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IT IS TIME TO MOVE BEYOND THE 'AI RACE' NARRATIVE: WHY INVESTMENT AND INTERNATIONAL COOPERATION MUST WIN THE DAY

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Cover Page Footnote

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**Director, Program on Data Management and Information Governance, Ostrom Workshop; Associate Professor Business Law and Ethics, Kelley School of Business, Indiana University. The views and opinions expressed herein are those of the author.

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IT IS TIME TO MOVE BEYOND THE ‘AI RACE’ NARRATIVE: WHY INVESTMENT AND INTERNATIONAL COOPERATION MUST WIN THE DAY

Kimberly A. Houser and Anjanette H. Raymond***

ABSTRACT—The United States has entered into technology races before, often with great success, for example, the moon landing. Yet, most of these successes were accomplished with local knowledge, even if the impact was global. Fifth Generation Cellular Wireless (5G), the Internet of Things (IoT), and Artificial Intelligence (AI) are simply incapable of being fully cultivated in the same local environment; thus, we must understand these technologies within the context of a global community. However, current U.S. policy and the absence of cooperation amongst countries are leaving the technology ecosystem to operate in a competitive, war-like environment. 5G, IoT, and AI—as part of a highly connected digital community—demand we consider each within a critical infrastructure framework, focusing on its place in a global environment. To accomplish this, we must think in cooperative mindsets, with a focus of investment, frameworks, and communities of trust, which create and progress ideas for the betterment of mankind.

This paper seeks to explore how the current AI race paradigm must be discarded and the necessary changes needed to create a framework to advance the responsible development of AI. Focusing on the immediate and long term needs of the technology ecosystem, with an emphasis on cooperation in investment and standards, the paper will explain the importance of 5G and AI in the context of global communications; will then explain why coordinated investment and standards are necessary; will return the focus to ethical considerations with global communities as key

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stakeholders; and will finally set out a brief series of recommendations for immediate and long term investment and guidelines.

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I. THE IMPORTANCE OF EMBRACING A TECHNOLOGY ECOSYSTEM

According to Klaus Schwab, founder of the World Economic Forum held each year in Davos, Switzerland, and the author of *The Fourth Industrial Revolution*.

Simply put, the Fourth Industrial Revolution refers to how technologies like artificial intelligence, autonomous vehicles and the internet of things are merging with humans’ physical lives. Think of voice-activated assistants, facial ID recognition or digital health-care sensors.¹

The first revolution utilized steam power, the second electrical power, and the third digital power. These advances quickly changed society to allow mass production, mass technological development, and mass communication and processing.² The fourth revolution is different from the previous three in that it will impact all disciplines, economies, and industries.³ As governments have come to realize the potential of this nascent technology, each has taken a different path in an effort to achieve supremacy in this field. This paper will examine how the difference in law and policy will affect the future of Artificial Intelligence (AI) development and why the U.S., EU, and China are wrangling over Fifth Generation Cellular Wireless (5G) technology.

¹ Elizabeth Schulze, *Everything You Need to Know About the Fourth Industrial Revolution*, CNBC (Jan. 22, 2019, 3:39 PM), <https://www.cnn.com/2019/01/16/fourth-industrial-revolution-explained-davos-2019.html> [<https://perma.cc/AJZ8-H583>] (referring to a speech made by Klaus Schwab at the World Economic Forum Annual Meeting in 2019).

² *Id.* The fourth revolution is just beginning. AI is still in the very early stages, which means it can still be shaped and guided.

³ See KLAUS SCHWAB, *THE FOURTH INDUSTRIAL REVOLUTION* 1–3 (1st ed. 2017).

The potential uses for AI are enormous, for both commercial and social good; however, the lack of a coordinated strategy and funding as well as the dearth of technical expertise in the U.S. government is already harming this field.⁴ While conflicting reports indicate that the U.S. is winning the AI race one day with the EU⁵ or China the next,⁶ the future of AI depends on cooperation, infrastructure, and uniform standards.⁷ The major players in AI are the U.S., the EU, and China, who have begun to disengage from one another due to a variety of factors. This split jeopardizes progress in all regions but will have the ultimate effect of reducing the U.S.'s position as a global tech innovation leader, which will have long term effects in the rest of the world.⁸

The reason for the notable advances in AI stem from the recent availability of big data and cloud computing. Because previously large data sets could not be processed on a single server, and so very few companies owned servers large enough to perform big data analytics (think Watson), progress occurred in fits and starts. As new technologies are developed and implemented, data transfer and processing speeds will be increased⁹ and latency will be decreased,¹⁰ resulting in an exponential increase in AI capability. As such, the future of AI, especially the Internet of Things (IoT), relies on the development and implementation of ancillary technologies such as 5G telecommunications networks.¹¹ IoT is the connection of devices, such as self-driving cars, that communicate over such networks. Unfortunately,

⁴ See *AI Policy – United States*, FUTURE OF LIFE INST., <https://futureoflife.org/ai-policy-united-states/> [https://perma.cc/U4SA-PPXT].

⁵ Daniel Castro et al., *Who Is Winning the AI Race: China, the EU or the United States?*, CTR. FOR DATA INNOVATION (Aug. 19, 2019), <https://www.datainnovation.org/2019/08/who-is-winning-the-ai-race-china-the-eu-or-the-united-states/> [https://perma.cc/4LD4-6BBZ].

⁶ Heather Long, *In Davos, U.S. Executives Warn that China Is Winning the AI Race*, WASH. POST (Jan. 23, 2019, 8:28 AM), <https://www.washingtonpost.com/business/2019/01/23/davos-us-executives-warn-that-china-is-winning-ai-race/> [https://perma.cc/YE4V-BSQR].

⁷ See *infra* Part III.

⁸ The Editorial Board, *US-China Trade War Risks Global Technology Split*, FIN. TIMES: THE FT VIEW (June 12, 2019), <https://www.ft.com/content/0e6c322e-8c4e-11e9-a1c1-51bf8f989972> [https://perma.cc/VSF4-3L5U].

⁹ See, e.g., RMIT Univ., *New Technology to Allow 100-Times-Faster Internet*, EUREKALERT! (Oct. 24, 2018), https://www.eurekaalert.org/pub_releases/2018-10/ru-ntt102318.php [https://perma.cc/63G2-P2LL] (discussing improvements to speed that can be made with orbital angular momentum and quantum computing).

¹⁰ Latency is the time delay between the input and output of a system (time between when the instruction is given and the transfer of data occurs). Tim Hwang, *Computational Power and the Social Impact of Artificial Intelligence* 9 (Mar. 23, 2018) (unpublished manuscript) (SSRN), <https://ssrn.com/abstract=3147971> [https://perma.cc/KZ3U-JD8K].

¹¹ See generally Rizwan Ahmed et al., *Comprehensive Survey of Key Technologies Enabling 5G-IoT*, 2D INT'L CONF. ON ADVANCED COMPUTING AND SOFTWARE ENG'G, Apr. 11, 2019, at 488, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3351007# [https://perma.cc/M4KQ-RCA3].

the U.S. failure of policy with respect to 5G technology will force it to take a back seat to China and the EU, who will be instrumental in setting standards for this required infrastructure and potentially building this infrastructure in the rest of the world.¹²

Although the U.S. has superiority in the type of chips needed for 5G, China and the EU produce most of the networking equipment necessary for its installation.¹³ As part of China's long term plan for becoming a world leader in technological innovation, it has created an environment supportive of industries underlying this goal, such as its 5G network manufacturers.¹⁴ In addition to a failure to support the telecommunications industry, the U.S. has further hindered the future of 5G with the initiation of a trade war preventing needed components for this infrastructure to be sourced from China. American companies are also harmed by the inability to sell their chips to banned entities in China due to recent U.S. restrictions on trade.¹⁵ The EU is also in an unfortunate position due to the U.S.'s warning that if the EU employs Chinese components in its infrastructure, it will withhold intelligence from these countries. This lack of cooperation is a relatively new event that has not been fully explored with respect to AI.

Because of the uncertainty surrounding how and if technology may be shared, the U.S., the EU, and China are all moving forward independently with their AI plans, preventing agreement on standards for equipment and processes.¹⁶ This move away from cooperation has the potential to not only

¹² Components for 4G telecommunications equipment made by European manufacturers are not interchangeable with those made in China. Should 5G be created on different sets of standards, depending on where the components originate, countries will need to choose whether to go with European, American, or Chinese manufacturers. Kimberly A. Houser, *The Innovation Winter Is Coming: How the U.S.-China Trade War Endangers the World*, 57 SAN DIEGO L. REV., 549, 608 (2020).

¹³ See Thomas Duesterberg, *Problems and Prospects for 5G Deployment in the United States*, FORBES (Apr. 30, 2019, 4:22 PM), <https://www.forbes.com/sites/thomasduesterberg/2019/04/30/problems-and-prospects-for-5g-deployment-in-the-united-states/#22098ca2312e> [https://perma.cc/8NKW-WL2H]. China currently relies on computer chips made with advanced U.S. technology, but new U.S. government restrictions have forced it to seek to reduce this dependence by partnering with chip makers closer to home.

¹⁴ See GREGORY C. ALLEN, CTR. FOR A NEW AM. SEC., UNDERSTANDING CHINA'S AI STRATEGY: CLUES TO CHINESE STRATEGIC THINKING ON ARTIFICIAL INTELLIGENCE AND NATIONAL SECURITY 12 (2019), <https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNAS-Understanding-Chinas-AI-Strategy-Gregory-C.-Allen-FINAL-2.15.19.pdf> [https://perma.cc/R23V-HNSS].

¹⁵ Don Clark, *Trade War Has Damaged U.S. Chip Industry in Ways a Deal May Never Fix*, N.Y. TIMES (June 27, 2019), <https://www.nytimes.com/2019/06/27/technology/trade-war-chipmakers.html> [https://perma.cc/BES7-MJ3H].

¹⁶ Darrell M. West & John R. Allen, *How Artificial Intelligence Is Transforming the World*, BROOKINGS (Apr. 24, 2018), <https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/> [https://perma.cc/2R93-GXXE] ("According to a McKinsey Global Institute study, nations that promote open data sources and data sharing are the ones most likely to see AI

delay advances in AI that would benefit society, but may actually encourage uses that are incompatible with a free and safe world.¹⁷ While the EU is actively seeking to establish ground rules, the U.S. and China are each seeking to assert dominance over the other. Despite the potential societal and commercial benefits that AI can bring, scholars have noted the dangers that could occur without appropriate safeguards for society. Racing to win will circumvent these needed considerations.

II. COORDINATED INVESTMENT AND REGULATION ARE NECESSARY

The U.S., the EU, and China have significantly differing legal systems, especially in terms of privacy and data security regulations. Behind these legal systems are divergent ideologies. While the U.S. has a more open society, the EU carefully guards personal information. In China, there is culturally a lower expectation of privacy. In addition, governments and private industry are seeking to move AI forward, some in concert and others at odds. The governments in each of these regions have set forth plans on the future of AI, but they are taking widely divergent avenues. In addition, each region has its own advantage in terms of talent, technology, funding, and hardware; but they are no longer working together, which will affect the building of the infrastructure needed for widespread adoption of AI, especially IoTs.

As such, this Part will explore the need to regulate both AI and IoT within a cooperative framework, with enhanced investment as a necessary element of the cooperative technology ecosystem.

A. Regulation of AI/IoT Is Essential

Despite the widespread knowledge that data is essential to the advancement and improvement of artificial intelligence, few countries, outside of the EU, actively regulate data with an eye toward its use. Instead, a hodgepodge of regulation, uncoordinated and unimaginative, drive data regulation into the realm of privacy-focused, limited-protection, siloed regulation.

advances. . . . The key to getting the most out of AI is having a 'data-friendly ecosystem with unified standards and cross-platform sharing.'").

¹⁷ See, e.g., Steven Feldstein, *Artificial Intelligence and Digital Repression: Global Challenges to Governance 1* (Apr. 18, 2019) (unpublished conference paper), <https://ssrn.com/abstract=3374575> [<https://perma.cc/5V52-QCDL>] ("To counter the spread of high-tech repression abroad, as well as potential abuses at home, policy makers in democratic states must think seriously about how to mitigate harms and to shape better practices.").

This Subsection will focus on the various data protection laws that are in existence, or that are significantly lacking, and the impact upon the other world actors.

1. Data Is the Fuel that Makes AI Possible

Data is the fuel on which AI runs. There are two aspects to data use for AI. The first is the amount of data available. The second is the legal structure around the use of data for AI. With 1.418 billion people, China has the distinct advantage of access to the largest data sets in the world.¹⁸ The EU's population is 446 million, while the U.S. population sits at 328 million.¹⁹ Developments in image recognition, voice recognition, self-driving cars, and predictive analytics would not be possible without access to big data²⁰ and the computer power to analyze the data.²¹ However, each of these three blocks addresses the use of data very differently. In the U.S., data protection laws are very narrow and out of date, which gives its private industry an advantage with much looser restrictions on how it can use this data.²² The EU's regulatory focus is on AI's impact on human rights. Its stringent data protection laws have stifled the growth of its tech industry due to these constraints.²³ However, it provides the most privacy and data security protections to its citizens. Because of its population size, China has access to the largest data sets and, due to firewall-type restrictions, has for the most part been able to keep the U.S. and EU from gaining access to this data.²⁴

¹⁸ *China Population*, WORLDOMETER, <http://www.worldometers.info/world-population/china-population/> [https://perma.cc/DW58-U3J3].

¹⁹ *Living in the EU*, EUROPA, https://europa.eu/european-union/about-eu/figures/living_en [https://perma.cc/YMQ6-SAHE].

