Generative AI: The Future of Innovation Power

SPECIAL EDITION REPORT

SPECIAL COMPETITIVE STUDIES PROJECT

This report reflects the incredible work of the SCSP staff. The depth of research, meticulous attention to detail, and thoroughness showcased are truly commendable. In addition, we thank SCSP's Board of Advisors, Dr. Eric Schmidt, Michèle Flournoy, Dr. Nadia Schadlow, William "Mac" Thornberry, and Robert Work. Their intellectual leadership since this project's inception has been invaluable. Lastly, we are grateful to Dr. Andrew Moore and Dr. Tom Mitchell, who co-chaired SCSP's Task Force on Generative AI and brought together some of the major frontier model companies and researchers that helped inform this important work.

When harnessed properly, generative AI (GenAI) has the potential to transform productivity, efficiency, and innovation itself. SCSP staff wrote this report with supervised assistance from GenAI tools, such as ChatGPT, Bard, and Claude, in the following ways:

- Surfacing and summarizing recent research on relevant topics, which was subsequently reviewed by humans.
- Brainstorming text for specific topics or sections.
- Experimenting with various writing styles and levels of detail.
- Identifying examples in support of the report's claims, which were subsequently cross-checked by a human for accuracy and relevance
- Evaluating the report's claims for logical consistency, comprehensiveness, redundancy, and potential counterarguments.

GenAI was at no point used to generate text, sources, or numbers that were not subsequently reviewed closely by humans.

Executive Team

Yll Bajraktari
Michael Gable
Angela Ponmakha

SCSP Staff

Jafer Ahmad
Tooba Awan
Ben Bain
Ylber Bajraktari
Karina Barao
Ryan Carpenter
Joseph Chapa
Carlie Doyle
Rama Elluru
Mike Garris
Hina Gir
Greg Grant
Nayanee Gupta
Brady Helwig
Chelsea Holt
Sarah Johnson
Jenilee Keefe Singer
Daniel Kroth
Abby Kukura
Katie Kurata
Channing Lee
Jung-Ju Lee
David Lin
Mike Lueptow
Justin Lynch
Peter Mattis
PJ Maykish
Brandon McKee
Will Moreland
Lauren Naniche
Ariana Orne
Rachel Pankuch
Tara Rigler
Jennifer Sheehan
James Smith
Nyah Stewart
Katie Stolarczyk
Liza Tobin
Jamie Tomberlin
William "Chip" Usher
Luke Vannurden
Meaghan Waff
Joe Wang

Research Assistants

Olivia Armstrong
Ethan Emery
Pieter Garicano
Addis Goldman
Samantha Hasani
Elsa Ianotta
Maryam Jameel
Paige Kelly
Isabelle Kern
Asra Khan
Nicole Makar
Tara McLaughlin
Pranav Pattatathunaduvil
Noah Stein
Jack Taylor
Daniel Trusilo
Tetiana Tsunik
Tyler Vail

Table of Contents

i

Letter from the Chair & CEO

Preface

ii

Special Edition Report

Executive Summary

iii

Introduction

The GenAI Moment

iv

Assessment

GenAI Assessment

v

Levels of Analysis

Grasping the GenAI Era

vi

Comparative Analysis

U.S. & PRC Generative AI Landscape

1

Platforms

Innovation Power for the GenAI Flywheel

2

Society

Governance of Generative AI

3

Economy

Building the Generative Economy

4

Foreign Policy

Establishing U.S. Global Leadership in the Era of GenAI

5

Defense

Department of Defense Adoption of GenAI

6

Intelligence

Implications of GenAI for the Intelligence Community

PART ONE

The Future of Innovation Power

- Preface
- Executive Summary
- The Generative AI Moment
- The Generative AI Assessment
- Grasping the Generative AI Era
- Comparative Analysis: U.S. & PRC Generative AI Landscape

Preface

Large Language Models (LLMs), and generative artificial intelligence (GenAI) more broadly, are the latest and potentially most significant technological advances in this time of rapid technological change. They represent a step change in AI's capabilities and a fundamentally different and promising path in AI's development. This special edition report provides an honest, sober, and comprehensive appraisal of GenAI's promise as well as the conceivable peril of this fast-evolving technology. We discuss GenAI's potential as an entirely new technology, its importance for national security, and also how it opens up a new era on the broader AI development timeline. This report offers a vision for how governments and the private sector must come together to steer the responsible development of GenAI, adroitly manage the national security implications, and put in place the organizations and supporting institutions to ensure we maintain a commanding lead not only in GenAI but the larger AI sector as a whole. This is a golden moment for U.S. government leadership.

This is a golden moment for U.S. government leadership.

Competition is SCSP's organizing principle. Strategic competition between the United States and the People's Republic of China (PRC), amidst the current wave of technological innovation, is the defining feature of world politics today. The United States must continue to out-innovate competitors and lead the development of future technologies. The geopolitical, technological, and ideological implications of this competition cannot be addressed in isolation – they must be managed together in a comprehensive competitive approach. To that end, we seek to help develop a new public-private model that is better suited to the geopolitical uncertainties of this competitive era, one in which technology will ultimately determine who leads and who follows.

To meet this moment, SCSP launched a focused effort to assess what the rise of GenAI means for the United States, our allies and partners, and the competition with strategic rivals. Bringing together leading experts in this fast-moving field, the SCSP Generative AI Task Force developed a range of recommendations - incorporated into this report - for the U.S. government, allies and partners, industry, and academia to address the challenges and opportunities that GenAI presents for national competitiveness. These included ways to foster responsible innovation and harness the transformative power of GenAI, while addressing ethical concerns and potential risks.

For every significant technological leap in our nation's modern history, there has been a call to action, a signal to the President that the nation needs a strategy to guide a concerted effort for adopting technology in a way that considers both the enormous benefits as well the critical national security implications. This principle guided the Rockefeller Special Studies Project of the 1950s, led by Dr. Henry Kissinger, to generate American strategic choices and organizational changes to respond to the challenges posed by the Soviet Union in the earliest days of the Cold War. It is that same model which SCSP embraces today.

The GenAI moment demands similar action and a comparable sense of urgency and consequence. It is incumbent upon us to ensure that the ongoing AI revolution aligns with our democratic values and promotes global freedoms, given the profound implications of this technology for our national security and society. The journey of AI – particularly GenAI – is far from over; we are only just beginning to understand the ripple effects of this transformative era. But with careful navigation and proactive strategies, we can steer this Age of AI towards a more secure and prosperous future.

Eric Schmidt

Ylli Bajraktari

Executive Summary

In these uncertain times, we face the emergence of increasingly sophisticated generative AI models, or GenAI. These models promise to transform society, revolutionize various industries, and drive innovation across multiple sectors. This technological development potentially marks a significant step towards the creation of more powerful forms of AI in the future, including Artificial General Intelligence (AGI).[1]

However, these advancements come at a time of complex and unstable geopolitical conditions which bear resemblance to the era before World War I. During that period, industrial growth and an uncertain security environment, along with clashing ideology, led to a conflict unparalleled in its ferocity and destructiveness.[2]

Today's technological breakthroughs, while filled with potential, also bring risks. The geopolitical environment should be a stark reminder of the complexities associated with massive shifts in power and technological capability. As we move towards the development of more advanced AI, we must navigate these complexities with caution, wisdom, and a keen awareness of history.

The competition for power and influence in this era will require that the United States, alongside allies and partners, develop government-supported, public-private partnerships that enable continuous technology innovation and deployment. This moment provides the United States government with a unique opportunity to lead with conviction as humanity enters a new era.

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1 Sébastien Bubek, et al., Sparks of Artificial General Intelligence: Early Experiments with GPT-4, arXiv (2023).

2 Tristan Bove, Henry Kissinger Says The U.S. And China Are In A 'Classic Pre-World War I Situation' That Could Lead To Conflict, But A.I. Makes This 'Not A Normal Circumstance', Yahoo Finance (2023).

TWO PRINCIPLES should guide U.S. action:

1. Global Leadership in Generative AI Should Be a U.S. National Security Priority. As the world enters the Age of AI, America's continued leadership in this field is a crucial national security imperative. Crucial because GenAI has the potential to revolutionize military capabilities, intelligence gathering and analysis, and cyber warfare, all of which means the United States and its allies and partners must maintain a competitive edge. The ability to develop and deploy advanced AI systems can enhance a nation's strategic advantage, deter potential adversaries, and ensure national security interests are protected. A failure to prioritize AI leadership would leave the country vulnerable to technological dominance by rivals, compromising its security and diminishing its influence on the world stage.

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2. Winning the Platforms Competition is Critical for our National Prosperity. After decades of growth and expansion, the People's Republic of China (PRC) is now facing significant economic headwinds exacerbated by mounting policy challenges. Still, Beijing is relentlessly pursuing its goal of becoming "the world's primary center for science and high ground for innovation," which it sees as key to shaping the global balance of power to its advantage.[3] While its current GenAI efforts lag behind U.S. platforms, the PRC is among a very short list of nations capable of building and deploying frontier large language models (FLLMs), given its top down leadership structure, immense resources dedicated for this effort, and innovative but constrained talent pool. GenAI is opening a new front in the technology competition. With both the PRC and the United States offering competing visions of the future trajectory of geopolitics, we are entering a new era of uncertainty that could become highly destabilizing, with potentially grave consequences for humanity.

3 Ben Murphy, et al., Xi Jinping: 'Strive to Become the World's Primary Center for Science and High Ground for Innovation', DigiChina (2021).

TWO OBJECTIVES will define success:

1. The United States, Together With Its Allies and Partners, Leads AI Innovation and Sets the Rules of the Road. The U.S. government, in close collaboration with its allies and partners, must seize the transformative potential of GenAI and strengthen our collective competitiveness for this new era. This pivotal moment demands swift action to ensure economic prosperity, build military strength, and promote social well-being. Given AI's global nature and its potential impact on societies worldwide, it is imperative for the United States to take the lead in establishing a framework of rules, norms, and ethical standards governing the development and deployment of AI. This community of like-minded nations must work together to counter bad actors – state and non-state actors both – who will invariably use GenAI in malicious and destructive ways. Through proactive engagement and strategic investments, we can harness the power of GenAI to shape a future where the United States and its partners thrive in a world characterized by stability, progress, and shared values.

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2. The United States, Together With its Allies and Partners, Works to Avoid a Destabilizing AI Arms Race. The potential military applications of AI, particularly to facilitate kinetic and cyberattacks, along with the relatively low barriers to entry of AI capabilities, could fuel an escalating global arms race with ever more powerful weapons available to a wide range of actors. To prevent such a catastrophic outcome, it is imperative for nations to engage in dialogue, cooperation, and the establishment of shared rules and norms around AI, and regulations and enforceable consequences addressing AI weapons. The United States should lead global engagement to promote transparency, foster trust, and encourage collaboration. Together, the international community can mitigate the risk of a destabilizing arms race, ensuring that AI technology is harnessed for the benefit of humanity rather than becoming a destructive and destabilizing force.

THREE MOVES are required to achieve our objectives:

1. Set the Conditions. To sustain and advance U.S. leadership in GenAI, the U.S. government must help its domestic actors by leading through a positive vision, getting the basics right, and rallying allies and partners in making similar, complementary investments. While GenAI is one of the many applications of AI, it shares the same basic requirements needed for broader AI adoption and advantage: data, compute, people, and a thriving innovation ecosystem. The U.S. government should accelerate its efforts to make quality, large datasets more widely available to U.S. organizations, particularly academia who lack access but are on the forefront of research; increase compute access while maintaining technological leadership; make targeted investments in those areas where private sector capital might be lacking or insufficient; and provide greater support in developing the next generation of technical innovators.

2. Shape the Terrain. To ensure continued U.S. leadership in this era of innovation power, the U.S. government must lead in convening a range of stakeholders to set responsible rules, both domestically and internationally. Because GenAI presents new challenges to privacy, security, and societal cohesion, the U.S. government must work closely with industry and international partners to shape its development and impact. By fostering cooperation, coordination, and joint research and development, the United States can shape the trajectory of AI development and promote a global ecosystem that prioritizes human welfare, privacy, and the rule of law.

3. Accelerate Implementation. The U.S. government must proactively incorporate GenAI into its daily work or risk falling behind geopolitical competitors and failing to maximize value creation for its citizens. Each branch, department, and agency of the U.S. government should be experimenting with how to responsibly incorporate GenAI tools into their mission sets. The nature of government work will involve unique requirements and constraints, but this should not serve as an excuse for inaction. Generative AI has the capacity to enhance government abilities, from administrative tasks to critical military operations, thereby boosting our national competitiveness.

As more powerful AI models – particularly AGI – increasingly come into view, it is crucial for our country to seize this moment and lead. We should approach GenAI – and AI more broadly

– not with irrational fears, but with the intellectual curiosity and rigor that is the hallmark of our innovative nation and that positioned the United States as the global technological leader throughout the 20th century and continues now into the 21st. We must not be paralyzed by a desire to eliminate every risk. We need to articulate a positive vision; responsibly harness the opportunities of GenAI; and, with our allies and partners, serve as a model as we chart a new path for human civilization.

We need to articulate a positive vision; responsibly harness the opportunities of GenAI; and, with our allies and partners, serve as a model as we chart a new path for human civilization.

Part I of this report explores the geopolitical implications of recent breakthroughs in GenAI. It presents the national security context, technological trajectory, and potential impacts of this disruptive new technology to inform effective, coordinated U.S. government actions.

Part II of this report includes a series of memorandums to senior U.S. government officials on the near-term implications of GenAI specific to their domains, along with policy recommendations for adapting to rapidly changing conditions. The topline takeaways from each memo are as follows:

Memorandums to the President of the United States and Congress

Innovation Power for the GenAI Flywheel

GenAI, unique from the technological revolutions preceding it, is changing the very nature of innovation. The first nation to master this step change will unlock a new form of soft and hard power – innovation power – by which military capabilities, economic prosperity, and cultural influence can be forged. The U.S. government needs to come together to organize, drive, and fuel the U.S. innovation ecosystem with empowered, tech-focused institutions; audacious moonshots; and new resources to convert its current technological edge into long-term advantage for the era of GenAI.

Governance of Generative AI

The governance landscape for GenAI is being shaped by two contrasting timelines: GenAI development is progressing rapidly, while AI governance is moving slowly. The need for AI governance is urgent because of the rapid societal uptake of GenAI and the imminent and pressing threats that GenAI presents, such as accelerating the spread of disinformation. For the sake of America's own democratic future, and given the global ideological contest over governance models, we must present the world with a democratic model for GenAI governance worthy of emulation, one that reaps the benefits of GenAI while also protecting our societies from the worst potential harms.

Building the Generative Economy

GenAI will have a transformative impact on the global economy. Nations that harness the potential of GenAI will increase productivity, a key economic measure that underpins economic growth, higher standards of living, and the ability to finance all other national priorities. Unlocking these benefits requires boosting competitiveness across the fundamental building blocks that underpin AI leadership: compute, data, and people. Compute is the engine that powers GenAI training and inference. Data serves as the fuel, but competitiveness hinges on digital infrastructure to move it from place to place, as well as a trusted regulatory framework that can ensure responsible use. Ultimately, people are the most important element for GenAI leadership. We must continue to attract the world's top AI talent while unlocking opportunities for Americans to benefit from the Age of AI.

Establishing U.S. Global Leadership in the Era of Generative Artificial Intelligence

GenAI is transforming the global environment in which America's diplomats operate and the tools with which they work. Success in the Age of AI requires the United States, with the Department of State in the lead, to implement a paradigm of "Platforms Statecraft" to ensure that our nation and our allies and partners can work together to support and promote our global technology platforms so that they underpin advantage in GenAI and other strategic technology areas. Simultaneously, the Department of State should adopt new tools that capitalize on GenAI's transformative power in executing its mission. Finally, the Department of State should lead an international effort to design and organize multiple layers

of international regimes, institutions, and dialogues to mitigate GenAI's high-consequence risks and support the broadest possible positive-sum applications that GenAI offers.

Adoption of Generative Artificial Intelligence for Military Purposes

America's advances in generative artificial intelligence present the Department of Defense (DoD) with a crucial opportunity to accelerate two of its most significant transformations – preparing for the future character of conflict and strengthening our military overmatch against our rivals, especially the People's Republic of China. The establishment of Task Force Lima on August 10, 2023, was a critical recognition of the importance of this moment by DoD. We propose that the Task Force prioritize four critical areas in integrating generative AI across DoD: enabling decisional advantage, enhancing operations, developing talent, and identifying new defensive measures. Furthermore and mindful that advances in generative AI will continue to accelerate in the near-term, we also recommend that the Department: 1) create a Defense Experimentation Unit to provide for much-needed operational experimentation and iteration with AI models; 2) build an Automated Orchestration Platform - a generative AI-powered interface that can call up relevant tools and datasets, can decompose the queries into discrete tasks, and semi-autonomously or autonomously complete tasks; and 3) develop defense-tailored generative AI models, trained on specific military information, terms, and jargon.

Implications of Generative Artificial Intelligence for the U.S. Intelligence Community

Rapid advancements in GenAI, and AI more broadly, make it clear we are on the threshold of the next era of intelligence, one that will be defined by how well intelligence services leverage AI tools to collect, sift, and analyze global data flows to generate insight and deliver effects. The U.S. Intelligence Community (IC) should take immediate action to leverage these emerging capabilities to protect the nation and maintain our competitive advantage over the PRC.

The Generative AI Moment

Historians will look back upon 2023 as a marker of the beginning of the AI Era. Indeed, the launch of the GenAI model ChatGPT in November 2022[4] marked a major turning point in both the rate of technological progress in the larger AI field and the mass adoption and diffusion of generative AI models. The scale and speed of GenAI's diffusion is nothing short of astounding. Consider the following: the IBM PC first shipped in 1981, and the iconic Apple Mac followed in 1984. Yet it would take until the early 1990s, nearly a decade, before there were 100 million PCs in use. Just six months after its release, there were already 100 million ChatGPT users.[5] GenAI is on pace to achieve the speed of diffusion in one year which the Internet took seven years to realize.[6]

The speed and breadth of GenAI's technological diffusion – driven as much by commercial incentives as technical progress – is more than in any previous period of AI development. Already, GenAI tools demonstrate the ability to solve university-level math questions,[7] score at a human equivalent on university entrance exams,[8] and compose realistic visual representations of complex and sometimes novel phenomena. Multimodal GenAI tools create images,[9] video,[10] and music[11] from text inputs, turn natural language into code,[12] and run tests to catch bugs.[13] Models fine-tuned on specific sets of data are being developed and

4 Introducing ChatGPT, OpenAI (2023).
5 AI and the Automation of Work, Benedict Evans (2023).
6 Abraham K. Song, The Digital Entrepreneurial Ecosystem—A Critique and Reconfiguration, Small Business Economics (2019).
7 Adam Zewe, New Algorithm Aces University Math Course Questions, MIT News (2022).
8 Benj Edwards, OpenAI's GPT-4 Exhibits "Human-Level Performance" on Professional Benchmarks, Ars Technica (2023).
9 DALL-E 2, OpenAI (last accessed 2023).
10 Make-A-Video, Meta (last accessed 2023).
11 Andrea Agostinelli, et al., MusicLM, Google Research (2023).
12 Andrew Tarantola, Natural Language Programming AIs are Taking the Drudgery Out of Coding, Engadget (2023); Tanya Tsui, Coding with ChatGPT, Medium (2023).
13 Codium AI (last accessed 2023).

used for domain-specific applications in finance,[14] science,[15] marketing,[16] research,[17] and more.

This Is Only the Beginning. What began as a trickle of progress in GenAI has grown exponentially over the past year into what is no less than a technological revolution – one that is ongoing, and that is still in its very early stages. GenAI has propelled an enormous wave of AI capabilities that will impact all aspects of our lives.

A technological revolution is underway that will impact all aspects of our society.

The United States must be prepared. GenAI is only one segment of a much larger and rapidly growing field of AI-accelerated technologies. Extremely powerful and strategic capabilities could be developed within the next five years – if not sooner. A technological revolution is underway that will impact all aspects of our society. GenAI has the power to drive significant advancements in science, medicine, and technology, enabling breakthroughs in areas like drug discovery, personalized healthcare, and climate modeling. It could help the world find cures for diseases that have long eluded us. It has the potential to enhance productivity, efficiency, and innovation across industries, leading to significant economic growth and improved quality of life.

We stand at the precipice of a new era of intelligent machines that heralds unprecedented opportunities and challenges for society at large. As AI tools continue to evolve and mature, the choices made today in terms of regulations, ethical guidelines, and governance frameworks will shape the trajectory of AI's impact on individuals, communities, and nations. This AI moment represents a critical juncture in human history. It is an era that holds immense promise, but also great peril.

Understanding the Moment We Are In. The GenAI ecosystem that has begun to emerge consists of a handful of mostly (though not exclusively) American companies with massive

14 Introducing BloombergGPT, Bloomberg Professional Services (2023).
15 Steph Batalis, et al., Large Language Models in Biology, Center for Security and Emerging Technology (2023).
16 See Raghu Ravinutala, The Power Of Domain-Specific LLMs In Generative AI For Enterprises, Forbes (2023); Copy.ai (last accessed 2023).
17 See GPT Researcher x LangChain, LangChain blog (2023); Elicit (last accessed 2023).

foundation models;[18] many more companies building an application layer of specialized products on top of these tools; and other actors releasing increasingly capable open-source general and specialized GenAI models.[19] In the coming months and years, significant capabilities will come from a wide set of smaller entities or open-source users. Further specialized GenAI systems will be refined for different applications, such as medicine or law. Some models will likely be built from scratch on domain- or application-specific data, while others will be fine-tuned from larger frontier models through licensing or other commercial use agreements. Additionally, we will likely see the emergence of clusters of AI systems that interact with one another in pursuit of specific goals.

In what will likely result in an even more fundamental change than the 3rd industrial revolution,[20] GenAI is already transforming the way we work and make decisions. With GenAI, every person in the world can access an AI-powered tutor on their personal phone. Software engineers are able to code up to twice as fast using GenAI tools,[21] businesses are using GenAI to improve their products,[22] and experiments have shown that GenAI raises productivity for writing-intensive jobs.[23] GenAI, at once both a tool for and a subject of scientific discovery, is revolutionizing the scientific process as scientists are able to conduct experiments faster, cheaper, and at a greater scale with AI-powered machines.[24]

GenAI is already transforming the way we work and make decisions.

18 Key players include OpenAI (GPT-3.5, GPT-4) with Microsoft, Google Deepmind (PaLM2, Gemini), Anthropic (Claude, Claude2), and Inflection (Pi). Large Chinese entities developing generative AI models include Baidu (ERNIE), Alibaba, Huawei (Pangu), the Beijing Academy of Artificial Intelligence (WuDao 2.0), and Tsinghua University, however their capabilities as publicly demonstrated appear at least a few months behind the state of the art in the U.S. ecosystem.

19 Key players developing open-source GenAI models include the UAE's Technology Innovation Institute's (Falcon), Meta (LLaMa, LLaMA-2), and Mosaic (MPT). See Cameron Wolfe, The History of Open-Source LLMs: Better Base Models (Part Two), Deep (Learning) Focus (2023).

20 The digital age of information and communications technology is commonly identified as the 3rd industrial revolution. While it changed the way humans interact with computers and new platforms certainly sped up countless processes, it did not extend across the entirety of human life, as AI will increasingly do. Nor did we not see breakthroughs that significantly augmented human intelligence, which remains the most promising feature of the new wave of AI tools. On the Internet as the 3rd Industrial Revolution, see Jeremy Greenwood, The Third Industrial Revolution, The AEI Press (1997).

21 Sida Peng, et al., The Impact of AI on Developer Productivity: Evidence from GitHub Copilot, arXiv (2023).

22 Paul Smith-Goodson, The Extraordinary Ubiquity Of Generative AI And How Major Companies Are Using It, Forbes (2023).

23 Shakked Noy & Whitney Zhang, Experimental Evidence on the Productivity Effects of Generative Artificial Intelligence, Science (2023).

24 Eric Schmidt, This Is How AI Will Transform the Way Science Gets Done, MIT Technology Review (2023).

GenAI has the potential to accelerate U.S. productivity growth, which has been sluggish (with brief exceptions) for the past few decades.[25] While it is difficult to measure the exact impact AI will have on productivity, what is certain is that every major leap in economic growth can be traced back to the role of innovation and technological change. As economic historian Robert Gordon reminds us, "Innovation is the ultimate source of all growth in output per worker-hour."[26] History demonstrates that technological change raises output directly and that capital investment follows innovation – already, we see enormous funds flowing into GenAI.

Period of Debate, Uncertainty, and Hope. As with any fast-moving, transformational technology, there is the potential for peril if GenAI is not smartly, responsibly, and effectively handled. These tools have sparked intense debates and a wave of uncertainty regarding their impact across society, the workforce, and even the relative military balance between nations. With their ability to generate human-like text, images, and even deepfake videos, these models raise concerns about the authenticity and trustworthiness of information in the digital age. The potential for misuse and manipulation has ignited discussions about the ethical implications, privacy concerns, and the need for robust regulations to safeguard against malicious uses of GenAI.

Furthermore, the rapid advancement of GenAI models has fueled apprehension about job displacement across various industries. As machines become increasingly adept at performing cognitive tasks, there is a growing realization that certain professions may become obsolete or significantly transformed. This has spurred discussions about the future of work, the need for reskilling and upskilling programs, and the potential impact on economic inequality. The uncertainties surrounding the extent and pace of job displacement have raised questions about the adequacy of social safety nets and the necessity for policy interventions to mitigate any adverse effects.

Moreover, GenAI models have triggered concerns about shifts in military and national power dynamics. In addition to the fact that greater economic power translates directly into military power, increasingly powerful AI models will also have an outsized impact on relative military balances and hard power equations. As nations compete to gain an

25 "From World War II until the early 1970s, labor productivity grew at over three percent a year. In the early 1970s productivity growth slowed dramatically, rebounding in the 1990s, only to slow again since the early 2000s." See Martin Neil Bailey, et al., Machines of Mind: The Case for an AI-Powered Productivity Boom, Brookings (2023).

26 Robert J. Gordon, The Rise and Fall of American Growth, Princeton University Press at 569 (2016).

edge in AI development and deployment, there is a potential for strategic imbalances and vulnerabilities in critical areas such as cyber warfare, autonomous weapons systems, and surveillance capabilities. The rapid integration of AI into military applications has prompted debates about arms control, international norms, and the need for global cooperation to ensure the responsible and accountable use of these technologies.

In this rapidly evolving landscape, the debates and uncertainties surrounding GenAI models highlight the need for thoughtful and comprehensive discussions to address the risks, mitigate potential harms, and establish ethical guidelines and regulatory frameworks that address the complex intersection of technology, society, and power dynamics.

The PRC and the Generative AI Moment. Technology lies at the heart of the strategic competition between the United States and the PRC. To date, the PRC's publicly released LLMs have lagged behind those of American companies – such as OpenAI, Google, and Anthropic – but access to open-source platforms and cloud infrastructure could enable PRC firms to accelerate the development of their domestic models.[27] That said, the PRC still faces a number of systemic challenges in developing and deploying its own LLMs. One challenge the PRC faces is a scarcity of data available for training LLMs in Mandarin Chinese, as less than two percent of the Internet is in Chinese compared to nearly 60 percent in English (although PRC entities are developing English-based LLMs as well).[28] The language issue is further exacerbated by the Chinese Communist Party (CCP)'s comprehensive system of information control and censorship that exacerbates this challenge. The PRC's domestic Internet domain is firewalled away from outside influence, minimizing the exchange of digital information with the rest of the world. At the same time, China maintains access to foreign data via products like TikTok, potentially an advantage for its AI industry.[29] The PRC's authoritarian tendencies and risk aversion to

Technology lies at the heart of the strategic competition between the United States and the PRC.

27 Yuka Hayashi, & John D. McKinnon, U.S. Looks to Restrict China's Access to Cloud Computing to Protect Advanced Technology, Wall Street Journal (2023); Josh Ye, Alibaba Rolls Out Open-Sourced AI Model to Take on Meta's Llama 2, Reuters (2023).

28 Languages Most Frequently Used for Web Content as of January 2023, By Share of Websites, Statista (2023).

29 Beyond software and data, the PRC faces a number of other constraints and limitations relative to the United States, which are discussed later in the section of this report titled: Comparative Analysis: U.S. & PRC Generative AI Landscape.

releasing potentially difficult-to-censor LLMs could impede progress, despite the ability to undertake economic reforms for technological advances.

Additionally, Beijing currently relies on U.S.-designed AI chips despite actively pursuing self-sufficiency for years, creating another potential choke point for China's AI development. Training and inference for LLMs and AI applications currently requires large-scale supercomputers which are powered, in turn, by clusters of thousands of specialized AI chips called Graphical Processing Units (GPUs). American export controls have aimed to limit PRC access to these advanced microelectronics. According to a recent assessment of the PRC's AI capabilities, GPUs designed by U.S. companies "remain the most popular GPUs for training Chinese large-scale models."[30] Market estimates (as of 2022) indicated that U.S. firm Nvidia accounted for as much as 95 percent of China's GPU market.[31] Furthermore, the PRC's domestic chip manufacturing capabilities at advanced nodes (e.g., 7nm) are presently operating at low yields, though Beijing remains determined to catch up.[32]

However, these challenges are not necessarily insurmountable and should certainly not lead to complacency on the part of the United States. Leadership in GenAI should not be taken for granted: the nation has never confronted a full-spectrum competitor and technological power at the scale of the PRC. In the 1990s, amidst the advent of the Internet, many Western commentators speculated that the CCP's centrally-controlled, top-down governance system would struggle to control the free-flow of information and democratic values embedded within the architecture of the World Wide Web.[33] Instead, the seemingly rigid PRC system adopted, adapted, and even excelled at remaking a domestic version of the Internet in its own image.[34]

Of late, the PRC has run headlong into multiple obstacles that have stalled the country's economic growth. These strains are exacerbated by high levels of national debt, unfavorable demographics, lessening Western demand for Chinese products, and a series of poor

30 Jeffrey Ding & Jenny W. Xiao, Recent Trends in China's Large Language Model Landscape, Center for the Governance of AI at 7 (2023).

31 Che Pan, Tech War: China Chip Veteran Says Nvidia Is Hard to Replace in Artificial Intelligence, Urges Start-Ups to Catch Up, South China Morning Post (2022); Kif Leswing, Meet the $10,000 Nvidia Chip Powering the Race for A.I., CNBC (2023). Huawei's Kunpeng 920, a leading indigenous chip developed in China, was reportedly only 18 percent as efficient as Nvidia's A100 chip as of July 2023. Jeffrey Ding, The Wudaokou Origins of China's Large Models, ChinAI (2023).

32 Anton Shilov, Huawei's Breakthrough 7nm Chips Projected at 50 Percent Yield, Tom's Hardware (2023).

33 Clinton's Words on China: Trade is the Smart Thing, New York Times (2000).

34 Bethany Allen-Ebrahimian, The Man Who Nailed Jello to the Wall, Foreign Policy (2016).

policy decisions by the PRC leadership.[35] The United States must be clear-eyed about the challenge and China's ability to evolve in the face of emerging technologies. The PRC has demonstrated advantages in other strategic sectors such as drones, advanced batteries, and advanced network hardware. China is a world leader in building modern infrastructure, such as high-speed rail.[36] The PRC has stepped up production of advanced fighter aircraft[37] while its shipbuilding industry is turning out warships at an impressive rate.[38] China has also made impressive strides in space. In addition to remote lunar rovers and a newly built space station,[39] it is quickly catching up to the U.S. in space launches.[40]

The Other Revolution – The Changing Character of War. There is another extremely consequential, technology-driven revolution underway – the ongoing revolution in warfare. Much like the telegraph, steam engine, and railroad, which were driven by commercial interests but ultimately changed the way wars were fought, AI is similarly impacting warfare, driving some of the most fundamental changes we have observed in decades. Nowhere are the battlefield realities of this revolution more visible than in Ukraine, where AI is used for imagery analysis and AI-equipped drones are employed for target detection and tracking. Militaries around the world are closely watching the fighting there in search of new sources of military advantage, taking stock of what works and what does not on Ukraine's highly dynamic battlefield where opposing sides adapt their methods and systems on a daily basis, and traditional military equipment is paired with the newest technologies in innovative ways.[41]

Of great concern in this period of great power competition, the PRC's military has recognized that a technologically-driven revolution in warfare is underway and is organizing itself for future warfare, including developing new warfighting concepts and supporting capabilities.[42] In that vein, the People's Liberation Army (PLA) has set an objective to *intelligentize* its armed

35 Lingling Wei & Stella Yifan Xie, China's 40-Year Boom is Over. What Comes Next?, The Wall Street Journal (2023).
36 Dan Wang, China's Hidden Tech Revolution: How Beijing Threatens U.S. Dominance, Foreign Affairs (2023).
37 Douglas Barrie, et al., China's Air Force Modernisation: Gaining Pace, International Institute for Strategic Studies (2023).
38 Joseph Trevithick, Alarming Naval Intel Slide Warns of China's 200 Times Greater Shipbuilding Capacity, TheDrive (2023).
39 William Harwoood, China Launches Fresh Crew To Tiangong Space Station, Maintaining A Permanent Residence In Space, CBS News (2023).
40 Svetla Ben-Itzhak, Is the US in a Space Race Against China?, Phys.org (2023).
41 Shashank Joshi, The War in Ukraine Shows How Technology is Changing the Battlefield, The Economist (2023).
42 Robert O. Work & Greg Grant, Beating the Americans at Their Own Game: An Offset Strategy with Chinese Characteristics, Center for a New American Security (2019).

forces by 2027.[43] That is, to put them in a position to leverage big data and AI algorithms to identify rivals' vulnerabilities, use influence operations to prevent opposing military leaders from understanding their environment, and employ multiple attacks to overwhelm military defenses.

That the PRC seeks to erode U.S. military advantages should come as no surprise, as serious competitors do not simply cede military advantage to their rivals. Yet the Pentagon's lagging response to PRC's military modernization has led to a decisive and potentially dangerous shift in the relative military balance in the Asia-Pacific. While the United States seeks to avoid a destabilizing AI arms race with the PRC, the U.S. military is not moving with the sense of urgency required to keep pace with this fast moving technology and adapt to the changing character of warfare. Generating military advantage in this new age of innovation requires more closely linking operational concepts with new technologies, specifically AI. For that reason, the United States needs "Offset-X," an effort to identify and develop the next disruptive competitive advantage to bolster conventional deterrence.[44] Like its antecedents, Offset-X makes explicit choices and prioritizations among available technical pathways and solutions in order to generate response options to reverse an eroding military balance.

The Need for a New Strategic Approach. Because of the outsized impact it is poised to have on both economic growth and relative military advantage, maintaining the United States' leadership in GenAI is of paramount importance to our national security interests. America's first-mover advantage in GenAI has given the United States a leg up on potential challengers, provided the nation with unique opportunities to drive innovation in this field, and – if action is taken now – will allow the nation to shape the trajectory of this ongoing technological revolution. Exceptional talent in AI research and development, a thriving startup ecosystem, and unmatched excellence in enterprise software development built a U.S. lead in creating cutting-edge technologies and solutions, providing a critical advantage in anticipating and countering emerging threats by strengthening America's defense capabilities and enhancing its intelligence gathering and analysis.

Furthermore, GenAI has the potential to revolutionize areas like critical infrastructure, advanced networks, biotech, and cybersecurity. By maintaining leadership in these

43 China's PLA Aims to Leverage Advanced Technology for Use of Unmanned Weapons, Artificial Intelligence, Says Report, Economic Times (2023).

44 The Future of Conflict and the New Requirements of Defense, Special Competitive Studies Project (2022); Offset-X: Closing the Deterrence Gap and Building the Future Joint Force, Special Competitive Studies Project (2023).

battleground sectors, the United States can secure its technological sovereignty and ensure the resilience of its national infrastructure. This is particularly crucial in the face of growing competition and attempts by adversaries to gain technological dominance. However, the United States must also bring its allies and partners along on this journey of discovery and innovation as they remain an unprecedented force multiplier, one that challengers lack.

The United States is faced with a historic opportunity to provide a vision that shapes the trajectory of this technology, establishes effective international norms for global security, and promotes democratic values and interests. This is the moment to lead the way, setting the standards for responsible and ethical AI development and deployment. By collaborating with allies and partners, the United States can establish a framework that safeguards national security while upholding human rights, privacy, and democratic principles. Embracing this moment is not only a matter of strategic advantage but also a testament to the United States' commitment to innovation, progress, and the prosperity and security of not only its citizens, but its allies and partners as well. The United States must invest in research, foster talent, and create an enabling environment that promotes entrepreneurship and technological leadership. This is the moment to shape the future.

The United States has been in the lead for strategic technologies before and lost advantages due to a lack of urgency and focused effort.[45] Learning from these missteps, the United States must pursue a new strategic approach for this transformative period that protects its advantages in GenAI. Because GenAI is changing far too quickly for traditional policy making and regulatory processes, the United States needs a more nimble approach that provides adequate safeguards and regulation while at the same time does not stifle innovation, close off areas of opportunity, or allow strategic competitors to get ahead.

This effort will require public-private partnerships at a scale for which the United States is not currently organized. A new model is needed – one that regularly brings together leaders in the public sector with world-leading academics, the private sector, and philanthropists to coordinate closely and address this rapidly evolving sector. This new public-private structure

45 Examples include hypersonic weapons in the defense space and 5G technology in the commercial.

could provide advice to governments, conduct its own research, and work with other leading AI centers around the world.[46]

A Warning - Preparing for the Next Wave. GenAI heralds an era of great promise and potential peril. As to the latter, it is important to highlight potential developments in the larger AI field spurred by the development of GenAI. As more powerful AI models, specifically AGI, loom on the horizon,[47] the nation must be prepared. AI has emerged as a transformative force capable of reshaping every facet of our existence. With unparalleled computational power and the ability to process massive amounts of data, AI algorithms have the potential to solve complex problems, revolutionize industries, and augment human capabilities. The significance of AI lies not only in its ability to augment our cognitive ability but also in its potential to revolutionize our understanding of intelligence itself.

GenAI heralds an era of great promise and potential peril.

Throughout history, certain moments stand out as turning points. These pivotal junctures serve as signposts, illuminating the transformative power of ideas and the extraordinary minds that shape the course of human events. Albert Einstein's letter to President Franklin D. Roosevelt in 1939 was one such epochal event.[48] The letter, written by a visionary mind, recognized the immense power locked within the atom. It ignited a series of scientific discoveries and technological advancements that reshaped the world order, giving birth to the atomic bomb, nuclear energy, and the delicate balance of nuclear deterrence. Its significance transcended the realms of science and reached into the realms of politics, diplomacy, and global security.

Today, we are standing at the precipice of another transformative era – the Age of AI. The advent of GenAI heralds a new frontier, one in which the boundaries of human potential are

46 We have done this before. During the Cold War, the U.S. government relied on strong public-private partnerships with federally funded laboratories and industry research centers that turned out impressive breakthroughs, such as the U-2 and SR-71 reconnaissance aircraft by Lockheed Martin Skunk Works' partnership with the Air Force and Central Intelligence Agency. See Thomas Mahnken & Tai Ming Cheung, The Decisive Decade: United States Competition in Defense Innovation and Defense Industrial Policy in and Beyond the 2020s, Center for Strategic and Budgetary Assessments (2023).

47 Sébastien Bubek, et al., Sparks of Artificial General Intelligence: Early Experiments with GPT-4, arXiv (2023).

48 Letter From Albert Einstein to President Franklin D. Roosevelt, Franklin D. Roosevelt Presidential Library and Museum (1939).

challenged and redefined. As we imbue machines with human-like reasoning and decision-making capabilities, we confront profound philosophical and ethical questions about the nature of consciousness, morality, and the very essence of what it means to be human. In a similar way that the Atomic Age brought forth a new era of enormous potential but also fraught with grave risks, the Age of AI carries its own set of challenges that demand careful consideration.

> Today, we are standing at the precipice of another transformative era – the Age of AI.

GenAI Assessment

The U.S. government must understand both the upside potential as well as the limitations and threats posed by GenAI. We cannot afford endless debate and hype-driven paralysis – this technology is moving much too fast and we risk missing the opportunity to steer GenAI's trajectory. Decisions made at this early stage in its development will have a marked impact on the geopolitical balance of power as GenAI changes the calculus for military, diplomatic, and economic power, as well as societal cohesion.

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Some applications of GenAI could exacerbate existing dangers, generate novel threats, and enable state and non-state adversaries to manipulate weak spots in open societies. Bad actors could employ this powerful technology to amplify cyberattacks, digital disinformation campaigns, and manufacture new ways of targeting individuals. GenAI could also aid in the creation of meticulously engineered biological agents. Moreover, adversaries will exploit the GenAI systems we will increasingly depend upon.

Defining Generative AI

GenAI is a category of algorithms that finds patterns in training datasets and extrapolates from them to generate content such as text, images, or audio, given natural language or multimedia input. The underpinning architecture of the Large Language Model (LLM) is a type of neural network called a transformer. LLMs are trained to predict the next word in each sequence provided as input. However, as a byproduct of this process, they also learn to develop a sophisticated internal representation of the meaning of the input text sequence, leading to surprisingly sophisticated capabilities in a range of tasks. Individuals can interact

directly with GenAI tools via natural language interface chatbots like ChatGPT or Bard, or through application portal interfaces (APIs) that connect software systems.[49]

Today's generative AI models can already perform a wide range of tasks. In the text modality alone, LLMs can generate stories and news articles, analyze meaning, translate between different languages and writing styles, and extract information for tasks such as sentiment analysis.[50] Looking forward, we will likely continue to see GenAI models stitched together with a wide range of other software tools, or "plug-ins." Some of these tools will be geared towards improving models' overall performance and accuracy, such as external information retrieval via search engines and calculator sidecars. Others will enhance models' capabilities for specific sub-tasks, such as route planners, scheduling algorithms, and access to proprietary or domain-specific databases. We are also seeing a second trend in which larger software systems call out to multiple GenAI models. For example, a system can prompt a specialized GenAI model trained to perform a specific task (e.g., generate a plan to code a website) and a second GenAI model that will critique that plan (e.g., check that code for cybersecurity vulnerabilities).

Limitations and Technology Trajectories

While today's models produce content that feels very human and have proven themselves to be more capable than humans in an astonishing array of tasks, they have considerable limitations. The technical limitations relate to the component parts of a GenAI model: the algorithms underpinning its architecture and how the model processes data, the data upon which it is trained, and the compute resources required to train and use it.

