HAI)

8 China’s Peaceful Development whitepaper (中国的和平发展白皮书), issued by the State Council Information Office (国务院新闻办公室) in 2011, specifies the other four core interests as; national sovereignty, national security, territorial integrity, national unification, political and social stability.

Shen Dingli (沈丁立), “Not firing the first shot” is never absolute [不开第一枪”从来就不是绝对的兆]” *Global Times*, 25 September 2020, <https://opinion.huanqiu.com/article/401GpSwZINA>

9 The term cyberspace here is a broad concept. It includes the computer revolution and the digital revolution spawned by digital computers and the Internet in the third industrial revolution and covers the core content of the fourth industrial revolution that began at the beginning of the 21st century. That is, the Internet has become more popular and ubiquitous, and mobility has dramatically improved; big data technology and the Internet of Things have continued to develop; at the same time, artificial intelligence and machine learning have also begun to emerge. Therefore, cyberspace is an ever-expanding and dynamic development concept.

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11 Wu Xinbo (吴心伯), “Competition-oriented U.S. Policy toward China and Transformation of China-U.S. Relations”[竞争导向的美国对华政策与中美关系转型],” *China International Studies*, No.3, 2019, <http://www.cas.fudan.edu.cn/view.php?id=3057>

12 Elizabeth Economy, “The United States, China, and the Great Values Game,” *COVID-19 and World Order: The Future of Conflict, Competition, and Cooperation*, ed. Hal Brands and Francis Gavin (Baltimore: Johns Hopkins University, 2020), 271

13 First referred to as “special populations” (特种人口) and encompassed landlords, rich peasants, and counterrevolutionaries prior to 1956. In 1956 the Ministry of Public Security issued “Interim Provision on Management of Targeted Population” (重点人口管理工作的暂行规定). Over the years the term evolved and in 1998 the list expanded to 19 types in 5 broad categories for those 1) suspected of endangering state security, 2) suspected of serious criminal activity, 3) those who because of conflicts and disputes have a potential to create a disturbance, engage in violent retaliation, or act

recklessly, 4) those who have been released from prison or labor reform within the past five years, 5) drug users.

Jennifer Pan, *Welfare for Autocrats: How Social Assistance in China Cares for its Rulers* (New York: Oxford University Press, 2020), 86-89

14 An algorithm lists the precise steps to take, such as a person writes in a computer program. AI systems contain algorithms, but often just for a few parts like a learning or reward calculation method. Much of their behavior emerges via learning from data or experience, a sea change in system design that Stanford alumnus Andrej Karpathy dubbed Software 2.0. (HAI)

15 Deep Learning uses large multi-layer (artificial) neural networks that compute with continuous (real number) representations, a little like the hierarchically organized neurons in human brains. It is currently the most successful ML approach, usable for all ML types, with better generalization from small data and better scaling to big data and compute budgets. (HAI)

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18 China’s innovation strategy focuses on “re-innovation” and “overtaking on curves.” These approaches indicate a second adapter or second mover process for innovation, which benefits from studying first-movers and pursuing innovation at later stages, without assuming the risks of costs incurred by first-movers or relying on basic research which may not mature to commercialization.

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The Global Initiative on Data Security, released in September 2020, purportedly borrowed heavily from GDPR and sought to demonstrate China’s sincerity in addressing global data concerns. <http://www.china-embassy.org/eng/zgyw/t1812951.htm>

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24 WSJ Opinion, “Beijing’s Secret Memo and the Jailing of Gao Yu,” *Wall Street Journal*, 23 April 2015, <https://www.wsj.com/articles/beijings-secret-memo-1429841508>

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26 Meituan-Dianping (美团的使命), is a Chinese shopping platform for locally found consumer products and retail

services, including entertainment, dining, delivery, travel, and other services. The company is headquartered in Beijing and was founded in 2010 by Wang Xing.