²⁰ This data comes from your online interactions, filling out forms, conducting searches, sending emails, purchasing from online stores, and the location data from your mobile device. Many electronic devices connected to the Internet that make your life easier are collecting your data. Bernard Marr, *How Much Data Do We Create Every Day? The Mind-Blowing Stats Everyone Should Read*, FORBES (May 21, 2018, 12:42 AM), <https://www.forbes.com/sites/bernardmarr/2018/05/21/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/#559b8ddb60ba> [https://perma.cc/F9UV-67BQ].

²¹ See Ashmeet Kaur Duggal & Meenu Dave, *Improving File Accessing Efficiency and Cloud Storage Performance - A Review*, 3D INT'L CONF. ON INTERNET OF THINGS AND CONNECTED TECHS., Apr. 27, 2018, at 578, <https://ssrn.com/abstract=3170184> [https://perma.cc/3L95-JKZD]. Advancements in the ability of chips to store and process data relies on the ability to cram more data into smaller components. The next advance, due to the Internet, is the ability to store and process data offsite, known as cloud storage, where users can access their data through the Internet. Cloud storage allows individuals and companies to store their data in a warehouse full of servers rather than on one's own servers or computers.

²² See *infra* Section II.A.1.a.

²³ See *infra* Section II.A.1.b.

²⁴ See Wei Chun Chew, *How It Works: Great Firewall of China*, MEDIUM (May 1, 2018), <https://medium.com/@chewweichun/how-it-works-great-firewall-of-china-c0ef16454475> [https://perma.cc/W56R-U58V].

While China has created innovation-inducing governmental policies and has few restrictions on the government's use of data, private industry is somewhat hampered by governmental control over its use of data and the trajectory of the development of AI.²⁵ In terms of actual data sets, the U.S. may have the advantage with self-driving car training sets due to the availability of labeled roads and maps, but China leads with medical data sets because of the looser restrictions on the use of health data there.²⁶

In addition to China's population size, its population's adoption of mobile electronic devices is far superior to that in the U.S. or the EU.²⁷ The reliance of the Chinese on their cell phones is a treasure trove for data collection (location, camera images, and payment activities). Because data collection and surveillance are socially acceptable in China, billions of data points can be publicly collected, which has given China an advantage in advancing AI facial and speech recognition.²⁸ In the U.S., surveillance is kept secret and the public seems mostly unaware of the government's data collection activities.²⁹ While most attention is focused on private corporations, such as Facebook's data collection and processing activities, most in the U.S. ignore the government's activities in this regard as well as its close relationship with Palantir.³⁰ In the EU, surveillance varies widely,

²⁵ See *infra* Section II.A.1.c.

²⁶ See Phred Dvorak, *Which Country Is Winning the AI Race—the U.S. or China?*, WALL ST. J. (Nov. 12, 2018, 11:15 AM), <https://www.wsj.com/articles/which-country-is-winning-the-ai-racethe-u-s-or-china-1542039357> [<https://perma.cc/93BR-EJ5Q>].

²⁷ See Bill Snyder, *Who Is Winning the Artificial Intelligence Race?*, STAN. ENG'G (Jan. 7, 2019), <https://engineering.stanford.edu/magazine/article/who-winning-artificial-intelligence-race> [<https://perma.cc/TKC7-M3E9>].

²⁸ See Sarah O'Meara, *Will China Lead the World in AI by 2030?*, NATURE (Aug. 21, 2019), <https://www.nature.com/articles/d41586-019-02360-7> [<https://perma.cc/AYA2-B42H>].

²⁹ See David Carroll, *China Embraces Its Surveillance State. The US Pretends It Doesn't Have One*, QUARTZ (July 23, 2019), <https://qz.com/1670686/the-us-has-a-lot-in-common-with-chinas-surveillance-state/> [<https://perma.cc/UU4Q-ZEZ4>]. The EU has expressed concern with U.S. intelligence surveillance. In July 2019, the European Court of Justice considered whether the U.S. could be considered lacking in adequate privacy protections as required by the GDPR. The court previously struck down the Safe Harbor agreement which permitted data transfers between the U.S. and EU due to Snowden's disclosure of mass government surveillance by the U.S. See Kimberly A. Houser & W. Gregory Voss, *The European Commission on the Privacy Shield: All Bark and No Bite?*, U. ILL. J.L. TECH. & POL'Y: TIMELY TECH (Dec. 20, 2018), <http://illinoisjltip.com/timelytech/the-european-commission-on-the-privacy-shield-all-bark-and-no-bite/> [<https://perma.cc/PX5L-ZFZP>].

³⁰ Palantir has contracts worth over \$1.5 billion with the U.S. government. Palantir conducts data mining and analysis for the Department of Homeland Security, the Federal Bureau of Investigation, Immigration and Customs Enforcement (ICE), and the Internal Revenue Service. Palantir's work with ICE has been labeled "militarized spyware." See MIJENTE, *THE WAR AGAINST IMMIGRANTS: TRUMP'S TECH TOOLS POWERED BY PALANTIR 4* (2019), https://mijente.net/wp-content/uploads/2019/08/Mijente-The-War-Against-Immigrants_-Trumps-Tech-Tools-Powered-by-Palantir_.pdf [<https://perma.cc/RHU3-C54D>]; see also Michael Tennant, *IRS Becoming Big Brother with \$99-Million Supercomputer*, NEW AM. (Jan. 22, 2019), <https://www.thenewamerican.com/usnews/politics/item/31263-irs-becoming-big->

with the UK utilizing CCTV on just about every street corner,³¹ and Germany having extreme restrictions on data collection.³² Although the EU notes that any type of surveillance impacts important human rights, such as those to privacy and data protection, it also acknowledges the need for such activities for national safety.³³

The basis of many countries' data protection regimes stems from the "Fair Information Practices" incorporated by the Organization of Economic Cooperation and Development (OECD) in 1980 into the *Guidelines on the Protection and Transborder Flow of Personal Data* (the "Guidelines").³⁴ Although the U.S. and the EU are both part of the OECD, China is not a member, but it has had a working relationship with the OECD since 1995.³⁵ In terms of the development of privacy law, many countries in Europe closely tracked the Guidelines in their own regulations, but privacy laws were harmonized for the EU with Directive 95/46/EC in 1995, which was replaced by the General Data Protection Regulation (GDPR) in 2018.³⁶ The U.S. on the other hand, although initially a leader in privacy protections in the 1980s, has failed to update its data privacy and security regulations.³⁷

brother-with-99-million-supercomputer [<https://perma.cc/M5R4-SLPN>]; Kimberly A. Houser & Debra Sanders, *The Use of Big Data Analytics by the IRS: Efficient Solutions or the End of Privacy as We Know It?*, 19 VAND. J. ENT. & TECH. L. 817 (2017).

³¹ Jess Young, *A History of CCTV Surveillance in Britain*, SWNS (Jan. 22, 2018), <https://stories.swns.com/news/history-cctv-surveillance-britain-93449/> [<https://perma.cc/52FR-B5KL>].

³² According to the GDPR, in the EU, personal data includes any data that identifies or could identify a person. For example, images obtained through video surveillance would qualify as personal data and be subject to this regulation, which provides certain rights (of access and control). *Video-Surveillance*, EUR. DATA PROT. SUPERVISOR, https://edps.europa.eu/data-protection/data-protection/reference-library/video-surveillance_en [<https://perma.cc/43JT-7F9C>]; *Germany: Land of Data Protection and Security – But Why?*, DOTMAGAZINE (Feb. 2017), <https://www.dotmagazine.online/issues/security/germany-land-of-data-protection-and-security-but-why> [<https://perma.cc/ZV9Z-6TQY>].

³³ 2 EUR. UNION AGENCY FOR FUNDAMENTAL RTS., SURVEILLANCE BY INTELLIGENCE SERVICES: FUNDAMENTAL RIGHTS SAFEGUARDS AND REMEDIES IN THE EU (2017), https://fra.europa.eu/sites/default/files/fra_uploads/fra-2017-surveillance-intelligence-services-vol-2_en.pdf [<https://perma.cc/8WCU-C9CP>]. For additional information on U.S. and EU government surveillance activities, see Joel R. Reidenberg, *The Data Surveillance State in the United States and Europe*, 49 WAKE FOREST L. REV. 583 (2014).

³⁴ Susan Landau, *Control Use of Data to Protect Privacy*, 347 SCIENCE 504 (2015).

³⁵ In 2007, the OECD adopted a resolution to include China in a program of enhanced engagement, which could potentially lead to membership in the future. *China and the OECD*, ORG. FOR ECON. COOP. & DEV. [OECD], <http://www.oecd.org/china/china-and-oecd.htm> [<https://perma.cc/7HW5-BSUV>].

³⁶ Commission Regulation 2016/679, of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation), 2016 O.J. (L 119) 1 [hereinafter GDPR].

³⁷ The current U.S. model is often characterized as a "consumer protection model," as contrasted with the EU's "data protection" model, "specifically designed from the outset to protect individual privacy or data security." WILLIAM MCGEVERAN, *PRIVACY AND DATA PROTECTION LAW* 257 (2016),

Privacy and data protection laws impact the development of AI because they limit what companies and governments can collect from people and what they can do with such data.³⁸ The following subpart explains how these regulations differ.

a. U.S. Data Protection Laws

Because of the U.S.'s focus on freedom of speech and disclosures in the public interest, privacy protections are fairly insignificant there.³⁹ Not only does the U.S. Constitution fail to mention privacy in the Bill of Rights, it was not until the late 19th century that invasion of privacy was established as a cause of action.⁴⁰ With respect to personal data, the law only applies to specific industries and covers only certain categories of information, such as financial,⁴¹ medical,⁴² and children's data.⁴³ The Federal Trade Commission (FTC) is the agency designated to enforce these data protection laws under its mandate to address "unfair and deceptive trade practices."⁴⁴ While the Privacy Act of 1974 applies to the government's use of data, there is no similar overarching privacy regulation that applies to private industry, and few cases are ever brought against the U.S. government for its massive data collection activities.⁴⁵ The main concerns for companies in the U.S. are state laws governing everything from data breaches to California's Consumer Privacy Act (CCPA).⁴⁶ The CCPA requires that certain for-profit entities that collect and process personal data from California residents must provide consumers with more control over their personal data, including (1) how data will be used, (2) the right to opt out of sharing with third parties, and (3) the right to request deletion of their data.⁴⁷ This can impact companies collecting

cited in W. Gregory Voss & Kimberly A. Houser, *Personal Data and the GDPR: Providing a Competitive Advantage for U.S. Companies*, 56 AM. BUS. L.J. 287, 294 n.24 (2019).

³⁸ See generally Kimberly A. Houser & W. Gregory Voss, *GDPR: The End of Google and Facebook or a New Paradigm in Data Privacy?*, 25 RICH. J.L. & TECH. 1 (2018).

³⁹ See Anne T. McKenna, *Pass Parallel Privacy Standards or Privacy Perishes*, 65 RUTGERS L. REV. 1041, 1046–47 (2013).

⁴⁰ Samuel D. Warren & Louis D. Brandeis, *The Right to Privacy*, 4 HARV. L. REV. 193, 193–95 (1890).

⁴¹ See Gramm-Leach-Bliley Act, 15 U.S.C. § 6801.

⁴² See Health Insurance Portability and Accountability Act of 1996, Pub. L. No. 104-191, 110 Stat. 1936.

⁴³ See Children's Online Privacy Protection Act, 15 U.S.C. § 6502.

⁴⁴ See *Division of Privacy and Identity Protection*, FED. TRADE COMM'N, <https://www.ftc.gov/about-ftc/bureaus-offices/bureau-consumer-protection/our-divisions/division-privacy-and-identity> [<https://perma.cc/T7XU-BPGN>] (explaining the responsibilities of the Federal Trade Commission as they relate to privacy breaches under Section 5 of the FTC Act).

⁴⁵ See, e.g., Houser & Sanders, *supra* note 30 (detailing how one U.S. government agency circumvents federal law on privacy).

⁴⁶ CAL. CIV. CODE § 1798.100 (West 2018).

⁴⁷ *Id.* § 1798.140(c).

data to use for training AI programs.⁴⁸ Although other states are now considering data protection laws similar to California's,⁴⁹ the virtually unregulated use of data in the U.S. by private industry has allowed companies there to significantly advance developments in AI.⁵⁰ This, however, is not the case in the EU.⁵¹

b. EU Data Protection Laws

The EU's robust data protection laws stem from its Charter of Fundamental Rights of the European Union which provides that: "Everyone has the right to the protection of personal data concerning him or her."⁵² While the U.S. protects specific types of data, the GDPR in the EU covers "personal data" as a whole, which includes any identified or identifiable information about an individual.⁵³ The GDPR expands the definition found in its predecessor, the Directive 95/46/EU, of "personal data" by adding genetic identity and GPS data:

[A]ny information relating to an identified or identifiable natural person ("data subject"); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one

⁴⁸ This regulation will require much more attention to the collection and processing of consumer data, and, depending on how the CCPA is interpreted, may prevent or severely limit the use of consumer data for AI use. Chris Ott, *Destination Unknown: The Perilous Future of Blockchain and Artificial Intelligence Technologies Under the California Consumer Privacy Act of 2018*, UCLA L. REV.: L. MEETS WORLD (Feb. 19, 2019), <https://www.uclalawreview.org/destination-unknown-the-perilous-future-of-blockchain-and-artificial-intelligence-technologies-under-the-california-consumer-privacy-act-of-2018/> [<https://perma.cc/UG47-826V>].