We can expect to overcome some limitations, while others will likely endure in varying degrees. Limitations of a purely technical nature are poised to change, if not disappear entirely, through potential disruptions to each layer of the generative AI "stack." The rate of technical progress will depend on barriers to entry, the business models adopted by major AI players, whether and how governments choose to regulate AI, and whether universities

49 This definition for generative AI comes from SCSP's Generative AI Task Force. SCSP formed a Generative AI Task Force designed to provide options for the U.S. government, allies and partners, industry, and academia to address the challenges and opportunities that generative AI presents for national competitiveness. Over the course of three meetings in the Spring of 2023, the task force developed recommendations for how to foster responsible innovation and harness the transformative power of generative AI, while addressing ethical concerns and potential risks. Many of their findings informed this report.

50 Introducing ChatGPT, OpenAI (2022).

remain a significant player in AI research. Across the GenAI ecosystem, current trends suggest rapid progress on a number of fronts at each layer of the technical stack.

Short of the frontier of technical achievements, we should expect most if not all of these capabilities to diffuse rapidly to a wide set of actors. Even at the frontier, while certain capabilities may remain limited to a small set of actors at first, we should expect them to diffuse over time, whether by way of deliberate open-source strategy, leakage, or some combination thereof.

Models

Since transformer models are based on next-word prediction and do not possess any fundamental "ground truth," today's preeminent GenAI models can "hallucinate" plausible-sounding but factually incorrect answers.[51] They cannot, at an architectural level, distinguish between queries soliciting purely factual responses and those soliciting creative ones. Additionally, while current generative AI models can sometimes explain the chain of reasoning by which they reached a particular answer, in other cases they cannot, or they provide unfounded explanations.

Transformer architectures and compute-based scaling laws will likely endure as a prominent vector for generative AI progress, with a number of algorithmic improvements poised to expand these models' capabilities and help overcome their current limitations. New techniques are already beginning to emerge for improving model inference. These include expanding the size of the context window on which a model conditions its response,[52] self-reflection capabilities that enhance models' reasoning[53] and could reduce their propensity to hallucinate,[54] chain-of-thought prompting to elicit model reasoning,[55] and rapid training techniques to achieve near- or real-time data awareness.[56]

51 James Vincent, Google's AI Chatbot Bard Makes Factual Error in First Demo, The Verge (2023).
52 Benj Edwards, Anthropic's Claude AI Can Now Digest an Entire Book like The Great Gatsby in Seconds, Ars Technica (2023).
53 Isaac Kauvar, et al., Curious Replay for Model-Based Adaptation, arXiv (2023).
54 Noah Shinn, et al., Reflexion: Language Agents with Verbal Reinforcement Learning, arXiv (2022).
55 Jason Wei, et al., Chain-of-Thought Prompting Elicits Reasoning in Large Language Models, arXiv (2022).
56 Adam Zewe, Learning to Grow Machine-Learning Models, MIT News Office (2023); Armen Aghajanyan, et al., Scaling Laws for Generative Mixed-Modal Language Models, arXiv (2023).

We can also expect technical tools to help mitigate some of the socio-technical limitations of today's generative AI models. To identify and reduce potentially harmful[57] responses, many model developers conduct red-teaming exercises to identify and mitigate problem areas before releasing models to the public.[58] Some have also imbued AI models with "constitutions" that function like an ethical cross-checking system for model outputs,[59] and further calibrated model outputs through techniques such as reinforcement learning with human feedback (RLHF)[60] and automated improvement approaches.[61] Some model developers are now making their content moderation software directly accessible over the internet.[62] There is also a growing suite of technical tools – and industry promises[63] – to help identify and label synthetic media, such as digital watermarking.[64]

Finally, we cannot rule out the emergence of novel algorithmic architectures. While unlikely to displace the transformer model entirely or imminently, research into approaches such as liquid neural networks with as few neurons as possible[65] and bayesian models that imbue a model with the ability to perform probabilistic reasoning[66] suggest the possibility of alternative models. These alternative architectures may prove appealing for certain uses, such as autonomous systems where efficiency will be paramount.

Data

Data is the fuel for GenAI models throughout their life cycles, from the initial pre-training corpus to subsequent domain- and task-specific fine-tuning to instrumentalization once models are operating in the real world. Today's GenAI models are limited by the quality, timeframe, and availability of relevant training data. Data, particularly at Internet-scale, carries with it human biases, inaccuracies, and falsehoods, meaning today's GenAI models can generate biased, inaccurate,

57 Robert Huben, Testing Ways to Bypass ChatGPT's Safety Features, LessWrong (2022).
58 Ethan Perez, et al., Red Teaming Language Models with Language Models, arXiv (2022).
59 Yuntao Bai, et al., Constitutional AI: Harmlessness from AI Feedback, arXiv (2022).
60 Nathan Lambert, et al., Illustrating Reinforcement Learning from Human Feedback (RLHF), Hugging Face (2022).
61 Jing Xu, Improving Open Language Models by Learning from Organic Interactions, arXiv (2023); Jack Clark, Import AI 332: Mini-AI; safety through evals; Facebook releases a RLHF dataset, ImportAI (2023).
62 See The Moderation Object, OpenAI (last accessed 2023).
63 Diane Bartz & Krystal Hu, OpenAI, Google, Others Pledge to Watermark AI Content for Safety, White House Says, Reuters (2023).
64 Kyle Wiggers, Microsoft Pledges to Watermark AI-Generated Images and Videos, TechCrunch (2023).
65 Payal Dhar, "Liquid" Neural Network Adapts on the Go, IEEE Spectrum (2023).
66 Yeung Wong, Why You Should Use Bayesian Neural Network, Towards Data Science (2021).

and offensive responses.[67] While increasingly chained to tools for external information retrieval, GenAI models cannot on their own generate accurate, up-to-date information about the world after the date they were last trained. There are also areas for which high-quality data is scarce or non-existent, limiting models' ability to generate output relating to certain emerging fields or phenomena. Finally, as models continue to scale, we may run out of new data on which to train them,[68] and could encounter model degradation as a result of datasets that include some amount of AI-generated text.[69]

> Today's GenAI models are limited by the quality, timeframe, and availability of relevant training data.

Data access also will impact future developments in GenAI.[70] While a great deal of openly accessible data exists for training GenAI systems, some of it is subject to various terms of use (e.g., Copyright or contractual violations). The U.S. Copyright Office and the courts are grappling with how to address these challenges.[71]

Model developers will continue to develop techniques to address data availability challenges. One major front is the use of high-quality datasets to train smaller models for specific tasks and domains.[72] Other techniques include the development of fully or partially synthetic datasets[73] as well as data-lite techniques such as few-shot learning, in which a model can learn underlying patterns from a few training samples and generalize those insights to a broader set of concepts.[74] Additionally, governments and other actors may curate and/or decide to publish unique datasets

67 Madhumita Murgia, OpenAI's Red Team: The Experts Hired to 'Break' ChatGPT, Financial Times (2023).
68 The Bigger-is-Better Approach to AI is Running Out of Road, The Economist (2023).
69 Carl Franzen, The AI Feedback Loop: Researchers Warn of 'Model Collapse' as AI Trains on AI-Generated Content, Venture Beat (2023).
70 SCSP issued a National Data Action Plan that discusses data availability across the public and private sectors and provides recommendations for maximizing accessibility in a responsible manner. See National Data Action Plan, Special Competitive Studies Project (2022).
71 See e.g., Blake Brittain, Getty Images Lawsuit Says Stability AI Misused Photos to Train AI, Reuters (2023).
72 Oliver Whang, The Race to Make A.I. Smaller (and Smarter), New York Times (2023); Katyanna Quach, Small Custom AI Models are Cheap to Train and Can Keep Data Private, Says Startup, The Register (2023).
73 Synthetic Data Generation: Definition, Types, Techniques, & Tools, Turing (last accessed 2023).
74 Archit Parnami & Minwoo Lee, Learning from Few Examples: A Summary of Approaches to Few-Shot Learning, arXiv (2022).

to fill current data gaps and drive research on specific topics such as the workforce or healthcare.

Hardware

Compute – the specialized computational hardware and infrastructure that allows companies to seamlessly train, deploy, and run inference on their models – has played a definitive role in driving the step-change in AI performance over the past decade. Since the dawn of the deep learning era, GPU performance has improved by roughly 1,000x due to a combination of advances in systems engineering and continued progress in microelectronics fabrication.[75] Today, the growth of the AI field remains contingent on continued advances in compute hardware, among other layers of the AI stack. So-called "scaling laws" predict that additional computational power is the chief limiting factor for building larger and more powerful AI systems.[76]

Training foundational models now requires thousands of GPUs, representing tremendous amounts of computing power rivaling the world's largest supercomputers – which are backed by nation-states.[77] What's more, the energy needed to run these supercomputers has dramatically increased, prompting frontier firms to build on-site power plants while investing in alternative long-term energy sources, such as fusion.[78] Continuing the current hardware trajectory will not only limit the range of actors capable of building massive-scale foundation models (absent policies designed to expand compute access), but also threaten to slow down or cap AI progress in the intermediate term.[79]

Even as the compute requirements for training massive scale models continue to grow, we should expect to see efficiencies at various stages of training, deployment, and hardware engineering. Model developers, particularly in the open-source ecosystem, will likely continue to devise methods for reproducing cutting-edge

75 John Russell, What's Stirring in Nvidia's R&D Lab? Chief Scientist Bill Dally Provides a Peek, HPCWire (2023).
76 Jared Kaplan, et al., Scaling Laws for Neural Language Models, arXiv (2020).
77 Jonathan Vanian & Kif Leswing, ChatGPT and Generative AI are Booming, But the Costs Can Be Extraordinary, CNBC (2023).
78 Andrew Paul, Microsoft Thinks This Startup Can Deliver on Nuclear Fusion by 2028, Popular Science (2023).
79 Andrew J. Lohn & Micah Musser, AI and Compute: How Much Longer Can Computing Power Drive Artificial Intelligence Progress?, Center for Strategic & Emerging Technology (2022); Lennart Heim, This Can't Go On(?) - AI Training Compute Costs, Lennert Heim (2023).

capabilities with as little compute power as possible.[80] We are already seeing the emergence of methods to efficiently finetune large language models on small amounts of hardware.[81] In addition, alternative compression techniques such as quantization[82] and pruning[83] may offer entirely novel ways to distill generative AI models to the essential parameter layers, data, and model weights for specific tasks and domains. We are already starting to see these techniques deliver. Falcon-40B, for example, achieved state-of-the-art model performance with only 75 percent of the compute needed for GPT-3 through algorithmic efficiencies and high-quality data.[84] Finally, the microelectronics industry and various R&D programs are also exploring novel, extremely low-power computational approaches – including analog and neuromorphic methods – that would enable the deployment of AI models that can process data and run inference locally on the edge.

Potential Threats

As with any new technological tool, GenAI models could cause harm as much as create opportunities and benefits. Many of these dangers are not novel, as GenAI will augment already existing threats. Nonetheless, the GenAI revolution marks a qualitative change in these challenges — one of scope, scale, and speed. GenAI's ability to lower barriers to action can expand the points of intersection between threat domains, extending the scope of certain types of threats. A growing number of malign actors, given access to GenAI-enabled tools with wide reach, heightens the scale of many existing challenges. And GenAI's swiftness in use is accelerating the speed at which harms can unfold. Together, these aspects paint a global threat landscape undergoing a foundational transformation.

Together, these aspects paint a global threat landscape undergoing a foundational transformation.

80 See, for example, Rohan Taori, et al., Alpaca: A Strong, Replicable Instruction-Following Model, Stanford University (2023).
81 Tim Dettmers, et al., QLoRA: Efficient Finetuning of Quantized LLMs, ArXiv (2023).
82 Zhewei Yao, et al., ZeroQuant-V2: Exploring Post-training Quantization in LLMs from Comprehensive Study to Low Rank Compensation, ArXiv (2023); Bringing Hardware Accelerated Language Models to Android Devices, Machine Learning Compilation (2023).
83 Elias Frantar & Dan Alistarh, SparseGPT: Massive Language Models Can be Accurately Pruned in One-Shot, ArXiv (2023).
84 Cameron R. Wolfe, Falcon: The Pinnacle of Open-Source LLMs, Deep (Learning) Focus (2023).

These augmented harms will, at times, be both distinct and intertwined, creating complex webs of overlapping issues. Policymakers require at least foundational paradigms distinguishing classes of harms in order to devise appropriate, effective responses for specific circumstances. While understanding of the full scope of risks that GenAI presents is still nascent, we offer the three categories below to that end.

First, GenAI is coming into existence in an era of great power competition. GenAI's ***geopolitical challenge*** is a pressing one. The PRC is a global power with the will, resources, and focus to rival the United States – this essential context cannot be overstated. GenAI will be a tool in this techno-economic competition and it has the potential to alter the global balance of power, requiring strategic orientation, concerted effort, and diplomacy on the part of the United States to navigate the challenges and opportunities that come. By successfully adopting and integrating GenAI systems into its economy, defense industrial base, and innovation (S&T) ecosystem, the United States can better position itself to counter a powerful and ambitious competitor. At the same time, an unrestrained arms race between global powers for AI dominance could also be destabilizing, particularly if nation states resort to coercive measures to develop and protect their AI advantages over rivals.

Second, as a tool that will diffuse across multiple sectors of the global economy and our lives, GenAI is susceptible to ***misuse or malign use challenges***. Malign actors could use GenAI to disrupt markets, conduct fraud, and enhance the risk and potency of cyberattacks, among other actions. Simultaneously, human misuse of GenAI tools could result in harm to oneself or others in circumstances where the human, due to lack of understanding or training, does not comprehend a tool's limitations. At the same time, misuse or poor alignment of GenAI tools could result in societal harms, such as perpetuating bias and discrimination. These threats pose severe risks to the security, stability, and prosperity of societies, particularly democracies, requiring a robust and adaptable set of policy defenses.

Third, ***misalignment challenges*** in GenAI refer to discrepancies between the user's intentions and the content the AI model generates. This can take various forms, such as ethical misalignment where the AI produces content that is inappropriate or harmful to a select population due to bias. Additionally, factual inaccuracies, where the AI disseminates incorrect information, are also a key concern. Inaccuracies need not rise to the level of intentional disinformation for a person to be harmed in relying on that generated information. Finally, in contextual misalignment, where the AI, despite being trained on

extensive datasets, fails to grasp the deep contextual cues that would be evident to a human, generates responses or activities with undesired consequences.

A few of the most challenging threats in the national security space include:

- ***The Problem of Disinformation***. As the 2024 elections draw closer, the most immediate threat posed by GenAI lies within the realm of disinformation. GenAI can generate text-based, audio, and visual content that is alarmingly convincing, and yet entirely fabricated. This capability can serve as a potent force multiplier for foreign troll farms, which have been systematically sowing discord within our public discourse.[85] Our institutions, tasked with the mission to unveil and counter these disinformation campaigns, are being stretched thin. Hostile actors are likely to employ GenAI to escalate the intensity and sophistication of their disinformation operations. This risk may grow as GenAI increasingly becomes open-source, widely accessible, and modifiable, thereby empowering less sophisticated actors to wage disinformation warfare. Without proactive countermeasures, GenAI may pose severe challenges to the robustness of our democratic institutions.

- ***Cybersecurity: A Shifting Battleground***. GenAI holds significant potential to intensify cyber threats. They can be harnessed to provide detailed tutorials and even generate malware codes, significantly lowering the entry barriers for both private and state-sponsored hackers.[86] They could enable such actors to employ hacking tools with unprecedented scale and precision. The mounting volume, speed, and sophistication of cyberattacks may soon outpace human defenses, making automated cyber defenses facilitated by GenAI an imperative. GenAI could thus escalate the costs and risks associated with cybersecurity for companies and governments alike, exacerbating the instability of cyberspace in times of crisis or war.

- ***The Intersection of GenAI and Biosciences***. GenAI can significantly influence the landscape of biology, chemistry, and medicine, presenting unique risks. As pharmaceutical companies and research laboratories begin to utilize GenAI to generate novel ingredients for vaccines and therapies, the risk of accidental releases of toxic substances, antibiotic-resistant superbugs, or highly contagious viruses increases. As GenAI fosters an expansion of the number of actors across the globe

85 Karen Hao, Troll Farms Reached 140 Million Americans a Month on Facebook Before 2020 Election, Internal Report Shows, MIT Technology Review (2021).

86 Jonathan Barney, et al., GenAI Will Amplify Cybersecurity Threats, But There's Hope, Security Magazine (2023).

capable of working on synthetic biology, it is reasonable to assume that not all of them will adhere to the highest safety standards. In addition, malevolent non-state actors or foreign regimes with covert biological and chemical weapons programs might exploit GenAI to create lethal agents custom-made for assassinations or even ethnic cleansing.

Open-Source AI Models

Open-source models uniquely illustrate the promise and perils of GenAI. Open-source GenAI models can be built and accessed with limited compute resources and even lower proficiency. They hold great promise to spread technological progress. Allowing a wider set of actors to contribute to, learn from, and govern a shared knowledge base will both expand the number of innovators and spur economic gains. Some private companies, including major actors in the space,[87] are staking their GenAI business model on open-source AI. While open-source models currently lag behind the frontier, many are quite capable.[88]

Open-source models uniquely illustrate the promise and perils of GenAI.

As is the case with the enterprise software ecosystem, companies can choose[89] whether it is in their best interest to go the proprietary or open-source route.[90] Open-source models also could offer a way for the academic community to remain a key driver of AI research as commercial competition closes off a historically open field. The cooperative research promoted through open-source GenAI could expand the range and diversity of actors driving the development and adoption of this technology, as well as the number of experts who can contribute to governance of these tools.

87 Nick Clegg, Openness on AI is the Way Forward for Tech, Financial Times (2023).
88 Jon Victor, Open-Source AI Is Gaining on Google and ChatGPT, The Information (2023).
89 Introducing BloombergGPT, Bloomberg's 50-Billion Parameter Large Language Model, Purpose-Built From Scratch for Finance, Bloomberg (2023); Jamiel Sheikh, Bloomberg Uses Its Vast Data To Create New Finance AI, Forbes (2023).
90 Open-source is not a binary condition of a GenAI model but rather occurs along a spectrum based on multiple criteria related to the model's availability, documentation, and access methods. See Andreas Liesenfeld, et al., Opening Up ChatGPT: Tracking Openness, Transparency, and Accountability in Instruction-Tuned Text Generators, arXiv (2023); Irene Solaiman, The Gradient of Generative AI Release: Methods and Considerations, arXiv (2023).

At the same time, by lowering the barriers to entry for developing and using GenAI, the diffusion of open-source models raises potential perils in the hands of malign actors, whether non-state entities or geopolitical rivals. These risks exacerbate existing social cohesion-based threats. Widening the group of actors capable of spreading synthetic media at speed and scale amplifies the already present disinformation challenge. Such broad access also deepens the challenge of monitoring for and preventing long-term risks of model misalignment. Complicating matters further, it appears to be technically possible to strip nearly any open-source GenAI model of guardrails against harmful outputs, posing considerable challenges to effective governance.

Certainly, GenAI is not the first time we have confronted technologies with such simultaneous potential for benefits and harms. However, by combining tremendous power with wide accessibility, GenAI signals a wave of empowerment so significant that it alters how we assess risk. Previously, we understood technologies would yield harms and built resilience systems to manage those impacts. Those systems acted as levees against potential floods. Today, the widespread access brought by open-source GenAI could yield changes that current systems were not designed to handle.

The diffusion of open-source generative AI models is irreversible. A more pragmatic and forward-thinking strategy is necessary if the government is to effectively manage and navigate the widespread dissemination of these GenAI models. Understanding GenAI's mechanics, dynamics, and future trajectory will enable the formulation of informed strategies and responsive measures to enhance our resilience and cultivate an environment where the positive elements of open-source collaboration can flourish, rather than chasing unobtainable controls. The United States is not currently positioned to mitigate potential risks and harmful uses, exploit opportunities, and guide the development of GenAI technologies in a manner consistent with our democratic values.

Grasping the GenAI Era

The rapid emergence of generative artificial intelligence (GenAI) begs a core question: how will this new general purpose technology impact the full extent of America's national security institutions? A natural starting point is thinking about GenAI in terms of national power. Constant jockeying with rivals for tech leverage is Positioning School logic as old as war and the notion of the state itself.[91] Fundamentally, as SCSP argued in *Mid-Decade Challenges to National Competitiveness*, a nation is better served by being strong in tech power rather than being weak.[92] A nation's competitive advantages grant it leverage in technology competitions. In a period of international competition, nations should be intentional and selective as to which competitive advantages they invest in and maintain in order to cultivate tech power.

An approach with multiple levels of analysis grants more command over the factors and nuances of tech power that a nation can harness.

Policymakers need a method for identifying and focusing on the critical variables. An approach with multiple levels of analysis does not inherently yield a strategy, but it grants more command over the factors and nuances of tech power that a nation can harness.[93] Then, given that foundation, policymakers can combine different facets of tech power to build a real strategy.

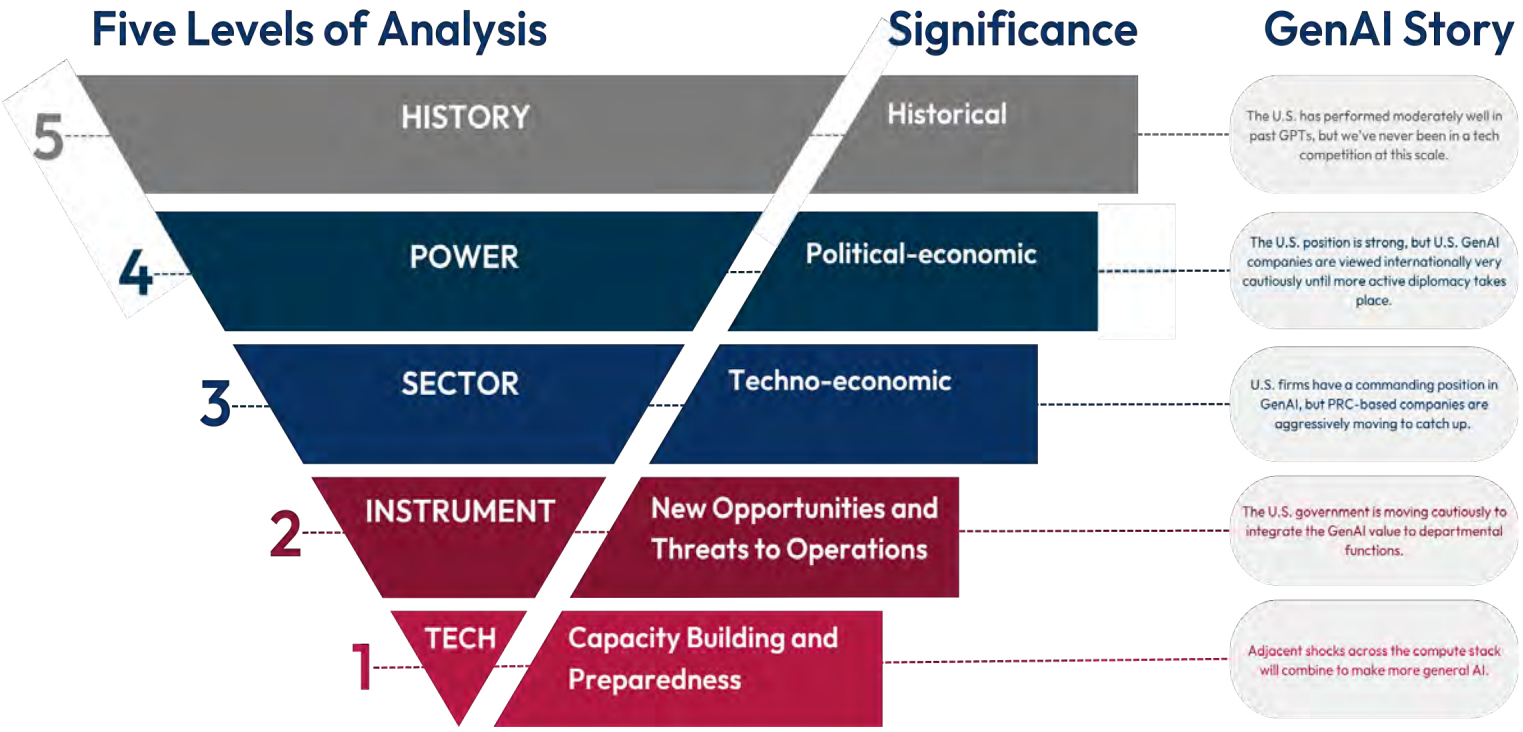
For GenAI, considering five levels of analysis would help policymakers grasp this technology's impacts on national security and provide a starting point for how to organize for this era.

91 On the Positioning School, see Henry Mintzberg, et al., Strategy Safari, Prentice Hall at 85 (2009).

92 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 16-27 (2022).

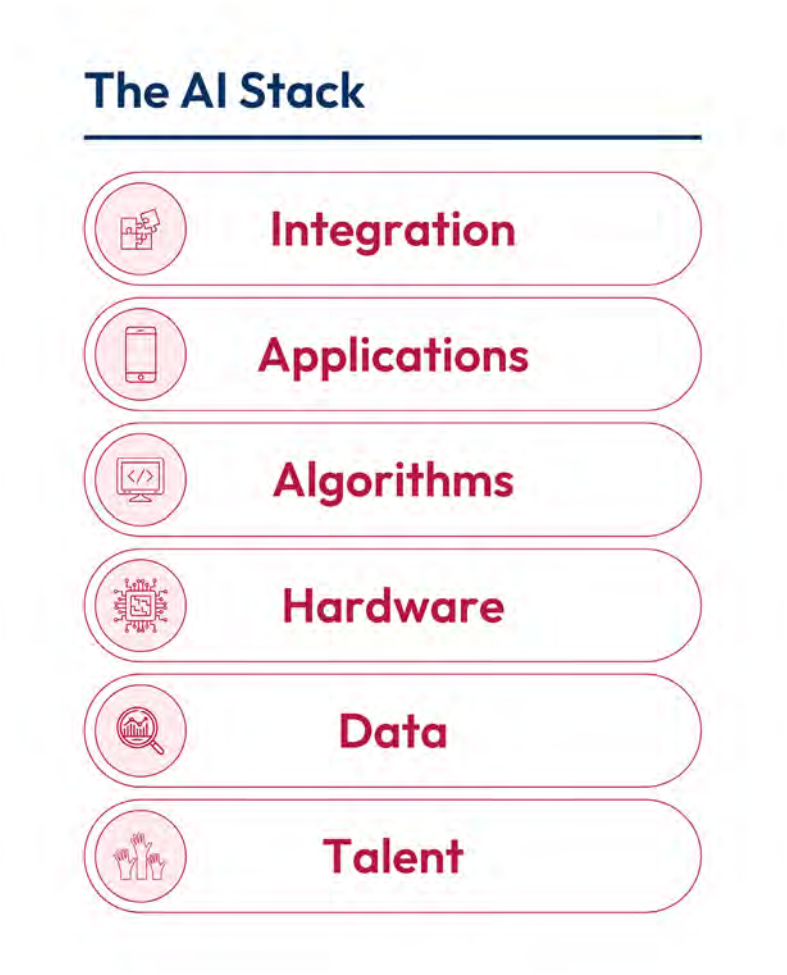
93 Pressing questions of grand strategy and international relations have often been addressed by a framework that incorporates multiple lenses to view complex security studies questions. See Kenneth Waltz, Man, the State, and War, Columbia University Press (2018); Steve Yetiv, Explaining Foreign Policy, Johns Hopkins University Press (2011); Graham Allison & Philip Zelikow, Essence of Decision, Longman (1999).

These start from a technology level and move to a more macro, historical level of thinking. Each level can stand alone, providing a framing in its own right. Yet simultaneously, adroit policymakers will recognize that employing all five levels cumulatively, each building out of the previous one, will offer a more comprehensive assessment.



The Tech Level surveys a technology's elements, or "stack," that make the technology actually work.[94] This level dives into how the technology actually works and then explores if a government or organization is organized to leverage its power. It is a way to understand the strengths and weaknesses of the inputs to the development of a technology. Understanding the strengths and weaknesses of these inputs enables projections of where and how fast the technology is headed, and what adjacent shocks could supercharge or upset the trajectory. It also clarifies what essential inputs or supply chains are necessary for the tech to function. As an example, the National Security Commission on Artificial Intelligence's (NSCAI) breakdown of AI into hardware (compute), data, algorithms, applications, integration into real-world operations, and talent goes behind the curtain into how AI functions.

94 The notion of the "compute stack" builds on that of the "AI stack" found in the Final Report of the National Security Commission on Artificial Intelligence. See Final Report, National Security Commission on Artificial Intelligence at 31-32 (2021).



Understanding these foundational elements will position policymakers to adapt to future developments as GenAI continues to evolve across the entire stack. From data "auto-labeling"[95] to algorithmic "pruning"[96] and human-machine "co-piloting,"[97] additional advances will continue to upend existing assumptions, offering new possibilities. The tech level of analysis helps policymakers ground themselves to form a more adaptable strategy that can leverage an ever-evolving GenAI suite of tools.

The Instrument Level considers how the technology will be used by the organizations that have access to the technology. The instrument level is the first step in understanding the output or impact that a technology creates. In the United States there are four basic

95 See Nikolaj Buhk, How to Automate Data Labeling, Encord (2023).
96 See Mark Kurtz, What is Pruning in Machine Learning?, Open Data Science Community (2020).
97 See Ian Sherr, et al., AI as Co-Pilot: Your Online Life Is About to Change, Like It or Not, CNET (2023).

instruments of state power — diplomatic, informational, military, and economic.[98] However, competitors may think about state power differently. For example, the People's Republic of China (PRC) may consider the internal security aspects of state power and the external subversion aspects differently from the way the United States does. Though, in both cases, this would be part of the informational instrument. The central question under this level is: how will this technology change the landscape of departments and agencies in which they operate and the functions to which the specific technology is applied?

GenAI holds the potential to reshape the landscape in which these instruments function. An AI-enhanced world alters how nations conduct diplomacy to prevent conflict or strategic communications amidst AI-generated content; and, as the October 7, 2022 export controls[99] clearly demonstrate, emerging AI tools can shift the use and priorities of long-standing instruments of economic statecraft.

Across all instruments of statecraft, private sector AI innovations are transforming the core functions of how instruments work, providing the potential to master that new environment if embraced and adopted. As such, each department or agency that wields these instruments of state power must also understand how to graft new GenAI tools into these existing functions. Absent such integration, these departments and agencies will struggle to operate effectively and with impact in a GenAI world. Most basically, every department or agency must take in information and proactively, or reactively, make decisions. GenAI models can help — analyzing massive quantities of real world, open-source data or providing novel recommendations. Likewise, as departments coordinate assets or move personnel and resources, new GenAI communications and logistics tools will facilitate faster and more accurate operations. Finally, GenAI can support more efficient and bespoke external strategic communications with policymakers both at home and abroad as well as with the wider public.

98 Power models come in many forms. These examples follow the DIME model, which recognizes the four instruments of national power as diplomatic, informational, military, and economic. See Jack Kiesler, A Next Generation National Information Operations Strategy and Architecture, Belfer Center for Science and International Affairs at 4 (2021). National tech power subtending these four instruments could yield a DIME-T model. Some Chinese scholars have built on Joseph Nye's hard/soft power distinction to model "comprehensive national power" that includes aspects such as a country's science and technology capacity, natural resources, educational system, and more. See Huang Shuofeng, New Theory on Overall National Strength (1999); Ryan Hass, From Strategic Reassurance to Running Over Roadblocks: A Review of Xi Jinping's Foreign Policy Record, China Leadership Monitor at 10 (2022).

99 Press Release, Commerce Implements New Export Controls on Advanced Computing and Semiconductor Manufacturing Items to the People's Republic of China (PRC), Bureau of Industry and Security, U.S. Department of Commerce (2022); Ana Swanson, Biden Administration Clamps Down on China's Access to Chip Technology, New York Times (2022).

Core functions for instruments of power, paired with private sector innovations, could improve performance of each function and thus, the overall instrument of power.

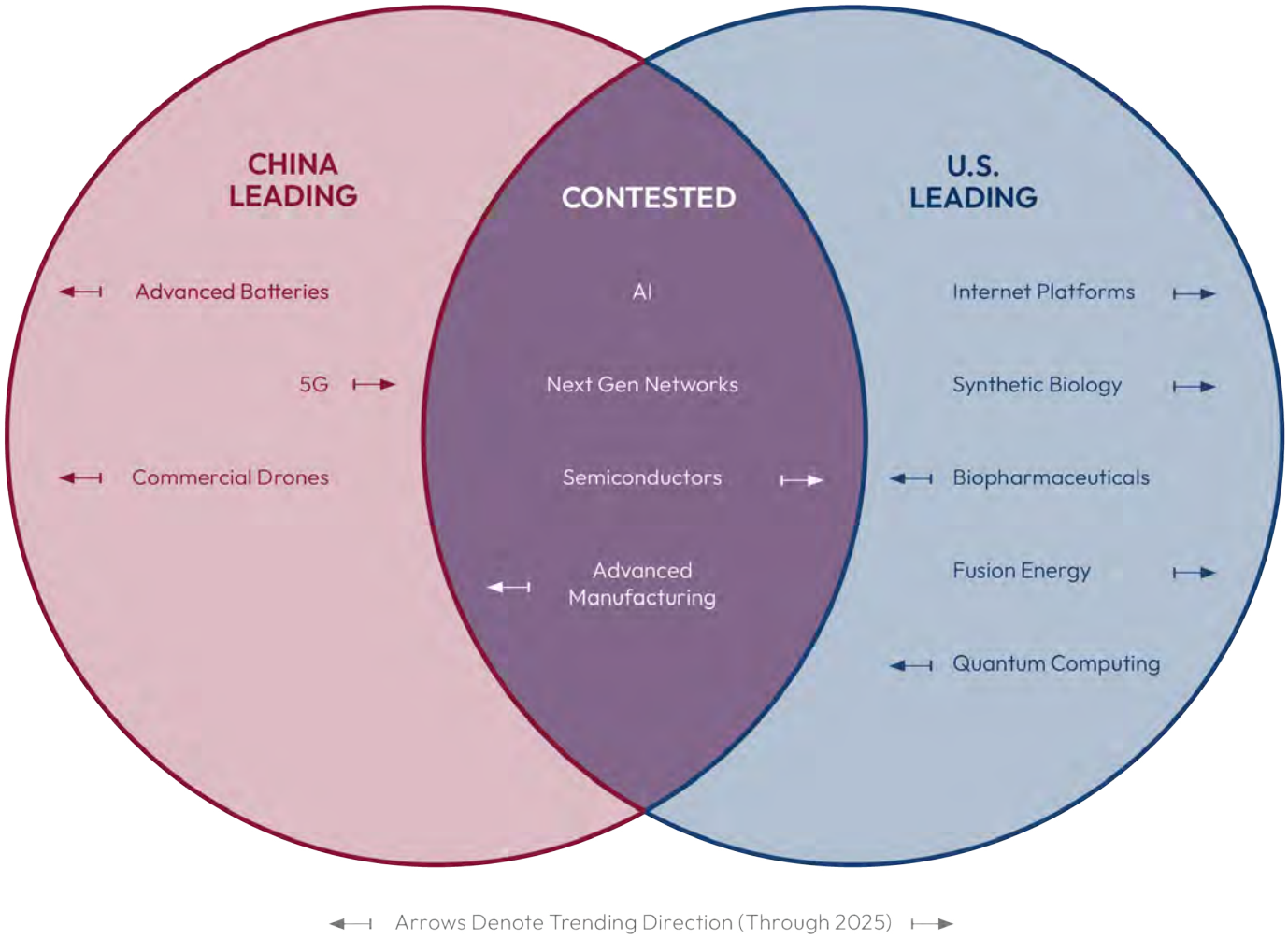
The Sector Level analyzes the impact of the technology on the overarching techno-economic competition by examining the intersection and interaction of strategic technology sectors at the competition's core.[100] As much as individual technological advances yield benefits in their own right, it is often at the junctures of multiple technologies that the greatest range of benefits and new opportunities emerge. Technologies will have different outputs and impacts depending on how they can be integrated into and reshape other technological and functional sectors. Some actors compartmentalize new technologies (e.g., the Soviet Union and compute technologies).[101] Others resist or over regulate the disruptive effects of new technologies.[102] Therefore, assessing GenAI, and AI in general, in tandem with other strategic technology sectors as a whole sheds light on the nation's broader techno-economic prowess.

Under the sector level, the PRC's overall ecosystem is producing real tech advantages. With respect to GenAI, the U.S. ecosystem enjoys a momentary lead. American actors likely will be able to harness that edge, deploying GenAI tools in other emerging technology sectors, like biotechnology, to deliver

The PRC's overall ecosystem is producing real tech advantages.

100 On selecting those strategic technology sectors, see Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 33-36 (2022).
101 Chris Miller, Chip War: The Fight for the World's Most Critical Technology, Scribner at 35-39 (2022).
102 For the historical example of Ming China, see Orville Schell, A Ming Emperor Would Have Grounded the Shuttle. Bad Idea, Washington Post (2003).

original, fast-paced breakthroughs.[103] However, the United States cannot afford to sit on its laurels. The PRC remains a powerful player in AI writ large, as well as in several other strategic technology sectors where the deployment of AI tools could yield real results. Between those existing advantages, robust PRC-based talent, and Chinese Communist Party (CCP) top-down emphasis and resourcing, the PRC could move rapidly to catch up, helping tip the balance in a number of other strategic sectors.



The Power Level considers how a technology will be used by the national government for the purpose of achieving its external objectives. The power level examines the capabilities identified via the instrument and sector lenses and how they can be deployed in pursuit of policy goals. The power level of analysis considers the advantages found under the sector level and, like a general, deploys those advantages upon a map to see how they would deliver

103 Eric Schmidt, This is How AI Will Transform the Way Science Gets Done, MIT Tech Review (2023).

influence in the physical world. Governments, private firms, and individual consumers all seek access to various technologies that shape the world in which they live and operate, providing the technology provider with influence. That influence easily spills across domains, as economic factors, such as port ownership, extend into military domains, such as which nations can reliably access that port.[104] However, different national governments may have different strengths and weaknesses in using the available technology.

For example, on GenAI, the U.S. private companies charging forward with the best LLMs grant the United States a certain international prestige that translates to influence but the U.S. government may face constraints in using private sector models.[105] The PRC may not face the same constraints. As GenAI tools increasingly combine with other tech and economic sectors, vectors to expand that influence will grow. As the PRC has made considerable strides through efforts like the Belt and Road Initiative[106] and Digital Silk Road,[107] the United States should seek to consolidate and build on its early AI gains and consider how to transfer that value to reinforce national security goals, foremost through steps outlined later in this report.

104 For one case study on how tech choices can have impacts on geopolitical calculations, see U.S. surveillance concerns regarding a PRC-based company building and installing equipment in the Israeli port of Haifa. Danny Zaken, Chinese-operated Port Opens in Israel Despite American Concerns, Al Monitor (2021); Arie Egozi, US Presses Israel On Haifa Port Amid China Espionage Concerns: Sources, Breaking Defense (2021).

105 Generative AI: A New Moment for American Leadership in the Indo-Pacific?, Special Competitive Studies Project (2023).

106 James McBride, et al., China's Massive Belt and Road Initiative, Council on Foreign Relations (2023).

107 See Assessing China's Digital Silk Road Initiative, Council on Foreign Relations (2023).

PRC Technology Spheres of Influence show how tech power is cumulative across seven categories of tech influence.[108]

The Historical Level studies the most sweeping question of how technology impacts the trajectory of human history. The question at this broadest level is: how can a nation position itself to be on the right side of history with this technology? This requires an assessment of the goals and values of the nation that is developing this technology and harnessing its power to advance its values and interests. Relative tech power between nations ebb and flow over decades. Thus, the historical level of analysis looks beyond momentary positional advantages to long-term trajectories that lend grand strategy the perspective

108 Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 10-14 (2022).

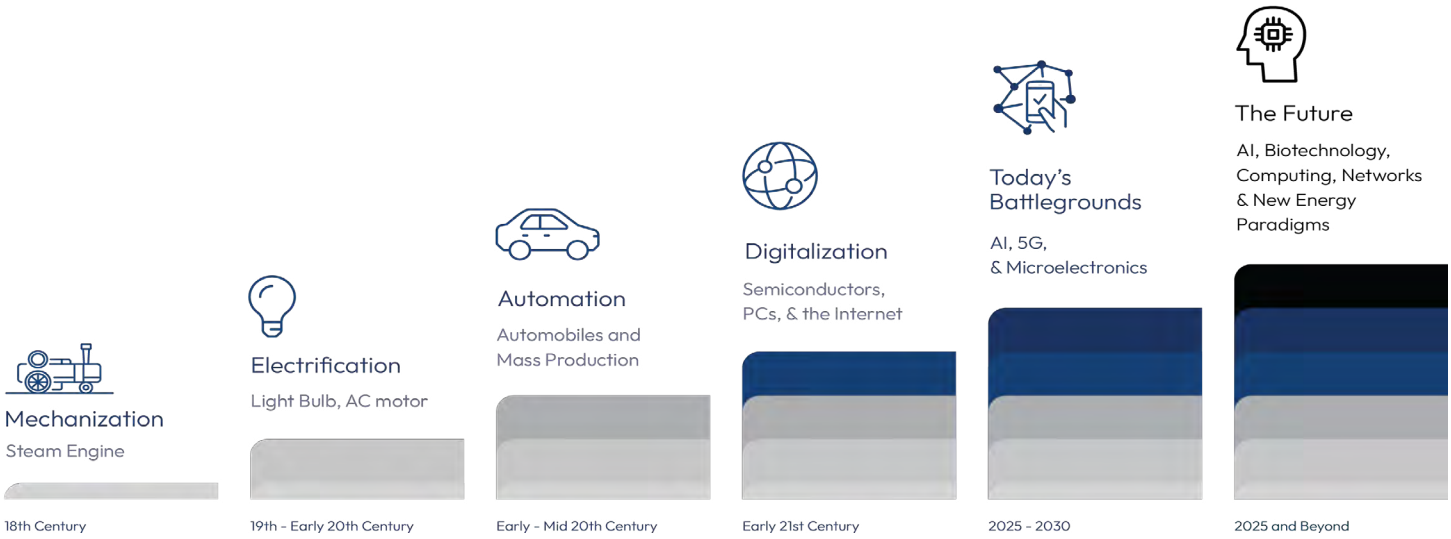
How can a nation position itself to be on the right side of history with this technology?

of time. There are eras in human history when technologies, or combinations of technologies, allow actors to change the world. 16th century nautical tools opened an age of global exploration. Together, electricity and mechanization yielded the Industrial Revolution. The further convergence of mechanization and electrification with the computer led to today's cyber domain, where information is instantly accessible on a global scale.[109] These technologies fundamentally transformed the way humans live, work, and communicate. Today we appear on the cusp of another such transformation.