Tian Tingyue (田廷玥), “2020 Future Science Awards Week: Youth Discuss “The Hottest” Technology Turning Crisis into Opportunity Only in One Thought [2020未来科学大奖周：青年论剑“最热”科技转危为机只在一念之间]” Phoenix News, 29 December 2020, <https://tech.ifeng.com/c/82bJ6FkGMD3>

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38 Freedom on the Net 2020, “China,” Freedom House, <https://freedomhouse.org/country/china/freedom-net/2020>

39 Aaron Friedberg, *A Contest for Supremacy* (New York: W.W. Norton & Company, 2011), 160

40 Within Chinese research, cyberspace (网络空间) here is a broad concept. It includes the computer revolution and

the digital revolution spawned by digital computers and the internet in the third industrial revolution and covers the core content of the fourth industrial revolution that began at the beginning of the 21st century. That is, the internet has become more popular and ubiquitous, and mobility dramatically improved; big data technology and the Internet of Things have continued to develop; at the same time, artificial intelligence and machine learning have also begun to emerge. Therefore, cyberspace is an ever-expanding and dynamic development concept.

41 Shen Dingli (沈丁立), a physicist by training, is an international relations professor at Fudan University. He is the founder and director of China's first non-government-based Program on Arms Control and Regional Security at Fudan University. He received his Ph.D. in physics in 1989 from Fudan University and did his post-doc in arms control at Princeton University from 1989-1991. In 1997, he was awarded an Eisenhower Fellowship. From 1997-2000, he served as Fudan University's Director of Office of International Programs and Deputy Director of Office of Development and Research.

Shen Dingli (沈丁立), "Not firing the first shot" is never absolute [不开第一枪”从来就不是绝对的兆]" Global Times, 25 September 2020, <https://opinion.huanqiu.com/article/401GpSwZINA>

42 Shen Yi (沈伊) studied at Fudan University from 1995 to 2005, and graduated from the Department of International Politics, School of International Relations and Public Affairs with Ph.D. in July 2005. From 2008-2009, Shen Yi went to Georgetown University and stayed there as a post-doctoral research fellow for one year. He is the associate professor of the Department of International Politics, School of International Relations; Standing Director of the Lab of National Cybersecurity Strategy and Technology, Fudan University; Deputy Director of the Center for BRICS Studies, Fudan University.

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49 Shanghai Huacheng Technology Co., Ltd. (上海华承光电科技有限公司) is a private communication technology company that develops, produces and sells optical fiber, optical cable and data center products. It was formally incorporated in March 2015 with the company headquartered in China, Shanghai Pudong, Zhangjiang Hi-Tech Park, R & D. Its production base is located in China, Zhejiang, Jiashan Industrial New City.

Jennifer Pan, Welfare for Autocrats: How Social Assistance in China Cares for its Rulers (New York: Oxford University Press, 2020), 147

50 The targeted population program is a preemptive control strategy that has been in place since the 1950s. It is premised on the belief that the regime could, with some degree of certainty, predict who is more or less likely to take action the regime wants to suppress and that the regime should systemically identify these individuals from the entire population and intervene in their behavior. The task for surveillance in the Chinese regime has always included identifying individuals who might take future actions the regime deems objectionable. Thus, this surveillance is not concerned only with monitoring current behavior but also with being able to see into the future.

Jennifer Pan, *Welfare for Autocrats: How Social Assistance in China Cares for its Rulers* (New York: Oxford University Press, 2020), 167

51 Megvii (旷视) - is a Chinese technology company that designs image recognition and deep-learning software. Based in Beijing, the company develops artificial intelligence (AI) technology for businesses and the public sector. In 2019, the company was valued at U.S.\$4 billion. Megvii is the largest third-party authentication software provider globally, and its product, Face++, is the world's largest open-source computer vision platform.

Kai Strittmatter, *We Have Been Harmonized: Life in China's Surveillance State*, (New York: Harper Collins, 2020), 249

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Xinktech (云思创智) is an artificial intelligence company dedicated to multi-modal deep, intelligent machine learning and multi-modal sentiment analysis. Through the self-developed multi-modal deep learning intelligent product system, the company provides one-stop services from algorithm construction, model training, reasoning verification, application release to form intelligent application solutions for unstructured data in all walks of life. The company's multi-modal sentiment analysis interactive products and core algorithms have independent intellectual property rights, which can meet the needs of customized scenarios in different industries.