⁴⁹ Odia Kagan, *Multiple States Considering New Data Privacy Legislation*, FOX ROTHSCHILD: PRIV. COMPLIANCE & DATA SEC. (Feb. 10, 2019), <https://dataprivacy.foxrothschild.com/2019/02/articles/california-consumer-privacy-act/multiple-states-considering-new-data-privacy-legislation/> [<https://perma.cc/X989-4JMG>].

⁵⁰ Karl Manheim & Lyric Kaplan, *Artificial Intelligence: Risks to Privacy and Democracy*, 21 YALE J.L. & TECH. 106, 160–61 (2019).

⁵¹ Eline Chivot & Daniel Castro, *The EU Needs to Reform the GDPR to Remain Competitive in the Algorithmic Economy*, CTR. FOR DATA INNOVATION (May 13, 2019), <https://www.datainnovation.org/2019/05/the-eu-needs-to-reform-the-gdpr-to-remain-competitive-in-the-algorithmic-economy/> [<https://perma.cc/AK6M-FRS5>].

⁵² Charter of Fundamental Rights of the European Union art. 8(1), Dec. 18, 2000, 2000 O.J. (C 364) 1. The European Convention for Human Rights (which includes among its contracting parties all of the EU member states) also provides a right to respect for private and family life in Article 8. Convention for the Protection of Human Rights and Fundamental Freedoms art. 8, *opened for signature* Nov. 4, 1950, 213 U.N.T.S. 221.

⁵³ The original definition of "personal data" comes from the 1995 Directive, which was repealed and replaced by the GDPR on May 25, 2018. GDPR, *supra* note 36, arts. 99(2), 94(1); Directive 95/46/EC, of the European Parliament and of the Council of 24 October 1995 on the Protection of Individuals with Regard to the Processing of Personal Data and on the Free Movement of Such Data, art. 2(a), 1995 O.J. (L 281) 31, 38 [hereinafter 95 Directive].

or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person[.]⁵⁴

The GDPR became applicable May 25, 2018, and consists of ninety-nine articles addressing data collection, maintenance, and use. The main thrust of this regulation is the ability to give users control over how information about them is used. Most uses require voluntary, explicit consent by the data subject.⁵⁵ The EU data regime has more in common with China than with the U.S. with respect to regulations regarding the collection and use of personal data by private industry, and although U.S. companies currently have the ability to access data from the EU through the Privacy Shield,⁵⁶ signs indicate that the EU is starting to crack down on practices that do not align with the GDPR, tax law, and antitrust law.⁵⁷ Google was recently fined €1.5 billion for violating EU antitrust laws.⁵⁸ Similar to the CCPA, the GDPR gives rights to subjects as to how their data is used. However, Article 22 also permits subjects to opt out of automated decision-making that “produces legal effects or significantly affects the data subject.”⁵⁹ Although there have not been any court actions on this right with respect to AI, scholars have indicated that because the wording of this provision is unclear, the precise limits cannot be known until “the GDPR matures via legal commentary, national implementation, and jurisprudence.”⁶⁰

Additional concerns revolve around Articles 5 and 6 of the GDPR. Article 5 regarding transparency may present an issue to companies claiming the way their algorithms operate is a trade secret or that the exact purpose of the processing of data cannot be determined prior to running the machine learning program. Article 6 on privacy by design and privacy by default presents obstacles with big data as these concepts require that only data necessary for the purpose for which it is collected be obtained.⁶¹ It is

⁵⁴ GDPR, *supra* note 36, art. 4(1); *see also* 95 Directive, *supra* note 53.

⁵⁵ GDPR, *supra* note 36, art. 9(2)(a).

⁵⁶ Model contract clauses and binding corporate resolutions can also be used.

⁵⁷ Cat Zakrzewski, *The Technology 202: Europe Is Still in the Lead when It Comes to Cracking Down on Big Tech*, WASH. POST (July 18, 2019, 8:20 AM), <https://www.washingtonpost.com/news/powerpost/paloma/the-technology-202/2019/07/18/the-technology-202-europe-is-still-in-the-lead-when-it-comes-to-cracking-down-on-big-tech/5d2f51421ad2e5592fc3593a/> [<https://perma.cc/K6G6-7QG2>].

⁵⁸ James Vincent, *Google Hit with €1.5 Billion Antitrust Fine by EU*, THE VERGE (Mar. 20, 2019, 7:11 AM), <https://www.theverge.com/2019/3/20/18270891/google-eu-antitrust-fine-adsense-advertising> [<https://perma.cc/3W6Q-DSGR>].

⁵⁹ GDPR, *supra* note 36, art. 22.

⁶⁰ Sandra Wachter & Brent Mittelstadt, *A Right to Reasonable Inferences: Re-Thinking Data Protection Law in the Age of Big Data and AI*, 2019 COLUM. BUS. L. REV. 494, 585 (2019).

⁶¹ *See generally* INFO. COMM’R’S OFF., BIG DATA, ARTIFICIAL INTELLIGENCE, MACHINE LEARNING AND DATA PROTECTION (2017), <https://ico.org.uk/media/for-organisations/documents/2013559/big-data-ai-ml-and-data-protection.pdf> [<https://perma.cc/LW4F-J6KV>].

unknown if these provisions will be interpreted as preventing the use of data sets for training AI, but at the very least, they will impose a significant regulatory burden on companies choosing to use data sets.⁶² This difference between EU and U.S. data privacy protection has been described as follows: “in the United States, what the European Commission (the EU’s executive) refers to as the ‘collecting and processing of personal data’ is allowed unless it causes harm or is expressly limited by U.S. law.”⁶³ In Europe, however, the “processing of personal data is prohibited unless there is an explicit legal basis that allows it.”⁶⁴ As a result, companies in the EU have a very limited ability to use data needed for certain AI machine learning activities.⁶⁵ China, on the other hand, has made use of the massive amounts of data collected in its country.

c. China Data Protection Laws

Contrary to popular belief, China actually has a rigorous set of privacy guidelines and regulations (unlike the U.S.),⁶⁶ but they only apply to private industry.⁶⁷ There are no limitations on the government’s ability to collect and process data or to request data collected by private industry.⁶⁸ While the U.S.

⁶² Andrew Burt, *How Will the GDPR Impact Machine Learning?*, O’REILLY: RADAR (May 16, 2018), <https://www.oreilly.com/ideas/how-will-the-gdpr-impact-machine-learning> [<https://perma.cc/FEU6-QEF4>].

⁶³ MARTIN A. WEISS & KRISTIN ARCHICK, CONG. RSCH. SERV., R44257, U.S.-EU DATA PRIVACY: FROM SAFE HARBOR TO PRIVACY SHIELD 2 & n.3 (2016), <https://fas.org/sgp/crs/misc/R44257.pdf> [<https://perma.cc/AX4L-WF86>] (citing Eur. Comm’n, *Collecting & Processing Personal Data: What Is Legal?*, EUROPA, http://ec.europa.eu/justice/dataprotection/data-collection/legal/index_en.htm [<https://perma.cc/4V6Z-V553>]).

⁶⁴ Ioanna Tourkochoriti, *The Snowden Revelations, the Transatlantic Trade and Investment Partnership and the Divide Between U.S.-EU in Data Privacy Protection*, 36 UALR L. REV. 161, 164 (2014); see also WEISS & ARCHICK, *supra* note 63, at 2 & n.4 (citing Paul M. Schwartz & Daniel J. Solove, *Reconciling Personal Information in the United States and the European Union*, 102 CALIF. L. REV. 877, 881 (2014)).

⁶⁵ Burt, *supra* note 62.

⁶⁶ See Samm Sacks, *New China Data Privacy Standard Looks More Far-Reaching than GDPR*, CTR. FOR STRATEGIC & INT’L STUD. (Jan. 29, 2018), <https://www.csis.org/analysis/new-china-data-privacy-standard-looks-more-far-reaching-gdpr> [<https://perma.cc/WBX6-QMRC>].

⁶⁷ Some of the provisions are considered tougher than the GDPR. A recent proposed change would prevent data collection for the performance of a contract (even that is permitted under the GDPR). Ray Schultz, *China Privacy Policy Tougher than GDPR, Attorney Writes*, EMAIL MKTG. DAILY (July 15, 2019), <https://www.mediapost.com/publications/article/338173/> [<https://perma.cc/AB35-P593>].

⁶⁸ Two pieces of legislation are of particular concern to governments—the 2017 National Intelligence Law and the 2014 Counter-Espionage Law. Article 7 of the first law states that “any organization or citizen shall support, assist and cooperate with the state intelligence work in accordance with the law,” adding that the state “protects” any individual and organization that aids it.

And it appears that organizations and individuals don’t have a choice when it comes to helping the government. The 2014 Counter-Espionage law says that “when the state security organ

and the EU publicly indicate an aversion to this type of surveillance, both blocks have monitored their own citizens' behavior.⁶⁹ In China, surveillance is expected. Due to different cultural norms, the Chinese have a lower expectation of privacy. The rights of the individual are subordinate to the rights of the family, community, and country.⁷⁰ China is also known for its firewall. China has been able to protect private industry, such as social media, from U.S. intrusion by strictly limiting access to sites like Facebook and Google, which has helped its WeChat and Baidu sites prosper.⁷¹ The basis of China's privacy and data security laws stems from a white paper published in 2010 that addressed Internet usage by citizens.⁷² In 2016, China passed its Cybersecurity Law, which went into effect in June 2017, is comprised of seventy-nine articles, and includes safeguards for national cyberspace sovereignty, protection of critical infrastructure, and data and privacy protections for individuals.⁷³ Shortly after its enactment, China shut down 3,000 websites for their failure to comply with the new regulations.⁷⁴

investigates and understands the situation of espionage and collects relevant evidence, the relevant organizations and individuals shall provide it truthfully and may not refuse.”

Arjun Kharpal, *Huawei Says It Would Never Hand Data to China's Government. Experts Say It Wouldn't Have a Choice*, CNBC (Mar. 5, 2019, 12:33 AM), <https://www.cnbc.com/2019/03/05/huawei-would-have-to-give-data-to-china-government-if-asked-experts.html> [https://perma.cc/WG68-5RQ4].

⁶⁹ See Charlie Savage, *N.S.A. Triples Collection of Data from U.S. Phone Companies*, N.Y. TIMES (May 4, 2018), <https://www.nytimes.com/2018/05/04/us/politics/nsa-surveillance-2017-annual-report.html> [https://perma.cc/VZE5-WCZV]; see also Asaf Lubin, *A New Era of Mass Surveillance Is Emerging Across Europe*, JUST SEC. (Jan. 9, 2017), <https://www.justsecurity.org/36098/era-mass-surveillance-emerging-europe/> [https://perma.cc/X9X8-GHLN].

⁷⁰ Tiffany Li & Zhou Zhou, *Chinese Privacy Law: A Practitioner's Guide to Current Regulations, Future Trends, & Business Applications 7* (Jan. 13, 2016) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2704131 [https://perma.cc/B2SH-38BJ].

⁷¹ While strict censorship is nothing new in one-party China, under President Xi Jinping online restraints have grown tighter, particularly around the time of politically sensitive events like the death of Nobel Peace Prize winner Liu Xiaobo and the Communist Party Congress in 2017. China began blocking Facebook's WhatsApp messaging service ahead of the congress and extended a clampdown on virtual private networks, a commonly used method to circumvent the Great Firewall. Securing China's "cyber sovereignty," or protecting the country's internet from undue foreign influence, is one of Xi's avowed goals.

The Great Firewall of China, BLOOMBERG (Nov. 5, 2018, 8:36 PM), <https://www.bloomberg.com/quicktake/great-firewall-of-china> [https://perma.cc/FZ7K-AESV].

⁷² *The Internet in China*, PEOPLE'S DAILY ONLINE (June 8, 2010, 1:05 PM), <http://en.people.cn/90001/90776/90785/7017177.html> [https://perma.cc/VB7N-Q5V6].

⁷³ KPMG CHINA, OVERVIEW OF CHINA'S CYBERSECURITY LAW 3 (2017), <https://assets.kpmg/content/dam/kpmg/cn/pdf/en/2017/02/overview-of-cybersecurity-law.pdf> [https://perma.cc/V59U-5FYF].

⁷⁴ PROTIVITI, CHINA'S CYBERSECURITY LAW AND ITS IMPACTS: KEY REQUIREMENTS BUSINESSES NEED TO UNDERSTAND TO ENSURE COMPLIANCE (2018), https://www.protiviti.com/sites/default/files/china/insights/china_cybersecurity_law_and_its_impact_-_a4.pdf [https://perma.cc/Z6A3-Q7NJ]; *Freedom on the Net 2018 - China*, REF WORLD (Nov. 1, 2018), <https://www.refworld.org/docid/5be16b20a.html> [perma.cc/GWA6-HCHW].

There are some 240 national standards connected to cybersecurity (including the cloud and big data).⁷⁵ It is generally understood that all companies (not just internet service providers and telecommunications companies) are subject to its provisions.⁷⁶ The Chinese government itself also collects massive amounts of data on its citizens via facial recognition, license plate scanners, video surveillance, GPS tagging, and communications monitoring.⁷⁷

While the government has unrestricted access to personal data,⁷⁸ private industry in China does not. China enacted a comprehensive privacy protection guideline that became effective May 1, 2018.⁷⁹ Some consider it more onerous than the GDPR.⁸⁰ One of the issues impacting the efficacy of Chinese privacy and data protection laws is the multitude of government players involved. Another issue is the law's lack of specificity, preferring broad principles that help to accommodate the competing government agencies but create difficulty for private industry trying to stay in compliance.⁸¹ The agencies charged with enforcing these regulations include the Cyberspace Administration of China, the Ministry of Public Security, the Ministry of Industry and Information Technology, and the National Information Security Standardization Technical Committee, as well as military and intelligence agencies that make decisions on what constitutes national security.⁸² In addition, there are several organizations that serve as intermediaries between private industry and the Chinese government, including the CyberSecurity Association of China, the China Artificial Intelligence Industry Development Alliance, and China's most influential tech companies, Baidu, Alibaba, and Tencent (together, BAT).⁸³

⁷⁵ Sacks, *supra* note 66.