GenAI, much like electricity, is positioned to be a general purpose technology that affects most aspects of our economy, our society, and our daily lives. At the historical level, one can better see the potential sweeping significance of GenAI. LLMs have ushered in the beginning of AI that is truly and broadly useful to anyone with an internet connection and GenAI is already combining with other sectors to yield original and faster discovery and innovation. This convergence is likely to drive technology history in the coming years.

109 Don Tapscott & Anthony Williams, Wikinomics: How Mass Collaboration Changes Everything, Portfolio at 12 (2006).

Waves of General Purpose Technologies (GPTs)



This chart shows the march of general purpose technologies going back to the machine age. Mechanization, electrification, automation, digitization, AI, and biotech are combining and stacking upon each other over time.[110]

GenAI has opened the door to a new era. The pace of change is rapid. Using these preceding lenses, policymakers can orient themselves on these shifting sands to strategize and organize for action. Absent such efforts, others will fill that space, and our future will be left to chance.

110 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 171 (2022).

Comparative Analysis: U.S. & PRC Generative AI Landscape

The United States currently has a lead over the People's Republic of China (PRC) in generative artificial intelligence (GenAI) stemming from U.S. industry's edge in the underlying technology and a more permissive approach to speech and content as an output of GenAI. Nonetheless, the United States could risk losing its advantage if the technology is not effectively integrated across the innovation ecosystem and broader economy. Both countries are expanding domestic partnerships and investments to develop new GenAI applications and current projections of GenAI's worldwide impact estimate that it could add up to $4.4 trillion annually to the global economy.[111] While the U.S. ecosystem includes a mix of general purpose and specialized GenAI innovation, the PRC ecosystem appears more focused on industry-specific AI applications, perhaps due to the Chinese Communist Party's (CCP) discomfort with domestic proliferation and experimentation with general purpose AI models. However, as more GenAI use cases emerge, sustained PRC government involvement could enable the technology to be deployed faster across many sectors.

111 Michael Chui, et al., The Economic Potential of Generative AI: The Next Productivity Frontier, McKinsey & Company (2023).

Area of Comparison	People's Republic of China	United States
Government Players	While the PRC central government leads a number of national-level AI development initiatives, its involvement in the actual development of GenAI applications is centered around its government-backed academic institutions, including: • Beijing Academy of Artificial Intelligence • Tsinghua University • Zhejiang Lab • Shenzhen's Peng Cheng Lab	Recent U.S. government efforts demonstrate growing recognition and strategic focus on AI, to include GenAI, but lack the enduring institutional and resource-marshaling power of PRC counterparts. To date, the government has played the role of convener, bringing together industry leaders to guide government thinking via organizations including: • National Security Commission on Artificial Intelligence (NSCAI) • National Artificial Intelligence Initiative Office (NAIIO) • National Artificial Intelligence Advisory Committee (NAIAC) U.S. departments and agencies, however, are launching initiatives to examine how best to leverage GenAI in government operations, such as the Department of Defense's recently announced Task Force Lima.[112]
Government Regulation	The PRC has already iterated on and is beginning to implement GenAI regulations that focus on industry, innovation, and asserting government control over its direction. The PRC's rapid dissemination — and subsequent narrowing — of regulatory controls on GenAI reflect its attempt to balance between its national goals and domestic political considerations, and ultimately determine the right length leash for industry.[113]	Current efforts on Capitol Hill to regulate GenAI via statutory changes are in preliminary stages, as the United States takes a more industry-led approach to developing GenAI norms and standards.[114] Major U.S. tech players in the GenAI space, at the urging of the White House, have adopted a voluntary framework on how to address future safety and transparency of GenAI applications.[115] Leading GenAI companies are also forming the Frontier Model Forum[116] to coordinate future AI development.

112 This task force will analyze and employ generative AI applications across the Department of Defense to streamline various processes. See DOD Announces Establishment of Generative AI Task Force, U.S. Department of Defense (2023).

113 The measure defines Generative AI, as well as GAI service providers. It aims to regulate GAI when it has public applications, thus, service providers within academia, industry/organizations do not have to conform to the regulatory measures. It also notes that outside GAI providers working or deploying products within China must conform to these regulations. These regulations particularly target the GAI providers role in deploying the technology, such as the providers are responsible for monitoring GAI content, marking generated content, and protecting user information. See Jenny (Jia) Sheng, et al., China Finalizes Its First Administrative Measures Governing Generative AI, Pillsbury (2023).

114 Andrew Solender & Ashley Gold, Scoop: Schumer Lays Groundwork for Congress to Regulate AI, Axios (2023).

115 Ryan Heath & Ashley Gold, White House Gets AI Firms to Take Safety Pledge, Axios (2023).

116 Dan Milmo, Google, Microsoft, OpenAI and Startup Form Body to Regulate AI Development, The Guardian (2023).

Private Investment	A smaller and less sophisticated capital market, as well as regulatory ambiguities, have resulted in significantly less private investment in GenAI in China, compared to the United States. • PRC AI startups raised $13.5 billion worth of private capital in 2022.[117] • Baidu launched a GenAI venture fund for domestic startups worth $145 million.[118]	U.S. firms benefit from easy access to the world's largest and most dynamic capital markets. While current demand for venture capital in the United States outweighs supply,[119] GenAI startups are still benefiting from massive investment as well as a positive acquisition trend. • U.S. AI startups raised $47 billion billion worth of private capital in 2022.[120] • Inflection, Anthropic, Cohere, Runway, and Mistral AI have all raised megadeals in 2023, with Inflection raising $1.3 billion.[121] • Snowflake paid an estimated $150 million for Neeva, while Databricks preempted a VC round for MosaicML with a $1.3 billion acquisition, both in 2023.[122]
Major Tech Players & Frontier Models	Major PRC tech players are inclined to focus on the industrial applications of GenAI.[123] The CCP's regulations and controls mean that these players are limited to conforming with China's national goals, posing potential constraints on their future innovative capabilities. Currently, China's domestic major tech players have been producing inferior frontier LLMs compared to global counterparts, but have shown promise in other types of transformer-based AI models.[124] **Major Tech Players & Their Frontier Models:** • Baidu [Ernie] • Huawei [Pangu] • Alibaba DAMO Academy [M6-10T] • Beijing Academy of Artificial Intelligence (BAAI) [WuDao 2.0] • Tsinghua University [BaGuaLu, WuDao, M6, CogView]	The private sector dominates most GenAI innovation in the United States, driven largely by commercial incentives. The current disjuncture between GenAI goals within the public and private sectors means that major tech players' goals may not always align with the government's national security concerns. In spite of this, major domestic tech players continue to demonstrate globally-superior GenAI frontier models. **Major Tech Players and Their Frontier Models:** • OpenAI [GPT-4, ChatGPT series] • Google Deepmind [PaLM 2] • Anthropic [Claude 2] • Microsoft Research [GitHub CoPilot] • Meta [LLaMA-2]

117 Just How Good Can China Get at Generative AI?, The Economist (2023).
118 Connie Loizos, As Part of AI Push, Chinese Tech Giant Baidu Is Now Rolling Out An AI Venture Fund, TechCrunch (2023).
119 Kyle Stanford, et al., Accounting for the Overcapitalization of VC, Pitchbook (2023).
120 Artificial Intelligence Index Report 2023 Chapter 4: The Economy, Stanford University (2023).
121 Brendan Burke, et al., Artificial Intelligence & Machine Learning Report Q2 2023, VC Trends and Emerging Opportunities, Pitchbook (2023).
122 Brendan Burke, et al., Artificial Intelligence & Machine Learning Report Q2 2023, VC Trends and Emerging Opportunities, Pitchbook (2023).
123 Josh Ye, China's Slow AI Roll-Out Points to its Tech Sector's New Regulatory Reality, Reuters (2023).
124 Zeyi Yang, The Bearable Mediocrity of Baidu's ChatGPT Competitor, MIT Technology Review (2023); Melissa Heikkilä, New AI Systems Could Speed Up Our Ability to Create Weather Forecasts, MIT Technology Review (2023).

Compute Infrastructure	China's AI development is likely to remain dependent on U.S.-made hardware and software, absent a major disruption to the algorithmic architecture driving or infrastructure underlying the field. China's AI sector predominantly depends on U.S.-developed Nvidia processors for model training. China also has a strong state-funded supercomputing ecosystem to include at least one world-leading supercomputer based on domestic hardware that is dedicated to AI applications.[125] Due to U.S. export controls, China's commercial AI firms have limited access to Nvidia GPUs, which are a core component of their efforts to build advanced compute clusters for their LLM development.[126] China's AI developers largely used GitHub-based open-source software as a foundation for their own model development. Domestically-developed open-source version have yet to gain broad traction, but include: • PaddlePaddle (Baidu) • Atlas (Huawei)	U.S.-developed AI hardware and software has been foundational to the transformer model paradigm, and will likely remain so barring a disruption to the algorithmic architecture driving or infrastructure underlying the field. Leading U.S. AI firms are building increasingly large GPU-based high performance computers (HPCs) for their LLM model development needs; current and under development HPCs include Nvidia's Selene, Meta's AI Research SuperCluster, Tesla's DOJO, and Google's TPU v4 cluster dedicated to LLM training. Other approaches for LLM training include the use of specialized AI processors like Groq and Cerebras and/or accessing compute clusters via cloud providers such as Nvidia, Microsoft, Cerebras, and AWS.[127] U.S.-developed software has been foundational in the global development of AI models and include ML platforms like: • TensorFlow (Google) • PyTorch (Meta/Linux) • CUDA (Nvidia) • CNTK (Microsoft)

125 Sebastian Moss, China May Be Planning 10 Exascale Computers by 2025, Data Center Dynamics (2022); Nicole Hemsoth, New Chinese Exascale Supercomputer Runs 'Brain Scale AI', The Register (2022).

126 Justin Hair, Bytedance (TikTok) Orders $1 Billion of NVIDIA GPUs: Boosting AI Capabilities Amidst Export Ban Concerns, Medium (2023).

127 Agam Shah, Nvidia Launches AI Factories in DGX Cloud Amid the GPU Squeeze, HPCWire (2023).

Data	As the world's second-most-populous country, China generates massive amounts of data and will likely continue to do so.[128] While PRC firms are developing English-language LLMs, when it comes to training Chinese-language LLMs specifically, the PRC faces some constraints as less than two percent of the Internet is in the Chinese language.[129] • Generated 7.6 zetabytes (ZB) of data (23 percent of total data generated globally) in 2018[130] • Estimated to generate 48.6ZB (27.8 percent of the world's data) in 2025[131]	Despite the United States' relative lag in data generation compared to China, U.S. AI developers have a massive advantage when training LLMs due to nearly 60 percent of the Internet using the English language.[132] Additionally, U.S. tech giants maintain a broad global presence which facilitates even greater data flows into the U.S., evening the lag in data generation between the U.S. & PRC. • Generated 6.9ZB of data (20 percent of global data volume) in 2018[133] • Estimated to generate 30.6ZB (17.4 percent global data volume) in 2025[134]
Talent	Many of the world's top AI researchers are based in the PRC, however the country is currently experiencing brain drain to other countries with an estimated 400,000 PRC scientists working abroad.[135] However, it is taking steps to mitigate this through national programs such as the Thousand Talents program.[136] Additionally, the CCP has increased domestic efforts to create university-level AI programs, training academies, and other initiatives in the hopes of retaining domestic AI talent.[137]	Many of the top AI specialists and academics are based within the United States; however, the immigration system has made it more difficult for foreign researchers to stay and work in the U.S. in recent years.[138] Additionally, some speculate that the industry is siphoning talent from academia, potentially leading to long-term issues in AI education capabilities.[139] Domestic AI education remains focused more on university-level education, instead of a comprehensive approach including primary and secondary levels of education (although some state-led programs are working to change that).[140]

128 China is building one of the world's strictest data governance regimes to manage its massive data holdings. See Eva Xiao, China Passes One of the World's Strictest Data Privacy Laws, Wall Street Journal (2023).
129 Languages Most Frequently Used for Web Content as of January 2023, By Share of Websites, Statista (2023).
130 Saheli Roy Choudhury, As Information Increasingly Drives Economies, China is Set to Overtake the US in Race for Data, CNBC (2019).
131 Saheli Roy Choudhury, As Information Increasingly Drives Economies, China is Set to Overtake the US in Race for Data, CNBC (2019).
132 Languages Most Frequently Used for Web Content as of January 2023, By Share of Websites, Statista (2023).
133 Saheli Roy Choudhury, As Information Increasingly Drives Economies, China is Set to Overtake the US in Race for Data, CNBC (2019).
134 Saheli Roy Choudhury, As Information Increasingly Drives Economies, China is Set to Overtake the US in Race for Data, CNBC (2019).
135 Paul Scharre, To Stay Ahead of China in AI, the U.S. Needs to Work with China, TIME (2023); The Global AI Talent Tracker, Macro Polo (last accessed 2023).
136 Alison Snyder, China Talent Program Increased Young Scientists' Productivity, Study Says, Axios (2023).
137 Liu Caiyu, School Students in East China's Zhejiang to Study AI as Compulsory Course, Global Times (2023); Zhejiang To Make AI Courses Compulsory in Primary, Secondary Schools, China Daily (2023).
138 Kaveh Waddell, Most Top AI Researchers in the U.S. Are Foreign, Axios (2019).
139 The Catch-22 Facing Academia and the Tech Sector in the War for Top Talent, Toptal (last accessed 2023).
140 Diana Gehlhaus, Why States Need an AI Education Agenda–Now!, Council on Foreign Relations (2022).

PART TWO

Memos to the President and Congress

- Innovation Power for the Generative AI Flywheel
- Governance of Generative AI
- Building the Generative Economy
- Establishing U.S. Global Leadership in the Era of Generative AI
- Department of Defense Adoption of Generative AI
- Implications of Generative AI for the U.S. Intelligence Community

Platforms Memo

MEMORANDUM TO THE PRESIDENT OF THE UNITED STATES AND CONGRESS

FROM: Special Competitive Studies Project

SUBJECT: Innovation Power for the Generative AI (GenAI) Flywheel

Introduction

The paramount determinant of success in the technology competition between the United States and China lies in each nation's ability to wield innovation power at an unparalleled speed, unmatched quality, and unrivaled scale.[141] System versus system, the security competition will come down to how technology diffuses into government affairs. That diffusion furthers a nation's innovation power, from which it can build military capabilities, economic prosperity, and cultural influence around the world. The convergence of different technologies can yield a special kind of technology power that fundamentally alters national security architectures around the world. Historical convergence, like the combined use of the printing press and the compass, further encouraged nations to explore the world.[142] The merging of electrification and mechanization paved the way for the Industrial Revolution.[143] The proliferation of data as a result of the Internet Age has led to revolutions in digitization and helped spark the Age of AI, where vast quantities of data are created each day, converging with AI paradigms like machine learning, self-reflection,[144] auto code-creation,[145] and new forms of advanced modeling pushing new boundaries in technology innovation.

141 Innovation power is a nation's capacity to invent, adopt, and adapt to new technologies. See Eric Schmidt, Innovation Power: Why Technology Will Define the Future of Geopolitics, Foreign Affairs (2023); Dan Wang, China's Hidden Tech Revolution: How Beijing Threatens U.S. Dominance, Foreign Affairs (2023).

142 Francis Bacon, Novum Organum, Open Court at 63 (1994).

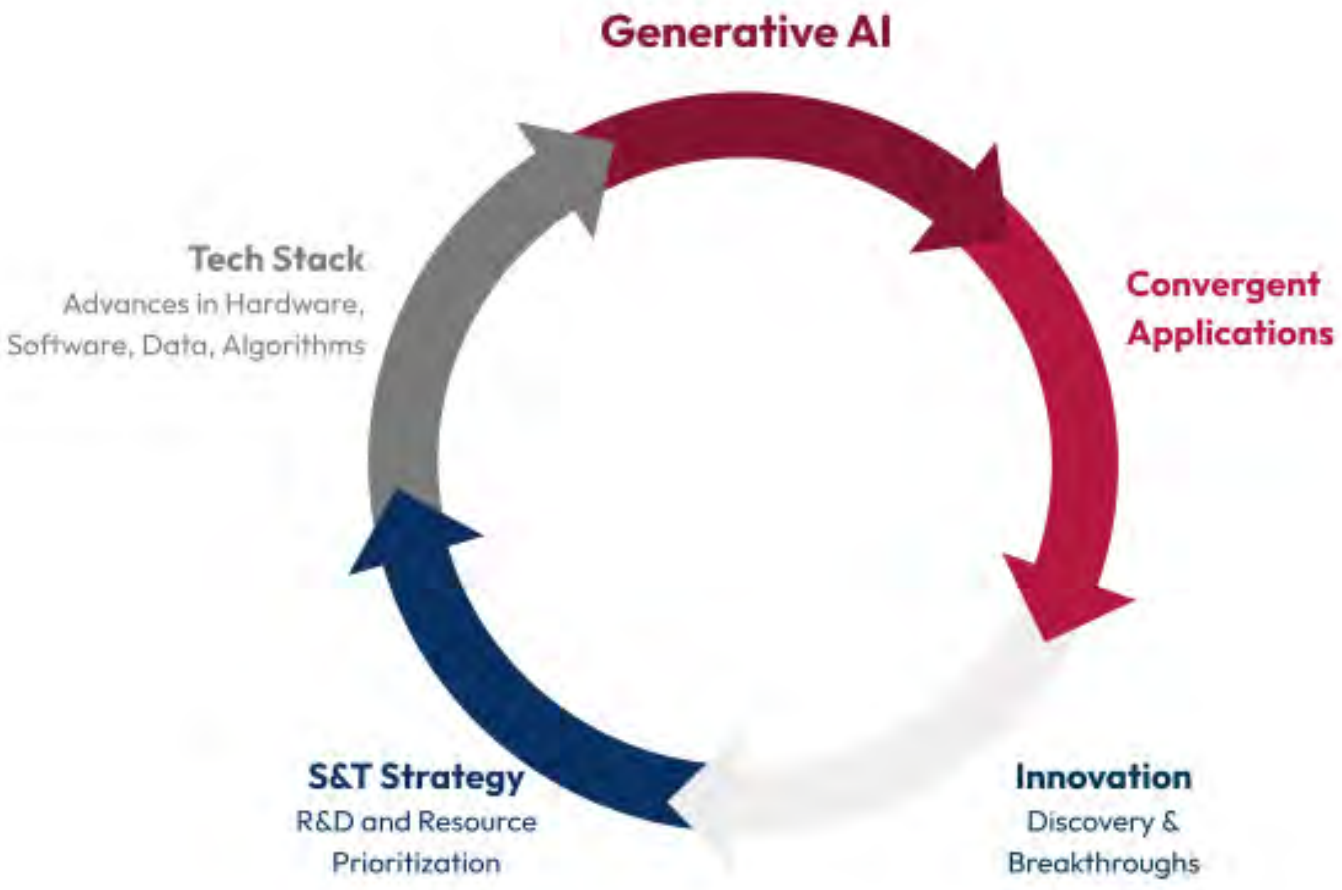
143 Joel Mokyr, The Lever of Riches: Technological Creativity and Economic Progress, Oxford University Press at 145-72 (1992).

144 Noah Shinn, et al., Reflexion: Language Agents with Verbal Reinforcement Learning, arXiv (2023).

145 Nat Friedman, Introducing GitHub Copilot: Your AI Pair Programmer, Github Blog (2021); Yiwen Lu, What to Know About ChatGPT's New Code Interpreter Feature, New York Times (2023).

GenAI is converging with other fields that will both change the very nature of how we innovate and usher in a stronger, more general form of AI. Thus, mastering GenAI will be critical in technology competition and the United States should adopt measures to organize, drive, and ensure it has the fuel and resources to sustain America's role as the world's leading innovation power. It is only the beginning. In this memo, we first explore how GenAI is acting like an "innovation flywheel." Then we will describe moves the nation could make to translate such innovation power into greater national security.

The GenAI Innovation Flywheel



GenAI is driving a flywheel[146] of value creation in which innovation will beget more, faster, and broader innovation. This will ultimately bring us closer to the prospect of a more general

146 The innovation flywheel concept has been used to characterize periods of acceleration in digital innovation. See Charles Gildehaus, et al., Powering the Innovation Flywheel in the Digital Era, Boston Consulting Group (2021).

form of AI, spinning out many other technologies along the way.[147] This flywheel occurs in four basic stages: first, GenAI is converging with other strategic technology sectors (biotech, energy, advanced manufacturing) to create an array of applications including many that cut across all fields (GenAI+). Second, the resulting innovations are changing the way the world works and helping people across society see the immense opportunity of AI.[148] Third, these opportunities are driving organizations – from governments to startups – to reprioritize their strategies to adapt and leverage the value of GenAI.[149] Finally, joining with independent compute innovation efforts already underway, such as quantum computing programs, this reprioritization fuels changes in the foundational technology inputs that make GenAI work: computing hardware, algorithms, data, and talent. This flywheel is already turning, and technological insights are likely to spin out at every stage. To be sure, there are potential limitations at each layer of the tech stack that could slow progress down. For example, we could run out of new data on which to train ever-larger models, and find synthetic data to be a poor substitute.[150] But GenAI greatly expands our toolbox to anticipate and design out these obstacles, allowing progress to churn on.

GenAI Convergence with Strategic Tech Sectors

Some early rotations of this flywheel are driving new GenAI applications across strategic technology sectors, in turn boosting economic productivity.[151] They are also enabling new pathways to scientific discovery itself, changing the way basic and applied R&D is being conducted, and more broadly, changing the way we innovate.[152] In the longer term, these tools will help us answer some of the most vexing questions of the global technology competition: what are the next-generation battery chemistries that will underpin the world's energy transition? What are the new active pharmaceutical ingredients (APIs) that will

147 Sébastien Bubeck, et al., Sparks of Artificial General Intelligence: Early Experiments with GPT-4. arXiv (2023). After much debate over the definitions, the commissioners of the NSCAI explained something between today and AGI as "more general artificial intelligence." This term captured the state of innovation between narrow AI and the theoretical concept of AGI. See Final Report, National Security Commission on Artificial Intelligence at 35-36 (2021).

148 See e.g., Linda Geddes, DeepMind Uncovers Structure of 200m Proteins in Scientific Leap Forward, The Guardian (2022). For a definition of innovation see Fred Gault, Defining and Measuring Innovation in all Sectors of the Economy, Research Policy (2018).

149 Marco Ianisiti & Karim R. Lakhani, Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World, Harvard Business Press (2020).

150 Madhumita Murgia, Why Computer-Made Data is Being Used to Train AI Models, Financial Times (2023).

151 Michael Chui, et al., The Economic Potential of Generative AI: The Next Productivity Frontier, McKinsey & Company (2023); See also Vildana Hajric & Lu Wang, AI Proves Mightier Than the Fed for Stocks Divorced From Economy, Bloomberg (2023).

152 Eric Schmidt, This is How AI Will Transform the Way Science Gets Done, MIT Technology Review (2023).

redefine the future of biotechnology and human life? To what degree will microelectronics system architectures improve when every designer has an AI co-pilot? The global race to find the answers has already begun, and the nation(s) able to innovate faster and better will have more power.

The step change that GenAI creates for innovation is multi-faceted. It is a natural language interface for machine intelligence, expanding humans' ability to team up and interact with machines in increasingly complex ways. It is an orchestrator that can stitch together machine-machine interactions in new and richer ways. And it is an inventor, building on existing scientific databases to discover entirely new insights and ultimately execute the entire scientific process on its own. The ways GenAI is already accelerating science are astounding. In July of 2021, DeepMind published AlphaFold, an AI model for predicting the structure of a protein from its amino acid sequence; within one year, the tool was used to predict structures for nearly all cataloged proteins known to science.[153] Less than a year later, the first entirely AI-discovered and AI-designed drug had begun phase 2 clinical trials, notably in China.[154] Yet AlphaFold was only possible because of the existence of publicly available datasets on which the model was trained and refined.[155] Replicating the AlphaFold story for other scientific fields is not out of the question, but will only be possible through concerted efforts to combine data that is currently scattered, proprietary, and/or limited.

153 AlphaFold Reveals the Structure of the Protein Universe, DeepMind (2022).
154 Jamie Smyth, Biotech Begins Human Trials of Drug Designed by Artificial Intelligence, Financial Times (2023).
155 Oana Stroe, Case study: AlphaFold Uses Open Data and AI to Discover the 3D Protein Universe, European Molecular Biology Laboratory (2023).

Cross-Cutting GenAI Applications	Sector-Specific Examples	
1. ModSim & Planning: Improve design functions via modeling and simulation[156] **2. Optimization & Productivity:** Make systems more efficient and effective[157] **3. S&T Discovery:** Learn, reason with, and draw insights from data[158] **4. Data Analytics:** Visualize vast amounts of data into charts, graphs, and tables quickly[159] **5. A Unique User Interface:** Create personalized compute capabilities[160]	Compute *computer science, applied mathematics, electrical engineering*	• Dataflow-centric hardware architectures that create step-changes in AI performance[161]
	Networks *electrical engineering, computer science*	• Simplify network planning, `configuration, and optimization[162] • Verification of Web3 identities[163] • Automated cyber attack/ defend with GenAI UI[164]

156 Jason Dorrier, Here's Why Google's Deepmind's Gemini Algorithm Could Be Next-Level AI, Singularity Hub (2023); NVIDIA Announces Digital Twin Platform for Scientific Computing, Digital Engineering (2022).
157 How We Harness Industrial Generative AI for Optimization, Zapata AI (last accessed 2023).
158 Tiechui Yao, et al, VenusAI: An Artificial Intelligence Platform for Scientific Discovery on Supercomputers, Journal of Systems Architecture (2022).
159 As one early example of such capabilities, see Yiwen Lu, What to Know About ChatGPT's New Code Interpreter Feature, New York Times (2023).
160 Ron Miller, Generative AI Could Transform the Way We Interact with Enterprise Software, TechCrunch (2023).
161 Pudi Dhilleswararao, et al., Efficient Hardware Architectures for Accelerating Deep Neural Networks: Survey, IEEE Access (2022); Adi Fuchs, AI Accelerators — Part IV: The Very Rich Landscape, Medium.com (2021).
162 Ishwar Parulkar, How Generative AI will Transform the Telco Industry—And Where It Won't, Light Reading (2023).
163 Tim Keary, Oasis Labs and Equifax Turn to Blockchain to Verify Web3 User Identities, VentureBeat (2022).
164 Introducing Microsoft Security Copilot: Empowering Defenders at the Speed of AI, Microsoft (2023).

Cross-Cutting GenAI Applications	Sector-Specific Examples	
6. New Automation: Automate research and natural language processing[165] **7. Code Creation:** Generate code for tailored algorithms[166] **8. Synthetic Data Production:** Fabricate datasets for research, modeling, and development[167] **9. Grant Writing:** Quickly raise financial support for innovation[168] **10. Content Creation:** Convey complex information in digestible, compelling formats[169]	Biotech *materials science,[170] mechanical engineering, chemical engineering, biology, life sciences*	• Lab automation coupled with GenAI-based experiment design[171] • Protein prediction with exponentially more accuracy[172] • Novel drug discovery[173] • Personalized medical treatments and therapies through GenAI augmented protein creation[174]
	Energy Generation & Storage *materials science, chemistry, chemical engineering*	• Aid in clean energy production by optimizing power plant operations to improve efficiency and to reduce emissions[175] • Automate operations within nuclear fusion reactors[176]
	Smart / Advanced Manufacturing *materials science, mechanical engineering*	• Strengthen bonding and adhesion in manufacturing[177] • Optimize the molecular structure of new materials[178] • Train smarter robots that could be used to increase automation efficiencies[179]

165 AI for Discovery and Self-Driving Lab, The Matter Lab (last accessed 2023); George Anadiotis, Red Hat and IBM Team Up to Enhance Alops with an Open Source Project, Venture Beat (2022).
166 Chris Stokel-Walker & Richard Van Noorden, What ChatGPT and Generative AI Mean for Science, Nature (2023).
167 Rob Toews, Synthetic Data is About to Transform Artificial Intelligence, Forbes (2022).
168 Chris Stokel-Walker & Richard Van Noorden, What ChatGPT and Generative AI Mean for Science, Nature (2023).
169 Reed Albergotti, Tome, an AI-Powered Storytelling Tool, Catches Fire with Gen Z, Semafor (2023).
170 Matteo Manica, et al., Accelerating Material Design with the Generative Toolkit for Scientific Discovery, Nature (2023).
171 Hector G. Martin, et al., Perspectives for Self-Driving Labs in Synthetic Biology, Current Opinion in Biotechnology (2023); Eric Schmidt, This is How AI Will Transform the Way Science Gets Done, MIT Technology Review (2023).
172 John Jumper & Demis Hassabis, Protein Structure Predictions to Atomic Accuracy with AlphaFold, Nature Methods (2022); Abel Chandra, et al., Transformer-Based Deep Learning for Predicting Protein Properties in the Life Sciences, Computational and Systems Biology (2023); Jiaying Huang, et al., Discovery of Deaminase Functions by Structure-Based Protein Clustering, Cell (2023).
173 Gary Liu, et al., Deep Learning-Guided Discovery of an Antibiotic Targeting Acinetobacter Baumannii, Nature Chemical Biology (2023); Vanessa Braunstein, Build Generative AI Pipelines for Drug Discovery with NVIDIA BioNeMo Service, NVIDIA Developer (2023).
174 Generating 'Smarter' Biotechnology, Nature Biotechnology (2023).
175 Spencer Acain, Reduce the Carbon Footprint of Manufacturing with Artificial Intelligence, Siemens (2022).
176 Amit Katwala, DeepMind has Trained an AI to Control Nuclear Fusion, Wired (2022); Jonas Degrave, et al., Magnetic Control of Tokamak Plasmas Through Deep Reinforcement Learning, Nature (2022).
177 Ginger Gardiner, Brighton Science Unveils BConnect: The World's First Surface Intelligence Platform, CompositesWorld (2023).
178 Mark Bergen, DeepMind Alum Wants to Use AI to Speed the Development of Green Materials, BNN Bloomberg (2023).
179 Kevin Roose, Aided by AI Language Models, Google's Robots Are Getting Smart, New York Times (2023).

Eight National Moves to Match the GenAI Moment

The United States will be well-positioned to lead if we organize, set audacious tech goals, and resource the R&D needed to shore up the nation's innovation power for the age of GenAI. Here are eight ways to do so.

What	How		Why
Organize	1	Establish a **Technology Competitiveness Council, Office of Global Competition Analysis, and a U.S. Advanced Technology Forum** to execute technology strategy.	An institutional home for the national technology strategy process is needed to gather the innovation ecosystem's potential.
	2	Develop a **top-down counterpart to a Digital Service Academy** that would teach government leaders about the latest developments in GenAI, inspired by the Senate's AI Insight Forums.	As the flywheel spins, Executive Branch policymakers would benefit from routine insights on the latest AI developments.
	3	Scale a **new model of public-private partnerships within the U.S. national laboratory system** focused on GenAI and other AI applications.	The national laboratory system is an underutilized asset as strong bridges are needed between the basic research and problem-solving corners of the innovation ecosystem.
Drive	4	Cooperate on **national security-focused, government-led moonshots**, such as an "AlphaStrategy", an S&T Platform, and a National Medical Shield.	Bar-setting moonshots can address national security challenges by driving the ecosystem to achieve positions of advantage in strategic technologies.
Fuel	5	Get back to basic research by fully **appropriating the "Science" in the CHIPS & Science Act**.	GenAI increases the overarching need for foundational basic research as it converges with other scientific fields and tech sectors.
	6	Expand overall **federal R&D funding**, starting with increases to federal non-defense AI R&D.	Increased funding towards strategic technology sectors would jumpstart GenAI's potential to accelerate innovation itself.
	7	Start a generative AI-enabled **rapid grant program**.	The federal funding process for R&D needs to be more agile to solve today's problems.
	8	Set up an **annual technology innovation fund** modeled after the DoD "Overseas Contingency Operations" or sector-specific R&D funding models similar to those outlined in the CHIPS and Science Act.	Long-term investments are needed to sustain commitment toward strategic technology targets.

Organizing for Innovation Power

No one corner of the U.S. innovation ecosystem will be able to sustain long-term AI leadership alone. Advancing, diffusing, and harnessing this general purpose technology will require public-private efforts to organize national technology strategy and execute cross-cutting national innovation projects.

No one corner of the U.S. innovation ecosystem will be able to sustain long-term AI leadership alone.

1. Establish a Small, Elite National Technology Strategy Organization. America needs an institutional home for the national technology strategy process to gather the innovation ecosystem's potential. The United States has long embraced new organizational arrangements[180] when the moment demands it.[181] Today is one of those moments.

- The National Security Commission on Artificial Intelligence and SCSP have argued[182] for a White House-based organization with two arms: an action-oriented Technology Competitiveness Council (TCC), and an analytic partner Office of Global Competition Analysis (OCA) that endures across administrations to provide long-term intellectual continuity on technology analysis and strategy.[183] To meet this moment in technology innovation, SCSP recommended the establishment of a federally-chartered non-profit U.S. Advanced Technology Forum (USATF) that methodically convenes the private sector on a voluntary basis in support of the TCC and OCA. The combination of these three entities would transform the government's innovation power if

180 For examples from the National Security Council to the War Industries Board, see Hal Brands, The Twilight Struggle, Yale University Press at 174-78 (2022); Mobilizing America's Economy and Society, U.S. World War I Centennial Commission (last accessed 2022).

181 SCSP has previously outlined the shortcomings of current organizations' capacity to serve as this institutional home. See Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 52 (2022).

182 Final Report, National Security Commission on Artificial Intelligence at 166 (2021); Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 51 (2022).

183 In 2022, Congress considered legislation for both a Technology Competitiveness Council (TCC) and Office of Global Competition Analysis (OCA). H.R. 8027, To Establish within the Executive Office of the President a Technology Competitiveness Council (2022); Courtney Albon, Lawmakers Propose 'Technology Competitiveness Council' to Champion US Innovation, C4ISRNet (2022); S. 4368, American Technology Leadership Act of 2022 (2022); Daniel Flatley, Senators Wary of China's Tech Prowess Seek Competition Office, Bloomberg (2022). More recently, in 2023, the U.S. Senate has also introduced a legislative bill to establish an OCA. S.1873, Global Technology Leadership Act (2023).

equipped with the authorities, resources, and expertise to execute a public-private national technology strategy method for the nation.[184]

2. Empower Policymakers to Get Smart on Tech. As the GenAI flywheel spins, even industry leaders are struggling to keep up with the rapidly changing applications and implications of this emerging technology. For government officials juggling competing policy priorities, the challenge of staying up-to-date on fast-moving technology developments is especially pronounced, particularly for those without deep technical backgrounds. On Capitol Hill, Senate Majority Leader Chuck Schumer is trying to address this through a series of AI Insight Forums, designed to educate Congressional leaders on the intricacies of AI as the legislative body considers regulations over the longer term.[185] Some departments and agencies are also convening groups to assess GenAI for their specific mandates, such as the Department of Defense's Task Force Lima.[186] Yet Executive Branch leaders across the interagency would benefit from a similar routine mechanism at the interagency level for gathering insights on the latest AI developments.[187]

- Building on NSCAI's calls to establish a Digital Service Academy[188] – a new service academy that would take a bottom-up approach to train future civil servants in the digital skills required to modernize government – there needs to be a top-down counterpart aimed at keeping the U.S. government's senior policymakers regularly updated on the latest emerging technology trends, to include GenAI. Taking inspiration from the Senate's AI Insight Forums and nonprofit initiatives to bring together experts like SCSP's Generative AI Task Force, the White House should convene the best AI minds in the country at regular intervals to teach government leaders about 1) the latest developments in GenAI and 2) how those might inform AI policies, adoption, and governance.

184 Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 49 (2022).
185 Ryan Heath, Schumer, Humbled by AI, Crafts Crash Course for Senate, Axios (2023).
186 DOD Announces Establishment of Generative AI Task Force, U.S. Department of Defense (2023).
187 The President's Council of Advisors on Science & Technology (PCAST) and federal advisory committees such as the Department of Commerce's National Artificial Intelligence Advisory Committee (NAIAC) are useful organizational models, but are limited in their reach and/or scope across the interagency and government department leaders.
188 Final Report, National Security Commission on Artificial Intelligence at 127 (2021).

3. Unleash the National Lab Ecosystem with More Public-Private Partnerships. The vast national laboratory system[189] is an underutilized asset in the American innovation ecosystem and should be leveraged to build new kinds of public-private partnerships. Expanding a reimagined model of public-private partnerships would allow the private sector increased access to the national labs' latent resources, such as high-performance computing (HPC) capabilities, and augment the research teams working in line with the labs' national missions. Currently, the Department of Energy (DOE) has difficulty scaling public-private partnerships due to funding constraints[190] and the United States needs to support this work to maximize our ecosystem's competitive advantages.

The vast national laboratory system is an underutilized asset in the American innovation ecosystem and should be leveraged to build new kinds of public-private partnerships.

- The White House and Congress should cooperate to increase DOE's ability to leverage public-private partnerships (PPPs) that advance AI and its convergence with other technology areas, and build lasting bridges between the basic research and problem-solving corners of the innovation ecosystem. This could come in the form of a new DOE directive for National Laboratories to assign a higher percentage of lab budgets toward creating PPPs focused on new approaches to GenAI and other AI applications for national security. One goal of this new lab-driven PPP model would be to grant industry — in particular startups — access to the labs' latent resources such as HPC clusters. Conversely, the national labs would draw upon industry insights to advance their national security missions. PPPs of this ethos are already happening in the national labs — this would be scaling that trend.[191]

189 The national laboratory system consists of 17 labs located across the United States that fall under the Department of Energy's directive. Each lab performs leading-edge research in pursuit of the Department's and the nation's science and national security priorities, and maintains "unique scientific user facilities" and supercomputing capabilities. See America's National Laboratory System, U.S. Department of Energy (2017).

190 To expand public-private partnerships, the DOE would most likely have to take funding "out-of-hide," creating a need to also increase funding for the department overall. "Out-of-hide" refers to funding a program out of existing, authorized and appropriated department funds. See DAU Glossary, Defense Acquisition University, (last accessed 2023).

191 Future "front door/back door" public-private partnerships could look like Lawrence Livermore National Laboratory's AI Innovation Incubator that serves as a collaboration hub to connect the lab's research and development with external academic and industry stakeholders like IBM. See AI Innovation Incubator, Lawrence Livermore National Laboratory (last accessed 2023).

Driving Innovation, Shooting for the Moon

The U.S. government can achieve the unthinkable when the moment demands it. The Manhattan Project of the 1940s, the Apollo Program of the 1960s, and – most recently – Operation Warp Speed succeeded because the White House and Congress rose above all else to cooperatively muster the will and resources required to achieve those historic goals. If AI poses societal-scale risks on par with pandemics or nuclear war[192] – not to mention immense opportunity – the United States needs to rediscover its sense of unified national purpose and urgency to drive next-generation innovation. The flywheel is accelerating, and global leadership cannot be left to chance.

The United States needs to rediscover its sense of unified national purpose and urgency to drive next-generation innovation.

4. Launch and Land Moonshots for the GenAI Era. The White House and Congress should cooperate on national security-focused, government-led moonshots with audacious and clear goals, leadership, and resourcing. As NSCAI identified in work that SCSP has continued, there are areas where bar-setting moonshots could address discrete challenges and opportunities by way of achieving positions of advantage in strategic technologies.

- ***Apply GenAI for National Security Decision Advantage***: Like the modern corporation, the government with the best decision-making "factory"[193] will have advantage over rivals. GenAI has demonstrated the technical pathway toward predictive decision making that could give nations real strategic advantages.[194] Commercial players are already trying to build predictive analytic models for the U.S. government for specific domains,[195] including one that predicted the start of the Russia-Ukraine War almost to the exact day.[196] Technical, bureaucratic, and

192 Billy Perrigo, AI Is as Risky as Pandemics and Nuclear War, Top CEOs Say, TIME (2023).
193 Iansiti and Lakhani describe the "AI Factory" as the scalable decision engine that powers the digital operating model of the twenty-first century firm, enabled by AI-powered data gathering, analytics, and decision-making. See Marco Iansiti & Karim R. Lakhani, Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World, Harvard Business Press at 53-54 (2020).
194 Will Knight, Google DeepMind CEO Demis Hassabis Says Its Next Algorithm Will Eclipse ChatGPT, Wired (2023).
195 Stephan Zheng, et al., The AI Economist: Taxation Policy Design via Two-Level Deep Multiagent Reinforcement Learning, Science Advances (2022).
196 Stanley McChrystal & Anshu Roy, AI Has Entered the Situation Room, Foreign Policy (2023).

commercial hurdles make a whole-of-government approach unlikely to emerge absent national strategic direction and resources. The United States should adopt an "AlphaStrategy" approach — inspired by the AlphaGo model that beat the world's best Go players[197] — that stitches together predictive models across all domains[198] to add a valuable voice in the room for national security decision-making at the highest levels.[199]

- ***Build an S&T Platform for Innovation Advantage***: As a natural language interface for accessing complex information and processes at machine speed and scale,[200] GenAI is poised to transform all stages of innovation, unlocking new capabilities and approaches for discovery, design, testing, building, and deployment.[201] We will need new government R&D structures for an era in which science and technology are growing ever closer. Various efforts are already underway to use GenAI to accelerate R&D, yet such projects are dispersed across the U.S. innovation ecosystem and lack a national mission.[202] A national GenAI-enabled S&T Discovery Platform moonshot could combine talent and resources across these efforts to build a proprietary model from scratch or license and/or fine-tune commercial or open-source LLMs. The U.S. government could house such an effort at one of DOE's National Labs to provide access to computing resources and S&T expertise.

- ***National Medical Shield***: The convergence of GenAI and biotechnology creates both immense opportunities and asymmetrically dangerous risks. To step comfortably into this world, the United States needs a robust, interagency system for identifying and rapidly responding to any potential biothreat. As called for in SCSP's *National Action Plan for U.S. Leadership in Biotechnology*, the U.S. government should field

197 David Silver, et al., Mastering the Game of Go Without Human Knowledge, Nature (2017).

198 Such a model could stitch together models used by relevant departments and agencies for economic, military, diplomatic, information, and technical domains, and be fused with real-time open-source intelligence.

199 A national program would need to include a full-time, competent national mission manager capable of integrating various private sector capabilities and facilitating interagency coordination; a legal framework for IP licensing across numerous private companies; a transition plan to departments/agencies who are not (all) looking for this capability; and data sharing, security, storage, and transport for a whole of government platform.

200 Generative AI: Understanding Generative AI and How it Will Fundamentally Transform Our World, Accenture (last accessed 2023).

201 For example, the technique of cognitive simulation (CogSim) is being used by researchers at Lawrence Livermore National Laboratory "to find large-scale structures in big data sets, teach existing models to better mirror experimental results, and create a feedback loop between experiments and models that accelerates research advances." Cognitive Simulation Supercharges Scientific Research, Lawrence Livermore National Laboratory (2022).