Ibid

55 Natural language processing strives to build machines that understand and respond to text or voice data—and respond with text or speech of their own—in much the same way humans do. <https://www.ibm.com/cloud/learn/natural-language-processing>

iFlytek (科大讯飞) is a partially state-owned Chinese information technology company established in 1999. It creates

voice recognition software and 10+ voice-based internet/mobile products covering education, communication, music, intelligent toys industries. State-owned enterprise China Mobile is the company's largest shareholder. The company is listed on the Shenzhen Stock Exchange with a market capitalization of 25 billion RMB, and several state-owned investment funds back it.

56 Kai Strittmatter, *We Have Been Harmonized: Life in China's Surveillance State*, (New York: Harper Collins, 2020), 281

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SenseTime (商汤科技) is currently the world's most valuable artificial intelligence (AI) company. It is established in Hong Kong with additional offices across China, Singapore, Japan, Abu Dhabi, and the United States. The company has a portfolio of 700 clients and partners, including the Massachusetts Institute of Technology (MIT), Qualcomm, Honda, Alibaba, Weibo, and more. It was the world's first Artificial intelligence unicorn and is valued at over \$7.7 billion. The company develops AI technologies including facial recognition, image recognition, object detection, optical character recognition, medical image analysis, video analysis, autonomous driving, and remote sensing for a variety of industries from healthcare to finance, online entertainment to education, retail to security, smart cities to smartphones, and more. In 2019, the company was placed on the United States Bureau of Industry and Security's Entity List for using its technology for human rights abuses on Uyghurs and other ethnic and religious minorities.

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once went to Stockholm School of Economics (1999-2000), Harvard University, and the National Bureau of Economic Research (NBER) for educational visits (2006-2007), and went to the International Monetary Fund for cooperative research (2009).

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Zhong Hang Futures (中航智造) – Shenzhen company founded in 2017. Relying on the Chinese aviation industry’s strong manufacturing capabilities, Zhong Hang is committed to researching and developing and sales of AI electronic products. The mission is to share a beautiful and intelligent life globally. They have branches and R&D centers in China, the United States, Japan, Australia, Singapore, etc. Products include smart audio-visual products, new energy power products, multi-purpose beauty, hair care products, and smart car electronics.

NetEase (网易)- As a leading internet technology company based in China, NetEase, Inc. (NASDAQ: NTES; HKEX: 9999) is dedicated to providing premium online services centered around innovative and diverse content, community, communication, and commerce. NetEase develops and operates some of China’s most popular mobile and PC-client games. In more recent years, NetEase has expanded into international markets, including Japan and North America. In addition to its self-developed game content, NetEase partners with other leading game developers, such as Blizzard Entertainment and Mojang AB (a Microsoft subsidiary), to operate globally renowned games in China. NetEase’s other innovative service offerings include the intelligent learning services of its majority-controlled subsidiary, *Youdao* (NYSE: DAO); music streaming through its leading *NetEase Cloud Music* business; and its private-label e-commerce platform, *Yanxuan*.

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132 Open source and open systems refer to platforms. Zheng Nanning (bio) is currently a Distinguished Professor of Xi’an Jiaotong University, where he teaches advanced digital signal processing, computer vision and pattern recognition, computational cognitive science, and engineering. He is the Founder and Director of the Institute of Artificial Intelligence and Robotics at Xi’an Jiaotong University (www.aiar.xjtu.edu.cn). His major research interests include computer vision, brain-inspired computing, advanced intelligent computing architecture, and autonomous vehicle. From August 2003 to April 2014, he was the President of Xi’an Jiaotong University.

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chairman of the Science and Technology Commission of the Ministry of Education, the Science and Technology Committee of the National Defense Science and Industry Bureau, and the State Council Convener of the Appraisal Group of the Instrumental Discipline of the Degree Committee, member of the 13th Five-Year Plan Expert Group of the Ministry of Science and Technology of the Aerospace Field, deputy head of the expert group of the Ministry of Industry and Information Technology, and leader of the intelligent manufacturing standardization expert advisory group of the Ministry of Industry and Information Technology.

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Chinese Association of AI (中国人工智能学会副理) was established in October 1981. It is the only national 4A-level social organization in intelligent science and technology officially registered by the Ministry of Civil Affairs of the People’s Republic of China. It is engaged in scientific and technological work in the field of artificial intelligence. It is a national non-profit academic society organization voluntarily formed with relevant enterprises and institutions and registered under the law. Its affiliate is Beijing University of Posts and Telecommunications; it is a formal group member of the China Association for Science and Technology and has the qualification to recommend “Academicians of the Chinese Academy of Sciences.”