⁷⁶ PROTIVITI, *supra* note 74, at 2.

⁷⁷ Zak Doffman, *Why We Should Fear China's Emerging High-Tech Surveillance State*, FORBES (Oct. 28, 2018, 10:35 AM), <https://www.forbes.com/sites/zakdoffman/2018/10/28/why-we-should-fear-chinas-emerging-high-tech-surveillance-state/#3ec64c634c36> [<https://perma.cc/MD9R-6354>].

⁷⁸ Kharpal, *supra* note 68.

⁷⁹ Although these are guidelines, they are enforced under the 2016 Cybersecurity Law. Yan Luo & Phil Bradley-Schmieg, *China Issues New Personal Information Protection Standard*, COVINGTON: INSIDE PRIVACY (Jan. 25, 2018), <https://www.insideprivacy.com/international/china/china-issues-new-personal-information-protection-standard/> [<https://perma.cc/7XZD-ZUAN>].

⁸⁰ Sacks, *supra* note 66.

⁸¹ See Carly Ramsey & Ben Wootliff, *China's Cyber Security Law: The Impossibility Of Compliance?*, FORBES (May 29, 2017, 3:29 AM), <https://www.forbes.com/sites/riskmap/2017/05/29/chinas-cyber-security-law-the-impossibility-of-compliance/#3091e4aa471c> [<https://perma.cc/9HCT-RENA>].

⁸² Paul Triolo et al., *China's Cybersecurity Law One Year On*, NEW AM. (Nov. 30, 2017), <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/chinas-cybersecurity-law-one-year/> [<https://perma.cc/F9ZT-G3MR>].

⁸³ *Id.*

One overarching feature of Chinese data protection law is the focus on cybersecurity, which is lacking in both the U.S. and the EU. According to President Xi Jinping, “without cybersecurity there is no national security, and without informatization there is no modernization.”⁸⁴ These security-focused laws underlie the regulatory system. The Chinese government exerts a great deal of control over media and communication channels, both traditional and online.⁸⁵ The new regulations permit the government to monitor all media and communication.⁸⁶ While this is the antithesis of the concept of free speech under U.S. law, it should be noted that during many recent Congressional hearings, companies such as Facebook and Google were repeatedly asked why they do not block content.⁸⁷ Additionally, the White House has floated a draft executive order that would give the Federal Communications Committee (FCC) and FTC the ability to monitor Internet content much like the Chinese currently do.⁸⁸

Additionally, regulations in China require the following: data on Chinese users must be stored in China (data localization requirement),⁸⁹ a minimum level of security protections must be instituted to protect the data from a data breach, any transfer of data outside of China must meet strict requirements, and consent must be obtained prior to collecting information.⁹⁰ These requirements are placed on private tech companies. The government conducts inspections on these companies' security protocols when the products and services are used in critical information infrastructures

⁸⁴ *Id.*

⁸⁵ See SAMP SACKS & MANYI KATHY LI, CTR. FOR STRATEGIC & INT'L STUD., HOW CHINESE CYBERSECURITY STANDARDS IMPACT DOING BUSINESS IN CHINA (2018), https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/180802_Chinese_Cybersecurity.pdf [<https://perma.cc/W4V4-QQK6>]. These laws provide a secure environment within China but present challenges to foreign businesses such as the need to provide confidential information to local firms to ensure that they are complying with these standards. *Id.* at 1.

⁸⁶ Beina Xu & Eleanor Albert, *Media Censorship in China*, COUNCIL ON FOREIGN RELS. (Feb. 17, 2017), <https://www.cfr.org/backgrounder/media-censorship-china> [<https://perma.cc/CC7T-NFV7>].

⁸⁷ Tony Romm, *Facebook and Google to Be Quizzed on White Nationalism and Political Bias as Congress Pushes Dueling Reasons for Regulation*, WASH. POST (Apr. 8, 2019, 5:55 PM), https://www.washingtonpost.com/technology/2019/04/08/facebook-google-be-quizzed-white-nationalism-political-bias-congress-pushes-dueling-reasons-regulation/?utm_term=.57cb8f0e99 [<https://perma.cc/FWM4-8M68>].

⁸⁸ Brian Fung, *Federal Officials Raise Concerns About White House Plan to Police Alleged Social Media Censorship*, CNN BUS. (Aug. 22, 2019, 1:27 PM), <https://www.cnn.com/2019/08/22/tech/ftc-fcc-trump-social-media/index.html> [<https://perma.cc/FH8D-5VK8>] (This draft has been criticized as appointing a government “speech police.”).

⁸⁹ Carmen Chan, *Understanding China's Data Security Law: An Intro for Foreign Businesses*, MEDIUM (Jan. 10, 2019), <https://medium.com/faun/understanding-chinas-data-security-law-an-intro-for-foreign-businesses-bedc7105231> [<https://perma.cc/S5C4-2GQU>].

⁹⁰ Triolo et al., *supra* note 82.

(utilities, media, etc.).⁹¹ Companies in both the U.S. and the EU regularly store data outside of their borders (except for Germany, which has a data localization law).⁹² The FTC does not audit companies for compliance, but instead investigates after a significant number of complaints. In the EU, due to the significant presence of data protection agencies, companies are scrutinized more closely than in the U.S.⁹³ While some have criticized China's data localization requirement as creating a "separate internet" from the rest of the world, it does have the effect of making Chinese data more secure vis-a-vis foreign bad actors.⁹⁴

One of the criticisms of Chinese regulations is that they seem to be more like principles than specific requirements. Their vagueness has caused issues for Chinese firms that have indicated that regulators can assess fines for failing to follow "recommended" standards.⁹⁵ Another concern is the potential for competition between privately-owned and state-owned firms.⁹⁶ This may have the effect of hindering private development of both ancillary and AI technology.⁹⁷ However, in 2018, President Xi named BAT, three of the top privately owned tech companies in China, as the country's official "AI champions."⁹⁸

Overall, China's regulatory scheme, which promotes the use of data to advance AI, is working, as numerous advances, such as voice and facial recognition, are rolled out. While the U.S. lacks a cohesive policy around data collection and use, the EU has carefully developed its policy, but may overly restrict technological development. The ability to use data collected by companies in the EU for AI training sets is limited by the GDPR.

⁹¹ *Id.*

⁹² Gesetz zur Einführung einer Speicherpflicht und einer Höchstspeicherfrist für Verkehrsdaten [Law to introduce a storage obligation and a maximum storage period for traffic data], Dec. 10, 2015, BGBL I at 2218 (Ger.).

⁹³ *EU to Scrutinize U.S. Tech Companies Even Further*, FOCUS WASH. (Aug. 1, 2019), <https://focuswashington.com/2019/08/01/eu-to-scrutinize-u-s-tech-companies-even-further/> [<https://perma.cc/W9YD-KSUD>].

⁹⁴ Catalin Cimpanu, *Oracle: China's Internet Is Designed More Like an Intranet*, ZDNET (July 23, 2019, 6:40 PM), <https://www.zdnet.com/article/oracle-chinas-internet-is-designed-more-like-an-intranet/> [<https://perma.cc/4TC4-TYGD>].

⁹⁵ Daniel Rechtschaffen, *Why China's Data Regulations Are a Compliance Nightmare for Companies*, THE DIPLOMAT (June 27, 2019), <https://thediplomat.com/2019/06/why-chinas-data-regulations-are-a-compliance-nightmare-for-companies/> [<https://perma.cc/HF33-V9VL>].

⁹⁶ *China's Talk of 'Two Unwaverings' Reveals Private Sector Fears*, BLOOMBERG (Oct. 25, 2018, 4:00 PM), <https://www.bloomberg.com/news/articles/2018-10-25/china-s-talk-of-two-unwaverings-reveals-private-sector-fears> [<https://perma.cc/3JC7-R8X2>].

⁹⁷ Daniel Faggella, *AI in China – Recent History, Strengths and Weaknesses of the Ecosystem*, EMERJ (Apr. 5, 2019), <https://emerj.com/ai-market-research/ai-in-china-recent-history-strengths-and-weaknesses-of-the-ecosystem/> [<https://perma.cc/E6CW-ZKHN>].

⁹⁸ ALLEN, *supra* note 14.

Although U.S. tech companies have taken advantage of the looser restrictions here, even they are now seeking the government's help in creating a regulatory structure due to the inconsistent treatment by the U.S. government. Recent actions have been initiated against companies in the U.S. by the U.S. government despite the lack of federal laws specifically addressing the violations alleged regarding data breaches, antitrust issues, and privacy. China, on the other hand, has crafted a long-term strategic plan to become a technological powerhouse, developing technological products and services and moving away from its reliance on manufacturing. China's laws support the development of AI in terms of data access and use. The difference in each region's regulatory scheme stems from their vastly different policies regarding innovation in general.

2. *War Narratives and Competitive Ecosystems Are Unlikely to Result in Positive Community Outcomes*

In addition to the issues discussed above regarding data availability and data laws, differing governmental policies impact the education, hiring, and retention of talent, the different levels and sources of funding, and the complicated issue of component sourcing; there are a number of obstacles that will impact both the installation of the infrastructure needed for the practical application of AI as well as AI itself. Recent executive orders and regulations passed by the U.S. government have also negatively impacted the future of AI. Because of the speed at which the U.S. and China are seeking to roll out 5G and AI developments, there are a number of concerns that are being overlooked. First, significant health risks have been raised with respect to 5G installations. Second, the loss of privacy and the increased level of surveillance once sensors and small cells are placed everywhere have not been adequately addressed. Third, many have expressed unease at the potential impact on society due to a rushed, uncoordinated, and incautious implementation of AI by powers seeking to outdo one another.

Perhaps due to the recent realization that the U.S. failed to carry out the strategic AI plan developed during the Obama administration, actions have now been taken to slow down China's expansion both internally and worldwide into 5G, the infrastructure for future developments in AI, and IoT.⁹⁹ China has made no secret of its desire to become a world economic power, seeking to move from a manufacturing base to an intellectual property and communication provider beyond its borders. In response, the U.S. has banned U.S. companies from doing business with Huawei, the largest supplier of 5G hardware, and is threatening its allies if they fail to do the

⁹⁹ For a full discussion on the impact of the trade war on the future of artificial intelligence, see Houser, *supra* note 12.

same.¹⁰⁰ The U.S. has also stopped the ready flow of U.S.-made chips into China.¹⁰¹ China has responded in kind with threats to severely restrict its exports to the U.S. of rare minerals needed for the computer chip industry.¹⁰² Both have instituted tariffs on one another and created banned entity lists. Although many believe all of these acts are just bargaining chips that will be tossed aside if China and the U.S. can come to an agreement on tariffs, the damage may have already been done. Trade talks have stalled for a number of reasons, but one is the insistence by the U.S. that China halt its Made in China 2025 Plan.¹⁰³ All of this has resulted in uncertainty in Europe over how to move forward with 5G without alienating either the U.S. or China.

The EU has not acted to stop partnerships with China for the development of the infrastructure necessary to roll out 5G technology there.¹⁰⁴ President Xi visited Italy and France in March 2019 as part of his Belts and Roads Initiative (BRI) tour.¹⁰⁵ Because Huawei offers the lowest prices in 5G equipment, it is possible that these countries will choose the Chinese product over Eriksson and Nokia.¹⁰⁶ In the EU, there is disagreement

¹⁰⁰ The U.S. is threatening to withhold intelligence cooperation from countries that incorporate Chinese components into their communication systems. Robin Emmott, *U.S. Warns European Allies Not to Use Chinese Gear for 5G Networks*, REUTERS (Feb. 5, 2019, 10:01 AM), <https://www.reuters.com/article/us-usa-china-huawei-tech-eu/u-s-warns-european-allies-not-to-use-chinese-gear-for-5g-networks-idUSKCN1PU1TG> [https://perma.cc/3AKN-2X3L].

¹⁰¹ This does not just hurt China, but also negatively impacts chip manufacturers in the U.S., where Chinese companies are their biggest market. Stephen Grocer, *Chip Makers Are Punished as the Trade War Drags On*, N.Y. TIMES (May 23, 2019), <https://www.nytimes.com/2019/05/23/business/dealbook/semiconductor-stocks-trade-war.html> [https://perma.cc/97TZ-KKUC].

¹⁰² Eustance Huang, *Shares of Rare Earth Miners Skyrocket After Beijing Threatens to Cut Off the Minerals*, CNBC (May 28, 2019, 11:35 PM), <https://www.cnbc.com/2019/05/29/rare-earth-miners-shares-rise-after-china-threatens-to-cut-off-supply.html> [https://perma.cc/JT6K-SKZG].

¹⁰³ James McBride & Andrew Chatzky, *Is 'Made in China 2025' a Threat to Global Trade?*, COUNCIL ON FOREIGN RELS., (May 13, 2019) <https://www.cfr.org/background/made-china-2025-threat-global-trade> [https://perma.cc/Q9YP-KP4L].