202 Jonathan Carter, et al., Advanced Research Directions on AI for Science, Energy, and Security, U.S. Department of Energy (2023).

a 24/7 national medical shield ("MedShield") housed in the Department of Defense (DoD) that functions as a NORAD-like incident command system.[203] GenAI not only increases the urgency of such an effort, but offers a practical tool to stitch together existing innovations in this space across the public-private spectrum in the United States and with allies and partners.

- ***Accelerate Other Moonshots with GenAI***: GenAI should be leveraged as a tool of first resort to spur moonshots in strategic technology sectors and boost existing moonshot efforts. For example, GenAI could help streamline network communications to achieve pervasive, interoperable connectivity nationwide by 2035.[204] GenAI-enabled design and process optimization can also help accelerate and integrate efforts to build a fully synthetic cell and move the field of biotechnology towards a paradigm of reliable and routine bioengineering.[205] GenAI could also propel new moonshots for challenges and opportunities such as personalized education at scale, global fresh water availability, or fast-charging batteries for electric vehicles. Finally, GenAI could augment moonshot efforts underway such as President Biden's Cancer Moonshot.[206]

GenAI should be leveraged as a tool of first resort to spur moonshots in strategic technology sectors and boost existing moonshot efforts.

Fueling the New Course to the Endless Frontier

Vannevar Bush, the American engineer, inventor, and science administrator, wrote in *Science: the Endless Frontier* about the crucial role of science in national development, underscoring the need for increased government support for scientific research in the

203 Innovation categories that a MedShield would combine include—but are not limited to—rapid vaccines, rapid therapeutics, a global biothreat "radar," advanced AI-enabled modeling to facilitate product development and testing, rapid manufacturing technologies, and an enhanced trial system that speeds up effectiveness and efficiency in the delivery of medical solutions to citizens. National Action Plan for U.S. Leadership in Biotechnology, Special Competitive Studies Project at 8 (2023).

204 National Action Plan for U.S. Advantage in Advanced Networks, Special Competitive Studies Project at 6 (2023).

205 National Action Plan for U.S. Leadership in Biotechnology, Special Competitive Studies Project at 8-9 (2023).

206 The White House, The President and First Lady's Cancer Moonshot, (last accessed 2023).

The current GenAI moment is an opportunity to get federal R&D spending – the lifeblood of innovation – back on track.

United States.[207] The current GenAI moment is an opportunity to get federal R&D spending – the lifeblood of innovation – back on track.[208] Even though private industry should be credited in this most recent wave of GenAI innovations, we should not forget the role the U.S. government played in some of the foundational research that made GenAI what it is today. In the 1960s, partly driven by the Apollo Program and America's mission to reach the Moon, the federal government funded the majority of total U.S. research and development, and for decades after, government R&D funding continued to play a role in the development of various transformative technologies.[209] Today, private industry is the big R&D spender, while the share of federal R&D dollars has fallen drastically, diminishing the government's ability to set strategic R&D priorities.[210] GenAI's revolutionary power could further tilt the geometry of innovation[211] towards industry as the primary driver of R&D while academia and government risk falling behind.[212] In pursuit of Bush's "endless frontier," Congress and the White House should adopt measures to rebalance America's geometry of innovation and allocate new resources to bolster the nation's innovation power so that the government can begin reasserting its role in creating future waves of innovation.

207 Vannevar Bush, Science The Endless Frontier, National Science Foundation (1945).

208 Current federal R&D funding falls below targets recommended by the National Security Commission on Artificial Intelligence. See Final Report, National Security Commission on Artificial Intelligence at 188 (2021); Supplement to the President's FY 2023 Budget, National Science and Technology Council (2022); and Chapter 6: Research and Development, Analytical Perspectives, Office of Management and Budget (2023).

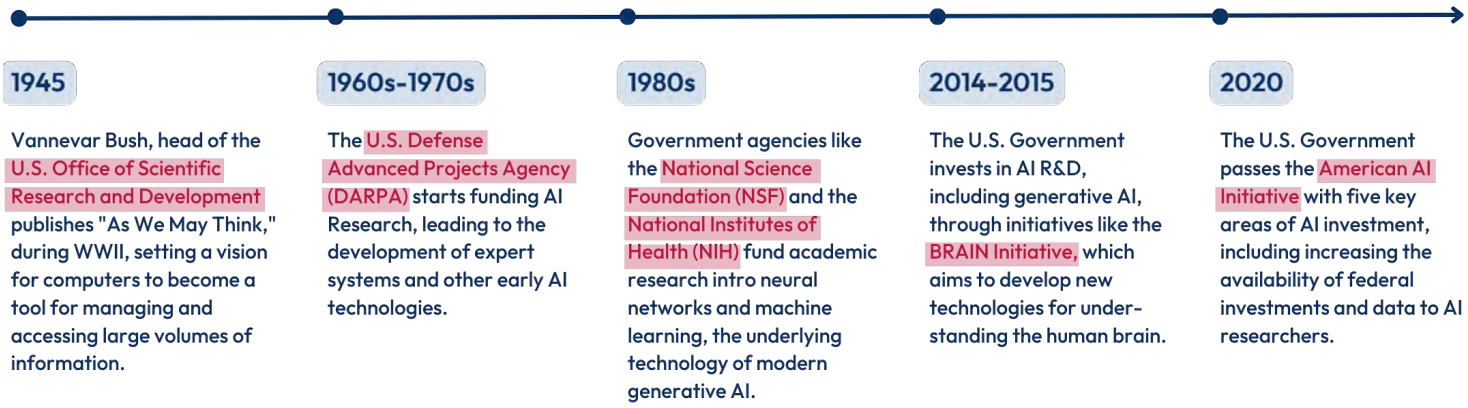
209 Research and Development: U.S. Trends and International Comparisons, Science and Engineering Indicators, National Science Board (2022).

210 Research and Development: U.S. Trends and International Comparisons, Science and Engineering Indicators, National Science Board (2022).

211 The geometry of innovation refers to the addition of private capital and a web-enabled "crowd" to Vannevar Bush's "Triangle of Innovation" which included industry, academia, and government. Bush's triangle supported U.S. technology leadership throughout the Cold War, but it has evolved to include the new actors we see within the ecosystem today. See Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 23 (2022).

212 Research and Development: U.S. Trends and International Comparisons, Science and Engineering Indicators, National Science Board (2022).

U.S. Public R&D Investment's Role in GenAI



5. Get Back to the Basics. Academia is the primary performer of basic research, and industry often builds upon the discoveries made by national labs and universities to translate them into practical applications and new technologies.[213] GenAI is changing every step of scientific discovery and its impact on basic research will be revolutionary across scientific fields and tech sectors.[214] To harness GenAI's convergence with other scientific areas, the government should increase funding for government basic research.

- For Fiscal Year 2024, Congress should fully appropriate the "Science" portion of the CHIPS and Science Act, as around $5 billion remains unfunded today.[215] This would increase the budgets for critical federal R&D agencies: the National Science Foundation, the National Institute of Standards and Technology, and the Department of Energy's Office of Science.[216] These agencies could use an increase in funding to provide for the automatic translation of PRC research papers to direct

213 Research and Development: U.S. Trends and International Comparisons, Science and Engineering Indicators, National Science Board (2022); Rebecca Mandt, et al., Federal R&D Funding: The Bedrock of National Innovation, MIT Science Policy Review (2020); The Future Postponed: Why Declining Investment in Basic Research Threatens a U.S. Innovation Deficit, MIT Committee to Evaluate the Innovation Deficit (2015).

214 Generative AI can help researchers derive answers from vast amounts of data, information, and existing knowledge quickly, breaking through bottlenecks within the scientific process and leading to more "eureka moments." Engaging with a broad range of information is necessary for discovery and innovation. See John R. Smith & Matteo Manica, How Generative AI Models Can Fuel Scientific Discovery, IBM (2022); Michael Park, et al., Papers and Patents Are Becoming Less Disruptive Over Time, Nature (2023).

215 CHIPS & Science Funding Update: FY 2023 Omnibus, FY 2024 Budget Both Short by Millions, Federation of American Scientists (2023).

216 CHIPS & Science Funding Update: FY 2023 Omnibus, FY 2024 Budget Both Short by Millions, Federation of American Scientists (2023).

projects toward areas where the United States falls behind the leading edge and for new directives aimed at creating high-quality datasets for every scientific field with which GenAI converges, which would enable AlphaFold-like accelerators of scientific discovery.[217] With the emergence of GenAI, increasing federal funding for basic research will bring dividends to S&T innovation for generations to come.

With the emergence of GenAI, increasing federal funding for basic research will bring dividends to S&T innovation for generations to come.

6. Expand Overall Government Investments in R&D. The private sector is likely to remain – and should remain – at the cutting-edge of AI research and commercial applications. The U.S. government, however, should invest resources to ensure a wide set of actors can contribute to the field. These resources should include providing academic and non-profit researchers access to computing power, as well as creating a demand for exploratory research and development that is in the nation's interest.[218] As GenAI is poised to add trillions to the global economy, the U.S. government should direct more R&D funding towards priority strategic technology sectors, including AI broadly, to jumpstart GenAI's catalytic potential to accelerate innovation itself.[219]

- The U.S. government should aim to increase federal R&D funding to one percent of the total U.S. GDP by 2026. Reaching this target means federal R&D funding would need to increase by approximately $83 billion over the next two years. To this end, Congress should, in the short term, fully appropriate the R&D spending target outlined in the President's 2024 Budget Request.[220] Subsequent budget requests

217 Whereas the scientific community would benefit from translated PRC research papers for fundamental science, policymakers would also benefit from an increased awareness of the PRC's technological progress. Translating research papers for policymakers could also be a function of the proposed Office of Global Competition Analysis (OCA). Additionally, for more information about datasets for scientific discovery see Eric Schmidt, This is How AI Will Transform the Way Science Gets Done, MIT Technology Review (2023).

218 Some scientific projects are in the public interest and therefore may not receive funding from non-federal sources. Areas of scientific research that have intangible value, involve high levels of risk, and have uncertain outcomes sometimes offer little financial or academic incentives for researchers to pursue. See Eric Schmidt, This is How AI Will Transform the Way Science Gets Done, MIT Technology Review (2023); The Future Postponed: Why Declining Investment in Basic Research Threatens a U.S. Innovation Deficit, MIT Committee to Evaluate the Innovation Deficit (2015).

219 For GenAI's monetary impact on the global economy see Michael Chui, et al., The Economic Potential of Generative AI: The Next Productivity Frontier, McKinsey & Company (2023).

220 Chapter 6: Research and Development, Analytical Perspectives, Office of Management and Budget (2023).

starting with Fiscal Year 2025 should dramatically increase R&D spending, including raising non-defense AI R&D by $14.2 billion.[221] Such a jolt to R&D spending would equip the federal government with the resources to reach its GenAI moonshots, spur investment from other sources across the innovation cycle,[222] and help recalibrate the ecosystem for the GenAI moment.

7. Create a More Agile Grant Process. The federal funding process should become faster and more flexible so researchers can spend more time solving today's pressing problems instead of applying and waiting for grant approvals.[223]

- Drawing inspiration from novel, agile funding models that have bubbled up across the innovation ecosystem, such as Fast Grants,[224] the National Science Foundation (NSF) should develop a GenAI-enabled rapid grant program through which it should shepherd a portion of the existing funding NSF distributes across the federal R&D enterprise.[225]

8. Move Beyond an Episodic Competition Budget Cycle. As the GenAI flywheel takes off, Congress needs to be ready to put its foot on the gas when new innovation opportunities demand it.

- To further remove the bureaucratic red tape that hampers sustainable and long-term R&D, Congress could establish an annual technology innovation fund modeled after the DoD "Overseas Contingency Operations"[226] or pursue sector-specific R&D funding models similar to aspects of the CHIPS and Science Act that would provide

221 This figure is in line with NSCAI's previous recommendations. Final Report, National Security Commission on Artificial Intelligence at 188 (2021). See also Supplement to the President's FY 2023 Budget, National Science and Technology Council, NITRD (2022).

222 Raising federal R&D funding by $1 would increase total U.S. R&D expenditures by $8 by spurring private investment. Welcome to the Machine: A Comparative Assessment of the USA and China to 2035 Focusing on the Role of Technology in the Economy, Fathom Financial Consulting Limited (2022).

223 M. Anthony Mills, Fix Science, Don't Just Fund It, Innovation Frontier Project (2021).

224 See Fast Funding for COVID-19 Science, Fast Grants (last accessed 2023); Derek Thompson, Silicon Valley's New Obsession: Science Funding, The Atlantic (2022).

225 The federal government is currently taking steps to streamline and simplify the federal funding process, like modernizing iEdison, the government's reporting system for federal R&D funding. In the future, iEdison could be enabled by artificial intelligence which would continue to speed up the reporting system, help track progress toward national goals, and be a resource for agencies to help decide where to invest. See Fact Sheet: Amidst Manufacturing Boom, President Biden Will Sign an Executive Order on Federal Research and Development in Support of Domestic Manufacturing and United States Jobs to Encourage "Invent it Here, Make it Here" in Industries of the Future, The White House (2023).

226 The Overseas Contingency Operations is a separate fund from the DoD's base funding, allocating funding for additional support towards emergencies. FY2022 NDAA: Overseas Contingency Operations, Congressional Research Service (2022).

long-term investments and lead to a sustained committed strategic technology targets.[227]

Conclusion

America's early lead in GenAI today proves the enduring strength of the innovation ecosystem Vannevar Bush helped build. Yet general purpose technologies are defined by their long-term diffusion, and technology leadership is determined by societies' willingness to lean into their disruptive potential, adapt, and adopt. The generative character of GenAI — unique among the GPTs to date — means that the nations that first use this technology to out-innovate their rivals and fully exercise their innovation power are unlikely to be caught. This flywheel has started, but steering it towards national security and national competitiveness will require gathering the strengths across our innovation ecosystem for public-private strategy, coordination, and investment. The government may not be in the driver's seat, but it must have a hand on the wheel. The White House and Congress should set the nation on a course to lead the AI era by organizing, goal-setting, and right-sizing R&D for AI-enabled innovation.

This flywheel has started, but steering it towards national security and national competitiveness will require gathering the strengths across our innovation ecosystem.

227 This annual technology innovation fund would be along the lines of the CHIPS and Science Act, but less episodic. Funding could be steered by a public-private technology strategy group run by the NSC or a future TCC. This funding mechanism could help move some federal R&D funding away from one year budget cycles. See Eric Schmidt, Innovation Power: Why Technology Will Define the Future of Geopolitics, Foreign Affairs (2023).

Governance Memo

MEMORANDUM TO THE PRESIDENT OF THE UNITED STATES AND CONGRESS

FROM: Special Competitive Studies Project

SUBJECT: Governance of Generative AI (GenAI)

Two different timeline trajectories are shaping the current GenAI governance landscape. The development of GenAI is evolving rapidly, while GenAI governance mechanisms[228] are moving slowly.

We have seen OpenAI's release of GPT-4 in March 2023, with significantly advanced capabilities compared to GPT-3.5, released in November 2022.[229] At the same time as frontier GenAIs are advancing, we have seen a proliferation of open-source models.[230] Open-source models democratize access to GenAI capabilities. While increased access has positive domestic implications (e.g., increased domestic competition as opposed to limiting the market to a few), it also means AI capabilities are available to U.S. adversaries and malign non-state actors who could potentially use them to harm us. This environment is still developing, but as open-source capabilities advance, the United States will have a clearer picture of the harms that can be advanced against U.S. interests from open-source GenAI systems.

In contrast, regulation rightly moves slowly in the United States. Governing GenAI to align with democratic values will take time. Employing regulation that harnesses opportunities from GenAI and mitigates its harms requires a well-informed picture of GenAI's implications and threats. Effective U.S. GenAI regulation requires aligning with both of these realities.

The United States must leverage and expand existing governance authorities by utilizing GenAI tools and upskilling regulators with the necessary expertise. The United States must

228 "Governance" includes regulation as well as non-regulatory mechanisms (e.g., self-governance, independent auditing, advocacy, philanthropy).
229 Jon Martindale, GPT-4 vs. GPT-3.5: How Much Difference Is There?, Digital Trends (2023).
230 Davide Castelvecchi, Open-Source AI Chatbots Are Booming — What Does This Mean for Researchers?, Nature (2023).

The United States must leverage and expand existing governance authorities by utilizing GenAI tools and upskilling regulators with the necessary expertise.

take the following specific actions, in order of urgency: (1) Protect our digital information and elections systems by convening stakeholders to agree to a synthetic media code of conduct for elections, passing legislation to assign a lead agency for alerting the public of synthetic media use in federal elections, and encouraging department and agency heads to use all available regulatory tools to adopt proposed public digital literacy education and disinformation awareness ahead of 2024 U.S. elections; (2) Find ways to help regulators identify AI uses cases that have highly consequential impacts on society based on their sector-specific contexts so that they can focus regulatory efforts on GenAI that has significant beneficial outcomes to society while mitigating the worst of the harms;[231] (3) Address threats posed by foreign digital platforms from countries of concern by tailoring restrictions to specific platforms like TikTok and subsequently establishing a comprehensive risk-based policy framework; (4) Over time consider establishing a centralized AI authority that can regulate AI issues that cut across sectors and fill regulatory gaps in sectors;[232] and (5) Establish under the G20 an international Forum on AI Risk and Resilience (FAIRR) that convenes key states and private actors to build a governance floor for managing GenAI tools' malign non-state use, potential state-based infringements on other states' sovereignty, and injurious societal impacts.

PURPOSE

GenAI is a Top Priority for Governance

The United States has long-established robust governance mechanisms that can be leveraged to address imminent GenAI threats to our society. At the same time, the United States must explore new approaches and authorities to address needs that are not met by existing authorities. In addition, given that GenAI crosses borders and jurisdictions, the

231 To balance the need for regulation without stifling innovation, the United States must focus regulation on AI that will have highly consequential beneficial or harmful impacts on society.

232 Immediate actions to govern GenAI outcomes must be taken in parallel with exploring the longer term goal of potentially establishing a new AI authority.

United States and other nations need to explore international governance mechanisms for addressing global issues raised by GenAI.

NEAR TERM IMPLICATIONS

GenAI's Impact on Society

Near-term implications of GenAI result from its capabilities and adoption pace. In the next 12 to 18 months, GenAI's acceleration of disinformation presents an imminent and pressing threat to trust in democratic institutions domestically and globally.[233] GenAI capabilities — including the creation of synthetic media,[234] such as deepfake images and synthetic audio — have advanced on the cusp of the 2024 election cycle, during which well over one billion people worldwide[235] will go to the polls.[236] While disinformation challenges to elections are nothing new, synthetic media adds qualitative and quantitative elements previously not present. Synthetic media is nearly, or at least soon will be, indiscernible from truth and GenAI allows for increased volume. These capabilities introduce heightened national security vulnerabilities by providing new attack surfaces to adversaries and malign non-state actors. GenAI also increases the risks posed by content distribution platforms – particularly those with the potential to come under the direct or indirect control of foreign governments in countries of concern – by making it easier to collect private data given increased platform engagement, influence users, and polarize society.[237]

Near-term implications of GenAI result from its capabilities and adoption pace.

233 Tiffany Hsu & Steven Lee Meyers, A.I.'s Use in Elections Sets Off a Scramble for Guardrails, New York Times (2023).

234 "[S]ynthetic media, also referred to as generative media, is defined as visual, auditory, or multimodal content that has been artificially generated or modified (commonly via artificial intelligence). Such outputs are often highly realistic, would not be identifiable as synthetic to the average person, and may simulate artifacts, persons, or events." See Responsible Practices for Synthetic Media: A Framework for Collective Action, Partnership on AI at 3 (2023).

235 The 2024 election calendar includes elections not only in the United States, but also in Taiwan, Indonesia, South Korea, India, the European Union, Mexico, Egypt, South Africa, and more.

236 See Mekela Panditharatne & Noah Giansiracusa, How AI Puts Elections at Risk — And the Needed Safeguards, Brennan Center for Justice (2023); Thor Benson, Brace Yourself for the 2024 Deepfake Election, Wired (2023).

237 The risks associated with TikTok and other foreign digital platforms from countries of concern are anticipated to grow with GenAI. See Meaghan Waff, TikTok Is the Tip of the Iceberg: National Security Implications of PRC-Based Platforms, Special Competitive Studies Project (2023).

The rapid advancement and adoption of GenAI applications[238] make addressing AI threats to democratic values such as privacy, non-discrimination, fairness, and accountability, more urgent.

GenAI's Impact on Global Governance

Governing GenAI in a manner consistent with democratic values is, first and foremost, a domestic imperative. Regardless of international conditions, the U.S. government has an obligation to ensure that innovation's impacts on society accord with U.S. constitutional rights and the democratic processes that support those rights. Yet, that fundamental reality does not obscure that the GenAI revolution is occurring amid a significant international shift toward an ideological contest of governance models.[239]

The U.S. government has an obligation to ensure that innovation's impacts on society accord with U.S. constitutional rights and the democratic processes that support those rights.

Around the world, AI governance models are on display for judgment and, ultimately, adoption.[240] The European Union has put forward its archetype in the EU AI Act.[241] Likewise, the People's Republic of China (PRC) is moving to regulate GenAI.[242] How these governance regimes either spur or stifle innovation and economic opportunity while furthering or curtailing human rights will impact the attractiveness of their approaches around the globe.[243] The United States should not underestimate these alternatives — including the PRC's. On paper, at least, Beijing's recent rules offer data privacy protections, worker protections,

238 Krystal Hu, ChatGPT Sets Record for Fastest-Growing User Base, Reuters (2023). Stability AI's Stable Diffusion hit 10 million daily users. See Mureji Fatunde & Crystal Tse, Stability AI Raises Seed Round at $1 Billion Value, Bloomberg (2022). Recent trends in GenAI include plugins connecting GenAI models and third party data. See Jason Nelson, These ChatGPT Plugins Can Boost Your Productivity With AI, Yahoo! Finance (2023); Kyle Wiggers, Microsoft Goes All in on Plug-ins for AI Apps, TechCrunch (2023).

239 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 16-27 (2022).

240 See Anu Bradford, The Race to Regulate Artificial Intelligence, Foreign Affairs (2023).

241 EU AI Act: First Regulation on Artificial Intelligence, European Parliament News (2023).

242 Qianer Liu, China to Lay Down AI Rules with Emphasis on Content Control, Financial Times (2023).

243 Whether the PRC can spur innovation with regulations designed to ensure the Chinese Communist Party's ultimate control remains to be seen. Qianer Liu, China to Lay Down AI Rules with Emphasis on Content Control, Financial Times (2023); Matt Sheehan, China's AI Regulations and How They Get Made, Carnegie Endowment for International Peace (2023).

and seek to prevent discrimination.[244] The appeal of the American experiment — its ability to foster innovation and harness significant benefits for society, while respecting individual rights and protecting society from the worst of the harms — is under scrutiny. Providing an effective democratic GenAI governance model that other democratic nations adopt will shape the future geopolitical order.

Providing an effective democratic GenAI governance model that other democratic nations adopt will shape the future geopolitical order.

U.S. GOVERNMENT APPROACH TO GENERATIVE AI: ACTING WHILE LEARNING

U.S. government attention to AI has grown exponentially in recent years. Congress has passed new legislation[245] and the Executive Branch[246] has prioritized action on internal government adoption, broader responsible development and use, and ensuring U.S. AI leadership globally. In recent months, the government has turned its attention to GenAI, seeking outside expertise on how to address the novel risks and opportunities presented by the technology.[247] The White House announced a "voluntary commitment" from the seven

244 Qianer Liu, China to Lay Down AI Rules with Emphasis on Content Control, Financial Times (2023).

245 See, for example, Pub. L. 116-283, National Artificial Intelligence Initiative Act of 2020 Div. E (2021); Pub. L. 116-260, AI in Government Act of 2020, Div. U (2020); Pub. L. 117-167, CHIPS and Science Act (2022); and Pub. L. 116-258, Identifying Outputs of Generative Adversarial Networks Act (2020).

246 Examples of Executive Branch actions include: the work of the National AI Initiative Office to coordinate AI policy; the Office of Science and Technology Policy (OSTP) releasing a Blueprint for an AI Bill of Rights and the National Institute of Standards and Technology (NIST) releasing an AI Risk Management Framework – both aiming to provide guidance on the responsible development and use of AI; Federal regulatory agencies announcing in April their shared commitment to mitigate bias and discrimination through application of their existing authorities to AI systems; export control regulators have moved to curb competitor's access to chips critical to powering AI; and issuing Executive Orders. See Legislation and Executive Orders. See National AI Initiative Office (last accessed 2023); Blueprint for an AI Bill of Rights, The White House (last accessed 2023); AI Risk Management Framework, National Institute of Standards and Technology (last accessed 2023); Justice Department's Civil Rights Division Joins Officials from CFPB, EEOC and FTC Pledging to Confront Bias and Discrimination in Artificial Intelligence, U.S. Department of Justice (2023); Commerce Implements New Export Controls on Advanced Computing and Semiconductor Manufacturing Items to the People's Republic of China (PRC), Bureau of Industry and Security, Department of Commerce (2022); EO 13859, Maintaining American Leadership in Artificial Intelligence (2019); EO 13960, Promoting the Use of Trustworthy Artificial Intelligence in the Federal Government (2020).

247 One example includes U.S. Copyright Office listening sessions on how to address the intersection of generative AI tools and copyrighted materials and the use of copyrighted materials to train generative AI tools. Copyright and Artificial Intelligence, U.S. Copyright Office (last accessed 2023). See also AI Inventorship Listening Session - East Coast, U.S. Patent and Trademark Office (2023).

As the GenAI revolution sweeps the nation and the world, it will continue to impact the U.S. government's governance mechanisms as much as the substance of what is governed.

foremost GenAI companies to ensure safety, security, and trust in their models prior to public release.[248] Separately, the White House is seeking public input as it builds a National AI Strategy,[249] and the President's Council of Advisors on Science and Technology established a GenAI working group to advise the White House as it develops GenAI policy.[250] Additionally, the National Institute of Standards and Technology (NIST) announced the establishment of a public, collaborative Generative AI Working Group.[251] In Congress, GenAI educational briefings[252] and hearings[253] populate the calendar, and a flurry of AI legislative and framework proposals have been introduced.[254]

248 See Fact Sheet: Biden-Harris Administration Secures Voluntary Commitments from Leading Artificial Intelligence Companies to Manage the Risks Posed by AI, The White House (2023). Following these commitments, four of the technology companies launched the Frontier Model Forum, a collaboration to develop frontier AI models safely and responsibly. Rebecca Klar, Top Tech Companies Create Joint AI Safety Forum, The Hill (2023).

249 The White House's Office of Science and Technology Policy issued a request for information on how the U.S. government should approach various aspects of AI, including how to incorporate GenAI into operations, and whether laws and policies may need to be updated to account for AI. See 88 Fed. Reg. 34194, Request for Information; National Priorities for Artificial Intelligence, The White House, Office of Science and Technology Policy (2023).

250 See PCAST Working Group on Generative AI Invites Public Input, The White House (2023).

251 The NIST Generative AI Working Group seeks to "address the opportunities and challenges associated with AI that can generate content, such as code, text, images, videos and music." Biden-Harris Administration Announces New NIST Public Working Group on AI, U.S. National Institute of Standards and Technology (2023).

252 Senators Chuck Schumer (D-NY), Martin Heinrich (D-NM), Mike Rounds (R-SD), and Todd Young (R-IN) announced in a June 2023 Dear Colleague letter that they are spearheading a series of AI educational briefings to all Senators. See Leader Schumer Leads Bipartisan Dear Colleague Letter – With Senators Rounds, Heinrich, And Young – Announcing Three Bipartisan Senators-Only Briefings This Summer, Including First-Ever Classified All-Senators AI Briefing, Senate Democrats (2023).

253 Congressional hearings have covered generative AI impacts to human rights, intellectual property, Department of Defense operations, and governance. See Artificial Intelligence and Human Rights, U.S. Senate Committee on the Judiciary (2023); Artificial Intelligence and Intellectual Property – Part I: Patents, Innovation, and Competition, U.S. Senate Committee on the Judiciary (2023); Hearing to Receive Testimony on the State of Artificial Intelligence and Machine Learning Applications to Improve Department of Defense Operations, U.S. Senate Committee on Armed Services (2023); Oversight of A.I.: Rules for Artificial Intelligence, U.S. Senate Committee on the Judiciary (2023).

254 For example, with an eye toward the impacts of generative AI, in June 2023, Senate Majority Leader Chuck Schumer announced a SAFE Innovation Framework, which outlines policy objectives for governing AI while fostering continued innovation. See Majority Leader Schumer Delivers Remarks To Launch SAFE Innovation Framework For Artificial Intelligence At CSIS, Senate Democrats (2023). Senators Josh Hawley and Richard Blumenthal held a hearing on July 26, 2023 to discuss guiding principles for regulating AI. See Hawley, Blumenthal Hold Hearing On Principles For Regulating Artificial Intelligence, Senators Josh Hawley and Blumenthal (2023).

As the GenAI revolution sweeps the nation and the world, it will continue to impact the U.S. government's governance mechanisms as much as the substance of what is governed. To address these impacts, the U.S. government requires the increased capacity to both adopt[255] and govern GenAI tools. While government collaboration with external GenAI experts and stakeholders is paramount, policymakers and regulators fulfilling their mandates will require expanded in-house capacity and expertise in data science and AI in order to understand these systems' impacts on their area of focus.[256] Regulators, in particular, will need new capabilities to investigate and take action where appropriate. Importantly, the U.S. government should utilize existing capabilities[257] to address the most pressing concerns presented by GenAI while continuing to explore additional mechanisms.

255 GenAI presents regulators with new tools that can be integrated into their existing sectoral operations. For example, large language models (LLMs) will provide regulators greater ability to query existing governmental databases to better inform policy making with long-term records and trend lines. GenAI's ability to draft text and manage administrative processes will free bandwidth for officials to spend more time performing higher-level cognitive tasks. Simultaneously, for both regulators and regulated entities, GenAI tools will improve information sharing between them. GenAI will assist the former in compliance and enforcement and the latter in clarity in determining applicable regulations and compliance. Thus, GenAI tools hold the potential to allow regulators and regulated entities to invest greater time and energy in smart solutions and decrease regulatory compliance burdens. See Applied AI Challenge: Large Language Models (LLMs), General Services Administration (2023).

256 To satisfy the need for more expertise, the U.S. government requires more pathways for recruiting and retaining technology talent in government, increased public-private partnerships opportunities for research and development and governance, greater resources for digital infrastructure, and expanded contracting flexibility. See Final Report, National Security Commission of Artificial Intelligence (2021); Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project (2022).

257 Adapting available capacities to better govern the GenAI space depends, at first principles level, on the existence of capable authorities for federal regulators. This memo would be remiss if it did not mention the growing foundational challenge of judicial developments, particularly surrounding the tension between the doctrines of Chevron Deference and Major Questions. These judicially applied doctrines concern, respectively, federal courts giving deference to decisions by administrative agencies and the ability of Congress to provide broader grants of decision-making authority to those agencies. Recent judicial developments have begun to weaken and create uncertainty for regulatory powers involving economic national security tools and domestic regulation that intersects with foreign policy matters by shifting policy authority to the courts, which might not be as well versed in the domain. The application of these doctrines could reverberate across the federal government with severe impacts on national security. See Walter Johnson & Lucille Tournas, The Major Questions Doctrine and the Threat to Regulating Emerging Technologies, Santa Clara High Technology Law Journal (2023); Amy Howe, Supreme Court Will Consider Major Case on Power of Federal Regulatory Agencies, SCOTUS Blog (2023); Niina H. Farah & Lesley Clark, Supreme Court Axes Debt Relief, Threatens Climate Regs, E&E News (2023). Executive and Congressional actions in response could reduce resulting uncertainty or prepare the space for a new regulatory environment. In the Executive Branch, the Department of Justice should increasingly raise the Court's awareness that these decisions that seem remote from them are actually closely tied to U.S. national security. See Timothy Meyes & Ganesh Sitaraman, The National Security Consequences of the Major Questions Doctrine, Michigan Law Review (2023). Simultaneously, the Congress should consider this doctrinal trend when legislating and take steps to ensure it has the capability to draft more precise and nuanced statutory law, of the type often left to regulations, should regulators lose those powers. Maya Kornberg & Martha Kinsella, Whether the Supreme Court Rolls Back Agency Authority, Congress Needs More Expert Capabilities, Brennan Center for Justice (2023).

WAY FORWARD

Recommended Actions

Domestic Election Systems. Protecting U.S. digital information and elections systems requires three simultaneous actions:

1. NIST should convene industry to agree to a voluntary standard of conduct for synthetic media around elections in advance of the 2024 U.S. elections.[258] Industry should use existing ethical guidance, such as the Partnership on AI's Responsible Practices for Synthetic Media,[259] to inform the new code of conduct.

2. Congressional leaders should work to scale public digital literacy education and disinformation awareness by: (1) passing legislation to assign a lead agency to alert the public of synthetic media use in federal elections, and (2) encouraging department and agency heads to use all available regulatory tools to build public resilience against disinformation under the guidance of the lead agency.

   Congressional leaders should work to scale public digital literacy education and disinformation awareness.

   a. First, Congress should authorize a federal entity (e.g., the Department of Homeland Security in coordination with expert agencies such as the Federal Election Commission, NIST,[260]

258 The recent White House convening of leading industry GenAI actors which resulted in voluntary commitments can serve as a model for convening stakeholders such as content distribution platforms. Fact Sheet: Biden-Harris Administration Secures Voluntary Commitments from Leading Artificial Intelligence Companies to Manage the Risks Posed by AI, The White House (2023).

259 See Responsible Practices for Synthetic Media: A Framework for Collective Action, Partnership on AI (2023).

260 These agencies would have jurisdiction over domestic identification of synthetic media use, whereas the Intelligence Community has jurisdiction over foreign actors' use of synthetic media.

and relevant Intelligence Community partners[261] as necessary) to take charge of documenting and alerting the public to the use of synthetic media in federal elections, assessing authenticity and attribution in highly consequential use cases, and taking proactive steps to increase public digital literacy in elections. Without overarching federal legislation, the U.S. government risks a patchwork of state-level regulatory frameworks.[262]

b. Second, Congress should encourage governmental entities with existing counter-disinformation and election integrity efforts to adopt measures to scale public digital literacy education and disinformation awareness ahead of the 2024 elections.[263] Relatedly, the U.S. government should encourage the private sector to continue to collaborate to identify potential authentic or inauthentic networks impacted by AI-enabled disinformation and synthetic media. Congress should also enact legislation clarifying the Federal Election Commission's authorities to regulate the use of deepfakes in federal elections.[264]

3. To encourage transparency and increase safety, content distribution platforms[265] should be required to technically support a content and provenance standard, such

261 The U.S. Intelligence Community has a leading role in combating foreign malign influence. Foreign malign influence is defined as "any hostile effort undertaken by, at the direction of, or on behalf of or with the substantial support of, the government of a covered foreign country with the objective of influencing, through overt or covert means." See 50 U.S.C. §3059, Foreign Malign Influence Center. Examples of existing efforts include the Office of the Director of National Intelligence's Foreign Malign Influence Center and the Federal Bureau of Investigation's Foreign Influence Task Force. Related government efforts also include the Cybersecurity and Infrastructure Security Agency "MDM Team" and Department of State's Global Engagement Center. Knowledge sharing with domestic entities around how to identify deepfakes and other synthetic content would further protect against synthetic media use for elections. For example, Cyber Command and NSA could share lessons learned and capabilities from how their experience protecting elections from foreign influence transfers to synthetic media. See How NSA, U.S. Cyber Command are Defending Midterm Elections: One Team, One Fight, National Security Agency/Central Security Service (2022).

262 Sixteen states have introduced or enacted legislation to restrict the use of deepfakes. These include: California, Connecticut, Delaware, Georgia, Hawaii, Illinois, Louisiana, Massachusetts, Minnesota, New Jersey, New York, Rhode Island, Texas, Virginia, Washington, Wyoming. See Isaiah Poritz, States Are Rushing to Regulate Deepfakes as AI Goes Mainstream, Bloomberg (2023).

263 These interventions include, but are not limited to pre-emptive education efforts for the public such as digital literacy. See generally: Emily K. Vagra & Melissa Tully, News Literacy, Social Media Behaviors, and Skepticism Toward Information on Social Media, Information, Communication & Society (2019); Andrew Guess, et al., A Digital Media Literacy Intervention Increases Discernment Between Mainstream and False News in the United States and India, PNAS (2022).

264 See Karl Evers-Hillstrom, AI-Generated Deepfake Campaign Ads Escape Regulators' Scrutiny, Bloomberg Law (2023).

265 The information environment surrounding elections is a prime concern, but only one of many, with respect to the safety of content distribution platforms. In our democratic society, it is difficult to draw bright lines between content directly pertaining to an election and the broader information space that informs individuals' political and economic decisions.

as the Coalition for Content Provenance and Authenticity technical standards, that identifies whether content is GenAI generated or modified.[266] A trusted federal entity, to be determined by Congress, should monitor the platforms and enforce these transparency levers as circumstances befit, while safeguarding the platforms' intellectual property.

Domestic Regulatory Needs. The United States should consider a flexible AI governance model, which would cover GenAI, in accordance with four key principles previously identified by SCSP:[267] (1) Govern AI use cases and outcomes by sector; (2) Empower and modernize existing regulators, while considering a longer-term centralized AI regulatory authority that can address gaps as well as sector-cross-cutting issues; (3) Focus on highly consequential uses, both beneficial and harmful significant impacts;[268] and (4) Strengthen non-regulatory AI governance, such as the voluntary codes of conduct, with input from industry and key stakeholders.

The United States should consider a flexible AI governance model, which would cover GenAI, in accordance with four key principles previously identified by SCSP.

The United States has existing, robust regulatory mechanisms that can be employed to address concerns raised by GenAI use. Given that GenAI opportunities and challenges are inextricably tied to the contexts in which it is used, the United States should continue adapting present sector-specific regulatory authorities to address issues raised by GenAI adoption. Regulatory bodies should apply their existing authorities to GenAI and be empowered with the necessary skills and expertise.[269] Congress should also legislate requirements that operationalize responsible and ethical AI principles. For example, legally requiring industry

266 C2PA Specifications, Coalition for Content Provenance and Authenticity (2023).
267 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 87 (2022).
268 This shares the risk-based approach common to both the EU's AI Act and the NIST AI Risk Management Framework. See Regulatory Framework Proposal on Artificial Intelligence, European Commission (2023).
269 On the application of existing legal authorities to "automated systems," including AI, see Joint Statement on Enforcement Efforts Against Discrimination and Bias in Automated Systems, U.S. Consumer Financial Protection Bureau, Department of Justice, Equal Employment Opportunity Commission, and Federal Trade Commission (2023).

to provide information about the data used to train commercial GenAI[270] and the model itself would operationalize "transparency," a common responsible and ethical AI principle.[271]

Regulators will not be able to regulate every AI model or tool — nor should they have to. To balance enabling AI innovation against regulation, regulators should expend their oversight efforts on AI use cases that are highly consequential to society. Specifically, regulators should focus on encouraging AI that has significant benefits and mitigating the worst of the harms. To do this, regulators need tools to identify potential benefits (e.g., "Physical Health" and "Liberty Protection") and harms (e.g., "Physical Injury" and "Liberty Loss"), and the magnitude of those impacts (e.g., likelihood and scope of impact) an AI system's development or use poses to society.[272] Accordingly, the White House Office of Science and Technology Policy (OSTP), in coordination with the Office of Management and Budget (OMB), or another equivalent government entity, should provide sector regulators with tools to determine which AI uses should be the focus of their regulatory efforts. This guidance should allow regulators flexibility to apply their sector-specific experience and expertise, but also be standardizable across agencies to provide industry and the public a level of certainty as to what AI uses will be considered highly consequential. Congress also should consider establishing a centralized AI authority that can regulate AI issues that cut across sectors and fill regulatory gaps in sectors.[273]

Regulators should expend their oversight efforts on AI use cases that are highly consequential to society.

270 See, e.g., The Dataset Nutrition Label, Data Nutrition Project (2023) ("The Data Nutrition Project takes inspiration from nutritional labels on food, aiming to build labels that highlight the key ingredients in a dataset such as meta-data and populations, as well as unique or anomalous features regarding distributions, missing data, and comparisons to other 'ground truth' datasets."). Model Cards report information about a machine learning model which can include its intended use, performance metrics, and limitations of the model. See Margaret Mitchell, et al., Model Cards for Model Reporting, arXiv (2019).

271 David Vergun, Defense Innovation Board Recommends AI Ethical Guidelines, U.S. Department of Defense (2019); Principles of Intelligence Transparency for the Intelligence Community, Office of the Director of National Intelligence (2015); OECD AI Principles Overview, Organisation for Economic Co-operation and Development (2019). On actions to operationalize responsible and ethical AI principles, see Key Considerations for Responsible Development and Fielding of Artificial Intelligence, National Security Commission on Artificial Intelligence (2021).

272 Such tools should be applied at different points in the AI lifecycle: (1) regulators foresee a new application for AI; (2) a new application for AI is under development or proposed to a regulatory body, and (3) an existing system has created a highly consequential impact that triggers a post facto regulatory review.

273 For an overview of governance options, see AI Governance Authority Options Memo, Special Competitive Studies Project (2023).

Digital Platforms from Countries of Concern. As we near the election cycle, there is an increased number of U.S. voters on foreign digital platforms from countries of concern. Concurrently, these platforms are converging with GenAI. For example, ByteDance has incorporated a chatbot "Tako"[274] into TikTok in Southeast Asia and is building out a large language model (LLM) for future use in its platforms under the codename "Grace."[275] GenAI presents the possibility of increasing the volume and speed of malign content on platforms. Moreover, GenAI increases the potential risks of sensitive data being used to target voters ahead of elections. GenAI models are typically trained on large amounts of data and given increased user engagement, privileged or sensitive user data is more accessible. The novel risk of these possibilities for digital platforms from countries of concern is that foreign governments or actors may have the ability to control or otherwise influence content, especially in cases where platforms are headquartered in locations where regulations and verification tools on platform use leave much to chance.

The United States should address threats posed by foreign digital platforms from countries of concern ahead of the 2024 election cycle using a two-path approach.

The United States should address threats posed by foreign digital platforms from countries of concern ahead of the 2024 election cycle using a two-path approach.

1. First, Congress should take necessary steps to consider narrow, product-specific restrictions on foreign digital platforms representing national security risks, such as TikTok.[276] A focused restriction would need to be introduced this fall for proposed enforcement at the start of 2024 ahead of U.S. elections. The ANTI-SOCIAL CCP Act[277] is an example of a legislative initiative with a narrow approach.