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318 Ma Jiajun is a Tsinghua University graduate with a PhD in Physics and started working at QuantumCTek (国盾量子) in 2017, QuantumCTek Co., Ltd. is a Chinese pioneer and leader in commercialized quantum information technology (QIT), now becoming one of the world's biggest manufacturer and provider of QIT-enabled ICT security product and service. Based on ongoing innovation and open collaboration of quantum science and technology, QuantumCTek is committed to providing competitive QIT portfolio of quantum secure solutions in telecom infrastructure, enterprise networks, cloud computing, as well as Big Data technology and services. Our solutions, products, and services are used in government, financial and energy industry, etc., ensuring long term quantum safety to numerous users. Till now, more than one thousand QuantumCTek quantum secure products have been manufactured and running online, securing communication links longer than 6000 km.

319 Ma Zhangchao focuses on secured data communication and appears to be very invested in [developing China's national standards](#) and influencing ITU standards, as evident by the [ITU and CAS QC brief](#) in Shanghai from 2019.

320 ITU-T Focus Group on Autonomous Networks was established by ITU-T Study Group 13 at its virtual meeting, 17 December 2020. The Focus Group will draft technical reports and specifications for autonomous networks, including exploratory evolution in future networks, real-time responsive experimentation, dynamic adaptation to future environments, technologies, and use cases. The Focus Group will also identify relevant gaps in the standardization of autonomous networks. The primary objective of the Focus Group is to provide an open platform to perform pre-standards activities related to this topic and leverage the technologies of others where appropriate. <https://www.itu.int/en/ITU-T/focusgroups/an/Pages/default.aspx>

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336 Yan Xuetong (阎学通) is a distinguished professor and dean of the Institute of International Relations at Tsinghua University. In 2008, he was named one of the world's Top 100 Global Thinkers by the American journal Foreign Policy. Dr. Yan received his Ph.D. of political science from the University of California, Berkeley in 1992, an MA in international relations from the Institute of International Relations in 1986, and a BA in English from Heilongjiang University in 1982. Yan is a member of the Chinese Communist Party

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339 Tan Tieniu (谭铁牛), Professor of Computer Vision and Pattern Recognition, Deputy Secretary-General of the Chinese Academy of Sciences. Tan is a Fellow of the IEEE and the IAPR (the International Association of Pattern Recognition). He has served as Chair or program committee member for many major national and international conferences. He is or has served as Associate Editor or member of editorial boards of many leading international journals, including IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), IEEE Transactions on Automation Science and Engineering, IEEE Transactions on Information Forensics and Security, IEEE Transactions on Circuits and Systems for Video Technology, Pattern Recognition, Pattern Recognition Letters, Image and Vision Computing, etc.

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Ibid

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343 Zhao Gang (赵刚), Ph.D., researcher of the Chinese Academy of Science and Technology Development Strategy, Ministry of Science and Technology, concurrently deputy director of the Ministry of Science and Technology, National Development and Reform Commission Office of Renewable Energy and New Energy International Science and Technology Cooperation Program, a senior expert of the Chinese National Committee of the International Chamber of Commerce, researcher of the Ecological Strategy Research Center of Tsinghua University, Senior consultant of the United Nations Industrial Development Organization, gifted to the senior strategic consultant of Asia Foundation, etc. Postdoctoral fellow at Tsinghua University, visiting professor at the Center for International Security and Cooperation of Stanford University, international visiting scholar of the U.S. State Department, visiting scholar of Asia Foundation Tian Changlin, the main member of the Chinese expert group of the China-U.S. Innovation Dialogue, and participated in the China-EU Innovation Dialogue and the China-Russia Innovation Dialogue.

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346 Lu Chuanying (鲁传颖), the Secretary-General and researcher of the Cyberspace International Governance Research Center of Shanghai Institute of International Studies. Lu has experience at the Russian Higher School of Economics, the Center for Strategic and International Studies in the United States, and the University of Oxford in the United Kingdom to research cybersecurity and governance.

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