¹⁰⁴ Matina Stevis-Gridneff, *Blocked in U.S., Huawei Touts 'Shared Values' to Compete in Europe*, N.Y. TIMES (Dec. 27, 2019), <https://www.nytimes.com/2019/12/27/world/europe/huawei-EU-5G-Europe.html> [https://perma.cc/6JGK-DYKP] (“Neither the European Union nor individual countries have moved to restrict the company’s [(Huawei’s)] access to their markets.”).

¹⁰⁵ Philippe Le Corre, *Mr Xi’s European Tour Is Response to US-China Rift*, CARNEGIE ENDOWMENT FOR INT’L PEACE (Mar. 18, 2019), <https://carnegieendowment.org/2019/03/18/mr-xi-s-european-tour-is-response-to-us-china-rift-pub-78611> [https://perma.cc/64P9-QH6E].

¹⁰⁶ As of May 2019, France indicated that it would permit Huawei to compete for its 5G business. Gwénaëlle Barzic et al., *France to Push Ahead with 5G Launch in 2020 Despite Huawei Woes*, REUTERS (May 21, 2019, 6:13 AM), <https://www.reuters.com/article/us-france-telecoms-huawei-tech/france-to-push-ahead-with-5g-launch-in-2020-despite-huawei-woes-idUSKCN1SR15E> [https://perma.cc/J4YE-73KLU]. As of March 2019, Italy indicated that it would not ban Huawei. Lucas Robinson, *Italy Rebuffs U.S. Calls to Bypass Chinese Firms like ZTE, Huawei in Ramp-Up to 5G*, MARKETWATCH (Mar. 7, 2019, 2:50 PM), <https://www.marketwatch.com/story/italy-rebuffs-uscalls-to-bypass-chinese-firms-like-zte-huawei-in-ramp-up-to-5g-2019-03-07> [https://perma.cc/T9ZV-8L7X].

over the risks of employing Chinese 5G cells throughout the member states.¹⁰⁷ While Italy has signed on, other countries, in signing deals with China, have indicated that they will also work with China.¹⁰⁸ Due to Italy's economy, relying on China will help it advance technologically, but at the cost of \$7.9 billion in debt (which includes energy, steel, and pipelines in addition to 5G).¹⁰⁹ Poland, Greece, Portugal, and Hungary have also inked deals under the BRI, although none have entered into a final agreement with any Chinese companies for the installation of 5G yet.¹¹⁰ The countries that will be auctioning off 5G licenses in the EU this year are Austria, Belgium, Czech Republic, France, Germany, Greece, Hungary, Ireland, the Netherlands, Lithuania, and Portugal.¹¹¹ In fact, rather than take security claims by the U.S. seriously, some European nations have indicated that the Trump administration's rhetoric was more likely due to the tech competition between the U.S. and China or the faltering trade negotiations.¹¹²

3. *The Absence of Coordination Is Incredibly Impactful*

While the narrative of an AI arms race may seem to spur on development and the best of competitive attitudes, in fact, a race is very troubling in this particular area. Remember, “[t]he last time a rival power tried to out-innovate the U.S. and marshaled a whole-of-government approach to doing it, the Soviet Union startled Americans by deploying the first man-made satellite into orbit.”¹¹³

¹⁰⁷ The budget commissioner has proposed allowing the EU to veto any member state's deals with Chinese-funded infrastructure; however, this is unlikely to pass. *Chinese Investments in Europe: German EU Commissioner Floats EU Veto Right*, DEUTSCHE WELLE (Mar. 24, 2019), https://www.dw.com/en/chinese-investments-in-europe-german-eu-commissioner-floats-eu-veto-right/a-48045932?maca=en-gk_volltext_AppleNews_world-16397-xml-atom [https://perma.cc/8RE6-CAAF].

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ *Id.* Portugal has signed a Memorandum of Understanding with Huawei for 5G. Li Tao, *Huawei Signs Deal to Upgrade Portugal's Largest Phone Network Altice to 5G Standard by 2019*, S. CHINA MORNING POST (Dec. 6, 2018, 12:46 AM), <https://www.scmp.com/tech/enterprises/article/2176597/huawei-signs-deal-upgrade-portugals-largest-phone-network-altice-5g> [https://perma.cc/EM63-7CXC].

¹¹¹ Reuters, *EU Demands Scrutiny of 5G Risks but No Bloc-Wide Huawei Ban*, CNBC (Mar. 27, 2019, 3:19 AM), <https://www.cnbc.com/2019/03/27/eu-demands-scrutiny-of-5g-risks-but-no-bloc-wide-huawei-ban.html> [https://perma.cc/97W2-8A2Y].

¹¹² Kate Fazzini, *Huawei CFO Defense Will Center on President Trump's Trade Comments*, CNBC (Mar. 6, 2019, 1:42 PM), <https://www.cnbc.com/2019/03/06/huawei-cfo-defense-will-center-on-president-trumps-trade-comments.html> [https://perma.cc/E8NW-94MG]; Julian E. Barnes & Adam Satariano, *U.S. Campaign to Ban Huawei Overseas Stumbles as Allies Resist*, N.Y. TIMES (Mar. 17, 2019), <https://www.nytimes.com/2019/03/17/us/politics/huawei-ban.html> [https://perma.cc/EBJ8-KEDX].

¹¹³ Luiza Ch. Savage & Nancy Scola, *We Are Being Outspent. We Are Being Outpaced': Is America Ceding the Future of AI to China?*, POLITICO (July 18, 2019, 5:03 AM),

Yet, this time is vastly different. First, an AI race lacks definition, a goal, or even an aspirational dream. Unlike placing an object in space, no one, not even those deep into the AI industry, could articulate a specific goal—nor could they tell you with any real certainty where the finish line is—as such, it is hard to imagine anyone ever truly winning this race. Moreover, even if we could define the “race” that we are desperately trying to win, there is a great deal of interest in the area now, and the reaction to some of the iterations of AI is pretty negative. So, if a term lacks definition, takes on a life of its own, and can be taken to mean everything from robots to predictions in policing, one wonders if all of it is tainted by the negative brush. How do you win a race when the citizens and policy makers begin to actively thwart your effort to win, even if we could define a finish line?

There is a tension between advancement resulting in efficiencies and pulling back because of safety and discrimination concerns. If advancement succeeds without considering and addressing the potential harms, putting limits on the collection and use of data, and developing international standards, winning the race may lead us straight into a vast surveillance global society. There are numerous issues that must be worked out, and not in isolation. So, again, setting a short-term deployment without a long-term strategic plan might not be the best idea. Framing the development of AI as a race will result in losses for everyone.

At the heart of this argument is the realization that we need to be careful to not think of this as a race—a race to spend money, deploy more, and do it faster—that the U.S. might just win. But at what cost to the bigger picture? This is not the same as putting an object in orbit or a man on the moon. This AI race has no end goal, no way to measure, and it seems there may be no way to think through where investment should be directed. And, unlike the object in space, the absence of a specific goal means we can continue to push an emotional narrative of winning, without ever being able to cross the finish line.

We as a global community must reject this race narrative and seek to deploy technology, including AI, in ways that better mankind. Cooperation in these key identified areas will allow us to define a goal and to use data from the global community to have AI that is built upon diversity, fairness, ethics, and the pursuit of social good. Yet, the “win the race” narrative is widely supported by those who draw direct benefit from the emotive

<https://www.politico.com/story/2019/07/18/global-translations-ai-china-1598442>
[<https://perma.cc/SQW7-2KG6>].

narratives of safety, security, and other usual arms race rhetoric.¹¹⁴ This must stop. Treating all of AI as being developed for the defense industry is a flawed approach, one that U.S. workers have pushed back against.¹¹⁵ The absence of coordination, regardless of whether it takes the form of regulation or international guidelines, has a drastic impact on the projects that are undertaken, the willingness to forgive bad AI, and the inability to evaluate the outcomes of the race. We must seek to coordinate toward a positive use and understanding of AI; without it, we will continue to be pushed by a narrative that shifts as the wind blows.

B. Investment in Technology Ecosystem Is Essential

While investment as an end goal is an incredibly poor choice, investment in the entire ecosystem, done in a planful, goal-oriented, societal way will result in positive steps in the further use of positively impactful AI. This Section examines concerns relating to the government policies that fail to focus on investment, the massive gaps in know-how and talent, the need to increase funding for development, demand for strategic planning for artificial intelligence, and the increasing evidence that demands we consider 5G as essential infrastructure.

I. Government Policy Fails to Focus on Investment

Although the EU government has committed \$24 billion (€20 billion) to the development of AI,¹¹⁶ the U.S. has relied on private funds to move this field forward.¹¹⁷ China's government, on the other hand, is believed to have committed over \$70 billion over the next several years to both public and privately owned entities.¹¹⁸ All three are struggling to find and hire qualified

¹¹⁴ Sam Biddle, *Why an "AI Race" Between the U.S. and China Is a Terrible, Terrible Idea*, THE INTERCEPT (July 21, 2019, 7:00 AM), <https://theintercept.com/2019/07/21/ai-race-china-artificial-intelligence/> [https://perma.cc/8GNK-4DUB].

¹¹⁵ *Id.*; Daisuke Wakabayashi & Scott Shane, *Google Will Not Renew Pentagon Contract that Upset Employees*, N.Y. TIMES (June 1, 2018), <https://www.nytimes.com/2018/06/01/technology/google-pentagon-project-maven.html> [https://perma.cc/5D22-E6QX].

¹¹⁶ *AI in Europe: Funding Hits €20 Billion*, NEXT GENERATION INTERNET (Jan. 8, 2019), <https://www.ngi.eu/news/2019/01/08/ai-in-europe-funding-hits-e20-billion/> [https://perma.cc/B899-DW8A].

¹¹⁷ Alaina J. Harkness et al., *The State of Tech Policy, One Year into the Trump Administration*, BROOKINGS: TECHTAKES (Jan. 30, 2018), <https://www.brookings.edu/blog/techtank/2018/01/30/the-state-of-tech-policy-one-year-into-the-trump-administration/> [https://perma.cc/XMZ7-N2Y8]; Houser, *supra* note 12, at 586.

¹¹⁸ Oriana Pawlyk, *China Leaving US Behind on Artificial Intelligence: Air Force General*, MILITARY.COM: DEFENSETECH (July 30, 2018), <https://www.military.com/defensetech/2018/07/30/china-leaving-us-behind-artificial-intelligence-air-force-general.html> [https://perma.cc/Z72B-5SBX].

data scientists and tech workers.¹¹⁹ Although the U.S. previously had the advantage of being able to attract workers from both China and the EU due to its high salaries, new governmental policy with respect to H-1B visas and the trade war have made the U.S. less attractive to foreign talent.¹²⁰ The development of AI will depend not only on funding and available workers, but also on the ease and speed with which ancillary industries develop.¹²¹ This presents one of the biggest obstacles. Although the installation of 5G telecommunication networks will exponentially increase the speed at which data can be processed well beyond 4G (LTE) and cloud computing, current political and technical issues are complicating the rollout.

The trade war between the U.S. and China is impacting both countries' ability to install 5G.¹²² Europe is stuck in the middle, with the U.S. threatening to withhold intelligence if Chinese equipment is installed there despite the fact that current telecommunications networks in the U.S. and EU already contain Chinese equipment.¹²³ The interdependence of China and the U.S. on each other for 5G presents a serious problem. China produces most of the hardware currently available for these networks while the U.S. is the primary producer of the needed chips.¹²⁴ The U.S. has virtually no 5G equipment capability and will need to rely on the EU and China for the hardware. Because each block now seeks to install 5G networks and develop AI independently of one another, this will slow down both the installation of 5G worldwide as well as advances in AI.¹²⁵ There are a number of other issues impacting the future of AI due to the differences between these regions.

¹¹⁹ Esther Shein, *Winning the War for AI Talent*, CIO (Feb. 6, 2018, 3:00 AM), <https://www.cio.com/article/3252338/winning-the-war-for-ai-talent.html> [https://perma.cc/H2MA-L4QK].

¹²⁰ Eric Rosenbach & Aditi Kumar, *To Win the AI Race, Open America's Doors*, THE HILL (Apr. 24, 2019, 12:00 PM), <https://thehill.com/opinion/technology/440280-to-win-the-ai-race-open-american-doors> [https://perma.cc/83KG-7NPY].

¹²¹ See *supra* Part II.

¹²² Houser, *supra* note 12, at 565, 590.

¹²³ James Griffiths, *With a Stroke of His Pen, Trump Worsens Europe's Huawei Dilemma*, CNN POLITICS (May 16, 2019, 8:30 AM), <https://www.cnn.com/2019/05/16/politics/huawei-europe-trump-intl/index.html> [https://perma.cc/C46Y-2CQT].

¹²⁴ Iris Deng, *Building China's Own Chip Industry Will Be a Costly 10-Year Marathon, Former Intel China MD Says*, S. CHINA MORNING POST (May 29, 2019, 6:00 AM), <https://www.scmp.com/tech/science-research/article/3012140/building-chinas-own-chip-industry-will-be-costly-10-year> [https://perma.cc/YA8C-PHU5].

¹²⁵ Sherisse Pham, *US Move Against Huawei Could Slow the Global Rollout of 5G*, CNN BUS. (May 16, 2019, 8:48 AM), <https://www.cnn.com/2019/05/16/tech/huawei-us-5g-rollout/index.html> [https://perma.cc/RRM9-KDUR].