2. Second, the United States should also develop a more comprehensive risk-based, policy framework to restrict foreign digital platforms from countries of concern. The framework should consider a suite of legislative, regulatory, and economic options available to mitigate harm from such platforms. The framework should pursue a

274 Josh Ye, TikTok Tests AI Chatbot 'Tako' in the Philippines, Reuters (2023).
275 Zheping Huang, ByteDance, TikTok's Chinese Parent Company, Is Testing an AI Chatbot, Time (2023).
276 See Meaghan Waff, TikTok Is the Tip of the Iceberg: National Security Implications of PRC-Based Platforms, Special Competitive Studies Project (2023).
277 See S.5245, ANTI-SOCIAL CCP Act (2022).

comprehensive range of options that policy leaders could employ on a case-by-case basis and be developed simultaneously as policymakers introduce focused bans on platforms. The RESTRICT Act[278] is an example of a legislative initiative considering a broad, risk-based approach.

Governing Transnational Generative AI Challenges. GenAI's transnational nature makes international mechanisms a necessary corollary to domestic governance steps. GenAI's risks cut across borders, affecting both states' sovereignty and many shared societal equities from social harms to legitimate law enforcement needs. To support the development of a common international foundation around global GenAI implications, the United States should liaise with the United Kingdom to make a central output of the upcoming UK global AI safety summit[279] the establishment of a new multilateral and multi-stakeholder "Forum on AI Risk and Resilience" (FAIRR),[280] under the auspices of the G20. FAIRR would convene three verticals focused on:

GenAI's risks cut across borders, affecting both states' sovereignty and many shared societal equities from social harms to legitimate law enforcement needs.

1. Preventing non-state malign GenAI use for nefarious ends (e.g., criminal activities or acts of terrorism);

2. Mitigating the most consequential, injurious GenAI impacts on society (e.g., illegitimate discriminatory impacts due to system bias), and;

3. Managing GenAI use that infringes on other states' sovereignty (e.g., foreign malign influence operations or the use of AI tools in cyber surveillance).

FAIRR would convene relevant stakeholders — including national officials, regulators, relevant private sector companies, and academia/civil society — to work in a soft

278 See S.686, RESTRICT Act (2023).

279 UK to Host First Global Summit on Artificial Intelligence, Office of the Prime Minister of the United Kingdom (2023); Esther Webber, UK to Host Major AI Summit of 'Like-Minded' Countries, Politico (2023).

280 GenAI offers an initial focus upon which to form an institution like FAIRR. Over time, success could support expanding its remit to cover broader AI governance. For a fuller description of FAIRR's elements, see Appendix.

law[281] fashion toward interoperable standards and rules that domestic regulators can independently implement.[282] Operationally, a peer review process of domestic regulators would provide political pressure to abide by a commonly established set of terms.[283] Establishing FAIRR under the G20 – including the PRC[284] – would provide a sufficiently inclusive foundation to enhance legitimacy and provide global economic scope to drive wider compliance with the established rules. FAIRR should go beyond the core G20 states in determining its full voting members in two respects. First, FAIRR should include any nation-state home to a private GenAI actor's headquarters where the GenAI model sits above a certain compute threshold.[285] Second, FAIRR should include a voting representative from the qualifying private GenAI actors themselves in the multi-stakeholder vein of entities like the International Telecommunications Union.[286]

281 International conditions make a formal treaty unlikely, preferencing a soft law approach. See Anya Wahal, On International Treaties, the United States Refuses to Play Ball, Council on Foreign Relations (2022). On soft law, see Gary Marchant, "Soft Law" Governance of Artificial Intelligence, UCLA AI Pulse (2019); Kenneth W. Abbott & Duncan Snidal, Hard and Soft Law in International Governance, International Organization (2000).

282 Such a structure is similar to that of the Financial Stability Board (FSB). See About the FSB, Financial Stability Board (2020); Stavros Gadinis, The Financial Stability Board: The New Politics of International Financial Regulation, Texas International Law Journal at 163-64 (2013).

283 See Peer Reviews, Financial Stability Board (2021); Stavros Gadinis, The Financial Stability Board: The New Politics of International Financial Regulation, Texas International Law Journal at 160 (2013). The Financial Action Task Force (FATF) uses a similar peer review, or "mutual evaluation" approach. See Mutual Evaluations, FATF (last accessed 2023).

284 An approach that includes the PRC would be wise on both the merits of the issues and as a diplomatic consideration. See Annabelle Dickson, Lord of the Supercomputers!: Britain's AI Minister is a Hereditary Peer, Politico (2023) (quoting the new UK AI minister, Jonathan Berry, that supporting PRC engagement as "it would be absolutely crazy to sort of try and bifurcate AI safety regulation globally").

285 Compute threshold would be determined based on the actual number of operations applied during the model's training. The UAE's May 2023 unveiling of the 40 billion parameter Falcon 40B serves as a sample model that could yield inclusion for the host state. UAE's First LLM is Open Source and Tops Hugging Face Leaderboard, Wired (2023).

286 See Kristen Cordell, The International Telecommunication Union: The Most Important UN Agency You Have Never Heard Of, Center for Strategic and International Studies (2020).

Appendix:

The Forum on AI Risk and Resilience (FAIRR)

Background

While domestic measures are the required foundation for the governance of GenAI, its transnational nature makes international mechanisms a necessary corollary.[287] Domestic governance cannot function if actors can operate beyond a state's jurisdiction. GenAI tools cross borders with relative ease.[288] An international regime is required to close gaps. A series of tailored mechanisms are most appropriate as governance arrangements work best when fitted to specific issues and challenges. GenAI presents risks at the nexus of geopolitical, transnational, and societal concerns. This memo focuses on a subset of three interconnected aims:

1. Preventing non-state malign GenAI use for nefarious ends (e.g., criminal activities or acts of terrorism);

2. Mitigating the most consequential, injurious GenAI impacts on society (e.g., illegitimate discriminatory impacts due to system bias); and

3. Managing GenAI use that infringes on other states' sovereignty (e.g., foreign malign influence operations or the use of AI tools in cyber surveillance).

SCSP proposes a new multilateral and multi-stakeholder Forum on AI Risk and Resilience (FAIRR). That new regime must function within the realities of today's international landscape – deepening geopolitical tensions and limited trust. The world has met similar

287 While still in its early stages, there is a growing body of scholarship exploring international AI governance and historical precedents. See Michael Veale, et al., AI and Global Governance: Modalities, Rationales, Tensions, Annual Review of Law and Social Science (2023); Ian Stewart, Why the IAEA Model May Not be Best for Regulating Artificial Intelligence, Bulletin of the Atomic Scientists (2023); Peter Cihon, et al., Should Artificial Intelligence Governance be Centralised? Design Lessons from History, Proceedings of Proceedings of the 2020 AAAI/ACM Conference on AI, Ethics, and Society (2020).

288 For an example of concerns of how AI will proliferate across jurisdictions, see Brian Nussbaum, Offshore: The Coming Global Archipelago of Corrosive AI, Lawfare (2023).

challenges before. The Cold War superpowers recognized shared challenges and created tools to manage them.[289] More recently, in confronting transnational terrorism, climate change, and financial crisis, nations have sought to avoid ungoverned spaces as fonts of instability.[290] Therefore, FAIRR is the path forward as a new international entity scoped in mission and inclusive in nature.

Mission

FAIRR's work would center on three interconnected governance needs. First, nation-states share broadly common ground in preventing misuse and malign use of GenAI tools by non-state actors. Illicit uses of GenAI tools that contribute to harms from economy-sapping fraud[291] to bio-terrorism[292] are detrimental to all. Second, while the contours might differ state-by-state, countries generally agree on the need to prevent harms such as discrimination.[293] Governance alignment to prevent these harms from creeping across borders and negatively impacting populations would constitute a likely point of at least partial agreement. Third, states require a forum to discuss and deconflict instances where GenAI tools can cross boundaries and impact the sovereign activities of other states. For instance, the world will require a forum for dialogue to develop norms around legitimate GenAI-enhanced speech in an era of both growing misinformation and transnational censorship, potentially including around elections. Finally, pursuing all three sets of issues within one entity would help address the blurred lines between the three spaces. Particularly in the digital realm, states have deployed non-state actors for state ends.[294]

Structure

FAIRR would not constitute a new formal international agency, with international legal personality grounded in a treaty and creating binding rules.[295] Hurdles from treaty

289 U.S.-Soviet cooperation covered a range of issues from bilaterally collaborating on research in the health sciences to establishing the IAEA to curb the proliferation of nuclear weapons. See Bernard Gwertzman, U.S. and the Soviet to Pool Research in 3 Health Areas, New York Times (1972); Bertrand Goldschmidt, The Origins of the International Atomic Energy Agency, IAEA Bulletin at 15-16 (1977).

290 See Bruce Jones, et al., Power and Responsibility: Building International Order in an Era of Transnational Threats, Brookings Institution Press (2009).

291 Sam Sabin, Generative AI is Making Voice Scams Easier to Believe, Axios Codebook (2023).

292 See John T. O'Brien & Cassidy Nelson, Assessing the Risks Posed by the Convergence of Artificial Intelligence and Biotechnology, Health Security (2020).

293 While states can vary in their interpretation, wide acceptance of the International Convention on the Elimination of All Forms of Racial Discrimination speaks to a broad acceptance of this goal. See International Convention on the Elimination of All Forms of Racial Discrimination, 1969 (EIF), 660 UNTS 195.

294 Erica D. Lonergan, Cyber Proxies in the Ukraine Conflict: Implications for International Norms, Council on Foreign Relations (2022).

295 See Anne Burnett, International Organizations, American Society of International Law at 3-4 (2015).

ratification[296] to skepticism of international institutions[297] preclude that path. Instead, FAIRR would serve as a forum to promulgate alignment based on soft law.[298] FAIRR would convene relevant stakeholders — including national officials, regulators, relevant private sector companies, academia, and civil society — to work toward interoperable standards and rules that domestic regulators can independently implement.

Participation

Establishing FAIRR under the auspices of the G20 would both provide a legitimate foundation and establish a basis for its founding members. As with the Financial Stability Board (FSB),[299] FAIRR would benefit from being sufficiently inclusive to cover enough of the global economy to drive both member and non-member adherence to the established rules. Such an impetus would support seeking PRC participation in order to work toward globally comprehensive and consistent practices. Less ambitiously, even if the members became deadlocked, the PRC's participation in FAIRR would help avoid forum shopping[300] that could lead to the PRC rallying an international grouping under alternative rules inimical to U.S. values and interests.[301]

Furthermore, while drawing on a G20 foundation, FAIRR should voluntarily go beyond that core G20 membership in two respects. First, it should include as full original members any state with a headquarters of a GenAI actor over a certain compute threshold, such as the

296 For instance, the U.S. domestic political environment remains skeptical of ratifying treaties. See Anya Wahal, On International Treaties, the United States Refuses to Play Ball, Council on Foreign Relations (2022).

297 See Stewart Patrick, The Sovereignty Wars: Reconciling America with the World, Brookings Institution Press at 227-32 (2018); Julian Ku & John Yoo, Taming Globalization: International Law, the U.S. Constitution, and the New World Order, Oxford University Press at 42-47 (2012).

298 See Gary Marchant, "Soft Law" Governance of Artificial Intelligence, UCLA AI Pulse (2019); Kenneth W. Abbott & Duncan Snidal, Hard and Soft Law in International Governance, International Organization (2000).

299 See About the FSB, Financial Stability Board (2020); Stavros Gadinis, The Financial Stability Board: The New Politics of International Financial Regulation, Texas International Law Journal at 165 (2013). Robert Fay at the Centre for International Governance (CIGI) has led the way in exploring adapting the FSB structure to the broader digital domain. See Robert Fay, Global Governance of Data and Digital Technologies: A Framework for Peaceful Cooperation, Centre for International Governance Innovation (2022); Robert Fay, Digital Platforms Require a Global Governance Framework, Centre for International Governance Innovation (2019).

300 The concept of "forum shopping" in international scenarios builds on the concept of the domestic U.S. legal practice "of pursuing a claim subject to concurrent jurisdiction in the court that will treat the claim most favorably." Forum Shopping, Cornell Legal Information Institute (2022). On forum shopping in the context of international AI governance, see Peter Cihon, et al., Fragmentation and the Future: Investigating Architectures for International AI Governance, Global Policy at 550 (2020).

301 As the PRC's Regional Comprehensive Economic Partnership (RCEP) initiative illustrates, the PRC is more than capable of seizing open ground to propose its own standards and norms. See Michael Sutherland, Regional Comprehensive Economic Partnership (RCEP), Congressional Research Service (2020).

United Arab Emirates (UAE).[302] Such a move would help avoid nations with GenAI capabilities looking to caucus states to build alternative regimes. Second, as GenAI is first and foremost a private sector-driven advancement,[303] FAIRR should be multi-stakeholder in composition, including major private entities with GenAI capabilities over a certain compute threshold as full voting members. A weighted voting system[304] would help ensure national governments remained dominant over private entities in order to maintain the primacy of public interests. Additionally, an advisory committee(s) of academic and civil society experts could help balance private sector interests at the table.

Operations

Full members, original members (state and non-state), plus states that grow to meet the criteria of being home to an above-threshold model, would set relevant standards and rules. Members would participate in a double-weighted voting system to capture both state and non-state equities and disparate capabilities. Under this system, the total voting share of states would equal twice the voting shares of non-state members. Simultaneously, to distinguish among state capabilities, the total share of votes for states would be proportional to the number of qualifying private GenAI entities in their jurisdiction (with a minimum of one vote per state).

Similar to the FSB or the Financial Action Task Force (FATF),[305] a peer review process of domestic regulators would provide political pressure to abide by commonly set terms.[306] Noncompliant members would confront market ramifications based on their recognized higher risk, such as business withdrawals or chilled investment in response.[307]

302 In May 2023, the UAE unveiled a 40 billion parameter LLM, the Falcon 40B. UAE's First LLM is Open Source and Tops Hugging Face Leaderboard, Wired (2023).

303 See Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 22-29 (2022).

304 While the FSB's Plenary operates on consensus, it offers a model in which countries receive different degrees of representation based on "the size of the national economy, financial market activity and national financial stability arrangements of the corresponding Member jurisdiction." Charter of the Financial Stability Board, Article 11 (2012). See also Diego Lombardi, The Governance of the Financial Stability Board, Brookings Institution at 10-11 (2011).

305 See What We Do, Financial Action Task Force (last accessed 2023).

306 See Peer Reviews, Financial Stability Board (2021); Mutual Evaluations, Financial Action Task Force (last accessed 2023). See also Stavros Gadinis, The Financial Stability Board: The New Politics of International Financial Regulation, Texas International Law Journal at 160 (2013).

307 As a comparable example, see the impact of FATF gray listing on foreign investment in Pakistan. Purvaja Modak, FATF's Scrutiny and What Non-Compliance Means, Centre for Public Policy Research (2021).

Funding

Resourcing must take place in a manner that maintains FAIRR's legitimacy. Perceptions of private funding leading to corporate interest capture would undercut the entire initiative.[308] Consequently, funding for the secretariat and operating costs should fall primarily (majority) with national contributions, likewise differentiated according to vote share. Private companies would contribute a minority share of the budget with proportions divided based on market capitalization.

308 Regulatory Capture, Oxford Reference (last accessed 2023).

Economy Memo

MEMORANDUM TO THE PRESIDENT OF THE UNITED STATES AND CONGRESS

CC: **DIRECTOR OF THE NATIONAL ECONOMIC COUNCIL; SECRETARIES OF STATE, TREASURY, COMMERCE, LABOR, EDUCATION, AND HOMELAND SECURITY; DIRECTOR OF OFFICE OF MANAGEMENT AND BUDGET; UNITED STATES TRADE REPRESENTATIVE; CHAIR, COUNCIL OF ECONOMIC ADVISORS; ADMINISTRATOR, SMALL BUSINESS ADMINISTRATION**

FROM: Special Competitive Studies Project

SUBJECT: Building the Generative Economy

Executive Summary

While the United States is currently the leader in generative artificial intelligence (GenAI), there is no guarantee that we will remain in the lead without a focused national effort. Our primary rival for AI leadership, the People's Republic of China (PRC), understands the strategic and economic significance of AI and has a track record of executing well-resourced technology strategies that have produced results.[309] Nations that harness the potential of GenAI will increase productivity, a key economic measure that underpins economic growth, higher standards of living, and the ability to finance all other national priorities. To unlock these benefits, the United States should bolster competitiveness across the fundamental building blocks that underpin AI leadership.

- ***Compute***: The United States should assure access to compute resources via cloud providers, encourage sustainable AI techniques, protect U.S. advantages in

309 For example, the PRC leads the world in 5G network hardware, hypersonic missiles, EV batteries, and (as of first quarter 2023) auto exports, and its social media apps have billions of users globally. See Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 60-92 (2022); David Lin, et al., China in the Drivers' Seat, Special Competitive Studies Project (2023). In 2017, the PRC issued a plan to lead the world in AI by 2030 and it is rapidly automating its manufacturing industry. Pablo Robles, China Plans to Be a World Leader in Artificial Intelligence by 2030, South China Morning Post (2018); Mai Tao, China Aims for Global Leadership in Robotics with New Five-Year Plan, Robotics & Automation News (2022).

microelectronics, and lead in accelerating hardware innovation.

- ***Data***: The United States should develop a whole-of-nation strategy for digital infrastructure and create a trusted regulatory framework that harnesses data for social and economic benefit while paving the way to increased digital trade with allies and partners.

- ***People***: The United States should pursue immigration reforms to continue to attract top AI talent, establish a National Commission on Automation and the Future of Work, and develop curriculum guidelines to safely deploy GenAI in the classroom.

> Nations that harness the potential of GenAI will increase productivity, a key economic measure that underpins economic growth, higher standards of living, and the ability to finance all other national priorities.

This memo outlines 1) the economic implications of GenAI and 2) steps the United States can take, along with allies and partners, to capture its full potential and sustain democratic leadership in this future-shaping technology.

Introduction

GenAI is poised to transform the global economy. Some paint a dystopian future in which deploying generative systems causes mass layoffs, rising inequality, and social instability. Others believe that this technology heralds the dawn of a fourth industrial revolution that will drive tremendous economic gains, enhancing human welfare while reversing years of deceleration in productivity growth in the United States and other advanced economies.[310]

The introduction of generative AI also comes at a time when the global economy is already undergoing transformative changes. Nations around the world are investing heavily in technology competitiveness while pursuing "de-risking" policies meant to build resilience for critical technology inputs. Companies, similarly, are pursuing diversification to

310 Top 10 Emerging Technologies of 2023, World Economic Forum and Frontiers Media (2023); Alistair Dieppe, Global Productivity: Trends, Drivers, and Policies, The World Bank (2021); Christopher Pissarides, et al., Measuring the Welfare Effects of AI and Automation, The Centre for Economic Policy Research (2019).

reduce overreliance on China. While trade and technology guardrails in strategic sectors have become commonplace, digital connectivity between nations is also accelerating.[311] Depending on whether the impact of GenAI remains largely confined to service industries or extends deeply into manufacturing, this technology's emergence could disrupt some of these trends, or it could accelerate them. It is simply too early to tell.

Ultimately, the future of the American economy – and, by extension, America's international leadership and the vitality of democratic market economies around the world – could hinge on promoting American economic dynamism in this rapidly evolving sector. Economic growth is the prerequisite for pursuing all other national goals: reducing deficits, projecting military power, funding R&D and social programs, and strengthening ties with allies and partners.[312] A GenAI-fueled productivity boom could bring more of these goals within reach.

The future of the American economy – and, by extension, America's international leadership and the vitality of democratic market economies around the world – could hinge on promoting American economic dynamism in this rapidly evolving sector.

Economic Implications

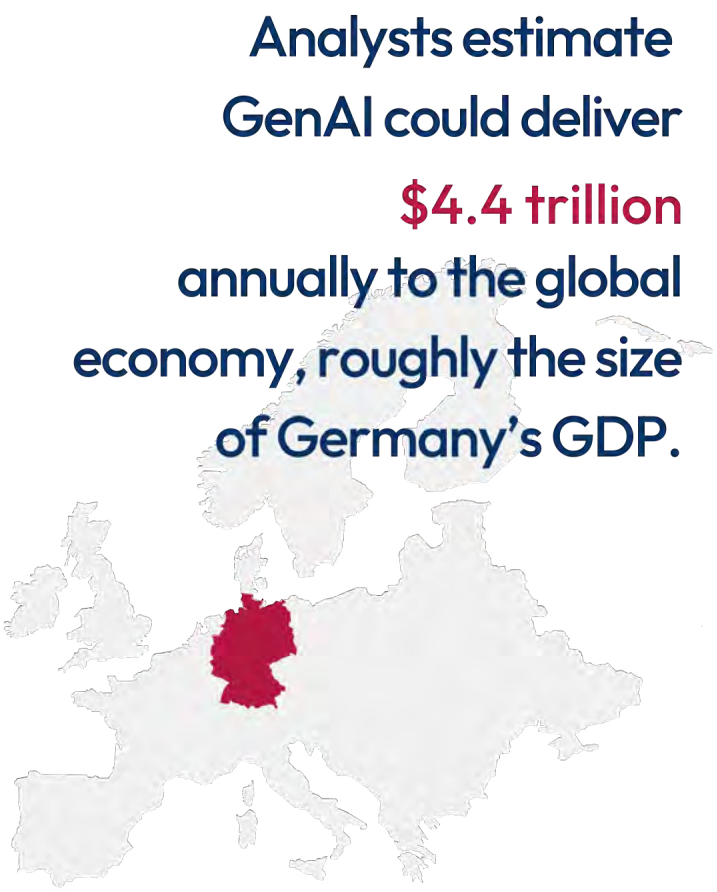
Increasing Productivity, Economic Output, and Welfare. Similar to previous general purpose technologies – such as the steam engine – GenAI could sharply increase the rate of technological change, paving the way for follow-on innovations that spark productivity improvements across every sector of the economy.[313] However, unlike industrial technologies such as the steam engine, GenAI tools can perform a diverse range of functions and, given the intangible nature and relatively low cost of

311 For example, digitally-delivered services accounted for 54 percent of total global services exports in 2022. Jordan G. Heiber, Why Digital Trade Is Critical to the U.S. and Global Economies, U.S. Chamber of Commerce (2023).

312 Robert D. Atkinson, Why Federal R&D Policy Needs to Prioritize Productivity to Drive Growth and Reduce the Debt-To-GDP Ratio, Information Technology and Innovation Foundation (2019).

313 Erik Brynjolfsson & Lorin M. Hitt, Beyond Computation: Information Technology, Organizational Transformation and Business Performance, Journal of Economic Perspectives (2000); Richard G. Lipsey, et al., Economic Transformations: General Purpose Technologies and Long-Term Economic Growth, Oxford University Press (2005); Timothy F. Bresnahan & Manuel Trajtenberg, General Purpose Technologies: "Engines of Growth?," National Bureau of Economic Research at 18-21 (1992); Erik Brynjolfsson, et al., The Productivity J-Curve: How Intangibles Complement General Purpose Technologies, American Economic Journal: Macroeconomics (2021).

consumer software, face fewer barriers to adoption and diffusion.[314] Analysts estimate that GenAI could deliver $4.4 trillion annually to the global economy — roughly equivalent to the GDP of Germany, the world's fourth largest economy.[315] Although these and other projections are not an exact science, they offer a sense of the potential magnitude of the impact of GenAI.[316]



314 OpenAI's multimodal ChatGPT, for instance, acquired 100 million users just two months after its release, making it the fastest growing consumer application in history. See Andrew R. Chow, How ChatGPT Managed to Grow Faster than TikTok or Instagram, Time (2023).

315 Michael Chui, et al., The Economic Potential of Generative AI: The Next Productivity Frontier, McKinsey & Company (2023). Germany's GDP in 2022 was $4.07 trillion. See GDP (current US$) - Germany, The World Bank (last accessed 2023).

316 Goldman Sachs estimates that GenAI could drive a $7 trillion increase in annual global GDP over 10 years, increasing productivity growth by 1.5 percentage points in the same period. Bloomberg Intelligence expects an "explosion of growth" in the GenAI software sector, with revenues rising to $1.3 trillion by 2032 (from $40 billion in 2022). Analysts also claim that the use of GenAI-powered coding assistance applications alone could "boost global GDP by over $1.5 trillion by 2032." See The Potentially Large Effects of Artificial Intelligence on Economic Growth, Goldman Sachs (2023); Jake Rudnitsky, ChatGPT to Fuel $1.3 Trillion AI Market by 2032, New Report Says, Bloomberg (2023); Sida Peng, et al., The Impact of AI on Developer Productivity: Evidence from GitHub Copilot, arXiv (2023).

Numerous corporations, including Oracle, Cisco, AT&T, Morgan Stanley, Crowdstrike, Amazon, Thomson Reuters, and Salesforce, are already leveraging GenAI to improve their products.[317] Economists found that customer service agents at a Fortune 500 software firm with access to GenAI tools were 14 percent more productive on average than their unassisted colleagues.[318] Evidence from experiments run by researchers at MIT suggest that generative AI "substantially raises" the average productivity of mid-level professionals with writing-intensive jobs.[319] Meanwhile, GenAI is leading to breakthroughs in scientific research that would "otherwise take decades," promising significant downstream economic significance.[320]

GenAI and the Federal Government. GenAI could improve organizational performance across the federal government, enabling departments and agencies to enhance the speed and quality of public services.[321] The U.S. Patent and Trademark Office, for example, is already using new AI tools to enhance and accelerate the patent approval process and improve the accuracy of the trademark register.[322]

317 Yiwen Lu, As Businesses Clamor for Workplace A.I., Tech Companies Rush to Provide It, New York Times (2023); Hugh Son, Morgan Stanley Is Testing an OpenAI-Powered Chatbot for Its 16,000 Financial Advisors, CNBC (2023); The Future of Generative AI for Legal and Tax Professionals, Axios (last accessed 2023); Michael Sentonas, CrowdStrike Introduces Charlotte AI, Generative AI Security Analyst, CrowdStrike (2023).

318 Erik Brynjolfsson, et al., Generative AI at Work, National Bureau of Economic Research (2023).

319 Shakked Noy & Whitney Zhang, Experimental Evidence on the Productivity Effects of Generative AI, Science (2023).

320 Eric Schmidt, This Is How AI Will Transform the Way Science Gets Done, MIT Technology Review (2023).

321 Brent Mitchell, How AI Can Enhance Government Services, Improve Productivity, and Better Support Communities, Google Cloud Blog (2023); Christina Montgomery, Automation With a Human Touch: How AI Can Revolutionize Our Government, U.S. Chamber of Commerce (2023); Alan Holden, et al., Designing for the Public Sector with Generative AI, Deloitte (2023); Generative AI for U.S. Federal Agencies, Accenture (last accessed 2023).

322 Seth Colaner, How the U.S. Patent Office Is Keeping up with AI, VentureBeat (2020); Andrew Toole, et al., The Promise of Machine Learning for Patent Landscaping, Santa Clara High Technology Law Journal (2020). Likewise, the Department of State is considering how to use GenAI to improve contract writing, market research, and acquisition planning, while members of Congress have begun experimenting with GenAI to produce constituent response drafts, policy papers, and bills. See Billy Mitchell, State Department Considers Generative AI for Contract Writing, FedScoop (2023); Nihal Krishan, Congress Gets 40 ChatGPT plus Licenses to Start Experimenting with Generative AI, FedScoop (2023).

Potential Use Cases

Agency	Potential Use Cases
Internal Revenue Service (IRS)	• Chatbot assistant to enhance end-to-end IRS electronic tax filing
Federal Reserve Securities and Exchange Commission (SEC) Federal Trade Commission (FTC) Department of Commerce	• Improve data analysis, forecasting, risk modeling, policy simulation • Conduct market research, detect fraud, increase compliance • Process "regulatory big data"
Department of Commerce Department of Energy Small Business Association (SBA) United States Agency for International Development (USAID)	• Organize enterprise data inventory • Improve permitting and licensing • Automate grant applications

Impact on the Workforce. Exactly how and to what extent GenAI will impact the labor force remains an open question.[323] Historical evidence suggests that automation technologies have, over the long run, created more jobs than they have displaced, and that they have made workers more productive across industries and professions, boosting productivity and per-capita GDP.[324] Concerns have been raised, however, that this time could be different: workers could "lose economic and political bargaining power" at an unprecedented scale as

323 Researchers claim, for example, that "around 80% of the U.S. workforce could have at least 10 percent of their work tasks affected" by GenAI. See Tyna Eloundou, et al., GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models, arXiv (2023). Amelia Sandhovel, Crafting the Future of Work: A Policy Framework for the Automation Age, Economic Innovation Group (2023).

324 David Lin & Katie Stolarczyk, Automation Across Industries: Industrial Automation and the American Economy, Special Competitive Studies Project (2023); Robert D. Atkinson, Robots, Automation, and Jobs: A Primer for Policymakers, Information Technology and Innovation Foundation (2017); Ajay Agrawal, et al., Artificial Intelligence: The Ambiguous Labor Market Impact of Automating Prediction, The Journal of Economic Perspectives (2019); David H. Autor, Why Are There Still So Many Jobs? The History and Future of Workplace Automation, The Journal of Economic Perspectives (2015); Daron Acemoglu & Pascual Restrepo, Automation and New Tasks: How Technology Displaces and Reinstates Labor, The Journal of Economic Perspectives (2019).

AI threatens to eclipse not only human labor, but perhaps even human intelligence.[325] Despite these anxieties, economists suggest that many professions, including low-wage occupations, are more likely to be "complemented rather than substituted by AI."[326] Scholars expect knowledge workers, in particular, to experience "groundbreaking shifts in their productivity within a few years" as a result of pervasive "cognitive automation."[327] More broadly, GenAI could address labor shortages that exist across various sectors of the economy.[328]

At this early stage, the economic consequences of recent advances in generative AI are difficult to project with certainty. However, one thing remains clear: maintaining democratic advantage vis-a-vis the PRC in this frontier technology requires a focused effort led by the United States and in collaboration with allies and partners.

Way Forward

GenAI leadership is built on three fundamental building blocks: compute, data, and people.[329] **Compute**, or access to clusters of advanced AI chips, is the engine that powers GenAI. Sustaining innovation requires both large and small players to have access to compute resources. **Data** provides the raw material for training AI models and is a critical U.S. asset that must be harnessed in a way that protects Americans' rights, including privacy, and complies with relevant legal regimes. Digital infrastructure like networking equipment and data centers is also vital for collecting, processing, and moving data. Finally, **People** – skilled AI researchers and end-users – are essential to advancing innovation, creating workforce opportunities, and sustaining national competitiveness.

GenAI leadership is built on three fundamental building blocks: compute, data, and people.

325 Erik Brynjolfsson, The Turing Trap: The Promise & Peril of Human-Like Artificial Intelligence, Daedalus (2022); Emma Goldberg, A.I.'s Threat to Jobs Prompts Question of Who Protects Workers, New York Times (2023).

326 Jan Hatzius, et al., The Potentially Large Effects of Artificial Intelligence on Economic Growth, Goldman Sachs (2023).

327 Martin Neil Baily, et al., Machines of Mind: The Case for an AI-Powered Productivity Boom, Brookings Institution (2023).

328 Stephanie Ferguson, Understanding America's Labor Shortage: The Most Impacted Industries, U.S. Chamber of Commerce (2023).

329 See Final Report, National Security Commission on Artificial Intelligence at 2-4 (2021); Micah Musser, et al., "The Main Resource is the Human": A Survey of AI Researchers on the Importance of Compute, Center for Security and Emerging Technology (2023).

Building Blocks of the Generative Economy

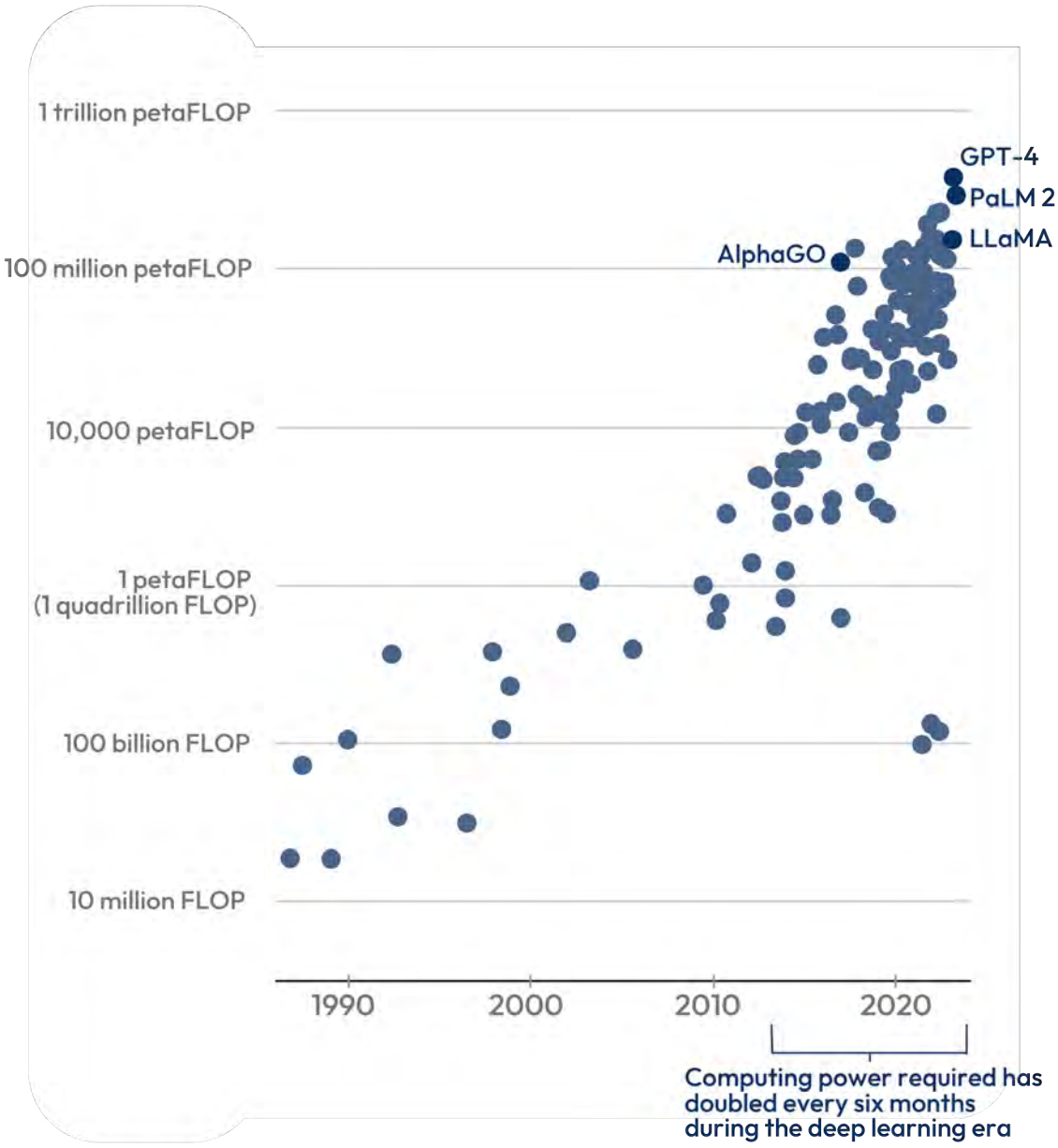
Compute

AI models require huge amounts of computing power, both for training runs and for inference (retrieval of information). Over the past decade, compute demand for AI has grown at an alarming rate. Since the first deep neural network-based AI model was demonstrated in 2012, the amount of compute resources needed to train frontier models has increased by roughly 55 million times – a doubling rate of about every six months.[330] Today, the largest training runs take months and require supercomputers outfitted with thousands of specialized GPUs.[331]

330 Jaime Sevilla, et al., Compute Trends Across Three Eras of Machine Learning, EpochAI (2022); Lennart Heim, Compute Trends Across Three Eras of Machine Learning, Montreal AI Ethics Institute (2023).
331 Guido Appenzeller, et al., Navigating the High Cost of AI Compute, Andreessen Horowitz (2023).

Increasing Computing Power to Train AI Systems[332]

Selected systems, floating-point operations, log scale



332 Jaime Sevilla, et al., Compute Trends Across Three Eras of Machine Learning, EpochAI (2022); Charlie Giattino, Artificial Intelligence, Our World in Data (last accessed 2023).

The United States enjoys a significant lead over the PRC in terms of both technological development and access to compute resources. Nvidia, the world's leading designer of AI chips, is based in the United States, as are AMD and Intel, its two largest competitors.[333] Last year, the United States announced restrictions on the export of cutting-edge AI chips and semiconductor manufacturing equipment to the PRC.[334] Controls on the former apply only to the highest-end chips that meet thresholds for performance and interconnect speed. As a result, U.S. firms enjoy easier access to compute resources than PRC counterparts. However, well over 90 percent of the world's AI chips are manufactured in Taiwan, leaving supply vulnerable for both countries.[335] And while China is making compute resources available to academic researchers, the United States has not taken comparable measures.[336]

America's leadership in cloud services provides a unique form of advantage that can be leveraged both in support of national competitiveness and to prevent bad actors from deploying dangerous models.

Compute Access & Cloud Computing

As noted above, when actors seek to train or deploy large models, access to computing power is a central consideration. Outside of large tech companies, most players – especially startups – access compute via cloud service providers.[337] U.S. companies currently enjoy a substantial edge in cloud computing,[338] although PRC cloud providers are actively attempting to undercut U.S. firms on price and are gaining market share in Asia, Latin America,

333 Stephen Nellis, Nvidia Chips Away at Intel, AMD Turf in Supercomputers, Reuters (2023).

334 Commerce Implements New Export Controls on Advanced Computing and Semiconductor Manufacturing Items to the People's Republic of China (PRC), U.S. Department of Commerce, Bureau of Industry and Security (2022). To complement the export controls, on August 9, 2023, the President issued an Executive Order that included new prohibitions and notification requirements on certain U.S. outbound investments in countries of concern in national security technologies including microelectronics. The new measures are intended to impose further limits on the transfer of expertise from U.S. investors to entities in China, potentially hampering China's ability to develop export-controlled technologies indigenously. See Executive Order on Addressing United States Investments in Certain National Security Technologies and Products in Countries of Concern, The White House (2023).

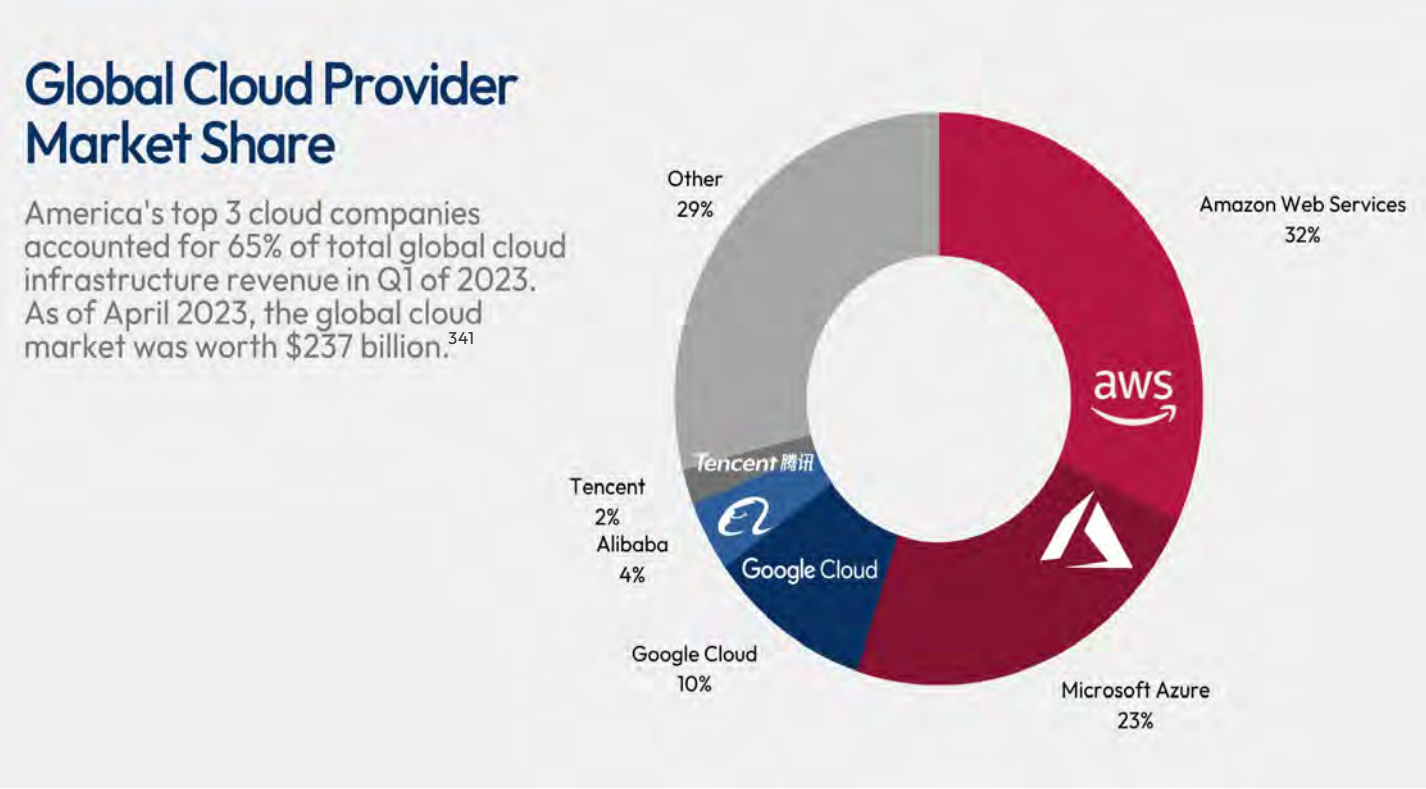
335 John VerWey, The Other Artificial Intelligence Hardware Problem, Computer (2022).

336 Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: An Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023); Liza Tobin, et al., Building a National Delivery System for Data: Taking Stock of China's 5G, Broadband, and Data Center Buildout, Special Competitive Studies Project (2023).

337 American cloud providers rent access to GPU clusters at a rate of $1.00 to $4.00 per chip. Guido Appenzeller, et al., Navigating the High Cost of AI Compute, Andreessen Horowitz (2023).

338 Felix Richter, Big Three Dominate the Global Cloud Market, Statista (2023).

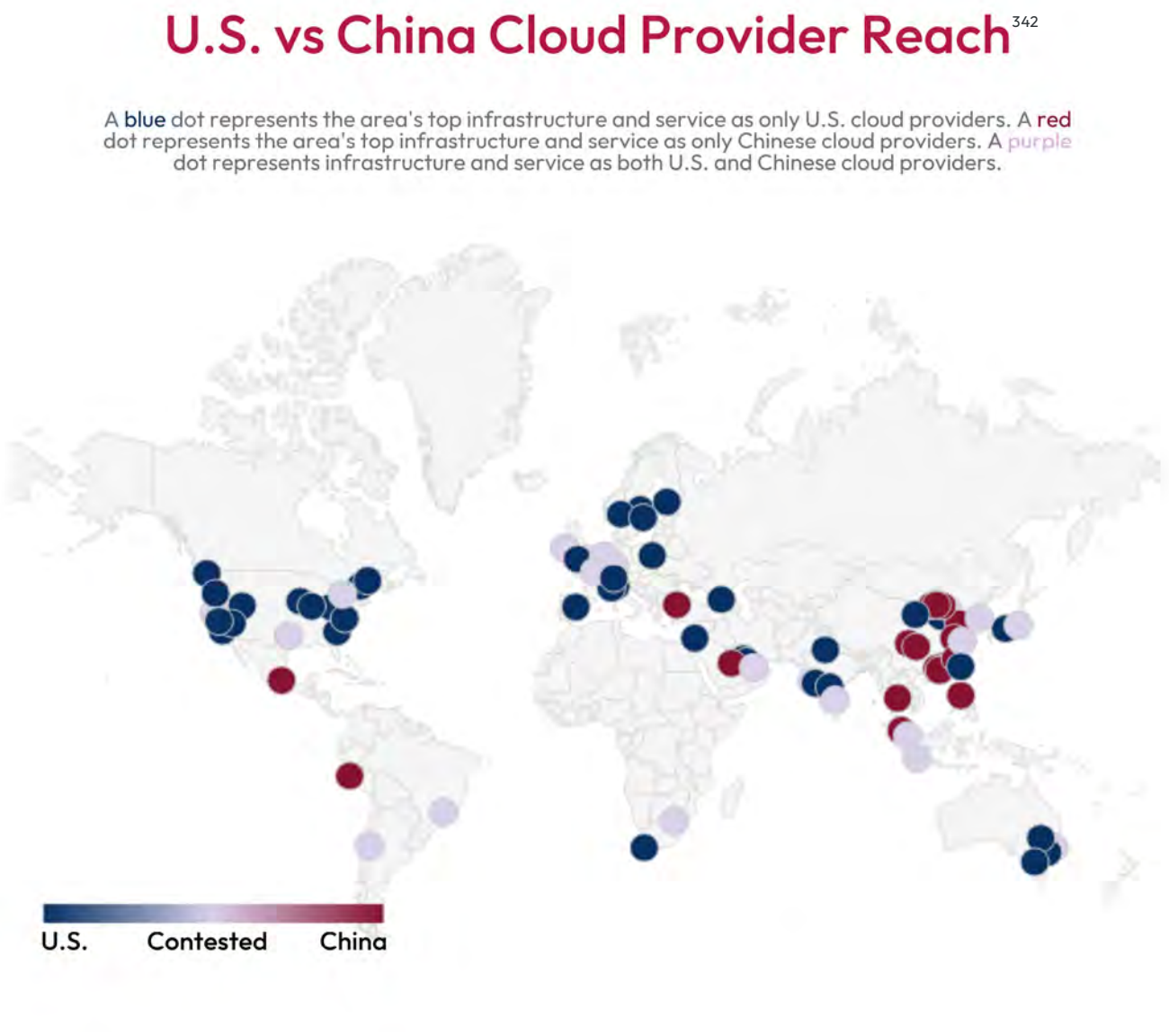
and Africa.[339] This U.S. lead is worth preserving. America's leadership in cloud services provides a unique form of advantage that can be leveraged both in support of national competitiveness and to prevent bad actors from deploying dangerous models.[340]



339 David McCabe, China's Cloud Computing Firms Raise Concern for U.S., New York Times (2023); Simon Sharwood, Oracle and Huawei Clouds the Big Movers on Gartner's Conjured Quadrilateral, The Register (2022).

340 Rama Elluru, et al., Crossing the Digital Atlantic: A U.S.-EU Agenda for the Age of AI, Special Competitive Studies Project (2023).

341 Felix Richter, Big Three Dominate the Global Cloud Market, Statista (2023).



Key Actions

- ***Create the National Artificial Intelligence Research Resource (NAIRR).*** To preserve America's competitive edge in AI research and prevent expertise from becoming concentrated in a handful of companies, the United States must ensure academic

342 Sources: AWS Global Infrastructure, Amazon Web Services (last accessed 2023); Azure Geographies, Microsoft Azure (last accessed 2023); Global Locations - Regions & Zones, Google Cloud (last accessed 2023); Alibaba Cloud Global Locations, Alibaba Cloud (last accessed 2023); Tencent Cloud Global Infrastructure, Tencent Cloud (last accessed 2023); Worldwide Infrastructure-HUAWEI CLOUD, Huawei Cloud (last accessed 2023).

researchers can access large amounts of compute resources via the cloud.[343] The National Science Foundation (NSF) and OSTP, through their NAIRR Task Force, have released a detailed implementation plan for the NAIRR, supported by input from leading experts, academic institutions, and industry,[344] and bipartisan, bicameral Members of Congress have introduced legislation to authorize the NAIRR.[345] If authorized, this program should be funded as quickly as possible at $2.6 billion over six years, as requested by NSF and OSTP.[346] The United States should also explore the creation of a parallel Democracies' Artificial Intelligence Research Resource (DAIRR) in concert with key allies and partners.

- ***Implement a know-your-customer regime for cloud providers***. Recent reports suggest that sanctioned PRC AI companies are seeking to circumvent the October 7, 2022 restrictions by renting access to controlled GPUs via cloud providers.[347] The Department of Commerce should begin by implementing know-your-customer requirements for U.S. cloud providers – as required by Executive Order 13984[348] – as well as conducting diplomatic outreach with the Department of State to encourage allies and partners to implement responsible screening practices among their providers.[349] These steps can be undertaken with existing resources and should be deployed as quickly as possible.

343 See e.g., Haomiao Huang, The Generative AI Revolution Has Begun – How Did We Get Here?, ArsTechnica (2023). Final Report, National Security Commission on Artificial Intelligence at 440-441 (2021).

344 Final Report, National Security Commission on Artificial Intelligence at 440-441 (2021); Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: An Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023).

345 See Press Release, AI Caucus Leaders Introduce Bipartisan Bill to Expand Access to AI Research (2023).

346 Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: An Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023).

347 See e.g., Eleanor Olcott, et al., Chinese AI Groups Use Cloud Services to Evade US Chip Export Controls, Financial Times (2023).

348 Executive Order on Taking Additional Steps to Address the National Emergency with Respect to Significant Malicious Cyber-Enabled Activities, The White House (2021).

349 Tim Fist, et al., Chinese Firms Are Evading Chip Controls, Foreign Policy (2023).

Potential Pathways for Compute Governance

Technical and policy pathways exist to increase oversight and monitoring for supercomputers powered by thousands of high-end AI chips. These notional pathways may also open the door to a broader governance regime – beyond the October 7, 2022 export controls – that could restrict malign uses of generative AI, such as disinformation or WMD development, and enable attribution or responses after an incident occurs. Options could include:[350]

- ***Leverage U.S. leadership in cloud services to cut off access to clear and present national security threats***. If U.S. firms were to retain leadership in providing cloud access to high-end AI chips, U.S. regulators might have the ability to ask firms to "pull the plug" on models that are used in malign ways, such as running disinformation campaigns or designing weapons of mass destruction.
- ***Create a registry for large compute clusters***. Under such a regime, actors that possess large supercomputers for AI training and inference would be required to register with a central authority, which could monitor compliance for high-risk use cases.
- ***Deploy hardware-enabled mechanisms for traceability or responsible use***. It is technically feasible to implant unique identifiers in cutting-edge AI chips or server modules that could function, in theory, as a cyber-physical "fingerprint." If robustly developed, such a program could help enhance supply chain traceability and responsible use.[351]

Energy & Sustainability

Continued compute scaling for generative AI is unsustainable at today's rate, both in terms of environmental impact and cost. Training frontier large language models generates massive amounts of carbon emissions while consuming significant water resources.[352] Likewise, if compute costs were to continue rising at the same pace, the cost to train the world's largest

350 For additional discussion of these options, see Robert Wiblin & Keiran Harris, Lennart Heim on the Compute Governance Era and What Has to Come After, 80,000 Hours (2023).

351 For an example of a compute governance regime based on hardware-enabled mechanisms, see Yonadav Shavit, What Does It Take to Catch a Chinchilla? Verifying Rules on Large-Scale Neural Network Training via Compute Monitoring, ArXiv (2023). Tim Fist, et al., Chinese Firms Are Evading Chip Controls, Foreign Policy (2023).

352 Measuring the Environmental Impacts of Artificial Intelligence Compute and Applications: The AI Footprint, OECD (2022); Pengfei Lei, et al., Making AI Less "Thirsty": Uncovering and Addressing the Secret Water Footprint of AI Models, ArXiv (2023); Payal Dhar, The Carbon Impact of Artificial Intelligence, Nature Machine Intelligence (2020).

AI model would approach the annual cost of the Apollo Program within a decade and exceed U.S. GDP by 2036.[353]

Solving this problem will require firms to **build more efficient algorithms and hardware** that require less compute and energy resources. AI firms can make their models more energy efficient by removing unnecessary layers, a technique known as "pruning," or by streamlining neural network architectures.[354] These techniques can improve energy efficiency by four to 10 times or more and, when combined with specialized hardware accelerators, energy efficiency can potentially be improved by several orders of magnitude.[355] Models can also be re-used or optimized for certain tasks, reducing the need for more energy-intensive and costly training runs.[356]

Key Actions

- ***In the near term, the White House should launch a Green AI Initiative with allies and partners.***[357] Such an initiative would consult with industry experts and researchers and share best practices for minimizing the carbon footprint associated with AI training and inference.[358] The program could be coordinated by the National Artificial Intelligence Initiative Office within the Office of Science and Technology Policy (OSTP) using existing resources.[359] Sustainable AI also represents a promising area of collaboration for groupings such as the Quad[360] or the U.S.-EU Trade and Technology Council (TTC), which could develop agreements on sustainable AI standards.

- ***Congress should encourage firms to disclose energy usage and carbon emissions from AI training.***[361] Additional transparency can provide an incentive to reduce the

353 Andrew J. Lohn & Micah Musser, AI and Compute: How Much Longer Can Computing Power Drive Artificial Intelligence Progress?, Center for Security and Emerging Technology (2022).
354 Kavitha Prasad, Achieving a Sustainable Future for AI, MIT Technology Review (2023); Vivian Sze, Energy-Efficient Deep Neural Networks, MIT Energy Efficient Multimedia Systems Group (2023).
355 Vivian Sze, Energy-Efficient Deep Neural Networks, MIT Energy Efficient Multimedia Systems Group (2023); Charles E. Leiserson, et al., There's Plenty of Room at the Top: What Will Drive Computer Performance After Moore's Law?, Science (2020).
356 Kavitha Prasad, Achieving a Sustainable Future for AI, MIT Technology Review (2023).
357 Roberto Verdecchia, et al., A Systematic Review of Green AI, ArXiv (2023).
358 See e.g., David Patterson, Carbon Emissions and Large Neural Network Training, ArXiv (2021); Kavitha Prasad, Achieving a Sustainable Future for AI, MIT Technology Review (2023).
359 About the NAIIO, National Artificial Intelligence Initiative Office (last accessed 2023).
360 The Quad includes Japan, Australia, India, and the United States.
361 Such a rule has been included in a recent version of the EU AI Act. See P9_TA(2023)0236, Artificial Intelligence Act, European Parliament (2023).

amount of energy used for model training and inference. Transparency should also extend to whether models are powered using clean energy sources. Congress could include these disclosure requirements in AI legislation.[362]

Novel Hardware Paradigms

To make matters worse, booming compute demand from GenAI comes at a time when chip manufacturing is running up against the laws of physics. The world's most advanced chips feature patterns just 3 nanometers across, or roughly 25,000 times smaller than the width of a human hair.[363] As today's chip manufacturing techniques push up against physical limits, Moore's Law – the prediction that the amount of computing power on a chip will double every two years – is slowing down.[364]

Several pathways exist to meet this challenge. The first is building **specialized chips and systems** for AI workloads. Over the past few years, for example, AI firms have moved away from using general purpose chips to train models and instead rely on Graphical Processing Units (GPUs) that can perform many computations in parallel. Building new kinds of specialized AI accelerators, which match custom hardware for specific applications, holds tremendous promise. U.S.-based large technology firms and AI chip startups are moving to capitalize on this trend, suggesting that substantial market incentives already exist.[365]

New computing paradigms like quantum and neuromorphic computing are well into development worldwide to provide compute gains beyond Moore's Law. The chip industry is already pursuing 3D heterogeneous integration – scaling Moore's Law in the third dimension by stacking components and connecting them in new ways.[366] DARPA's Electronics Resurgence Initiative 2.0 is pursuing a robust research program in this area, with a focus on driving rapid commercialization while supporting defense mission requirements.[367] But a number of other emerging paradigms exist that could help meet skyrocketing compute demand in the intermediate term: examples include silicon photonics; heterogeneous classical-quantum

362 See e.g., SAFE Innovation Framework, Office of Sen. Majority Leader Chuck Schumer (2023).
363 Understanding Nanoscale | Part 1: How Small Is Small?, Medium (2020).
364 See John Shalf, The Future of Computing Beyond Moore's Law, Philosophical Transactions of the Royal Society (2020).
365 What Is an AI Accelerator?, Synopsys (last accessed 2023); Doug O'Laughlin, The Coming Wave of AI, and How Nvidia Dominates, Fabricated Knowledge (2023).
366 What Is 3DIC Technology?, Synopsys (last accessed 2023).
367 Electronics Resurgence Initiative 2.0, DARPA (last accessed 2023).

computing; neuromorphic and in-memory computing; and superconducting electronics.[368] Today, many of these paradigms face hurdles to commercialization, making them ideal targets for government investment and other policies to de-risk private investment.[369]

Key Action

- ***Launch moonshot projects focused on incentivizing investments in emerging microelectronics paradigms that could power future generations of AI models.*** True microelectronics moonshots can occur across the U.S. innovation ecosystem, ranging from companies to DARPA's Microsystems Technology Office. But who sets the bar for the nation, supports implementation, and reports results to the President? Short of a Technology Competitiveness Council,[370] the National Semiconductor Technology Center (NSTC), already funded under the CHIPS and Science Act and scheduled to launch later this year, could be the place. To achieve genuine moonshots, a coordinating mechanism across government programs is needed.[371] In addition, the NSTC Investment Fund should be rapidly stood up and sufficiently resourced with at least $1 billion in government seed funding. As part of its mission, the NSTC has

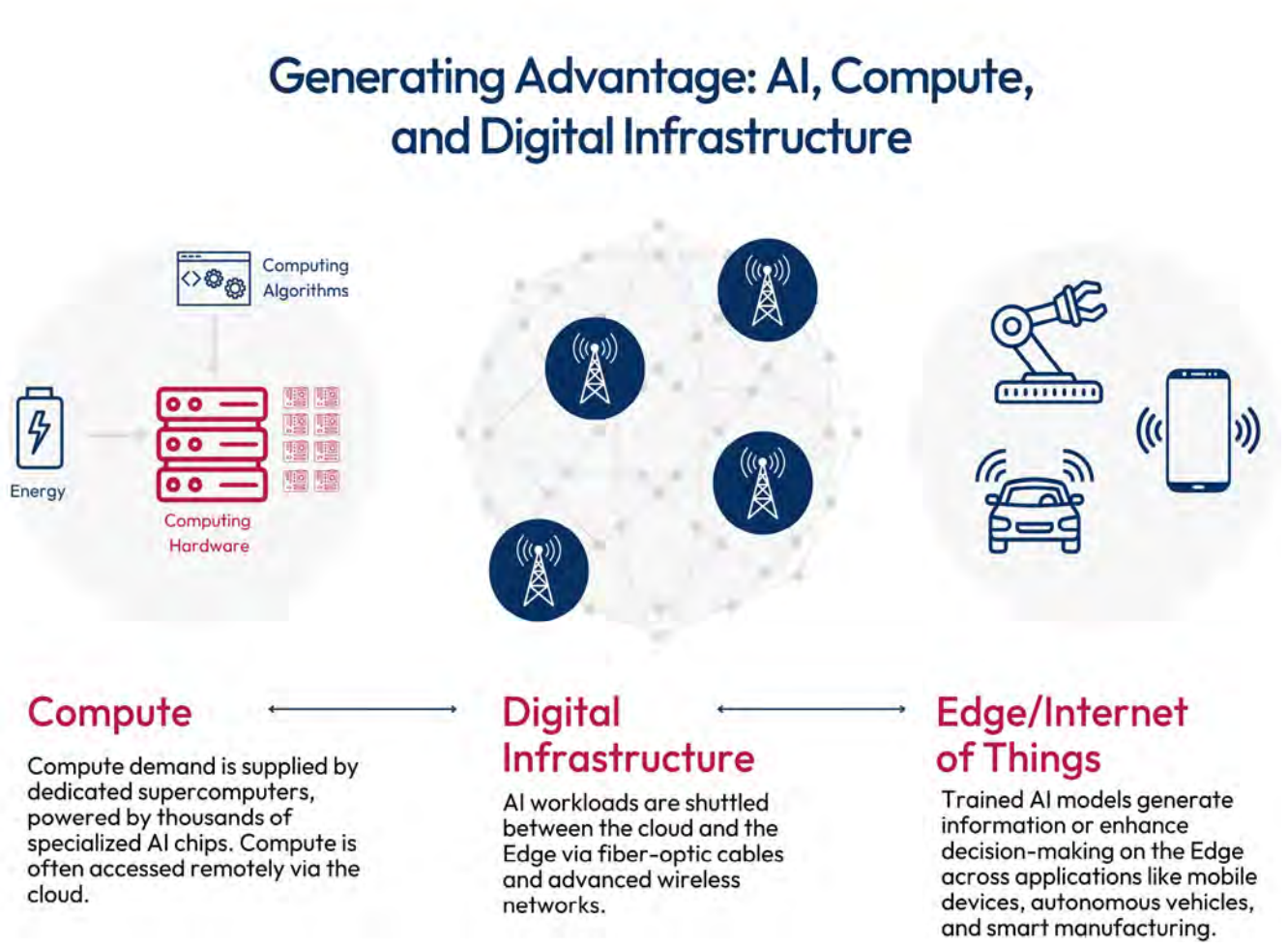
368 In-memory computing, for example, improves energy efficiency by placing processing and memory units closer together, allowing for increasingly brain-like neuromorphic computing. Silicon photonics uses light to replace the wires in and between chips. Superconducting circuits drop the level of resistance in a circuit to zero, allowing for extremely fast, energy-efficient computation. See Chapter 16: Emerging Research Devices, Heterogeneous Integration Roadmap: 2023 Edition (2023); National Action Plan for U.S. Competitiveness in Microelectronics, Special Competitive Studies Project (forthcoming).

369 On government de-risking, see Restoring the Sources of Techno-Economic Advantage, Special Competitive Studies Project at 15-16 (2022). Enhancing the United States' R&D tax credit – which lags significantly behind other industrialized nations – would also crowd in industry R&D dollars, in the microelectronics industry and elsewhere. Robert D. Atkinson, The Case for Improving America's Research and Experimentation Tax Credit, The Hill (2021).

370 In 2022, Congress considered legislation for both a Technology Competitiveness Council (TCC) and Office of Global Competition Analysis (OCA). H.R. 8027, To Establish within the Executive Office of the President a Technology Competitiveness Council (2022); Courtney Albon, Lawmakers Propose 'Technology Competitiveness Council' to Champion US Innovation, C4ISRNet (2022); S. 4368, American Technology Leadership Act of 2022 (2022); Daniel Flatley, Senators Wary of China's Tech Prowess Seek Competition Office, Bloomberg (2022). More recently, in 2023, the U.S. Senate has also introduced a legislative bill to establish an OCA. S.1873 - Global Technology Leadership Act (2023).

371 Ana Swanson & Don Clark, Commerce Dept. Outlines Plans to Fund Cutting-Edge Chip Research, New York Times (2023).

an opportunity to serve as an incubator, providing a one-stop-shop "help desk" for innovators as they attempt to navigate the public-private ecosystem.



Data

Data, plus the infrastructure needed to query, process, and transport it to and from connected devices and users, is essential to AI leadership. GenAI models require huge amounts of data for training: OpenAI's GPT-3 is estimated to be trained on 45 terabytes of text data – equivalent to a quarter of the entire Library of Congress – at an estimated cost of several million dollars.[372] To maintain our competitive advantage in GenAI, the United States must treat the nation's data as a strategic asset by organizing coherent approaches to digital infrastructure and data governance.

372 What Is Generative AI?, McKinsey & Company (2023).

Digital Infrastructure

Digital infrastructure, from fiber optic cables and infrastructure for wireless networks to data centers and satellite arrays, is the backbone for incorporating AI in the cloud and on edge devices. But delivering useful AI-powered applications – from smart cities and smart factories to autonomous vehicles – requires a unified national approach. The United States must develop a national strategy for strengthening its digital infrastructure, including by ensuring U.S. leadership in advanced networks which store, process, and transport data nationwide.[373] Internationally, the United States must also strengthen coordination with allies and partners on standards, which will shape future leadership in networks and AI.[374]

The United States must develop a national strategy for strengthening America's digital infrastructure, including by ensuring U.S. leadership in advanced networks which store, process, and transport data nationwide.

Key Actions

- ***Develop a National Strategy for Digital Infrastructure***. Congress has appropriated more than $100 billion for digital infrastructure since 2018, but the United States lacks a coordinated, strategic approach to strengthen America's digital backbone.[375] In particular, the United States must position itself to win the competition for the next generation of advanced networks by prioritizing industrial and enterprise use-cases.[376] Wireless networks will be crucial as the proliferation of GenAI-powered applications increases data flows at the edge. Congress should require the Federal Communications Commission, in coordination with the Departments of

373 The most recent comprehensive U.S. digital infrastructure plan was produced by the FCC in 2010. See Connecting America: The National Broadband Plan, Federal Communications Commission (2010). After more than a decade, a 2022 study by the U.S. Government Accountability Office found that federal broadband efforts are fragmented and overlapping and recommended the President develop a national broadband strategy. Broadband: National Strategy Needed to Guide Federal Efforts to Reduce Digital Divide, Government Accountability Office (2022).

374 Robert D. Atkinson & Martijn Rasser, Help US Companies Compete Against China on Technology Standards, RealClear Policy (2022).

375 Restoring the Sources of Techno-Economic Advantage, Special Competitive Studies Project at 32 (2022).

376 SCSP has proposed a plan to do this. See National Action Plan for U.S. Leadership in Advanced Networks, Special Competitive Studies Project (2023).

Commerce and Agriculture and other relevant agencies, to deliver a National Digital Infrastructure Strategy within 270 days.[377]

- ***Assert U.S. leadership in international network technology standards-setting bodies.*** The PRC has organized its firms to show up in force in these bodies and advance its political objectives. The National Institute of Standards and Technology (NIST), working with others like the Department of State, should develop a clear strategy for 6G and forthcoming network standards to help support, not replace, the industry-led standards-setting process.[378] The United States should coordinate these efforts with democratic allies and partners,[379] including by establishing a "Free 6G Leadership Group."

Free 6G Leadership Group

In concert with private sector-led efforts like the NextG Alliance,[380] the U.S. government and other advanced democracies should form a group to support proactive leadership in development of 6G network standards and principles in line with democratic values. U.S. and European governments have begun discussing 6G within the U.S.-EU Trade and Technology Council (TTC).[381] These stakeholders should expand engagements to include Japan, Australia, and India – which have created an Open RAN-focused working group within the Quad – and other partner countries.[382]

- ***Catalyze domestic and friendshored production of key network components.*** To ensure stable and trusted supply chains, Congress and the Department of Commerce should leverage incentives, R&D funding, and further restrictions on PRC-made

377 The Department of Agriculture manages broadband programs for rural areas, schools, and libraries. For more on a proposed national strategy, see National Action Plan for U.S. Leadership in Advanced Networks, Special Competitive Studies Project, at 6-7 (2023).
378 Including those developed by the 3rd Generation Partnership Project (3GPP), an international body focused on technical specifications for mobile networks. Introducing 3GPP, 3GPP (last accessed 2023).
379 Existing groupings such as the Quad (Australia, India, Japan, United States) and the TTC could be used.
380 See NextG Alliance (2023).
381 U.S.-EU Joint Statement of the Trade and Technology Council, The White House (2023); 6G Outlook, The European Commission (2023).
382 See National Action Plan for U.S. Leadership in Advanced Networks, Special Competitive Studies Project at 17-18 (2023).

components to promote the production of trustworthy alternatives to PRC core, RAN, Internet of Things (IoT), and satellite components.[383]

Data Governance

The United States has long enjoyed significant advantages in data access for AI training – owing to the global presence of U.S. tech firms and large volumes of English language text on the Internet – but its current ad hoc approach to data governance is putting U.S. leadership at risk.[384] America is home to the world's largest tech companies, has the most data centers, and leads in the big data market.[385] But China is making gains with a comprehensive digital strategy that restricts access to its large domestic data resources and leverages its tech firms' growing global footprint to access global data resources.[386] Meanwhile, the EU is adopting a regulation-first approach that prioritizes privacy but threatens to dampen innovation and limit opportunities for U.S. firms.[387]

The United States cannot afford to take a wait-and-see approach, sitting on the sidelines as others write the rules for its digital future and waiting for its adversaries to stumble.[388] The United States must resolve uncertainty

> The United States must resolve uncertainty around regulatory issues like data privacy and ownership, make valuable government data more accessible, and create public-private partnerships to aggregate siloed government, private sector, and academic datasets for strategic effect.

383 National Action Plan for U.S. Leadership in Advanced Networks, Special Competitive Studies Project (2023) at 9-11.

384 The United States has no comprehensive national data privacy standard; has valuable, but difficult to access and use, data across the US government; and no scalable model for aggregating public and private data, including insufficient infrastructure for data sharing, such as a national AI research cloud. See National Data Action Plan, Special Competitive Studies Project at 2 (2022); First Quarter Recommendations Memorandum, National Security Commission on Artificial Intelligence (2020); Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: An Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023).

385 Jonathan Ponciano, The World's Largest Technology Companies In 2023: A New Leader Emerges, Forbes (2023); National Data Action Plan, Special Competitive Studies Project at 2 (2022).

386 Emily de la Bruyere, et al., China's Digital Ambitions: A Global Strategy to Supplant the Liberal Order, National Bureau of Asian Research (2022).

387 See Rama Elluru, et al., Crossing the Digital Atlantic: A U.S.-EU Agenda for the Age of AI, Special Competitive Studies Project (2023).

388 Beijing's increasingly stringent measures to wall of foreign access to Chinese data is causing foreign businesses to rethink operations in China. See e.g., The Crackdown on Foreign Firms Will Deter Global Businesses – and Undermine China's Own Interests, The Economist (2023).

around regulatory issues like data privacy and ownership, make valuable government data more accessible, and create public-private partnerships to aggregate siloed government, private sector, and academic datasets for strategic effect.[389] In addition to facilitating public-private partnerships for sharing data, these partnerships should be leveraged to create unique data sets that can be treated as "national assets" (e.g., shared medical data sets to support improved diagnosis and therapies, and information for the U.S. workforce about shifting supply and demand for different types of jobs and skills and associated opportunities for continuing education).

Key Actions

- ***Pass comprehensive data privacy legislation***. As AI permeates industries, a data governance model will be instrumental in efforts to establish checks and balances that ensure data and technology are used ethically, safely, and in keeping with our nation's values. Legislation is a key element of such a model and is urgently needed to unify the patchwork of state laws and enable trust in the U.S. data ecosystem to set conditions for new digital trade agreements.[390] By defining legal requirements surrounding data usage, the United States can maximize data as a strategic asset while protecting rights such as privacy and addressing harmful society-level impacts.[391]

- ***Pave the way for digital trade in the age of generative AI***. The AI revolution dramatically raises the stakes for us to work with democratic allies and partners to increase digital trade. In particular, firms and workers in the United States and the EU, two of the largest markets in the world, stand to gain economically by enabling cross-border data flows and reducing costs associated with customs duties on digital transactions.[392] The Office of the United States Trade Representative (USTR), in coordination with the Departments of Commerce and State, must accelerate efforts

389 See National Data Action Plan, Special Competitive Studies Project (2022).

390 For proposed principles for federal privacy legislation, see National Data Action Plan, Special Competitive Studies Project (2022). An American data governance model would also include additional regulatory and non-regulatory elements to protect privacy and promote accessibility of government and non-government data.

391 Kevin Roose, A.I. Poses 'Risk of Extinction,' Industry Leaders Warn, New York Times (2023); Cade Metz & Gregory Schmidt, Elon Musk and Others Call for Pause on A.I., Citing 'Profound Risks to Society', New York Times (2023).

392 The Digital Trade Revolution: How U.S. Workers and Companies Can Benefit from a Digital Trade Agreement, The U.S. Chamber of Commerce (2022). Additional agreements could be modeled after digital trade agreements with Japan and the digital chapter of the U.S.-Mexico-Canada Agreement (USMCA). See FACT SHEET on U.S.-Japan Digital Trade Agreement, U.S. Trade Representative (2019); United States-Mexico-Canada Agreement, U.S. Trade Representative (last accessed 2023).

to develop compatible approaches to AI and data flows and regulation with the EU and other democracies.[393]

- ***Explore the need for intellectual property rights in data***. The Secretary of Commerce, in coordination with the United States Patent & Trademark Office and other relevant agencies, should explore the implications of intellectual property rights in data for national security, economic, and privacy issues, especially as pertaining to domestic and international data sharing between private and public entities.[394]

People

People are America's most important asset for AI competitiveness. Leadership in generative AI requires the ability to attract and retain the "rare talent to make AI breakthroughs" – the "holy grail" for enhancing U.S. national competitiveness.[395] While the United States remains an attractive destination for technical experts, increasing numbers of high-skilled immigrants are choosing to take their talents elsewhere due to the administrative burdens of the immigration system.[396] In addition, providing high quality STEM education and pathways for reskilling and training are vital to unlock productivity gains and create opportunities for the American workforce. Training skilled end-users is a critical factor in the diffusion of any general purpose technology.[397]

Immigration

Generative AI opens up a new world for employment, skills, and innovation capacity, but its potential benefits will only materialize if the United States continues to attract the world's top AI talent. Sixty-five percent of America's top AI companies have immigrant

Sixty-five percent of America's top AI companies have immigrant founders or co-founders.

393 See Rama Elluru, et al., Crossing the Digital Atlantic: A U.S.-EU Agenda for the Age of AI, Special Competitive Studies Project (2023). Japan's "Digital Free Flow with Trust" concept, launched at the G7 in 2023, offers principles for greater allied and partner collaboration on data governance. See Operationalizing Data Free Flow with Trust (DFFT), Center for Strategic and International Studies (2023).

394 Testimony of Rama Elluru before the U.S. Senate Judiciary Subcommittee on Intellectual Property, Artificial Intelligence and Intellectual Property – Part I: Patents, Innovation, and Competition (2023).

395 Final Report, National Security Commission on Artificial Intelligence at 2 (2021).

396 Jon Marcus, With New 'Talent Visas,' Other Countries Lure Workers Trained at U.S. Universities, The Hechinger Report (2023).

397 Jeffrey Ding, The Rise and Fall of Great Technologies and Powers, GitHub (2021).

founders or co-founders.[398] Despite its current position of leadership, the United States faces an increasingly troubling tech talent deficit that must be overcome if it is to realize potential GenAI-enabled productivity gains.[399] High-skilled immigrants play a crucial role in alleviating this deficit, and the current immigration system's hurdles not only prevent talent from coming to the United States, but inadvertently direct talent elsewhere.[400]

The United States must act quickly to create new pathways to attract AI talent from around the world. Failure to improve our system is prompting global talent to go elsewhere, harming America's ability to innovate.[401] Other countries are capitalizing on this trend: Canada, for example, implemented a new program in July 2023 to attract H1-B visa holders frustrated with the American system to work in Canada, with clear pathways to permanent residency.[402] In addition, ex-China emigration, including technical experts, is rising, offering the United States an opportunity to attract AI talent.[403]

Key Actions

- ***Increase the H-1B visa cap***. A comprehensive strategy from the Departments of Labor and Homeland Security is required to improve the H-1B system and, in collaboration with Congress, recommend a cap increase to 195,000, as well as other measures to enable a greater inflow of vital technical and STEM talent.[404]

- ***Grant conditional green cards to STEM Ph.D. graduates from accredited American universities***. Congress should consider granting conditional green cards to STEM Ph.D. graduates from accredited American institutions, with an initial focus on

398 Ashley Gold, Exclusive: Immigrants Play Outsized Role in the AI Game, Axios (2023).
399 Global and U.S.Talent Shortage Report – Statistics and Studies, Advantis Global (2023).
400 Immigration Policy is Innovation Policy, Economic Innovation Group (last accessed 2023).
401 Steve Case, Opinion: America's Big Mistake in the War for High-Tech Talent, CNN (2023).
402 Michelle Hackman & Paul Vieria, Canada Woos American H1-B Visa Holders Fed Up with U.S. Immigration System, The Wall Street Journal (2023).
403 Nathaniel Taplin, China's Brain Drain Threatens its Future, Wall Street Journal (2023). Among the emigrants are AI researchers leaving China due to U.S. export controls on high-end AI chips. Eleanor Olcott, et al., Microsoft to Move Top AI Experts From China to New Lab in Canada, Financial Times (2023).
404 Final Report, National Security Commission on Artificial Intelligence at 424-425 (2021).

students from partner nations, and also reconsider adding a new visa category for technology entrepreneurs.[405]

- ***Adjust return-to-home requirements for J-1 visa holders***. The Department of State should adjust return-to-home requirements for J-1 exchange visa holders working or studying fields pertaining to AI and other critical emerging technologies to reduce the need for such holders to return to their home nations for two years prior to returning to the United States.[406]

Workforce Development

The diffusion of GenAI could dramatically improve the nation's productivity,[407] but at this early stage, it remains unclear how widespread deployment of these capabilities will affect labor markets and the nature of work in the long run.[408] To unlock new opportunities for the American workforce, economic policymakers should invest in and update worker training and development programs that are adaptable to the rapidly changing nature of GenAI tech.

Key Action

- ***Form a National Commission on Automation and the Future of Work***. Congress should form a bipartisan commission to review the current state of automation in the United States, analyze its impact on our workforce and economic competitiveness,

405 International students play a vital role in advancing the innovation ecosystem. Roughly 40 percent of all STEM PhDs from American universities between 2000 and 2019 were international students, Jack Corrigan, et al., The Long-Term Stay Rates of International STEM PhD Graduates, Center for Security and Emerging Technologies (2022).

406 J-1 visas are granted to students, professors, researchers, and specialists. This includes those studying and specializing in AI fields. See Exchange Visitors, U.S. Citizenship and Immigration Services (last accessed 2023); Eric Schmidt, To Compete With China on Tech, America Needs to Fix Its Immigration System, Foreign Affairs (2023).

407 Michael Chui, et al., The Economic Potential of Generative AI: The Next Productivity Frontier, McKinsey & Company (2023); Generative AI Could Raise Global GDP by 7%, Goldman Sachs (2023); Erik Brynjolfsson, et al., Generative AI at Work, National Bureau of Economic Research (2023).

408 Michael Chui, et al., The Economic Potential of Generative AI: The Next Productivity Frontier, McKinsey & Company (2023).

and propose policy changes that address human-machine teaming, upskilling, and reskilling.[409]

STEM Education

GenAI holds enormous potential for improving the U.S. STEM education system. It can provide personalized learning for students while easing burdens placed on educators. That said, it is important to acknowledge that these systems could exacerbate the digital divide or problems associated with social media usage.

Key Action

- ***Develop guidelines for deployment of GenAI in the classroom***. NIST should coordinate with the Department of Education's Office of Elementary and Secondary Education and state-level education agencies to ensure the prioritization – and appropriate use – of GenAI tools within the K-12 curriculum, developing a set of guiding principles in the process.[410] In addition, Congress should increase grant funding from NSF by $25 million, in coordination with the Department of Education and non-profit and private sector organizations, to increase school systems' access to the most updated large language models.[411]

Conclusion

The advent of generative AI marks an economic turning point. As with past general purpose technologies, nations that lead in the adoption of generative AI will reap the long-term benefits of

As with past general purpose technologies, nations that lead in the adoption of generative AI will reap the long-term benefits of increased productivity and economic growth.

409 The Commission could include the National Science Foundation, Departments of Labor, Commerce, and Education, General Services Administration, and others, and representatives from academia, labor unions, and manufacturing and technology sectors. Initiatives such as MIT's Work of the Future have conducted research on a number of these objectives. See MIT Work of the Future, Massachusetts Institute of Technology (last accessed 2023); Kenan Fikri, Towards a More Socially and Spatially Inclusive Innovation Economy, Brookfield Institute (2019). Congress should appropriate approximately $15-20 million for this commission, based on previous commission budgets and factoring in inflation.

410 Office of Secondary and Elementary Education, U.S. Department of Education (last accessed 2023).

411 Figure based on National Science Foundation grants with similar efforts, which are between $20-$30 million for around 20-30 awards. See e.g., Computer Science for All (CSforAll: Research and RPPs), National Science Foundation (2023); Discovery Research PreK-12 (DRK-12), National Science Foundation (2023).

increased productivity and economic growth. Productivity gains mean additional resources for national priorities, from defense spending to R&D and social programs. GenAI also marks an opportunity to open digital markets among allies and partners who treat data as an asset that can be leveraged to enrich and empower rather than control and repress. Without a focused effort, however, continued leadership cannot be assured. By shoring up the essential building blocks for AI leadership, the United States can ensure democratic competitiveness in the Age of AI.

Foreign Policy Memo

MEMORANDUM TO THE PRESIDENT OF THE UNITED STATES AND CONGRESS

CC: **SECRETARY OF STATE**

FROM: Special Competitive Studies Project

SUBJECT: Establishing U.S. Global Leadership in the Era of Generative Artificial Intelligence

Purpose

The United States is in the midst of a generational, strategic shift to address two challenges: 1) a geopolitical competition with a systemic rival, the People's Republic of China (PRC), and 2) the broad implications of emerging technologies on the national security, economic prosperity, and social cohesion of nations around the world. The United States government's pivot toward both sets of challenges is underway.[412]

While the PRC poses a more "traditional"[413] geopolitical challenge to the United States, the technology competition will be a paradigm-shifting issue that will require the United States government to significantly alter how it advances American interests around the world. This is reflected in the ongoing global discourse on the game-changing ramifications of generative artificial intelligence (GenAI) on not just national security, but also work, education, social interaction, and other aspects of our lives.[414]

The current U.S. lead in GenAI, with U.S. companies demonstrating the continued "innovation power"[415] of the United States, creates a unique moment for U.S. global

412 The United States has set both a strategic direction in two sequential National Security Strategies and begun to move in support of that strategy. See National Security Strategy, The White House (2022); U.S. National Security Strategy, The White House (2017); Pub. L. 117–167, CHIPS and Science Act (2022).

413 National Security Strategy, The White House at 11 (2022); Derek Chollet, et al., Building "Situations of Strength," Brookings Institution at 21-23 (2017).

414 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 16-27 (2022).

415 Eric Schmidt, Innovation Power: Why Technology Will Define the Future of Geopolitics, Foreign Affairs (2023).

leadership to chart the way forward on how this technology can be used for good, and to work with allies, partners, and even rivals to put in place appropriate governance guardrails to prevent or mitigate negative consequences. **To achieve this, the United States government will need to adjust its mission and tradecraft to advance American interests in a GenAI world. At the President's direction, the Secretary of State should lead the United States government in developing a new model of statecraft and new global institutions for this purpose:**

The United States government will need to adjust its mission and tradecraft to advance American interests in a GenAI world.

- ***Develop and implement "Platforms Statecraft" as an integrated, strategic effort, in concert with U.S. allies and partners, to build out the global technology platforms that underpin advantage in GenAI and other strategic technologies*** — from the telecommunications infrastructure (e.g., cell towers, satellite arrays, submarine cables), to the digital networks (e.g., digital payments, e-commerce), to the software and applications (e.g., AI), to standards and regulations, and beyond — in order to ensure that these platforms are governed by the transparent, rules-based principles of our open societies;

- ***Adopt new tools to capitalize on the transformative power that GenAI can unlock*** to ensure the Department of State remains at the cutting-edge in leveraging technology to execute and achieve its mission; and

- ***Design and organize multiple layers of international regimes, institutions, and dialogues*** to ensure that governments, and the private sector as needed, can work together to mitigate against the highest consequence negative use cases of GenAI and support the broadest possible positive-sum applications GenAI offers. This must also include bilateral discussion between the two leading nations in this field — the United States and the PRC — to seek to preserve strategic stability over strategic risks GenAI may create.

Background and Near-Term Implications of GenAI for Foreign Policy

Fundamentally, American interests have remained consistent for the past century. The United States has, if imperfectly, sought a free, open, market-driven world governed by a respect for the rule of law — this was better for both Americans and others around the world, than an international system less free, less open, or more centrally-planned.[416] American ingenuity and dynamism would be the engine that ensured our nation's success. Neither the strategic competition with the PRC nor the global technology competition changes these foundational assumptions. **With GenAI, the systemic foreign policy issue for the United States to consider is how to shape GenAI's global use and function so that it reinforces these interests.**

GenAI's rapid global scaling sharpens the existing risks and opportunities in the global technology competition and foreshadows the disruptive power that emerging technologies will bring, with their corollary positive and negative impacts on foreign policy:[417]

- Digital freedom[418] will need further reinforcement in the face of GenAI-amplified disinformation,[419] though GenAI itself offers to unlock a new era of learning for people around the world.

- GenAI's required compute power will heighten the criticality of global digital infrastructure, from data centers to the

GenAI's rapid global scaling sharpens the existing risks and opportunities in the global technology competition and foreshadows the disruptive power that emerging technologies will bring.

416 National Security Strategy, The White House at 8-11 (2022). See generally, G. John Ikenberry, A World Safe for Democracy, Yale University Press (2022).

417 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 98-119 (2022).

418 See Defending Digital Freedom and the Competition for the Future of the World Order, Special Competitive Studies Project (2022).

419 Paul M. Barrett & Justin Hendrix, Safeguarding AI: Addressing the Risks of Generative Artificial Intelligence, NYU Stern School of Business at 8-9 (2023); Madison Fernandez, Fakery and Confusion: Campaigns Brace for Explosion of AI in 2024, Politico (2023).

communications networks that connect them to edge devices, as well as the importance of who controls that infrastructure.[420]

- The network effects[421] that amplify the utility of technology platforms mean that whoever can better provide a technology package around GenAI will sway key swing states to their side, attracting more users to more attractive and increasingly useful platforms.