2. Massive Gaps in Know-How and Talent

In order to facilitate the growth of AI, you need both research talent and skilled workers to implement the infrastructure and AI. Not only does the U.S. churn out more data scientists than the rest of the world, it also hires them in greater numbers and pays them more.¹²⁶ Those working for tech companies make an average of \$120,000 a year and have a great deal of flexibility in what areas they want to pursue.¹²⁷ The U.S. has more AI talent skilled in machine learning than both the EU and China.¹²⁸ While the EU also has a demand for data scientists, it pays on average less than half of what employees can make in the U.S.¹²⁹ The expected 2020 demand for data scientists in Europe is 346,000.¹³⁰ China also has a shortage and pays less than the U.S.¹³¹ However, due to recently enacted H-1B restrictions in the U.S., more students are choosing to remain in China.¹³² In addition, H-4 visas

¹²⁶ Cade Metz, *Tech Giants Are Paying Huge Salaries for Scarce A.I. Talent*, N.Y. TIMES (Oct. 22, 2017), <https://www.nytimes.com/2017/10/22/technology/artificial-intelligence-experts-salaries.html> [https://perma.cc/6FHM-35UD]; Kamalika Some, *Countries Which Hold the Greatest Opportunities for Data Scientists*, ANALYTICS INSIGHT (June 15, 2019), <https://www.analyticsinsight.net/countries-which-hold-the-greatest-opportunities-for-data-scientists/> [https://perma.cc/FPN9-JPEY]; Vivian Zhang, *A Snapshot of Data Scientist Jobs Around the World*, ITPROPORTAL (Oct. 3, 2018), <https://www.itproportal.com/features/a-snapshot-of-data-scientist-jobs-around-the-world/> [https://perma.cc/G99C-NGTS].

¹²⁷ Jackie Luo, *I Know the Salaries of Thousands of Tech Employees*, MEDIUM: ONEZERO (Oct. 23, 2018), <https://medium.com/s/powertrip/i-know-the-salaries-of-thousands-of-tech-employees-4841bc26d753> [https://perma.cc/F58L-HMWR]; Zhang, *supra* note 126.

¹²⁸ Alison DeNisco Rayome, *62% of China's Machine Learning Graduates Leave to Work in the US*, TECHREPUBLIC (Dec. 4, 2018, 8:43 AM), <https://www.techrepublic.com/article/62-of-chinas-machine-learning-graduates-leave-to-work-in-the-us/> [https://perma.cc/KU6J-7R47].

¹²⁹ See Zhang, *supra* note 126.

¹³⁰ *Data Scientist Jobs: Where Does the Big Data Talent Gap Lie?*, ITPRO (Sept. 17, 2019), <https://www.itpro.co.uk/careers/28929/data-scientist-jobs-where-does-the-big-data-talent-gap-lie> [https://perma.cc/T2SZ-MGUM]. The UK, however, is advancing higher education by committing to fund 1,000 PhDs in AI research. Sam Shead, *U.K. Government to Fund AI University Courses With £115m*, FORBES (Feb. 20, 2019, 10:32 PM), <https://www.forbes.com/sites/samshead/2019/02/20/uk-government-to-fund-ai-university-courses-with-115m/?sh=45cf4ec3430d> [https://perma.cc/64NQ-4FNG].

¹³¹ *Asia's AI Agenda: AI for Business*, MIT TECH. REV. (Feb. 28, 2019), <https://www.technologyreview.com/s/613044/asias-ai-agenda-ai-for-business/> [https://perma.cc/DT4p-5D6R]. Some estimates expect China's AI talent to reach 5 million in a few years. Sarah Dai, *World's Most Populous Country Lacks the One Thing It Needs to Become an AI Powerhouse: Enough Talented People*, S. CHINA MORNING POST (Dec. 13, 2017, 8:00 AM), <https://www.scmp.com/tech/china-tech/article/2123949/worlds-most-populous-country-lacks-one-thing-it-needs-become-ai> [https://perma.cc/9CRC-CNEF].

¹³² Rosenbach & Kumar, *supra* note 120. China has also instituted a number of successful retention programs for AI workers. Sarah O'Meara, *Will China Overtake the U.S. in Artificial Intelligence Research?*, SCI. AM. (Aug. 24, 2019), <https://www.scientificamerican.com/article/will-china-overtake-the-u-s-in-artificial-intelligence-research/> [https://perma.cc/2GFK-WEVL].

permitting spouses to work in the U.S. are also at risk.¹³³ This governmental interference is causing the U.S. to lose its advantage in workers due to the uncertainty foreign workers have about their longevity in the U.S. and their new preference for other locations.¹³⁴

Depending on whether you use cited scholarly papers or patents as an indication of superior research, all three regions have made significant advances over the past decade and can argue superiority over the others.¹³⁵ Reviewing sheer numbers of papers on AI, Europe leads with 28%, China has 25%, and the U.S. has 17%.¹³⁶ China leads with the most published papers specifically on deep learning.¹³⁷ U.S. universities and tech companies hold the most patents on AI.¹³⁸ A report put out by Stanford indicated that in the ten-year period examined from 2004 to 2014, 30% of all AI patents came out of the U.S.¹³⁹ However, China argues that as of 2018, it actually has the greatest number of patents in AI.¹⁴⁰ Because the U.S. makes some research open source, allowing advances to be made by other companies and universities, some argue that it removes this competitive advantage because China would also have access and be able to exploit research advances created in the U.S.¹⁴¹ With respect to 5G patents, China's Huawei holds 11,423, Sweden's Ericsson 10,351, and Finland's Nokia 6,878.¹⁴²

¹³³ Nick Kolakowski, *H-4 Authorization for H-1B Visa Spouses Heads to Chopping Block*, DICE (Feb. 27, 2019), <https://insights.dice.com/2019/02/27/h-4-authorization-h-1b-visa-spouses-doom/> [<https://perma.cc/4YHT-PFXT>].

¹³⁴ Ananya Bhattacharya, *US Employers, Indian Employees—Everybody Wants a Piece of Canada*, QUARTZ INDIA (Mar. 26, 2019), <https://qz.com/india/1579747/as-trump-tightens-us-h-1b-norms-jobs-move-to-canada/> [<https://perma.cc/A3BB-8PFX>].

¹³⁵ *The Global AI Race – Which Country Is Winning?*, NANALYZE (Dec. 31, 2018), <https://www.nanalyze.com/2018/12/global-ai-race-country-winning/> [<https://perma.cc/HQ5-3R6S>].

¹³⁶ YOAV SHOHAM ET AL., AI INDEX STEERING COMM., HUMAN-CENTERED AI INITIATIVE, ARTIFICIAL INTELLIGENCE INDEX: 2018 ANNUAL REPORT 10 (2018), https://hai.stanford.edu/sites/default/files/2020-10/AI_Index_2018_Annual_Report.pdf [<http://perma.cc/4PMD-VEK3>].

¹³⁷ *Who Is Winning the AI Race?*, MIT TECH. REV. (June 27, 2017), <https://www.technologyreview.com/s/608112/who-is-winning-the-ai-race/> [<https://perma.cc/26DW-H38T>].

¹³⁸ Snyder, *supra* note 27.

¹³⁹ SHOHAM ET AL., *supra* note 136, at 35.

¹⁴⁰ *The Global AI Race – Which Country Is Winning?*, *supra* note 135.

¹⁴¹ Patrick Kulp, *In the AI Race, China Is Mere Steps Behind the U.S.*, ADWEEK (Sept. 20, 2018), <https://www.adweek.com/programmatic/in-the-ai-race-china-is-mere-steps-behind-the-u-s/> [<https://perma.cc/HLC7-QSSR>].

¹⁴² Naushad K. Cherrayil, *Trump's Huawei Ban a 'Double-Edged Sword'*, TECHRADAR.PRO (May 20, 2019), <https://www.techradar.com/news/trumps-huawei-ban-a-double-edged-sword> [<https://perma.cc/TUP7-BHYR>].

There is a shortage of skilled workers who can install the infrastructure needed for future development in technology.¹⁴³ China has the advantage of both a larger population than both the U.S. and EU combined and is working to solve the skill gap in its public school system, unlike the U.S.¹⁴⁴ The EU's Digital Single Market initiative also supports education for AI in schools, research centers, and joint business-education partnerships.¹⁴⁵ There are expected to be two million jobs open by 2020 in the U.S., many of which will go unfilled¹⁴⁶ The U.S. has not made education for the AI future a priority.¹⁴⁷ While initially the U.S. had a major advantage in developing and retaining tech talent, recent actions by the recently-replaced U.S. Trump administration have made the U.S. much less attractive for foreign workers. The gap will likely increase there while decreasing in China and the EU, which have adopted policies promoting education in the area of AI designed to create a skilled workforce down the road. Additionally, tech centers will likely be moved out of the U.S. to areas that provide more favorable conditions, further depleting the U.S. tech force.¹⁴⁸

3. Increased Funding for Development

In addition to workers, you also need money to develop AI. In just one company, Google, on just one project (self-driving cars), Google spent \$1.1 billion between 2009 and 2015 to create the needed AI technology.¹⁴⁹ In China and the EU, funding for such projects has traditionally come from government-academic or government-industry partnerships; in the U.S.

¹⁴³ In addition to tech workers to develop and advance 5G and AI technology, there is also a shortage for workers who can actually install 5G. For example, it is estimated that in the U.S. alone, 20,000 additional tower climbers will be needed to build out 5G. *Serious Workforce Shortage Has the Wireless Industry and FCC Pulling Together to Solve It*, WIRELESSESTIMATOR.COM (Apr. 22, 2019), <https://wirelessestimator.com/articles/2019/serious-workforce-shortage-has-the-wireless-industry-and-fcc-pulling-together-to-solve-it/> [<https://perma.cc/96B6-J5LK>].

¹⁴⁴ Zhang, *supra* note 126.

¹⁴⁵ Eur. Comm'n, *EU Member States Sign Up to Cooperate on Artificial Intelligence*, EUROPA (Apr. 10, 2018), <https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence> [<https://perma.cc/2849-NHQQ>].

¹⁴⁶ Zhang, *supra* note 126.

¹⁴⁷ John R. Allen, *Why We Need to Rethink Education in the Artificial Intelligence Age*, BROOKINGS (Jan. 31, 2019), <https://www.brookings.edu/research/why-we-need-to-rethink-education-in-the-artificial-intelligence-age/> [<https://perma.cc/2XHN-SGAU>].

¹⁴⁸ Justin Shields, *Smart Machines and Smarter Policy: Foreign Investment Regulation, National Security, and Technology Transfer in the Age of Artificial Intelligence*, 51 J. MARSHALL L. REV. 279, 299–300 (2018).

¹⁴⁹ Danielle Muoio, *Google Spent at Least \$1.1 Billion on Self-Driving Cars Before It Became Waymo*, BUS. INSIDER (Sept. 15, 2017, 1:31 PM), <https://www.businessinsider.com/google-self-driving-car-investment-exceeds-1-billion-2017-9> [<https://perma.cc/XE6Y-JPU5>].

however, the bulk of funding has been left to private industry.¹⁵⁰ It is reported that 80% of the top breakthroughs in AI in the U.S. over the past forty years came from private investment.¹⁵¹

Overall government investment in AI by China exceeds that of other regions.¹⁵² China has allocated \$30 billion to state-owned firms for the development of AI,¹⁵³ with total government spending expected to reach \$70 billion.¹⁵⁴ The U.S. government, on the other hand, has only allocated about \$100 million per year over the past few years to AI research and development (R&D) projects.¹⁵⁵ These projects fall under the purview of the National Science Foundation (NSF), but funding for scientific research (outside the military) has actually been decreasing over the years since the 1960s.¹⁵⁶ In fact, President Trump's recent budget request would further cut funding to

¹⁵⁰ Kaveh Waddell, *A Power Shift in AI Funding May Hobble the U.S.*, AXIOS (July 4, 2018), <https://www.axios.com/power-shift-artificial-intelligence-funding-government-51f9a28a-0da5-4787-b84f-a69c9b9c92da.html> [<https://perma.cc/4H4G-JN8G>].

¹⁵¹ Schulze, *supra* note 1.

¹⁵² Snyder, *supra* note 27.

¹⁵³ Additionally, Beijing has dedicated \$2 billion and Tianjin \$16 billion. Thomas H. Davenport, *Opinion: China Is Overtaking the U.S. as the Leader in Artificial Intelligence*, MARKETWATCH (Mar. 7, 2019, 11:08 PM), <https://www.marketwatch.com/story/china-is-overtaking-the-us-as-the-leader-in-artificial-intelligence-2019-02-27> [<https://perma.cc/9ABB-HSHX>].

¹⁵⁴ Tristan Greene, *China Set to Leapfrog US in the AI Race*, TNW (July 30, 2018), <https://thenextweb.com/artificial-intelligence/2018/07/30/china-set-to-leapfrog-us-in-the-ai-race/> [<https://perma.cc/EXS4-Q4PF>].

¹⁵⁵ Sebastian Moss, *Understanding the United States' National AI Strategy*, DATA CTR. DYNAMICS (Feb. 12, 2019), <https://www.datacenterdynamics.com/analysis/understanding-united-states-national-ai-strategy/> [<https://perma.cc/MSPG-5XQG>].

¹⁵⁶ Conventional wisdom was that industry invested in applied research leading to commercial products and services, while government picked up the tab for fundamental and discovery research. By 2017, it was becoming abundantly clearer that this long-standing juxtaposition was being turned on its head. Jeffrey Mervis, writing in the March [10], 2017 issue of *Science* magazine, noted that for the first time in the decades since World War II, the federal government was no longer paying for the lion's share of the fundamental research done in the US.

Bernard B. Tuls, *As Federal Research Funds Recede, the Private Sector Is Filling the Gap*, LAB MANAGER (May 6, 2018), <https://www.labmanager.com/business-management/2018/05/as-federal-research-funds-recede-the-private-sector-is-filling-the-gap#.XWgqOehKiUk> [<https://perma.cc/2NHH-8C6E>].

the NSF by 13%.¹⁵⁷ Even the 2019 American AI Initiative put out by the previous administration provides no new funding for AI research.¹⁵⁸

Despite the lack of attention to general AI funding by the U.S. federal government, the Defense Advanced Research Projects Agency (DARPA) has allocated funds to military AI R&D.¹⁵⁹ In 2019, DARPA put out a request for proposals aimed at tech companies to assist with the development of technology needed for its AI Next campaign.¹⁶⁰ One of the issues with requesting proposals for military uses of AI is the tech industry's reluctance to become involved in that field. In June 2019, for example, Google decided not to renew its military contract with the Pentagon for Project Maven due to employee pushback.¹⁶¹ Facebook, Microsoft, and Amazon have also encountered similar objections to military projects.¹⁶²

¹⁵⁷ Joel Achenbach et al., *Trump Budget Seeks Cuts in Science Funding*, WASH. POST (Mar. 11, 2019, 1:15 PM), <https://www.washingtonpost.com/science/2019/03/11/trump-budget-seeks-cuts-science-funding/> [https://perma.cc/9B2Q-WRFR]. Although numerous federal budget requests ask for AI R&D funds, it is unclear if the requests will be granted and whether this will be a new allocation or just a refiguring of the current budget allotment. Chris Cornillie, *Finding Artificial Intelligence Money in the Fiscal 2020 Budget*, BLOOMBERG GOV'T (Mar. 28, 2019, 3:27 PM), <https://about.bgov.com/news/finding-artificial-intelligence-money-fiscal-2020-budget/> [https://perma.cc/3J45-QVAH].

¹⁵⁸ Exec. Order No. 13,859, 3 C.F.R. 254 (2020); see also *Artificial Intelligence for the American People*, WHITE HOUSE: FACT SHEETS (May 10, 2018), <https://trumpwhitehouse.archives.gov/briefings-statements/artificial-intelligence-american-people/> [https://perma.cc/EE8W-SLCG].

¹⁵⁹ Drew Harwell, *Defense Department Pledges Billions Toward Artificial Intelligence Research*, WASH. POST (Sept. 7, 2018, 7:39 AM), <https://www.washingtonpost.com/technology/2018/09/07/defense-department-pledges-billions-toward-artificial-intelligence-research/> [https://perma.cc/Y5LU-W5P2].

¹⁶⁰ Key areas of the campaign include automating critical DoD business processes, such as security clearance vetting or accrediting software systems for operational deployment; improving the robustness and reliability of AI systems; enhancing the security and resiliency of machine learning and AI technologies; reducing power, data, and performance inefficiencies; and pioneering the next generation of AI algorithms and applications, such as 'explainability' and common sense reasoning.

AI Next Campaign, DEF. ADVANCED RSCH. PROJECTS AGENCY, <https://www.darpa.mil/work-with-us/ai-next-campaign> [https://perma.cc/5HX8-R7TV].

¹⁶¹ Four thousand, six hundred employees signed a petition asking Google to cancel the contract with the Pentagon to develop AI to help detect humans and identify targets captured by drone images. Paresh Dave & Heather Somerville, *Google to Scrub U.S. Military Deal Protested by Employees - Source*, REUTERS (June 1, 2018, 2:16 PM), <https://www.reuters.com/article/uk-alphabet-defense/google-to-scrub-u-s-military-deal-protested-by-employees-source-idUKKCN1IX5YC> [https://perma.cc/J4CH-C6EC].

¹⁶² Brittain Ladd, *The Military Industrial Complex Is in a Massive Battle Against Big Tech*, OBSERVER (May 24, 2019, 8:00 AM), <https://observer.com/2019/05/military-industrial-complex-big-tech/> [https://perma.cc/ZV97-NBKH]. More than one hundred engineering students also signed a pledge to "[r]efuse to participate in developing technologies of war." John Horgan, *Antiwar Movement Spreads Among Tech Workers*, SCI. AM. (Oct. 15, 2018), <https://blogs.scientificamerican.com/cross-check/antiwar-movement-spreads-among-tech-workers/> [https://perma.cc/LCB4-D2ZW].

In terms of private funding, the U.S. is the leader in this regard but risks losing out to China due to consequences of the trade war. Although China initially focused its foreign direct investments in the U.S. tech industry, recent restrictions, discussed in Section III.A., have forced China to invest elsewhere forming new AI global partnerships around the world.¹⁶³ AI startups in Silicon Valley used to be the main recipient of AI venture capitalist funding, primarily from China.¹⁶⁴ Silicon Valley, however, is now beginning to feel the pain from China's withdrawal.¹⁶⁵ A survey of 740 tech leaders indicated they expect Silicon Valley to be replaced by new tech hubs due to increased investments outside of Silicon Valley.¹⁶⁶ In fact, in 2018, almost half of all venture capital in AI went to firms in China.¹⁶⁷ Chinese start-ups raised \$4.9 billion, compared to the U.S.'s \$4.4 billion.¹⁶⁸

The EU government (along with member states and private industry) has pledged €20 billion over the next two years for AI R&D.¹⁶⁹ An additional

¹⁶³ Sarah O'Meara, *An Artificial Race for Intelligence*, 569 NATURE 533, 534 (May 29, 2019), <https://www.nature.com/articles/d41586-019-01681-x> [<https://perma.cc/JL7N-NYP7>].

¹⁶⁴ *China Is Starting to Edge Out the US in AI Investment*, CB INSIGHTS (Feb. 12, 2019), <https://www.cbinsights.com/research/china-artificial-intelligence-investment-startups-tech/> [<https://perma.cc/X5CM-KLAB>]; Elizabeth Dwoskin, *China Is Flooding Silicon Valley with Cash. Here's What Can Go Wrong.*, WASH. POST (Aug. 6, 2016), https://www.washingtonpost.com/business/economy/new-wave-of-chinese-start-up-investments-comes-with-complications/2016/08/05/2051db0e-505d-11e6-aa14-e0c1087f7583_story.html [<https://perma.cc/FR87-4FY5>]; Heather Sommerville, *Chinese Tech Investors Flee Silicon Valley as Trump Tightens Scrutiny*, REUTERS (Jan. 7, 2019, 12:57 AM), <https://www.reuters.com/article/us-venture-china-regulation-insight/chinese-tech-investors-flee-silicon-valley-as-trump-tightens-scrutiny-idUSKCN1P10CB> [<https://perma.cc/2FQY-98U6>].

¹⁶⁵ In 2016, China invested over \$6 billion in Silicon Valley start-ups. Dwoskin, *supra* note 164. In 2018, that amount decreased by \$3 billion; in 2019, the money dried up. Sommerville, *supra* note 164.

¹⁶⁶ See Press Release, KPMG, Majority Tech Industry Leaders Expect Silicon Valley to Be Surpassed as Leading Innovation Center (Feb. 21, 2019), <https://home.kpmg/us/en/home/media/press-releases/2019/02/majority-tech-industry-leaders-expect-silicon-valley-to-be-surpassed-as-leading-innovation-center.html> [<https://perma.cc/BJ6Z-6VH8>]. In fact, eleven of the top fifteen rising tech hubs are located outside of the U.S. *Id.*

¹⁶⁷ See Snyder, *supra* note 27. In 2018, "48 percent of the venture capital money directed to AI went to China, compared to 38 percent invested in U.S. ventures," according to Dr. Kai-Fu Lee, a venture capitalist and author of *AI Superpowers: China, Silicon Valley and the New World Order*. *Id.* China ranks first in financing for AI ventures with 577 out of 745 entities raising over \$55.4 billion according to a report by the Chinese Institute of New Generation Artificial Intelligence Development Strategies. *China's AI Industry Poised to Enter Boom Times*, GLOB. TIMES (May 19, 2019, 10:16 PM), <http://www.globaltimes.cn/content/1150659.shtml> [<https://perma.cc/4MXJ-PHGN>].

¹⁶⁸ Uptin Saiidi, *China Could Surpass the US in Artificial Intelligence Tech. Here's How*, CNBC (Dec. 13, 2018, 10:37 PM), <https://www.cnbc.com/2018/12/14/china-could-surpass-the-us-in-artificial-intelligence-tech-heres-how.html> [<https://perma.cc/4WR8-BCK9>].

¹⁶⁹ Elias Kruger, *Who Will Win the Global AI Race? Part I: China vs USA*, AI THEOLOGY (May 21, 2018), <https://www.aitheology.com/2018/05/21/the-battle-for-ai-supremacy-contrasting-us-china-and-europe/> [<https://perma.cc/L32P-X22L>].

€27 billion has been earmarked for skills development for AI.¹⁷⁰ France and the UK in particular have initiated plans that rely on education and innovation, with both pledging €1.4–1.5 billion.¹⁷¹ The EU also has the benefit of twenty-eight member states that can pool their resources.¹⁷² However, each state has differing plans for AI, which may be at odds with the vision of the EU as the leader in human-centric AI.¹⁷³ The EU, realizing the need to ramp up its basic research in AI, has allocated €50 million to such projects.¹⁷⁴ Similar to China, the EU is looking to create AI research centers throughout its member states.¹⁷⁵ The U.S. government has no comparable plan for the creation of research centers.

In sum, China has made a massive investment in AI technology, which shows no signs of slowing. It has reduced its investment in the U.S., which will negatively impact private AI start-ups there. The U.S. government still has not come up with a plan to either guide or fund AI research (outside of military uses) and is relying on private industry to move the field forward. The EU is taking a cautious approach to developing AI through education, research centers, and guidelines for the ethical development of AI.

4. Strategic Planning for Artificial Intelligence

As indicated earlier, AI is not an isolated technology, but rather a field of science that consists of many different technologies with many different applications.¹⁷⁶ AI can be used to make processes more efficient, pathology

¹⁷⁰ Eur. Comm'n, *Factsheet: Artificial Intelligence for Europe*, EUROPA (July 4, 2019), <https://ec.europa.eu/digital-single-market/en/news/factsheet-artificial-intelligence-europe> [<https://perma.cc/36R5-XCSV>].

¹⁷¹ Elias Kruger, *Who Will Win the AI Race? Part II: The European Way*, AI THEOLOGY (May 29, 2018), <https://www.aitheology.com/2018/05/29/who-will-win-the-ai-race-part-ii-the-european-way/> [<https://perma.cc/85ZR-LUSE>].

¹⁷² See *AI in Europe: Funding Hits €20 Billion*, *supra* note 116. A problem may arise from individual state funding in that each member state is seeking to develop its own tech center specializing in AI, which may cause redundancies. See also Ulrike Franke & Paola Sartori, *Machine Politics: Europe and the AI Revolution*, EUR. COUNCIL ON FOREIGN RELS. (July 11, 2019), https://www.ecfr.eu/publications/summary/machine_politics_europe_and_the_ai_revolution [<https://perma.cc/5U9T-Z42C>].

¹⁷³ Franke & Sartori, *supra* note 172.

¹⁷⁴ See Nicholas Wallace, *EU Commission Launches €50M Call for Artificial Intelligence Research Networks*, SCI. BUS. (July 15, 2019), <https://sciencebusiness.net/news/eu-commission-launches-eu50m-call-artificial-intelligence-research-networks> [<https://perma.cc/8P85-KSDF>]. Nvidia has agreed to provide the equipment and software for a national AI lab in Luxembourg. Press Release, The Luxembourg Government, Luxembourg to be the First European Country to Create an Artificial Intelligence (AI) Partnership with NVIDIA (Jan. 30, 2019), https://gouvernement.lu/en/actualites/toutes_actualites/communiqués/2019/01-janvier/30-bettel-partenariat-nvidia.html [<https://perma.cc/NB2N-MMVD>].

¹⁷⁵ See Conor Reynolds, *EU Opens €50 Million Tender for AI Centres of Excellence*, COMPUT. BUS. REV. (July 12, 2019), <https://www.cbronline.com/news/eu-ai-funding> [<https://perma.cc/25ZX-WLRX>].

¹⁷⁶ See *supra* Part I.

detection more accurate, and travel by cars safer.¹⁷⁷ AI can also be used to hack into the electrical grid, manipulate voters, and create autonomous weapons.¹⁷⁸ Due to the incredible transformative power of AI for both good and bad, it is imperative that countries create a national strategy around its development.¹⁷⁹ AI will impact each country's population base, industries, and economy. AI must be developed in a way that maximizes its benefits and minimizes its risks.¹⁸⁰

Both China and the EU have developed detailed strategic plans for the use and development of AI.¹⁸¹ These include various initiatives for funding, education, scientific research, ethics, infrastructure, and standards.¹⁸² Although a national AI plan was prepared during the Obama administration,¹⁸³ it has not been followed through.¹⁸⁴ According to Chris Demchak of the Cyber Innovation Policy Institute, “[i]n the pursuit of AI dominance, a strategically coherent nation is more likely to announce strategic goals in investments, R&D, and education, and streamline actions to achieve those advances across sectors.”¹⁸⁵ There is no doubt that China has

¹⁷⁷ West & Allen, *supra* note 16

¹⁷⁸ Marr, *supra* note 20.

¹⁷⁹ Ganesh Bell, *Why Countries Need to Work Together on AI*, WORLD ECON. F. (Sept. 16, 2018), <https://www.weforum.org/agenda/2018/09/learning-from-one-another-a-look-at-national-ai-policy-frameworks/> [<https://perma.cc/AA9W-HCSU>].