- How the United States and the PRC incorporate GenAI into a substantive bilateral dialogue, given the scope and scale of GenAI's impacts, will be a central factor for global peace and stability.

- The potential adversarial — and existential — risks GenAI creates will require new fora and dialogues for engagement with like-minded allies and partners, as well as potential rivals, to mitigate these risks.

In addition to such broad ramifications, GenAI also holds important applications for foreign policy and the Department of State's practical operations. GenAI will transform the speed, efficiency, and efficacy of the day-to-day work of the Department of State and other government agencies:

- Large language models (LLMs) can provide readily accessible translation services, help draft memoranda, and provide immediate research support on any pressing international issue.

- A GenAI system trained on and source-grounded in the Department of State's history of cables and diplomatic reporting could become an unrivaled oracle of information to guide international relations and negotiations.

- GenAI could accelerate visa review and processing, boost foreign policy departments and agencies' regulatory compliance responsibilities with automated review systems, and provide analytic trends and information regarding geopolitical events and crises.

420 A battle over the world's digital infrastructure is already well underway in many dimensions. See Joe Brock, Inside the Subsea Cable Firm Secretly Helping America Take on China, Reuters (2023); Jacob Helberg, Wires of War, Avid Reader Press at 91-94 (2021).

421 What Is the Network Effect?, Wharton Online, University of Pennsylvania (2023).

The State of Play at the Department of State

The Department of State (the Department) is beginning to build the institutional capacity to establish U.S. leadership on the global dimensions of the technology competition. The creation of an Ambassador-at-Large and a Bureau of Cyberspace and Digital Policy,[422] an Office of the Special Envoy for Critical and Emerging Technology,[423] an Office of Critical Technology Protection,[424] a Regional Technology Officer (RTO) Program,[425] and other steps position the Department for the global tech competition, particularly vis-a-vis the PRC.

The Department of State (the Department) is beginning to build the institutional capacity to establish U.S. leadership on the global dimensions of technology competition.

To advance its work around GenAI, the Secretary of State should lead the Department, alongside other government agencies, to take further steps to strengthen a **whole-of-government integration of the domestic and foreign policy aspects of technology competition.**

- The significant commercial, industrial, and regulatory policy dimensions of GenAI (and other emerging technologies) will require a truly whole-of-government approach to bring together disparate departments, authorities, talent, and tools to advance U.S. interests.

- Simultaneously, policymakers must appreciate the domestic and international interconnections that technology policy holds for national strategy. The absence of domestic regulatory policy will hinder the ability of the United States to align allied action on regulations. Conversely, the absence of global context in shaping our domestic regulations may disadvantage the U.S. private sector in a global competition.

422 Press Release, Establishment of the Bureau of Cyberspace and Digital Policy, U.S. Department of State (2022).
423 Establishing the Office of the Special Envoy for Critical and Emerging Technology, U.S. Department of State (2023).
424 About Us – Bureau of International Security and Nonproliferation, U.S. Department of State (last accessed 2023).
425 Establishment and Expansion of Regional Technology Officer Program, 22 U.S.C. §10305 (2023).

The Department will also need to build its own requisite tech policy expertise for its staff and bring online new tools, tailored to its unique collection and possession of national security sensitive information.

Just as nations in prior eras competed over access to coal, steel, oil, and other resources that dictated power in the physical world, a similar competition already is underway around tech and the digital world.

- The new capabilities that GenAI and other emerging technologies offer will require the foreign policy workforce to build new skill sets around these tools. Mastering the present GenAI moment demands not only understanding how to use GenAI tools but also how their policy implications interweave with the geopolitics of microelectronics[426] or advances in synthetic biology.[427]

- Some entrepreneurial foreign and civil servants have already begun experimenting with GenAI tools like ChatGPT.[428] The Department should encourage creativity in how GenAI can address operational gaps in the Department's mission and work. And as its workforce identifies its tech needs to improve the efficiency and effectiveness of its work, the Department will need to be agile and responsive in identifying the necessary policy changes and resource requirements to adopt new capabilities.

Way Forward

Technology has always been a source of national power and influence in geopolitics. Today, it has become the center of gravity in strategic competition, given its scope, scale, and pervasive impact on nations and individuals alike.[429] In this regard, technology platforms – those that facilitate our digital interactions with machines, information, services, businesses, and each other – form the foundations of today's digital world, as well as connect it to the physical one. **Technology platforms are elements of power that matter strategically**. Just

426 See Rob Tows, The Geopolitics Of AI Chips Will Define The Future Of AI, Forbes (2023); Chris Miller, Chip War, Scribner at 283-94 (2022).

427 See Rebecca Sohn, AI Drug Discovery Systems Might be Repurposed to Make Chemical Weapons, Researchers Warn, Scientific American (2022).

428 Alexander Ward, et al., Shaheen to Admin: Get Me the Black Sea Strategy, Politico: National Security Daily (2023) ("At least one U.S. embassy [Embassy Conakry] already is using ChatGPT for its public diplomacy products…").

429 Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 22-23 (2022); See also Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 10-14 (2022).

as nations in prior eras competed over access to coal, steel, oil, and other resources that dictated power in the physical world, a similar competition already is underway around tech and the digital world.

We face today the *terra incognita* of a GenAI world and a global competition to chart the map of unexplored challenges and opportunities.

- For such a competition, the United States needs to develop and implement, with its allies and partners, a foreign policy approach to win the technology platforms that matter, such as advanced networks, next-generation computing, and GenAI and its applications. **We call this "Platforms Statecraft."** To do this, **the Department must modernize its tools** to meet the opportunities and challenges it will face.

- The United States also must work with its allies and partners to shape global frameworks and institutions to manage GenAI's challenges and opportunities. We will need to manage GenAI's highest consequence risks, and find a way to do so with rivals who do not share our world view. We will also need to craft mechanisms alongside like-minded allies and partners to build out a vision for how GenAI and other emerging technologies can better enable our open societies to thrive - we call this the "DemTech" agenda. **We propose two multilateral frameworks to manage both priorities, as well as a bilateral approach with the PRC** to reinforce strategic stability around the highest consequence risks.

A. Platforms Statecraft

Platforms Statecraft[430] should be built around the following elements: (1) *mission and competition*, (2) *jointness of effort*, (3) *modernization*, and (4) *sub-national diplomacy*.

430 A forthcoming, dedicated report on reforming foreign policy for technology competition will build out these recommendations in detail.

- ***Mission and Competition***. The U.S. government broadly remains structured to tackle the global counter-terrorism mission of the past 25 years. The United States needs a new mission statement to pivot U.S. foreign policy, with the Department at the lead, toward a new era of competition around technology platforms; a new "force posture" for U.S. foreign policy personnel and organizations to execute this new mission; and new or updated U.S. government and international institutions to advance a tech-focused mission.

- ***Jointness of Effort***. Stovepiping in government is not new. Nevertheless, given the interlinked nature of domestic and foreign policy, as it relates to technology, the United States should seize on a new era of competition to break down as many silos as possible to build greater unity of effort toward a new mission. In short, a "Goldwater-Nichols"[431] for foreign policy is needed to build more jointness in executing foreign policy across government agencies.

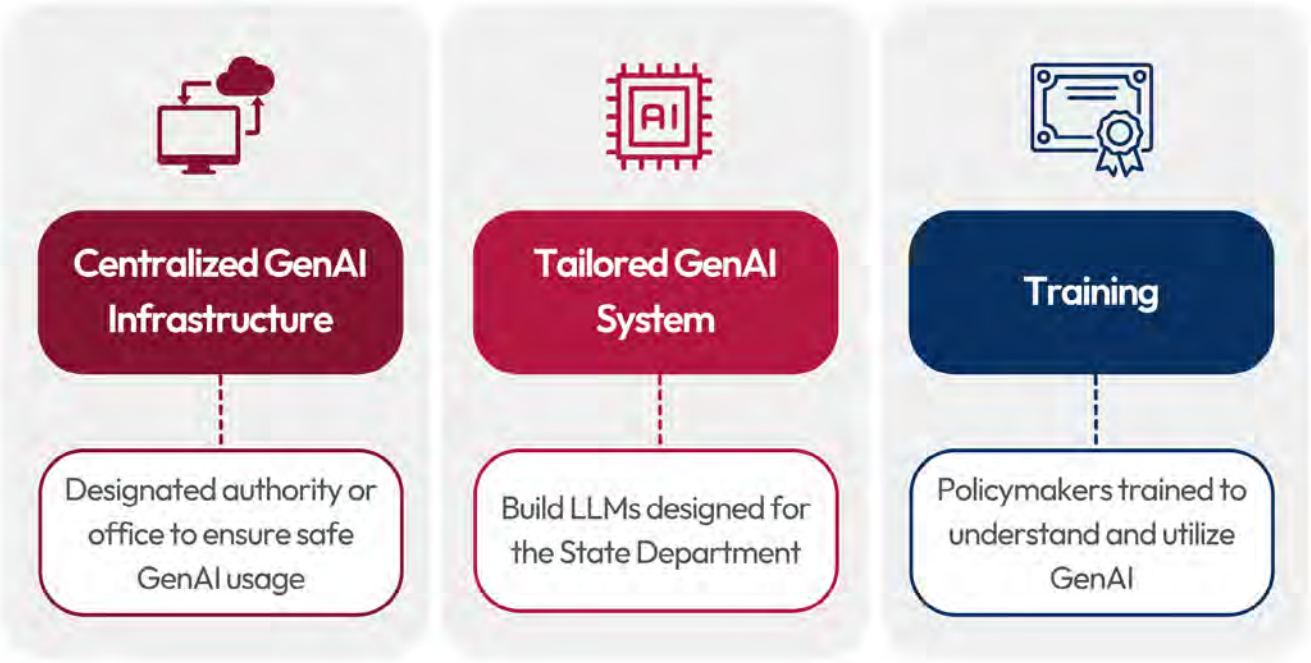
- ***Modernization***. Diplomatic tradecraft will always entail a person-to-person connection. However, the Department's foreign policy tools must keep pace with technological change, so it can bring to bear relevant technology expertise to

431 See James R. Locher III, Victory on the Potomac: The Goldwater-Nichols Act Unifies the Pentagon, Texas A&M University Press (2004).

advance American interests and relevant new tools to improve decision-making and deliver greater impact on the ground.

- ***Sub-National Diplomacy.*** If the private sector is the driver of American innovation,[432] the United States needs to build a new strategic alignment between its public and private sectors to leverage the best of both in a global technology competition. This means a more robust infrastructure of sub-national diplomacy to ensure the Department and U.S. foreign policy are tied into domestic sources of innovation, including at the state and local levels, and can work hand-in-hand with domestic policy priorities.

B. Adoption of New Tools at the Department of State



GenAI tools will transform how the Department and the United States government operates by allowing the workforce to leverage tools to do their jobs faster — just as has happened with transitions from typists, to email, to Blackberries, and to Teams. GenAI tools do not take the agency out of policy makers in decision-making, but rather provide additional, and

432 In 2018, the private sector funded 70 percent of U.S. research and development, while the federal government funded only 22 percent. See Melissa Flagg & Paul Harris, System Re-engineering: A New Policy Framework for the American R&D System in a Changed World, Center for Security and Emerging Technology at 4 (2020).

potentially novel, recommendations and solutions based on an amount of information that no one human can process as quickly as a machine.

GenAI tools...provide additional, and potentially novel, recommendations and solutions based on an amount of information that no one human can process as quickly as a machine.

The challenge with GenAI is the speed at which it is being adopted around the world — the United States government will have months, not years or decades, to adapt to the transformational capabilities these tools offer. The Department should move now to integrate GenAI to support its mission, and create channels for its workforce to help Department leadership identify tech needs that improve the efficiency and effectiveness of its work. The Department should also identify opportunities to work with allies to build out relevant joint capabilities. For instance, NATO's recently launched Defence Innovation Accelerator for the North Atlantic (DIANA) offers a platform to coordinate the development of a GenAI capability that all allies can use to advance their shared mission at NATO.

In addition to aforementioned applications, agency-wide programs to leverage GenAI that the Department can build out include:

- ***A Centralized GenAI Infrastructure***. To capitalize on GenAI's promise, the Department needs a designated departmental authority to set the direction for safe GenAI usage. This authority should have the responsibility and resources to build and maintain an enterprise-wide IT infrastructure for the diversity of GenAI needs across the Department. This authority should also serve as the Department's liaison with counterparts at other U.S. government agencies, to leverage GenAI for national security purposes.

- ***A Tailored GenAI System***. Today's leading LLMs demonstrate the potential to transform day-to-day work. The Department and other U.S. government agencies will need a system designed to handle sensitive and classified information. The Department should designate new skill codes and, as necessary, contract for the development, training, maintenance, and operation of a new GenAI system tailored to its specific needs. The system should be trained on the Department's classified

and unclassified databases holding cable traffic, internal deliberations, and policy decisions. The Department should conduct a security assessment on how and whether the system could operate on both unclassified and classified networks, or solely on a classified network.

- ***Training for Smart Employment of GenAI***. GenAI tools should help transition time- and labor-intensive data aggregation tasks to machines, freeing the workforce to prioritize mission critical tasks, such as policy development and diplomatic engagement. Training policymakers to understand how these systems work and when and where to exert human oversight over these systems' outputs will be a necessary step in adopting these systems.

C. Global Frameworks for Managing GenAI

We recommend a three-pronged approach to manage GenAI as a simultaneous geopolitical and transnational issue: (1) **A leaders-level forum** that brings together key nations to address the highest consequence risks that GenAI may pose; (2) **A leaders-level agenda item on GenAI in bilateral U.S.-PRC dialogues** to help the two nations manage associated strategic stability risks; and (3) **A working-level forum for like-minded nations** to build out the positive use cases around GenAI and to mitigate against the practical challenges.

By setting a global governance floor against misuse, governments open the space for innovation to capitalize on GenAI's wealth of opportunities.

1. Managing the Highest Consequence Risks: A Global AI Security Forum

Geopolitical competition will be a driver of escalatory GenAI risks. Nations — and affiliated non-state actors — seeking to advance their geopolitical interests may be tempted to unleash GenAI-enabled tools developed without guardrails that ensure their safe and ethical use. This heightens the chances of multiple forms of GenAI risk materializing, given the speed, scope, and scale at which potentially dangerous GenAI tools can operate, producing both intended and unintended consequences.[433]

The world requires a forum for capable actors to identify, dialogue on, and address emergent misalignment risks where evolving GenAI systems diverge from human intentions or control, leading to unintended consequences.[434] A notional example of such risks would be early warning systems picking up erroneous threat signals based on aberrant patterns. This forum should also manage heightened threats emanating from the intersection of GenAI with the chemical, biological, radiological, and nuclear (CBRN) domains as weapons of mass destruction.[435] Establishing a new forum to address these issues must not preclude discussion through existing mechanisms with U.S. allies (e.g., NATO, G7, AUKUS) on our core national security interests. Nonetheless, a new entity is required to facilitate critical conversations among a wider set of necessary stakeholders if governance efforts are to be truly feasible.

At the President's direction, the Secretary of State should lead the creation of a Global AI Security Forum (GAISF) focused on defining, placing, and ensuring guardrails around highest consequence GenAI risks.

433 See Bill Drexel & Hannah Kelley, China Is Flirting With AI Catastrophe, Foreign Affairs (2023).

434 Geopolitics is a potential key driver of risky behavior that could yield existential challenges, but it is not the only one. As the 2022-2023 release of U.S.-based LLMs illustrates, regular market pressures can push actors to run fast and push boundaries without developing corresponding guardrails or controls. See Kevin Roose, How ChatGPT Kicked Off an A.I. Arms Race, New York Times (2023). International efforts to mitigate geopolitically-driven existential risk must be paired with complementary rules/guardrails around private actors competing commercially.

435 SCSP has proposed a new Forum on AI Risk and Resilience (FAIRR) grounded in the G20 as a complementary recommendation focused on managing transnational GenAI-enhanced risks at the regulator level. Given the complexity and overlapping issues involved in GenAI governance, multiple lines of effort addressing different vantage points is a preferable option. See Gabrielle Sierra & Sebastian Mallaby, AI Meets World, Part Two, Why It Matters, Council on Foreign Relations at 18:53 (2023).

- ***Membership***: Participants should include leaders of nations and regional integration organizations with the capacity to significantly shape, determine, or use GenAI at a scope and scale that can cause or prevent a global cascading disaster. Initial members could include the United States, the PRC, the European Union, the United Kingdom, Russia, Israel, Japan, South Korea, Singapore, India, Brazil, the African Union, and the Gulf Cooperation Council.[436]

- ***Industry Engagement***: The GAISF should also engage private sector actors, given their central role in driving GenAI innovation. The GAISF should invite private sector partners to join appropriate discussions and build appropriate mechanisms — such as advisory committees or working groups — to sustain dialogue between public and private sector participants.

- ***Coordinate with Existing Regimes***: The GAISF should engage with existing international institutions with mandates to address CBRN risks, such as the International Atomic Energy Agency[437] and Organisation for the Prohibition of Chemical Weapons,[438] as well as multinational initiatives supporting applicable provisions of international law.[439]

- ***Emergent Misalignment Risks***: The GAISF should establish a stronger scientific and technical consensus as to the risks of AI systems escaping human control. An

436 Particularly, U.S.-PRC trust levels in this space are low. The PRC is as, if not more, concerned about geopolitical risk from the United States as existential GenAI risk. Dake Kang, Cooperation or Competition? China's Security Industry Sees the US, Not AI, as the Bigger Threat, Associated Press (2023). Likewise, the United States would be entering discussions cognizant of past PRC divergence from cyber/digital agreements. See U.S. Accuses China of Violating Bilateral Anti-Hacking Deal, Reuters (2018).

437 See History, International Atomic Energy Agency (last accessed 2023); Statute, International Atomic Energy Agency (last accessed 2023).

438 See Mission, Organisation for the Prohibition of Chemical Weapons (last accessed 2023).

439 In addition to formal international institutions, nations have flexible minilateral regimes to create effect, such as the Proliferation Security Initiative. The Proliferation Security Initiative, PSI (last accessed 2023). In some cases, international agreements — like the Biological and Toxin Weapons Convention — are monitored and enforced by coordinated national efforts. See Filippa Lentzos, Compliance and Enforcement in the Biological Weapons Regime, United Nations Institute for Disarmament Research at 1 (2019).

Intergovernmental Panel on AI Security (IPAIS)[440] could convene academic, civil society, and private sector experts to assess this issue.[441]

- ***Set and Adapt Expectations***: At its most ambitious, participating leaders could direct their governments to work toward creating an agreed set of governance guardrails against the highest consequence risks with GenAI. This could include mechanisms to monitor, verify, and enforce compliance in order to mitigate against or prevent these risks.[442] At a minimum, the GAISF could serve the important purpose of informing leaders about unforeseen risks of which leaders may not be aware, or exposing malign activity of irresponsible actors.

2. Incorporating GenAI as an Agenda Item in U.S.-PRC Dialogues

Responsible world leaders engage in dialogue on issues of global importance. Particularly when engaging from a position of strength,[443] leading powers recognize that dialogue can avoid precipitous slides into conflict, advance national interests, and further mutually beneficial resolutions of matters of common global concern. The United States and the PRC have a history of conducting strategic dialogues.[444] The United States also has deep experience in conducting dialogues with a geopolitical rival – the Soviet Union – that kept the peace, unlocked strategic advantages, and even found points of collaboration.[445] As the United States structures its channels of

440 The IPAIS could draw on the model of the Intergovernmental Panel on Climate Change. About the IPCC, Intergovernmental Panel on Climate Change (last accessed 2023). See also Nicolas Miailhe, Why We Need an Intergovernmental Panel for Artificial Intelligence, UN University: Our World (2019).

441 Deploying the IPCC model in a narrow lane on this subject avoids the critique that an IPCC model that restricts broad AI development and deployment until the panel renders its assessment would overly restrict humanity's ability to adopt AI tools in the near-term. See Eline Chivot, French Proposal for an "IPCC of AI" Will Only Set Back Global Cooperation on AI, Center for Data Innovation (2019).

442 Monitoring, verification, and enforcement of GenAI's risks, from practical to highest consequence, will require a new doctrinal approach to better understand the nature of real risks of harm to humans that GenAI systems can create, the cascading nature of these harms to larger human populations, the constituent capabilities that underpin GenAI systems, and how and whether these capabilities can be effectively monitored and controlled. Existing institutions such as the International Atomic Energy Agency (IAEA) offer useful, though imperfect, models for what a new institution to address GenAI risks can look like.

443 Dean Acheson, Present at the Creation, W.W. Norton at 378 (1969).

444 See U.S.-China Comprehensive Economic Dialogue, U.S. Department of the Treasury (2017); 2016 U.S.-China Strategic and Economic Dialogue, U.S. Department of State (2016).

445 See Hal Brands, The Twilight Struggle, Yale University Press at 130-150 (2022).

bilateral communication,[446] the implications of GenAI should be a priority agenda item in appropriate channels with the PRC.

As the two leading countries in frontier large language model (FLLM) capabilities, the United States and PRC have a shared interest in understanding the strategic implications of and preserving strategic stability around the highest consequence risks of this novel technology. Dialogue can range from setting expectations around GenAI's use in military settings[447] to managing these tools' societal impacts, particularly in those use cases that permeate across national borders.[448] Conversations to clarify intentions and to avoid surprise, where possible, will become increasingly important to avoid unintentional escalations.

Bilateral dialogues that include GenAI should include a track 1.5 dimension to bring U.S. and PRC companies into the discussion. As with the cyber domain, it is often private actors that possess cutting-edge capabilities in GenAI.[449] Their insights are crucial to informed, nuanced dialogue. Likewise, strategic stability discussions around GenAI will require making agreed guardrails and protocols clear to these private actors so that they do not inadvertently spur escalatory incidents.[450]

3. Building a Like-Minded Forum to Advance a New DemTech Vision

Mastering GenAI could provide a model for like-minded collaboration across several strategic "DemTech" battlegrounds.[451] The United States and its allies and partners

446 Press Release, Readout of Secretary Raimondo's Meeting with Minister of Commerce of the People's Republic of China Wang Wentao, U.S. Department of Commerce (2023); Kaanita Iyer, Blinken Says US is 'Working to Put Some Stability' into Relationship with China, CNN (2023); Keith Bradsher, 3 Takeaways From Janet Yellen's Trip to Beijing, New York Times (2023); Demetri Sevastopulo, CIA Chief Made Secret Trip to China in Bid to Thaw Relations, Financial Times (2023).

447 See Jacob Stokes, et al., U.S.-China Competition and Military AI, Center for a New American Security (2023).

448 See Paul Sampson, On Advancing Global AI Governance, Centre for International Governance Innovation (2023).

449 See Harnessing the New Geometry of Innovation, Special Competitive Studies Project at 22-29 (2022).

450 Limitations on private actors for international stability reasons could be similar to the "no hack-back" rules that the United States currently applies to private cyber actors. See James Rundle, Letting Businesses 'Hack Back' Against Hackers Is a Terrible Idea, Cyber Veterans Say, Wall Street Journal (2021).

451 SCSP has identified six technology battlegrounds that democracies must lead in to shape the future in line with the values and interests of the democratic world: (1) AI; (2) novel microelectronics and computing paradigms; (3) next-generation networks; (4) biotechnology; (5) new energy generation and storage; and (6) smart manufacturing. Mid-Decade Challenges to National Competitiveness, Special Competitive Studies Project at 170-81 (2022).

have a shared, vested interest in: (a) innovating together; (b) funding joint research and commercialization; (c) governing emerging technologies in a more aligned manner; and (d) building out technology platforms around the globe to protect and expand the DemTech ecosystem in an interconnected world. The recent G7 discussions[452] offer a launching point for the United States and a core set of partners to create a cooperative DemTech forum to commence this work, beginning with GenAI.

This forum would facilitate:

- ***Innovating Together***: The G7 nations and like-minded partners should reinforce pathways to collaborate on research and development driving cutting-edge innovation. Those opportunities should include both government-to-government partnerships[453] and support for academic/private sector cooperation, beginning with STEM-focused exchanges.

- ***Funding Paths to Commercialization***: In an international contest of technology platforms, research and development initiatives must move toward commercialization at global scale. That task demands funding projects not only in the United States, but also in allies and partners, alongside joint ventures. The Department of State should work with the Department of Commerce to convene investors from across the G7 and like-minded partner countries for opportunities to engage GenAI application developers seeking investment.

452 See Fact Sheet: The 2023 G7 Summit in Hiroshima, Japan, The White House (2023).
453 See Strengthening and Democratizing the U.S. Artificial Intelligence Innovation Ecosystem: An Implementation Plan for a National Artificial Intelligence Research Resource, National Artificial Intelligence Research Resource Task Force (2023).

- ***Aligning Governance on GenAI Uses***: The global expansion of DemTech platforms begins with harmonizing governance regimes so that GenAI models can operate in G7 and like-minded country markets in a manner consistent with democratic values and compatible with local regulatory requirements. To further this effort, the Department of State should establish a new G7 forum under the Hiroshima AI Process[454] that would:

    - Align standards and norms around data inputs in furtherance of accountability and transparency in GenAI models;

    - Develop common rules on high-consequence use cases, such as the use of GenAI tools in critical infrastructure, law enforcement, national security operations, and election integrity;[455]

    - Convene a multinational working group of experts from the G7 and like-minded countries that subscribe to the Hiroshima AI process/Data Free Flow with Trust (DFFT) framework to determine violations and consequences for violations of these shared practices;[456] and

    - Explore a minilateral monitoring and verification regime for GenAI actors' compliance with these shared practices.

- ***Building Out DemTech Platforms Globally***: The United States and its allies and partners must cooperate to promote the reach and use of technologies developed in line with democratic values to the broader world. This task entails jointly facilitating new innovation partnerships with actors in the developing world, financing local uses of GenAI and the underlying digital infrastructure, supporting foundational educational efforts, and providing capacity-building

454 G7 Hiroshima Leaders' Communiqué, The White House (2023).

455 This forum could be harmonized with the G7's Data Free Flow with Trust (DFFT) initiative, as data privacy and security are core inputs to GenAI models. Overview of DFFT, Japanese Digital Agency (last accessed 2023); G7 Digital and Tech Track Annex 1: Annex on G7 Vision for Operationalising DFFT and its Priorities, G7 (2023).

456 At best, these higher-level standards and norms may become the seed of wider global governance practices. At a minimum, these agreements can serve as mutually agreed to redlines among forum members for action against external malign actions, akin to the Tallinn Manual in cyberspace. See Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations, Cambridge University Press (2017); Michael Schmitt, Tallinn Manual 2.0 on the International Law of Cyber Operations: What It Is and Isn't, Just Security (2017).

tech and governance assistance.[457] Accordingly, the Department of State should convene other relevant U.S. government agencies, allied counterparts, and private sector partners to:

- Support foundational development activities to strengthen local GenAI capacities and digital literacy programing to help build local skills to develop and use GenAI tools;[458] and

- Support technical and regulatory assistance for Global South countries seeking to govern GenAI use cases and adopt their own models,[459] including funding South-South exchanges for more tailored lessons on governance and entrepreneurship.

The GenAI world will reinforce the importance for the United States to lead and help shape a DemTech agenda, alongside allies and partners, to advance the interests of open societies against closed authoritarian systems. The United States, with its allies and partners, will need to preserve its advantages in the global technology competition and strengthen those areas where it is falling behind. Ultimately, the United States' security and prosperity in a world defined by technological interlinkages and global impacts will depend on its ability to convince the widest range of nations to join a DemTech ecosystem grounded in respect for individual liberties, fair competition, and the rule of law.

457 Without directly comparing GenAI as a technology to the nuclear revolution, there is precedent of the United States providing technical and governance support to enable other countries to safely adapt new technologies. See Peter Lavoy, The Enduring Effects of Atoms for Peace, Arms Control Today, Arms Control Association (2003).

458 See Michael Trucano, AI and the Next Digital Divide in Education, Brookings Institution (2023).

459 One example of a program worth exploring scaling in the Global South is the German government's "FAIR Forward" initiative. See Open Data for AI, BMZ Digital.Global (last accessed 2023).

Defense Memo

MEMORANDUM FOR THE PRESIDENT OF THE UNITED STATES AND CONGRESS

CC: SECRETARY OF DEFENSE
DEPUTY SECRETARY OF DEFENSE

FROM: Special Competitive Studies Project

SUBJECT: Department of Defense Adoption of Generative Artificial Intelligence (AI)

Executive Summary

The United States has opened a critical technological advantage over the rest of the world with the recent advances in generative artificial intelligence (GenAI). This moment, which may not last, presents the Department of Defense (DoD) with a crucial opportunity to accelerate two of its most significant transformations – preparing for the future character of conflict and strengthening our military overmatch against our rivals, especially the People's Republic of China (PRC).

The United States has opened a critical technological advantage over the rest of the world with the recent advances in generative artificial intelligence.

The establishment of Task Force Lima by DoD on August 10, 2023, was a critical recognition of the importance of this moment, a strong signal that the Department intends to remain the leader of AI innovation across the U.S. government, and an important commitment that the U.S. military will remain the most innovative fighting force the world has ever known.[460]

To help the Department succeed in this endeavor, we propose four critical areas that DoD should consider prioritizing as it embarks on integrating generative AI across its activities:

460 DOD Announces Establishment of Generative AI Task Force, U.S. Department of Defense (2023).

- ***Enabling Decisional Advantage***. Presently, the most promising aspect of generative AI models is as a decision aid, or what we would term a cognitive co-pilot. The Department should identify both operation centers and weapons platforms where it can immediately and securely integrate generative AI models to enable better informed and faster decision making, including in the oversight and conduct of operations.

- ***Enhancing Operations***. The Department of Defense is already exploring the use of AI for predictive maintenance[461] and select back-office support functions. The next areas that could benefit from AI-enabled models are (1) logistics and sustainment; (2) investment and divestment decisions; (3) experimental course of action generation; and (4) global force deployment management decisions, particularly of high demand, low inventory capabilities.

- ***Developing the talent***. Much like generative AI will impact labor productivity and create new occupations in the private sector, it will most certainly affect current military occupational series and create demand for new skill sets. The Department of Defense needs to put in place policies that recruit, develop, and retain talent that can develop mission driven requirements for, evaluate, build, and – crucially - employ AI tools for military effects.

- ***Identifying new defenses***. Generative AI will most certainly accentuate threats against our nation from disinformation, in the cyber domain, and from chemical and biological agents. Rival militaries will also adopt generative AI. The Department of Defense should identify what threats can be reasonably expected to arise, and begin to plan for additional defensive measures that need to be undertaken, including to counter AI generated attacks by our adversaries.

Mindful that advances in generative AI will continue to accelerate in the near-term, and that such advances could pave the way towards artificial general intelligence (AGI) and super intelligence (SI), the Department of Defense should:

- ***Establish a Defense Experimentation Unit (DEU)***. Such a unit, which would complement either the Defense Innovation Unit (DIU) or the Chief Digital and AI Office (CDAO), would provide for much-needed operational experimentation and

461 GAO-23-105556, Military Readiness: Actions Needed to Further Implement Predictive Maintenance on Weapon Systems, U.S. Government Accountability Office (2022).

iteration with AI models across missions in order to enable their broader and faster deployment and mainstreaming across the Joint Force.

- ***Build an Automated Orchestration Platform***, a generative AI-powered interface that can call up relevant tools and datasets, is able to receive user prompts, can decompose the queries into discrete tasks, and semi-autonomously or autonomously complete tasks.

- ***Develop defense-tailored generative AI models***, trained on specific military terms and jargon, secured from revealing the data they were trained on, the impact of tuning, or the content of prompts and their outputs, inspectable and instrumented by cleared researchers, and broadly accessible to cleared personnel, including for operational purposes.

Finally, progress in generative AI will most certainly accelerate three trends in warfare – the imperative of human-machine collaboration and teaming, the criticality of software advantage, and the necessity of empowering warfighters at the edge so that they can conduct distributed, network-based operations. These three trends, as SCSP has previously argued in our proposed Offset-X competitive strategy for the Department of Defense,[462] will be among the key determining factors of U.S. military advantage, particularly vis-a-vis the PRC.

Strategic Context

Much like the commercially-driven telegraph, steam engine, and railroad changed the way wars were fought at the dawn of last century, the advances in AI, automation, and unmanned platforms are driving some of the most fundamental changes in the character of warfare in this century. Nowhere is this more visible than in Ukraine.[463] Ubiquitous sensors, big data processing, automated orchestration platforms, and drones employed at scale are dramatically compressing detection-to-destruction timelines, and in combination with a digital levee en masse are introducing new ways of warfighting.

462 The Future of Conflict and the New Requirements of Defense, Special Competitive Studies Project (2022); Offset-X: Closing the Deterrence Gap and Building the Future Joint Force, Special Competitive Studies Project (2023).

463 Shashank Joshi, The War in Ukraine Shows How Technology is Changing the Battlefield, The Economist (2023).

If these changes were to occur during peacetime or with military overmatch assured, the United States military would still take notice. But they are occurring in the midst of an intensifying geopolitical competition with an increasingly belligerent PRC and on a timeline where there is a real risk that the PRC may decide to invade Taiwan, making the changes in the character of conflict even more alarming and the need for adaptation and adoption more urgent. Moreover, China – the only nation with the intent and latent capacity to compete with the United States[464] - has already articulated a vision and is preparing for the changing character of warfare with the development of new concepts and supporting capabilities. Its military, the People's Liberation Army (PLA), is fusing mechanization, informatization, and "intelligentization"[465] into a new way of war purpose-built to overcome and leapfrog U.S. military capabilities. AI plays an essential role in the PLA's ambitions, particularly in its objective to "intelligentize" its armed forces.[466] Specifically, the PLA has set its sights on leveraging AI and big data to exploit U.S. vulnerabilities, use influence operations to prevent U.S. military leaders from understanding their environment, and employ swarm attacks to overwhelm U.S. military's defenses.[467]

While the changes in the character of conflict and China's ambitions are concerning, the recent and rapid advances in generative AI by American companies are encouraging. They have opened up a window of opportunity for the United States to re-demonstrate its innovation power, and strengthen its military might. As this moment may not last, however, the Department of Defense needs to significantly enhance the pace, scope, and cohesion of the efforts it has undertaken since 2015 to respond to both geopolitical and technological changes.[468] To be clear, generative AI is but one aspect of the enhancements; SCSP has previously provided a comprehensive blueprint – Offset-X – for a new competitive strategy that would both close any deterrence gaps in the near-term and position the United States for a competition that is likely to be enduring.[469]

464 National Security Strategy, The White House at 8 (2022).
465 Military and Security Developments Involving the People's Republic of China, U.S. Department of Defense (2022).
466 Xie Kai, et al., A Perspective on the Evolution of the Winning Mechanism of Intelligent Warfare, China Military Network - PLA Daily (2022).
467 Koichiro Takagi, The Future of China's Cognitive Warfare: Lessons from the War in Ukraine, War on the Rocks (2022).
468 Gian Gentile, et al., A History of the Third Offset, 2014-2018, RAND Corporation at 42-45 (2021).
469 The Future of Conflict and the New Requirements of Defense, Special Competitive Studies Project (2022); Offset-X: Closing the Deterrence Gap and Building the Future Joint Force, Special Competitive Studies Project (2023).

Defense Applications of Generative AI

...generative AI holds the promise of delivering in the near-term a significant information advantage for the U.S. military.

Even in its current nascent stage, generative AI is already powerful enough to help military personnel access faster and more data and tools; generate text and initial recommendations for memos, plans, orders, and information campaigns; and prepare elements of planning for legal and operational review. As generative AI models become increasingly sophisticated, they will further help synthesize and display data from different datasets and multiple modalities. Finely-tuned models, such as foundation models for multimodal geospatial intelligence,[470] could deliver advanced battlespace awareness, including visualizations of the battlespace and provide commanders with a detailed and updated common operational picture. Generative AI could also conduct real-time fusion, correlation, and pattern analysis of massive volumes of data and adaptively orchestrate novel attacks or defenses with minimal human intervention. In short, generative AI holds the promise of delivering in the near-term a significant information advantage for the U.S. military.

But the potential is much broader. With the Department of Defense having now stood up Task Force Lima to explore and integrate generative AI more broadly across DoD, there are at least four critical areas that are ripe for transformation.

1. ***Enabling Decisional Advantage***. Presently, the most promising aspect of generative AI models is as a decision aid, or what we would term a cognitive co-pilot. Current models help – imperfectly to be sure – synthetize and summarize large volumes of information, answer broad and specific questions, compose initial takes, and provide recommendations. These are all inputs that can augment human cognition and enable better informed and faster decision making, as well as creative and unexpected courses of action. Additionally, there are three specific mission areas that current AI models can significantly enhance. The first of these is with indications and warning (I&W) which is customarily the mission of the Directorate of Intelligence

470 Gengchen Mai, et al., Towards a Foundation Model for Geospatial Artificial Intelligence (Vision Paper), SIGSPATIAL (2023).

(J2).[471] AI models are particularly effective at performing pattern analysis across vast volumes of data in order to flag anomalies. While current models are still descriptive and not predictive, identifying deviations can still greatly assist human analysts. Second, generative AI models could prove useful tools in operation centers, such as the National Military Command Center at the Pentagon, or in the Combined Air Operations Center in Qatar. Layered on appropriate data sources and streams of information, AI models can help with alerting, planning, monitoring, or simply answering questions. Lastly, further refined AI models could help improve the operational survivability of platforms and our personnel operating them. They can inform human operators in planning infiltration and exfiltration routes, and assist in pre-empting detection, discovery, and destruction – an increasingly challenging task.

> …additional missions could benefit from AI models…logistics and sustainment planning… budget planning and auditing…resource allocation decisions… generating initial courses of action… global force deployment management decisions.

2. ***Enhancing Operations***. The Department of Defense is already exploring the use of AI for predictive maintenance and select back-office support functions.[472] However, additional missions could benefit from AI models. One mission is logistics and sustainment planning. Given the complexity of logistics planning and the reliance on private carriers, AI models can aid in breaking down the various tasks, help formulate or create parallel plans, and assist in anticipating sustainment demands. Additional DoD functions that would benefit from AI models are Comptroller in budget planning and auditing, and Cost Assessment and Program Evaluation office in resource allocation decisions. Generative AI models can also help with generating initial courses of action, not just for military operations, but also for policy actions and campaigning options. The current models may not come up with new and original recommendations, but — at a minimum — they can help planners and action officers capture a broader menu of possible options. Finally, they can help senior leaders with

471 J2 Joint Staff Intelligence, U.S. Joint Chiefs of Staff (last accessed 2023).
472 GAO-23-105556, Military Readiness: Actions Needed to Further Implement Predictive Maintenance on Weapon Systems, U.S. Government Accountability Office (2022).

global force deployment management decisions, weighing the potential impact of deploying high value force packages to global hot spots, and adjudicating competing demands among regional commands that invariably exceed available forces, while avoiding burning down force readiness with low consequence deployments.

3. ***Developing the talent***. Much like generative AI will impact labor productivity and create new occupations in the private sector, it will also affect current military occupational series and create demand for new skill sets. The Department of Defense needs to focus on developing talent that can generate requirements for, and evaluate, build, and – crucially - employ AI tools for military effects. The U.S. military needs to ensure that it has the ability to responsibly deploy and employ generative AI-enabled technologies, including for military operations. This means it must connect the operators with the engineers in order to develop and field effective AI tools. The most important step is for each of the military services to establish AI and software development career fields for commissioned officers and enlisted personnel. The military already has hundreds of personnel able to develop or deploy generative AI and other software.[473] The establishment of dedicated career fields for these personnel will make it far easier for the military to recruit, retain, train these personnel so that they can develop new tools, in partnership with industry where appropriate.[474] Just as importantly, they are needed to help tactical leaders responsibly and effectively employ generative AI-enabled systems during military operations, and to understand how to best counter and defeat adversary AI-enabled systems.[475] The military services should also include effective human-machine interaction, including prompt engineering and other methods for interacting with large language models,

Much like generative AI will impact labor productivity and create new occupations in the private sector, it will also affect current military occupational series and create demand for new skill sets.

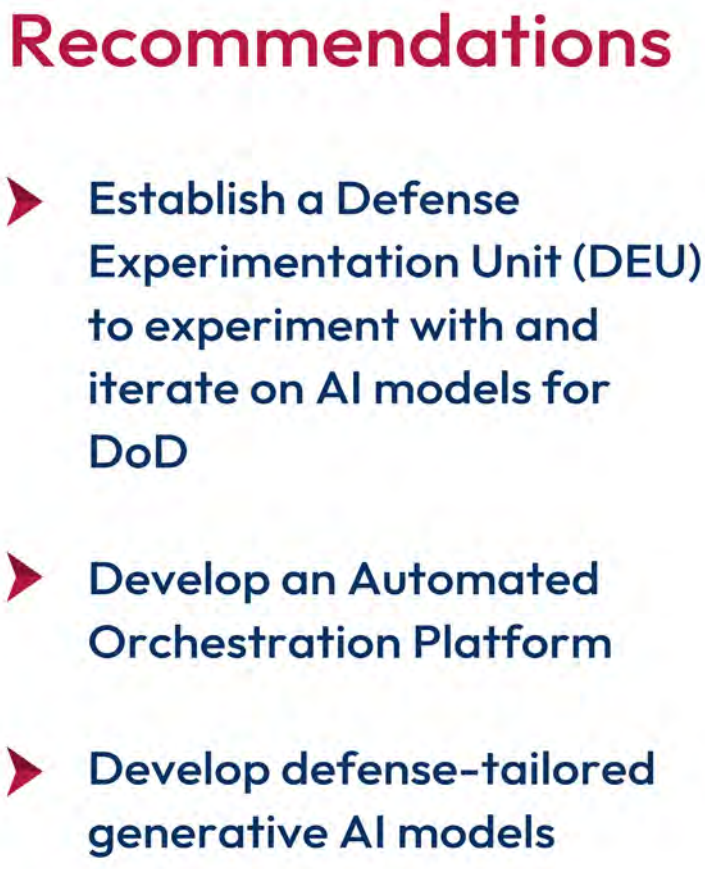
473 Interviews with DoD personnel responsible for the development of technology solutions.
474 Final Report, National Security Commission on Artificial Intelligence at 373-374 (2021).
475 Interim Report, National Security Commission on Artificial Intelligence at 61-65 (2019).

as a basic task for all military personnel.[476] Human-machine interaction has already become a necessary skill, and will only become more necessary as human-machine collaboration and human-machine teaming come to play a more central role in U.S. military operations.

4. ***Identifying new defensive areas***. Generative AI will most certainly accentuate threats against our nation from disinformation, in the cyber domain, and from chemical and biological agents. These threats will also specifically target our military personnel and operations. Therefore, DoD should identify what additional threats and vectors of attack can be reasonably expected to arise, and begin to plan for additional defensive measures that need to be undertaken. These measures need to account for not only AI generated attacks by our adversaries, but also for attacks by our adversaries against our AI-enabled systems.

Concrete Steps

We are still in the early stages of generative AI development. The technology's capabilities, limitations, and sources are rapidly changing, and will continue to evolve, potentially in areas that we cannot yet predict. Therefore, it is important to urgently position the DoD to both capitalize on today's early use cases and prepare for increasingly powerful and sophisticated models, including artificial general intelligence and



476 SCSP and the National Security Commission on AI have recommended including problem curation, the AI lifecycle, data collection and management, probabilistic reasoning and data visualization, and data-informed decision-making as core tasks for effective human-machine interaction. This recommendation would add prompt engineering to this list based on recent trends in generative AI.

superintelligence. A dedicated and adaptable approach to quickly fielding generative AI-enabled capabilities is vital.

In order to enable progress in the four areas outlined in this memo, the Department of Defense should also urgently pursue three concrete steps:

1. ***Establish a Defense Experimentation Unit (DEU) to experiment with and iterate on AI models for DoD***. DEU's mission would be to advance the use of generative AI and other key technologies in the DoD through an iterative and continuous process of experimentation, learning, and development. To accomplish this, the DEU would build a "sandbox environment" for generative AI experimentation and concept development that is accessible DoD-wide; develop new generative AI capabilities for use in the sandbox environment; emphasize partnerships with front-line units, field-to-learn processes, rapid iteration, and concept exploration; and establish feedback mechanisms to quickly and consistently share lessons learned from experiments to the entire DoD. DEU could augment or partner with the Defense Innovation Unit to identify and acquire new capabilities, or augment and leverage the infrastructure and standards established by the CDAO.

2. ***Develop an Automated Orchestration Platform***. This platform would be a generative AI-powered interface that would serve as an intermediary between users and the vast suites of tools and databases available in many military environments. The platform would receive user prompts, decompose the queries into discrete tasks, and assist users in executing them by calling up relevant tools and datasets, and semi-autonomously or autonomously complete tasks. This process greatly reduces the time and enterprise knowledge needed to interact with large or complicated datasets, accelerating both decision-making and operations. The DoD should partner with industry to develop a generative AI-enabled orchestration platform and an accompanying suite of tools, with the intent to further develop and update this platform as increasingly powerful generative AI models continue to be developed, either by industry or the government.

3. ***Develop defense-tailored generative AI models***. While it would be difficult for the U.S. government to develop a leading edge foundation model, it is possible for DoD to acquire or develop models based on the technology previously developed

by OpenAI, Google, Anthropic, or Meta. This would allow DoD to spend far fewer resources, while still reaping many of the benefits of generative AI. A defense-tailored model would allow the military to fine-tune and prompt the model without exporting information to an uncleared commercial model. Once developed, the model could be used for experimentation or operational employment, and could facilitate the development of an automated orchestration platform.

Recommendations for DoD

	Responsible Agency	Resources	Timeline
Defense Experimentation Unit (DEU)	Office of the Deputy Secretary of Defense	$20 million annually	January 1, 2024
Automated Orchestration Platform	Chief Data and Artificial Intelligence Officer (CDAO)	$30 million	September 30, 2024
Defense-tailored Generative AI Models	Chief Data and Artificial Intelligence Officer (CDAO)	Hardware and Personnel	September 30, 2024

An Important Consideration

The rapid pace of generative AI development will most certainly exacerbate the challenge of maintaining interoperability and interchangeability between the U.S. military and its allies. Variations in access to and levels of trust in generative AI models across allies will lead to barriers to coalition-wide implementation of generative AI in military systems and operations.[477] The Department of Defense should start working immediately with our allies to coordinate the pursuit of generative AI models, or to begin offering U.S. models to allies that cannot otherwise access them. In the process, the DoD and allies need to establish international standards to ensure the collective security and integrity of generative AI

477 Final Report, National Security Commission on Artificial Intelligence at 82 (2021).

models, and coordinate technology solutions to address the risk of compromise.[478] At a fundamental level, the DoD also needs to work with its counterparts and political leaders in NATO and other alliances to address public distrust to the employment of generative AI by engaging in public education and discourse on the uses of generative AI in defense.

478 Final Report, National Security Commission on Artificial Intelligence at 560 (2021).

Intelligence Memo

MEMORANDUM TO THE PRESIDENT OF THE UNITED STATES AND CONGRESS

CC: DIRECTOR OF NATIONAL INTELLIGENCE
DIRECTOR, CENTRAL INTELLIGENCE AGENCY

FROM: Special Competitive Studies Project

SUBJECT: Implications of Generative Artificial Intelligence for the U.S. Intelligence Community

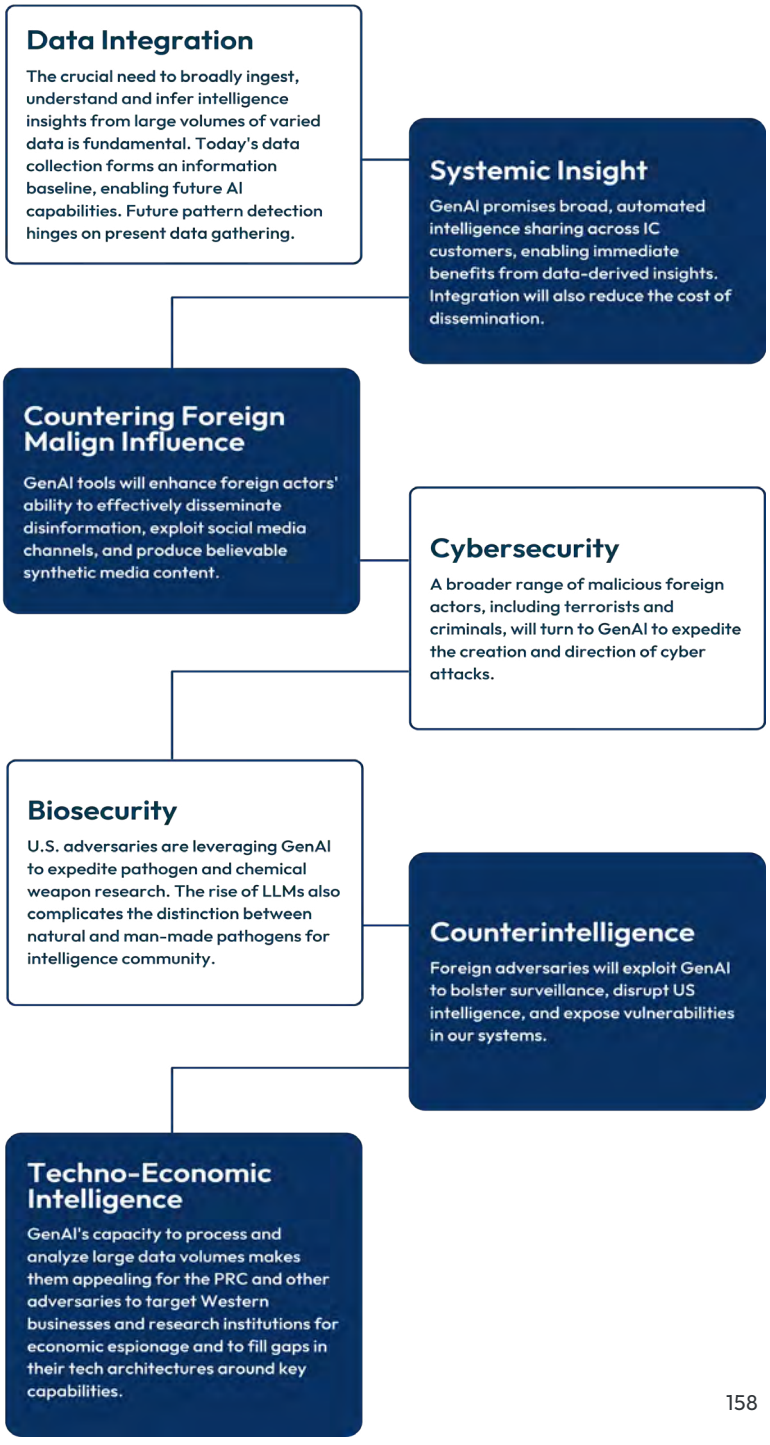
Recent advances in artificial intelligence (AI) have made it clear we are on the threshold of the next era of intelligence, one that will be defined by how well intelligence services leverage AI tools to collect, sift, and analyze global data flows to generate insight and deliver effects. The U.S. Intelligence Community (IC) should take immediate action to leverage these emerging capabilities to protect the nation and maintain our competitive advantage over the People's Republic of China (PRC). The IC has traditionally been at the cutting edge of adopting emerging technology. However, unlike earlier technological leaps that were mostly additive in nature, generative AI (GenAI) will not only transform how intelligence work is done but also enable intelligence services to accomplish far more than they can today.

The IC has already taken advantage of earlier forms of AI and is using machine learning (ML) and natural language processing (NLP) tools to help it manage the exponential increase in data that has overwhelmed collectors and analysts in recent years.[479] GenAI will have an even broader impact. As Large Language Models (LLMs) – multi-modal models that can generate images, video, and sound, and other forms of GenAI become more numerous,

479 Since the 1980s, US intelligence has recognized AI's potential for efficient data management. However, experiences with AI have been inconsistent and modest at best, delivering modest successes in speech-to-text and speaker recognition technologies. Still, the ambition to apply AI to routine tasks or vital applications across the IC has been constrained by compliance concerns and the technology's nascent stage. See more at 1983 AI Symposium Summary Report, CIA Records Search Tool (1983); Community Sponsored Plan for Artificial Intelligence, CIA Records Search Tool (1983); AI Symposium, CIA Records Search Tool (1983); Philip K. Eckman to John McMahon, Appreciation for Participation in AI Symposium, CIA Records Search Tool (1983); AI Steering Group: Meeting 4 Minutes, CIA Records Search Tool (1983); Proposal to Expand the Current APARS System, CIA Records Search Tool (1986); Philip K. Eckman to John McMahon, Intelligence Community Efforts Companion to Darpa Strategic Computing Program, CIA Records Search Tool (1984).

Where the Impact of Generative AI Will Be Most Visible

We envision GenAI will have an immediate and pronounced impact on the following mission areas:



faster, more accurate, and more capable – IC agencies will come under strong pressure to adapt their approaches to every portion of the intelligence cycle, from planning and collection to analysis and dissemination.

Without question, the spread of GenAI will further complicate the IC's already complex mission. For our adversaries, GenAI will provide them new avenues to penetrate its defenses, spread disinformation, and undermine the IC's ability to accurately perceive their intentions and capabilities. More broadly, GenAI will further democratize intelligence capabilities, enabling more actors to swim in the ocean of global data in pursuit of their own goals. Just as the IC tracks foreign leaders and institutions, intelligence services will eventually need to plan and account for AI-enabled machines acting as semi-independent actors, directing operations and making decisions, both for our adversaries and allies.

The effects of GenAI will not stop there. As AI tools become more prevalent and mature, they will put additional strain on several long-held IC practices and cultural norms, such as the relative importance of classified over unclassified data sources, legal restrictions against the use of data sources that might contain privacy and

proprietary information, and what it means for something to be "secret" or "clandestine" in a global, hyper-connected, digital datasphere. Relying on unique, sensitive, and often expensive sources and methods to uncover secrets will no doubt remain a core component of what the IC does in the future. But the utility of traditional intelligence collection will increasingly be measured against what can be obtained from publicly and commercially available sources that are processed and analyzed by AI acting in partnership with humans.

Despite these challenges, developing an AI action plan for the IC deserves leadership's urgent attention for two reasons. For one, the speed with which generative AI is evolving is staggering. OpenAI released the first version of ChatGPT in November 2022; it released GPT-4 in March 2023, and newer versions with much greater capability are due by the end of 2023.[480] In a clear indication that the global race is on to master this new domain, private industry has already responded by directing over $14.43 billion toward generative AI tools in 2023 compared to $1.57 in 2020.[481] Economists at Goldman Sachs estimate that two-thirds of jobs that now exist will be changed by AI in some manner.[482] Even more concerning is the prospect of autocratic nations gaining a technological lead that would be extraordinarily difficult for the United States to match, let alone surpass.[483] This could leave the country vulnerable to losing the tech competition with the PRC, and eventually relegate U.S. intelligence services to obsolescence as they will not be equipped to handle the data environment of the future.

Visualizing the Potential

With the appropriate governance controls in place and support from sufficient infrastructure, the rewards for moving quickly to embrace the potential of GenAI are numerous. Fully deployed LLMs would enhance the IC's performance in every stage of the intelligence cycle and enable it to cover more issues, and at greater depth.

With the appropriate governance controls in place and support from sufficient infrastructure, the rewards for moving quickly to embrace the potential of GenAI are numerous.

480 Introducing ChatGPT, OpenAI (2022); GPT-4 Technical Report, OpenAI (2023).
481 VC investment funding to U.S.-based generative AI companies between Jan 1, 2020 and July 12, 2023, SCSP Analysis via Pitchbook (July 2023).
482 Generative AI Could Raise Global GDP by 7%, Goldman Sachs (2023).
483 Final Report, National Security Commission on Artificial Intelligence at 7 (2021).

	Tasks	New Capabilities Enabled by GenAI
Collection Tasks	**Planning**	• Create and disseminate updated and validated tasking requirements to appropriate collectors, identifying and elucidating opportunities for prioritization and deconfliction. • Continuously refine collection requirements based on new analytical findings and policymaker requests. • Provide collectors with rapid, integrated feedback on reporting from assets and sources for validation purposes and to spot potential CI threats.
	Targeting & Exploitation	• Simulate 'what-if' scenarios to reveal novel collection vectors and devise effective tactics. • Automate comprehensive patterns-of-life analyses, identifying anomalies and assessing potential risks presented by evolving threats. • Fuse intelligence from multiple INTs for joint target insights. • Identify and analyze anomalies in large multi-domain datasets.
	Counterintelligence & Security	• Leverage AI for continuous encryption and decryption of intercepted signals. • Embed threat intelligence into workflows, proactively blocking malicious entities. • Map adversaries ubiquitous technical surveillance networks. • Monitor employees and contractors to detect unauthorized or potential insider threats.
	Reports & Production	• Taking intelligence outputs and making them rapidly available to their intended audience, either as a direct intelligence product or as a resource for AI-powered queryable technologies, such as heads-up displays (HUDs). • Identify and label manipulated and synthetic content across various formats (e.g., text, images, videos, audios) to ensure data authenticity.

	Tasks	New Capabilities Enabled by GenAI
Analytic Tasks	**Scanning, Monitor & Query Data**	• Automate alerts for new key data. • Revise draft assessments dynamically based on new reports. • Enrich datasets using AI-generated synthetic data. • Fuse various types of information (text, image, audio) to efficiently and effectively "connect dots." • Triage information flow, prioritizing the most relevant, authoritative sources. • Identify and label manipulated and synthetic content. • Leverage inductive dependency parsing to understand public opinion and potential societal shifts.
	Bolstering Analytic Rigor	• Simulate causality between data points or events. • Create simulations for preparedness and outcome prediction. • Use past data to forecast future trends and threats.
	Building Substantive & Tradecraft Expertise	• Rapidly ingest past production for periodic Analytic Line Reviews. • Maintain a Library of Past Production and outside readings for tacit knowledge transfer on analytic accounts. • Apply structured analytic techniques to data. • Formulate key intelligence questions from data and feedback. • Ideate hypotheses based on data and new requirements. • Assess performance and tradecraft skills.
	Producing Analytic Assessments & Supporting Customers	• Produce first drafts of written assessments. • Flag upcoming meetings, visits, and requests by U.S. officials. • Automate responses to basic policymaker inquiries. • Monitor and evaluate analytic input from liaison partners.

More fundamentally, the advent of GenAI offers the opportunity to galvanize the IC to embrace the broader cultural changes necessary to ensure its success in the digital era. Dubbed by some as the "revolution in intelligence affairs,"[484] these cultural shifts include a willingness to use AI and other autonomous systems to process huge volumes of data, reconsideration of the bureaucratic stovepipes separating the different INTs and stages of the traditional intelligence cycle, a greater openness toward the private sector (especially the sources of cutting-edge technology), and even a reconsideration of what constitutes "secret" information.

More fundamentally, the advent of GenAI offers the opportunity to galvanize the Intelligence Community to embrace the broader cultural changes necessary to ensure its success in the digital era.

At the heart of this transformation should be open source intelligence (OSINT).[485] Unlocking the power of OSINT should up-end traditional models for intelligence collection and analysis that focused almost exclusively on the IC's unique, exquisite, and highly-classified intelligence sources and methods. Unlocking secrets will always be an important IC task, but what will matter more in a future high-speed, data-driven tech competition with the PRC will be speed-to-insight, using the best sources available including those that are not traditionally viewed as "intelligence" sources.. Most of those sources will be openly or commercially available, and the new AI tools to exploit this data will already be trained on much of it. The IC should emphasize greater use of OSINT, making it the INT of first recourse rather than the last. Deploying GenAI tools would enable the IC to do this at speed and at scale, comparatively cheaper, and at lower risk to sensitive sources. Adopting this mindset would put the IC in a better position to keep pace with what industry vendors and academic institutions will be providing U.S. policymakers, and allow it to husband its resources and fragile sensitive capabilities and target them against only the most difficult of targets.

484 Anthony Vinci, The Coming Revolution in Intelligence Affairs: How Artificial Intelligence and Autonomous Systems Will Transform Espionage, Foreign Affairs (2020); The Revolution in Intelligence Affairs: Future Strategic Environment, The National Academy of Sciences (2021); Anthony Vinci & Robert Cardillo, AI, Autonomous Systems and Espionage: The Coming Revolution in Intelligence Affairs, Center for Security and Emerging Technology (2021).

485 The Office of the Director of National Intelligence defines open source intelligence (OSINT) as "intelligence produced from publicly available information that is collected, exploited, and disseminated in a timely manner to an appropriate audience for the purpose of addressing a specific intelligence requirement." See more at U.S. National Intelligence: An Overview 2011, Office of the Director of National Intelligence at 54 (2011).

AI and Disinformation: A Critical Near-Term Challenge

Generative AI will magnify the threat of disinformation and foreign malign influence. As more foreign adversaries, criminal groups, and online trolls lay their hands on GenAI capabilities, they will be able to create disinformation in greater volumes, cheaper, at greater speed, and they will be able to deliver their message payloads with greater precision and with more stealth than ever before. The democratization of these tools will further lower the barrier to entry for malign actors and will enable them to generate deepfake images, synthetic audio, and text that is nearly indistinguishable from other content.

The pro-Chinese Communist Party (CCP) influence operation "Spamouflage" illustrates the new danger. First identified in 2019,[486] "Spamouflage" has progressively incorporated AI, starting with AI-generated fake avatars in 2020.[487] This year US industry revealed that the group was promulgating fully-synthetic videos that contained fake content. The "Spamouflage" operators embedded AI-generated video clips of fictitious news anchors from the fictitious "Wolf News" into their network that appeared incredibly life-like and initially fooled experts before deeper technical analysis revealed them as fakes. In the videos, the voiceovers promoted ideas in line with CCP interests, such as accusing "the U.S. government of attempting to tackle gun violence through 'hypocritical repetition of empty rhetoric'" and stressing "the importance of China-U.S. cooperation for the recovery of the global economy."[488] While none of the videos received more than 300 views[489] between November 2022 and their exposure in February 2023,[490] they were the first incident of wholly AI-generated videos (as opposed to AI edited). In August 2023, Meta announced its largest takedown to date of the same Spamouflage network with 7,704 Facebook accounts, 954 Pages, 15 Groups and 15 Instagram accounts.[491]

The IC should devote more resources and attention toward revealing and understanding foreign malign influence operations that use GenAI tools and provide U.S. law enforcement, homeland defense organizations, and election security officials with more timely and actionable Indications & Warnings (I&W) intelligence support. GenAI will

486 Ben Nimmo, et al., Cross-Platform Spam Network Targeted Hong Kong Protests: "Spamouflage Dragon" Used Hijacked and Fake Accounts to Amplify Video Content, Graphika (2019).
487 Ben Nimmo, et al., Spamouflage Goes to America: Pro-Chinese Inauthentic Network Debuts English-Language Video, Graphika (2020).
488 Deepfake It Till You Make It: Pro-Chinese Actors Promote AI-Generated Video Footage of Fictitious People in Online Influence Operation, Graphika (2023).
489 Deepfake It Till You Make It: Pro-Chinese Actors Promote AI-Generated Video Footage of Fictitious People in Online Influence Operation, Graphika (2023).
490 Incident 486: AI Video-Making Tool Abused to Deploy Pro-China News on Social Media, AI Incident Database (2023).
491 Ben Nimmo, et al., Second Quarter Adversarial Threat Report, Meta at 12 (2023).

also provide new opportunities to mitigate disinformation threats. Newly-developed AI classifiers[492] and detection algorithms could help the IC identify synthetic media. Similar to the work being done by entities abroad, the IC could employ various AI models to run similarity analysis across suspected disinformation to identify narratives and cross-reference them with known, or suspected, troll activity.[493] Alongside the use of GenAI, existing efforts inside and outside the U.S. government to mark synthetic data via digital watermarking,[494] content provenance,[495] and blockchain immutable ledgers[496] could further enhance IC capabilities. Natural Language Processing technologies also present the opportunity to automatically run sentiment analysis at speed across the worlds' media outlets and social media platforms to quickly identify trends in malign influence campaigns and assess their impact on foreign opinion.

Actions the IC Should Be Taking Now

To fully capitalize on GenAI's potential, the IC must quickly move beyond experimentation and limited pilot programs to begin deploying GenAI tools at scale. Speed is essential. IC agencies should make it a priority to incorporate and begin using enterprise-level generative AI tools within the next two years. This is an ambitious goal, but it is achievable and essential if the IC is to stay relevant. It will require the IC – with the support of the White House and Congress – to make some critical decisions about how the IC will utilize GenAI, particularly whether to build its own in-house models or leverage commercially-

To fully capitalize on GenAI's potential, the IC must quickly move beyond experimentation and limited pilot programs to begin deploying GenAI tools at scale. Speed is essential.

492 Steven T. Smith, et al., Automatic Detection of Influential Actors in Disinformation Networks, PNAS (2021).

493 For example, Taiwan AI Labs uses a series of AI technologies to identify, analyze, and summarize suspected disinformation. See Infodemic: Taiwan Disinformation Understanding for Pandemic, Taiwan AI Labs (last accessed 2023).

494 Watermarking tools may include attaching green tokens to text outputs of LLMs, hiding an image or marker inside another image, or embedding identification tones within audio. See generally, John Kirchenbauer, et al., A Watermark for Large Language Models, arXiv (2023); Eric Hal Schwartz, Resemble AI Creates Synthetic Audio Watermark to Tag Deepfake Speech, voicebot.ai (2023).

495 Content provenance verifies the source and version history of a given piece of media. The Coalition for Content Provenance and Authenticity's (C2PA's) technical specification is a leading example from industry. See Pawel Korus & Nasir Memon, Content Authentication for Neural Imaging Pipelines: End-to-end Optimization of Photo Provenance in Complex Distribution Channels, arXiv (2019); C2PA Technical Specification, Coalition for Content Provenance and Authenticity (last accessed 2023).

496 What is Blockchain Technology?, IBM (last accessed 2023).

developed models, the extent to which it builds unified or federated GenAI systems across the Intelligence Community, and what standard will govern the IC's use of AI. While all these issues are important to getting AI right across the IC, it will take time and further experience working with GenAI to resolve them. This should not stand in the way of the IC making progress now toward implementation.

To ensure alignment across the IC, the DNI should insist that IC agencies adhere to four critical principles regarding AI implementation:

1. ***Begin Using GenAI Tools Immediately.*** Because GenAI will have such a profound impact on how IC professionals will go about their work, it is vital that the IC begins to make broader use of these tools immediately so that it can train its workforce and begin to create the infrastructure and policies it will need to employ LLMs safely and effectively. In part to help the Office of the Director of National Intelligence (ODNI) respond to Congressional requirements for updates, ODNI should require IC agencies participate in a new IC-wide AI Governance Committee (see below) and demonstrate how they are contributing to or using IC-wide GenAI architectures, and/or developing their own enterprise solutions.

2. ***Focus on Being an "Agile Adopter."*** IC agencies are being pressed to choose between two extreme approaches when thinking about how to deploy LLMs and multi-modal models: 1) opt to do very little in-house development and instead rely on commercially-provided models for limited purposes, or 2) invest large sums of money to build state-of-the-art models at IC owned-and-operated facilities that utilize OSINT in addition to IC data holdings and seek to match the latest generations of commercial systems. However, there is a more balanced alternative. The IC should partner with a leading foundation model provider to acquire their LLM. Then, modify it to incorporate IC-owned datasets and unique terminology, or pair it with a smaller, IC-developed model. Given that many of the 'largest' LLMs do not disclose their training datasets, the IC should advance efforts by the General Services Administration (GSA)[497] to establish independent standards or rating systems for evaluating the datasets used in training (as described in the text box below). This strategy would offer an effective method for assessing the resulting model's efficacy, promoting greater transparency and trust in the application of these models.
3. ***Tackle Privacy Concerns Up Front.*** By their nature, LLMs – particularly so-called frontier models – include anonymized data from across the Internet, to include data on U.S. persons, for training purposes. ODNI should work on getting IC agencies the necessary authorization to make use of LLMs that include personal identifiable information (PII). This may require exemptions to existing PII restrictions,[498] or it may require creative partnership with another agency – such as the GSA – that is authorized to manage LLMs[499] on behalf of the U.S. government. Left unresolved, IC agencies are likely to take a varied approach, with some embracing LLMs and others severely restricting their use. In addition, this will open opportunities for adversaries to "poison" LLMs with privacy or protected intellectual property data to prevent IC use.

497 Security Policy for Generative Artificial Intelligence (AI) Large Language Models (LLMs), General Services Administration (2023).

498 The use of personally identifiable information (PII) by the Intelligence Community (IC) must adhere to the Privacy Act of 1974 (5 U.S.C. § 552a) and additional, disparate restrictions. Governing documents also include Executive Order 12333 (1981, 2003, 2004, 2008), and Intelligence Community Directive 503 (2008, 2015) by the Office of the Director of National Intelligence. See more at 5 U.S.C. § 552a, Privacy Act of 1974; Executive Order 12333—United States Intelligence Activities, U.S. Federal Register (1981, 2003, 2004, 2008); Intelligence Community Directive 503: Intelligence Community Information Technology Systems Security Risk Management, Certification and Accreditation, Office of the Director of National Intelligence (2008, 2015).

499 The General Services Administration issued an instructional letter (IL) to provide an interim policy for controlled access to generative AI large language models (LLMs) from the GSA network and government furnished equipment (GFE). The rule is valid until June 30, 2024. See more at Security Policy for Generative Artificial Intelligence (AI) Large Language Models (LLMs), General Services Administration (2023).

4. ***Insist on IC-Wide AI Solutions Wherever Possible.*** The IC will need to strike the right balance between fostering a climate of innovation to encourage AI development across the 18 agencies and establishing coordinated approaches to achieve economies of scale. AI expertise varies across the Intelligence Community and there will be a tendency for agencies to protect their unique datasets and capabilities. Left unaddressed, this could result in a proliferation of small LLMs that individually and collectively will pale in comparison to what will be used by the PRC or that will be commercially available. And the IC would achieve none of the economies of scale or uniform governance standards possible. ODNI's just-published 2023-25 Data Strategy should serve as the model for aligning IC agencies on AI strategy.[500] ODNI should use its budget authority to insist that the major IC players – CIA, NSA, NGA, and DIA – cooperate to acquire near-cutting-edge LLMs from the private sector to train on their data holdings, and it should exercise its convening authority to bring the Intelligence Community together to set standards for AI use. As the IC's LLM capabilities mature, there ought to be flexibility for some agencies to tailor their stand-alone, smaller models for specific purposes aimed at protecting sensitive sources and methods. As long as such models are the exception, not the rule, then they will add to AI's impact without inhibiting overall IC performance.

500 The IC Data Driven Future: Unlocking Mission Value and Insight, Office of the Director for National Intelligence (2023).

Desirable Characteristics for IC Large Language Models

As IC agencies consider which LLMs to license, test, build, or deploy, they should require them to fulfill at least the following criteria:

- Accessible to cleared researchers, analysts, and operators for inspection and instrumentation throughout the model development and deployment lifecycle.
- Able to ingest structured and unstructured live data from various IC elements, irrespective of location (e.g., multi-cloud, hybrid, prem), modality (e.g., text, image, audio, video), or classification level (e.g., unclassified, confidential, secret, top-secret).
- Secured from revealing sensitive information, including classified data, tradecraft methods, and the content of prompts and outputs.
- Minimize the risk of being trained on sensitive data, especially proprietary[501] or privacy information.[502]
- Adheres to analytic and operational standards, generating accurate and relevant insights with sources that are credible and verifiable, with minimal hallucinations.

With these broad goals in mind, we recommend that the DNI ***appoint a senior IC lead for AI implementation***. That officer should report directly to the DNI, have the appropriate expertise and skills to lead the IC's AI efforts, and be given authority over agencies' AI budgets and implementation. The AI Lead should convene a panel of AI program managers, IT security experts, and acquisition officials from across the Intelligence Community to begin making decisions on LLM acquisition, governance, and use. This ***IC Committee on AI Deployment and Use*** should be the body that advises the DNI on which direction to take on matters pertaining to creating common IC architectures (datasets and AI algorithms), security and counterintelligence requirements, setting standards for analysts, collectors, and others to use AI tools, and establishing guardrails for the protection of privacy information and intellectual property. The AI Committee should be appropriately resourced and empowered to complete the following tasks within six months:

501 Laura Dobberstein, Samsung Reportedly Leaked Its Own Secrets through ChatGPT, Situation Publishing (2023).

502 Nicholas Carlini, et al., Extracting Training Data from Large Language Models, arXiv (2021); Nicholas Carlini, Privacy Considerations in Large Language Models, Google Research Blog (2020); Matt Burgess, ChatGPT Has a Big Privacy Problem, Wired (2023); GPT-4 Technical Report, OpenAI at 53 (2023).

- ***Publish DNI Guidance on the Use of AI Across the IC***. The Committee should produce an Intelligence Community Directive (ICD) by March 1, 2024, that defines and establishes the parameters that will govern the IC's use of LLMs and other AI tools.[503] Among other objectives, the new ICD should define acceptable IC uses for generative ICD tools and provide exemptions for using private data on U.S. citizens, consistent with the guidelines established by ODNI's Chief for Civil Liberties, Privacy, and Transparency.[504]

- ***Identify Steps to Remove the Obstacles to Faster Acquisition and Deployment of LLMs***. Leveraging GenAI necessitates faster technology acquisition and absorption. ODNI should exercise its full authority to shorten procurement timelines for critical emergency technologies related to LLMs. This includes finding ways to move faster in the context of the federal government's annual budget and appropriations cycle. The IC, for example, could do so by encouraging IC element Directors, Deputy Directors, and Senior Acquisition Executives (SAE) to use Other Transaction Authority (OTA) and Commercial Solutions Opening (CSO) authorities to pursue non-standard procurement and innovative commercial capabilities or technological advances at fixed price contracts of up to $100 million, respectively.[505] To facilitate the adoption of AI technologies, ODNI should require greater transparency across elements to understand the GenAI technology acquisition environment. The status of various efforts could be consolidated into a single platform, allowing the DNI and agency leaders to identify opportunities for collaboration and places where they should amend IC acquisition authorities to increase the speed of technology adoption.

ODNI should exercise its full authority to shorten procurement timelines for critical emergency technologies related to LLMs.

503 ODNI's Office of Augmented Intelligence Mission (AIM) would be the most logical entity to act as the executive secretariat for the Committee.

504 The ethics principles and the ethics framework are meant to guide the implementation of AI solutions in the IC. See more at Principles of Artificial Intelligence Ethics for the Intelligence Community, Office of the Director of National Intelligence (2020); Artificial Intelligence Ethics Framework for the Intelligence Community, Office of the Director of National Intelligence (2020).

505 Corin R. Stone, The Integration of Artificial Intelligence in the Intelligence Community: Necessary Steps to Scale Efforts and Speed Progress, Digital Commons @ American University Washington College of Law at 18-21 (2021).

- ***Establish Analytic Tradecraft Standards for the Use of Generative AI for Finished Intelligence***. The recommended IC Committee on AI Deployment and Use, in coordination with the National Intelligence Board that includes the heads of analysis from each IC agency, should articulate common standards and concepts to measure the efficacy of novel analyses produced by humans in collaboration with generative models. The Committee's findings should be integrated into strategic planning and budget documents, and incorporated into existing analytic tradecraft standards, including ICD 203.[506] Meanwhile, the DNI should incentivize analytic units across the IC to experiment with LLMs by directing relevant IC leaders to: 1) deploy OSINT-trained LLMs to analysts' computers, 2) work with the Office of Human Capital and the IC Training Council to update intelligence training to prepare all personnel for continuous machine collaboration in their careers, and 3) grant National Intelligence Program (NIP) Managers and Military Intelligence Program (MIP) Component Managers the freedom and resources necessary to accelerate HMT at the analyst level.

- ***Design AI Capabilities with Allies From the Start***. The Committee should plan now on how the IC will enable and empower friendly liaison services to also leverage GenAI capabilities to prevail in a long-term techno-economic contest with the PRC. Many U.S. partners such as the United Kingdom,[507] Israel,[508] the United Arab Emirates,[509] and Japan,[510] are already fostering private sector development and government use of AI-enabled tools; others are farther behind. In concert with the DNI, the Directors of CIA, NSA, and DIA should convene a consortium of AI-proficient allied states to share best practices and establish common use guidelines and principles. This consortium should broaden AI-related technical collaboration to develop shared tools. It could also be undertaken within the AUKUS Pillar II framework and ongoing

506 IC Directive 203: Analytic Standards, Office of the Director of National Intelligence at 1 (2015).
507 Industrial Strategy Building a Britain Fit for the Future, UK Secretary of State for Business, Energy and Industrial Strategy (2017); Regulatory Sandbox Final Report: Onfido Limited (Onfido), Information Commissioner's Office (2020).
508 Yaniv Kubovich, Israeli Air Force Gets New Spy Plane, Considered the Most Advanced of Its Kind, Haaretz (2021); Anna Ahronheim, Israel's Operation Against Hamas was the World's First AI War, The Jerusalem Post Customer Service Center (2021).
509 UAE National Strategy for Artificial Intelligence 2031, Government of the United Arab Emirates (2017); UAE Council for Artificial Intelligence and Blockchain, Government of the United Arab Emirates (2021); The Artificial Intelligence Program, Government of the United Arab Emirates (2020).
510 New Robot Strategy, Japanese Ministry of Economy, Trade and Industry, Headquarters for Japan's Economic Revitalization (2015); Impacts and risks of AI networking issues for the realization of Wisdom Network Society, (WINS), Japanese Ministry of Internal Affairs and Communications, Telecommunications Research Laboratory (2016); Fumio Shimpo, Japan's Role in Establishing Standards for Artificial Intelligence Development, Carnegie Endowment for International Peace (2017); Kosuke Takahashi, Japan to Outfit Kawasaki P-1 MPAs with AI Technology, Jane's 360 (2019).

AUKUS Artificial Intelligence and Autonomy working group.[511] Other possibilities include forums like the Quadrilateral Security Dialogue's Critical and Emerging Technology Working Group.[512] Because the United States is a leader in AI, such an approach would position America to help set standards for global intelligence services' use of GenAI that ensure U.S. citizens' privacy and U.S. industries' interests are better protected.

Longer-Term Efforts

These measures are the minimum necessary to start making progress toward deploying LLMs and stay ahead of the PRC, but they will not be enough to sustain the IC's leadership. Additional reforms to the IC's approach to workforce recruitment and development and how it leverages open source intelligence will be necessary to maintain the intelligence advantage in AI. Specifically, the IC should focus on:

Increasing Collection and Analysis on Foreign AI Capabilities. It is essential that the IC provide U.S. policymakers with accurate information and analysis on how foreign adversaries and competitors - particularly the PRC - are progressing in their development and deployment of GenAI tools, and how they intend to use them against us. The DNI should task collectors to devote more resources to obtaining non-public insights into foreign AI plans, and this may require a tighter lashup between HUMINT and technical collection experts and the IC's analytic experts on AI to better refine the IC's targeting. The DNI also should task the National Intelligence Council (NIC) to assemble a network of IC all-source analytic experts to assess foreign development and use of LLMs and other GenAI tools. IC analysts should regularly evaluate foreign GenAI models and their potential utility for disinformation, weapons development, counterintelligence, and other harmful uses. The NIC should organize a cross-IC Red Team to also consider how the PRC or other adversaries would seek to forestall, or undermine, the U.S. government's use of LLMs and to augment their ability to conduct cyberattacks against our infrastructure

The DNI should task collectors to devote more resources to obtaining non-public insights into foreign AI plans...

511 AUKUS Fact Sheet, The White House (2022).
512 Quad Critical and Emerging Technology Working Group, Australia's Department of Foreign Affairs and Trade (2021); Husanjot Chahal, et al., Quad AI: Assessing AI-related Collaboration between the United States, Australia, India, and Japan, Center for Security and Emerging Technology (2022).

and ramp up their disinformation operations targeting U.S. citizens. The NIC AI Red Team should present its findings to the White House and Congressional oversight committees by January 1, 2024.

Building an AI-Ready IC Workforce. The key to harnessing GenAI's potential for securing an intelligence edge resides in the IC's people — from the developer to the end-user. The IC cannot afford to "buy" external expertise. To stay abreast of the fast-paced advancements in GenAI and related technologies, the IC must attract the right talent while also sharpening the digital acumen of its existing cadre of intelligence professionals. The DNI should delegate the ADNI/IC Human Capital to undertake three key measures:

1. *Establish a universal "AI technical competence" standard for intelligence elements*. These should incorporate new and existing AI skills defined by the Office of Personnel Management (OPM).[513] The DNI should also update and harmonize directives[514] with workforce strategies and existing technology-centric talent exchange programs such as the IC's Intelligence Learning Network,[515] Civilian Joint Duty Program,[516] and the Public-Private Talent Exchange.[517]

2. *Build official career tracks for GenAI tech talent across the IC*. In coordination with the OPM and the Office of Science and Technology Policy (OSTP), the IC should develop one or more occupational series, associated policies, and official position titles related to GenAI and digital career fields.[518] Descriptive parenthetical titles should be introduced to accurately identify IC software professionals in the short-term.[519] This immediate step will assist IC talent management strategies for attracting and retaining GenAI tech talent.

513 Kiran A. Ahuja, Memorandum For Chief Human Capital Officers, Office of Personnel Management (2023).
514 ICD 651, Performance Management for the Intelligence Community Civilian Workforce, Office of the Director for National Intelligence (2017); ICD 656, Performance Management System Requirements for IC Senior Civilians Officers, Office of the Director for National Intelligence (2012).
515 Public Law No: 108-458, Intelligence Reform and Terrorism Prevention Act of 2004 § 1041(C).
516 ICD 660, IC Civilian Joint Duty Program, Office of the Director for National Intelligence (2013); ICD 651, Performance Management System Requirements for the IC Civilian Workforce, Office of the Director for National Intelligence (2012); IC Standard (ICS) 660-02, Standard Civilian Joint Duty Application Procedures, Office of the Director for National Intelligence (2018).
517 ICPM 2022-600-02, Intelligence Community Public-Private Talent Exchange, Office of the Director for National Intelligence (2022).
518 5 U.S.C. § 5105(a)(2), Introduction to the Position Classification Standards, (2009).
519 5 U.S.C. § 5105, Introduction to the Position Classification Standards, at 14 (2009).

3. *Revamp analytic incentives*. The rise of GenAI will transform how analysts go about their work. New tools will enable analysts to contend with the mountains of data available, but human experts will need to adjust their approach and learn to partner with machines to be successful. Rather than spending their time painstakingly searching through reports to find relevant data, analysts increasingly will oversee AI Agents — autonomous software skilled at web navigation, information validation and disinformation detection, and keeping track of ever-evolving customer requirements - to discover new information and discern when the data support alerting customers to potentially valuable new insights.[520] This will require a different, more proactive mindset to manage these networks of virtual AI Agents on the one hand, and an increased willingness to trust in what these Agents are saying is new, important, or otherwise relevant to policy consumers.[521] To ease this shift, the IC must revamp its training initiatives, equipping analysts with the essential skills and tools to handle GenAI-centric tasks, including guiding AI Agents towards making better discoveries..

> The rise of GenAI will transform how analysts go about their work.

4. *Leverage American expertise in GenAI as a national resource for IC competitive advantage*. The IC should encourage technical experts leaving the IC to join the National Intelligence Reserve Corp (NIRC),[522] while simultaneously establishing new volunteer avenues for private sector technology specialists to become part of the NIRC, effectively serving as a "digital reserve force."[523]

Reinvigorating the Open Source Mission. To get the best use out of LLMs, particularly foundation models that are trained on vast amounts of OSINT data, the IC needs to dramatically increase its access and use of OSINT of all kinds, including commercially

520 For more on AI Agents and similar systems, see Kyle A. Kilian, et al., Examining the Differential Risk from High-Level Artificial Intelligence and the Question of Control, Futures (2023).

521 A Decadal Survey of the Social and Behavioral Sciences: A Research Agenda for Advancing Intelligence Analysis, National Academies of Sciences, Engineering, and Medicine at 6, 189–238, 312–315 (2019); Nick Hare & Peter Coghill, The Future of the Intelligence Analysis Task, Intelligence and National Security at 858–870 (2016); Efren R. Torres-Baches & Daniela Baches-Torres, Through the Cloak and Dagger Crystal Ball: Emerging Changes that will Drive Intelligence Analysis in the Next Decade, Journal of Mediterranean and Balkan Intelligence at 161- 186 (2017).

522 Established under the Intelligence Reform and Terrorism Prevention Act of 2004. ICPM 2006-600-1 - National Intelligence Reserve Corps, Office of the Director for National Intelligence (2006).

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To get the best use out of LLMs, particularly foundation models that are trained on vast amounts of OSINT data, the IC needs to dramatically increase its access and use of OSINT of all kinds, including commercially available information.

available information. As a first step, ODNI should empower the new position of OSINT Executive to harmonize the use of OSINT across the enterprise and to identify successful programs and advocate for them to receive greater resources. But this step alone is unlikely to overcome IC agencies' reluctance to make OSINT a priority or deliver the variety or quality of OSINT information required. ODNI should also begin exploring alternative solutions, including the possible creation of a new Open Source Agency (either within the IC or outside of it) or creating a new public-private partnership with industry to gain greater access to the private sector's growing capabilities.

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