¹⁸⁰ *Id.*

¹⁸¹ *Id.*

¹⁸² Tim Dutton, *An Overview of National AI Strategies*, MEDIUM (June 28, 2018), <https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd> [<https://perma.cc/A3F9-A5C7>].

¹⁸³ See NETWORKING AND INFO. TECH. RSCH. AND DEV. SUBCOMM., NAT'L SCI. AND TECH. COUNCIL, THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN (2016), https://www.nitrd.gov/PUBS/national_ai_rd_strategic_plan.pdf [<https://perma.cc/7QDP-J9NZ>]; COMM. ON TECH., NAT'L SCI. AND TECH. COUNCIL, PREPARING FOR THE FUTURE OF ARTIFICIAL INTELLIGENCE (2016), https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/microsites/ostp/NSTC/preparing_for_the_future_of_ai.pdf [<https://perma.cc/4K2R-2UXG>]. The 2016 plan included both funding of AI research by the government and setting regulatory policy. In an interview with *WIRED*, President Obama said the government should support artificial intelligence research. “The way I’ve been thinking about the regulatory structure as AI emerges is that, early in a technology, a thousand flowers should bloom. And the government should add a relatively light touch, investing heavily in research and making sure there’s a conversation between basic research and applied research.” Scott Dadich, *Barack Obama, Neural Nets, Self-Driving Cars, and the Future of the World*, *WIRED* (Nov. 2016), <https://www.wired.com/2016/10/president-obama-mit-joi-ito-interview/> [<https://perma.cc/HK75-E4Q3>].

¹⁸⁴ Cade Metz, *As China Marches Forward on A.I., the White House Is Silent*, N.Y. TIMES (Feb. 12, 2018), <https://www.nytimes.com/2018/02/12/technology/china-trump-artificial-intelligence.html#> [<https://perma.cc/8P3T-TE76>].

¹⁸⁵ Chris C. Demchak, *Chapter 13. Four Horsemen of AI Conflict: Scale, Speed, Foreknowledge, and Strategic Coherence, in AI, CHINA, RUSSIA, AND THE GLOBAL ORDER: TECHNOLOGICAL, POLITICAL, GLOBAL, AND CREATIVE PERSPECTIVES, A STRATEGIC MULTILAYER ASSESSMENT (SMA) PERIODIC PUBLICATION 100, 103* (Nicholas D. Wright ed., 2018), <https://nsiteam.com/social/wp->

obtained strategic coherence when it comes to AI.¹⁸⁶ The 2019 American AI Initiative hastily put out by the previous U.S. administration is not really a strategic plan, but rather a brief statement of what the government would like to do; it mostly appears to be a reaction to China's progress.¹⁸⁷ One of the risks from the U.S. government's lack of direction and support is that most development will continue to be in the commercial area supported by private funding,¹⁸⁸ not AI for public good.¹⁸⁹ In addition, the U.S. government still has no coordinated plan for the rollout of 5G.¹⁹⁰ This is especially concerning as the FCC has made the least workable bandwidths available for 5G to operate in.¹⁹¹ The lack of a U.S. strategic plan in this area also means that

content/uploads/2019/01/AI-China-Russia-Global-WP_FINAL_forcopying_Edited-EDITED.pdf [https://perma.cc/5GJA-4F9T].

¹⁸⁶ *Id.*

¹⁸⁷ "This is a tacit acknowledgement that China is advancing quickly in AI," said Paul Haswell, a partner who advises technology companies at international law firm Pinsent Masons. "Much of this US initiative looks like window dressing, and a reactionary step to counter reports that China is rapidly advancing in its AI capabilities."

Sarah Dai, *Is Trump's AI Executive Order a Sputnik Moment for the US?*, S. CHINA MORNING POST (Feb. 13, 2019, 6:00 AM), <https://www.scmp.com/tech/start-ups/article/2185891/trumps-ai-executive-order-sputnik-moment-us> [https://perma.cc/GX3Z-GD7X]. The American AI strategic plan has been described as little more than a fluff piece. See Adam Lashinsky, *President Trump's A.I. Plan Is Management Consultant Fluff*, FORTUNE (Feb. 12, 2019, 3:24 PM), <https://fortune.com/2019/02/12/ai-executive-order/> [https://perma.cc/WS83-3U74]. The former Trump administration's plan lacks funding and seeks to "remov[e] regulatory barriers" to the deployment of AI. See *Artificial Intelligence for the American People*, *supra* note 158; Exec. Order No. 13,859, 3 C.F.R. 254 (2020).

¹⁸⁸ Most AI technologies in the U.S. relate to improving manufacturing efficiencies, developing the technology for self-driving cars, improving delivery logistics, etc. Although some universities have begun to develop centers for what is known in the EU as "human-centric AI," this is a relatively new development which is lacking government funding or acknowledgement. Houser, *supra* note 12, at 597, 602, 604.

¹⁸⁹ Although the EU is at the forefront of AI for public good, some U.S. companies have privately funded research streams in these areas. McKinsey reports the potential for AI to be used for security and justice, crisis response, economic empowerment, education, environment, equality and inclusion, health and hunger, information verification and validation, infrastructure, and the public and social sector. Michael Chui et al., *Applying Artificial Intelligence for Social Good*, MCKINSEY & CO. (Nov. 28, 2018), <https://www.mckinsey.com/featured-insights/artificial-intelligence/applying-artificial-intelligence-for-social-good> [https://perma.cc/4EH3-U53J].

¹⁹⁰ Margaret Taylor, *What Congress Is (and Isn't) Doing on 5G*, LAWFARE (Aug. 28, 2019, 8:18 AM), <https://www.lawfareblog.com/what-congress-and-isnt-doing-5g> [https://perma.cc/NX3T-TADF].

¹⁹¹ The recent FCC spectrum bandwidth auctions have focused on primarily high-spectrum waves, with a few low-spectrum waves. Unfortunately, they have not made any mid-spectrum waves available for 5G. The U.S. is selling millimeter waves, which are present above twenty-four GHz. They do not work well for cellular networks because signals can only reach short distances and can be blocked by solid objects. The U.S. is the only country seeking to use millimeter waves for the installation of its 5G network. China and countries in Europe and elsewhere are all focused on the mid-band spectrums, which will be faster and cheaper. Jessica Rosenworcel, *Choosing the Wrong Lane in the Race to 5G*, WIRED (June 10, 2019, 1:05 PM), <https://www.wired.com/story/choosing-the-wrong-lane-in-the-race-to-5g/> [https://perma.cc/X83X-N8NN].

standards for 5G equipment are uncertain at this point.¹⁹² In discussing the U.S. position on 5G, Nigel Inkster, a former British intelligence official and senior advisor at the International Institute for Strategic Studies, stated,

I think they've been rather leaden-footed in the way they've responded. Firstly[,] by lacking an explicit, government-articulated strategy in relation to 5G which is only now starting to emerge, but also in arguing or shaping the challenge from China and from Huawei solely as an espionage issue.¹⁹³

China, on the other hand, began to prepare for the rollout of 5G in 2013 when it created a regulatory board fitted with members from the academic and industrial community to oversee the process.¹⁹⁴

The government and private industry in the U.S. have an uneasy relationship, resulting from the government's desire to both limit what private industry can do with data (due to the attention given to the Cambridge Analytica debacle),¹⁹⁵ while at the same time encouraging private industry to help with the weaponization of AI for the military.¹⁹⁶ The U.S. federal government's lack of understanding of technology has resulted in disjointed policy and a lack of updated laws.¹⁹⁷ The U.S. government has also encountered problems in meeting its military needs due to U.S. tech companies pledging not to help the U.S. military in this regard.¹⁹⁸

China, on the other hand, has a robust strategy aimed at all areas of AI, which includes the needed 5G infrastructure.¹⁹⁹ In 2017, China released its

¹⁹² This presents problems with the potential for U.S. companies to expand into foreign markets. Because China, the EU, and the U.S. all developed their own cell phone standards without cooperation, telecom companies are limited to their own areas. For example, while the EU chose GSM (Global System for Satellite Communication), the U.S. bet on CDMA (Code Division Multiple Access). Although 4G runs on LTE, phone service is not interchangeable (thus the need to either use roaming or switch out SIM cards when traveling to foreign countries). Houser, *supra* note 12, at 601–05.

¹⁹³ Elizabeth Schulze, *The US Is Attacking Huawei and China — Without Its Own 5G Strategy*, CNBC (Apr. 21, 2019, 10:08 PM), <https://www.cnbc.com/2019/04/22/us-attacks-huawei-and-china-without-a-5g-strategy.html> [<https://perma.cc/WHK5-7VYZ>].

¹⁹⁴ Josh Chin, *The Internet, Divided Between the U.S. and China, Has Become a Battleground*, WALL ST. J. (Feb. 9, 2019, 12:00 AM), <https://www.wsj.com/articles/the-internet-divided-between-the-u-s-and-china-has-become-a-battleground-11549688420> [<https://perma.cc/ZQ4H-7XWT>].

¹⁹⁵ *Congress Is Trying to Create a Federal Privacy Law*, THE ECONOMIST (Feb. 28, 2019), <https://www.economist.com/united-states/2019/02/28/congress-is-trying-to-create-a-federal-privacy-law> [<https://perma.cc/3HXE-4V56>].

¹⁹⁶ Tom Simonite, *The Pentagon Doubles Down on AI—and Wants Help from Big Tech*, WIRED (Feb. 12, 2019, 7:30 PM), <https://www.wired.com/story/pentagon-doubles-down-ai-wants-help-big-tech/> [<https://perma.cc/8UE9-EZ25>].

¹⁹⁷ Devin Coldewey, *Congress Flaunts Its Ignorance in House Hearing on Net Neutrality*, TECHCRUNCH (Feb. 7, 2019, 3:26 PM), <https://techcrunch.com/2019/02/07/congress-flaunts-its-ignorance-in-house-hearing-on-net-neutrality/> [<https://perma.cc/E4TL-MG75>].

¹⁹⁸ Horgan, *supra* note 162.

¹⁹⁹ As part of China's Belts and Road initiative, it is seeking to install its 5G equipment in Asia and Europe allowing them to “maximize the opportunities they have for extending their influence in the world

Next-Generation Artificial Intelligence Development Plan (the “China AI Plan”), seeking to be the world’s leader in AI by 2030.²⁰⁰ The plan builds off of the Made in China 2025 Plan²⁰¹ and contains three major benchmarks: boost innovation and advanced technology integration by 2025, “reach parity with global industry at intermediate levels” by 2035, and “lead global manufacturing and innovation with a competitive position in advanced technology and industrial systems by 2049.”²⁰² The China AI Plan addresses research, infrastructure, educating future workers, business, and academia.²⁰³ It demonstrates an understanding of how AI can improve all industries, including manufacturing, healthcare, agriculture, and national defense.²⁰⁴ It recognizes the importance of government-industry partnerships.²⁰⁵ While this creates financial advantages for business, it also allows the government to play an enormous role in guiding the development of AI.²⁰⁶ The goal of the China AI Plan is to become a world leader in AI by 2025 and the “primary” center for AI innovation by 2030.²⁰⁷

The governmental strategy in the EU reflects a desire to balance government, private industry, and academic development of AI with protections for its citizenry.²⁰⁸ The EU is focused on increasing investment

and underpinning their global position and power,” according to Anthony Glees, director of the Centre for Security and Intelligence Studies at the University of Buckingham. Schulze, *supra* note 193.

²⁰⁰ Julio Rivera, *Which Country Will Win the Artificial Intelligence Arms Race?*, AM. THINKER (Dec. 12, 2018), https://www.americanthinker.com/blog/2018/12/which_country_will_win_the_artificial_intelligence_arms_race.html [https://perma.cc/S6MY-S93G].

²⁰¹ Although the US had a head start, AI has assumed a key role in Beijing’s “Made in China 2025” [(MIC2025)] master plan, which promises to lift the country’s industries—from robotics and aerospace to new materials and new energy vehicles—up the value chain, replacing imports with local products and building global champions able to take on Western giants in cutting-edge technologies.

Sarah Dai & Alice Shen, ‘*Made in China 2025*’: *China Has a Competitive AI Game Plan but Success Will Need Cooperation*, S. CHINA MORNING POST (Oct. 1, 2018, 11:00 PM), <https://www.scmp.com/tech/article/2166177/made-china-2025-china-has-competitive-ai-game-plan-success-will-need> [https://perma.cc/7PBJ-UD3E].

²⁰² *AI Policy – China*, FUTURE OF LIFE INST., <https://futureoflife.org/ai-policy-china/> [https://perma.cc/3JMP-6W7Q]; KAREN M. SUTTER, CONG. RSCH. SERV., IF10964, “MADE IN CHINA 2025” INDUSTRIAL POLICIES: ISSUES FOR CONGRESS (Aug. 11, 2020), <https://fas.org/sgp/crs/row/IF10964.pdf> [https://perma.cc/AEK8-R2W4].

²⁰³ *China’s New Generation of Artificial Intelligence Development Plan*, FOUND. FOR L. & INT’L AFFS. (July 30, 2017), <https://flia.org/notice-state-council-issuing-new-generation-artificial-intelligence-development-plan/> [https://perma.cc/AY8Y-6CHW].

²⁰⁴ Kruger, *supra* note 169.

²⁰⁵ Dutton, *supra* note 182.

²⁰⁶ Kruger, *supra* note 169.

²⁰⁷ Dutton, *supra* note 182.

²⁰⁸ See *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on Building Trust in Human-Centric*

in AI, preparing for socio-economic changes, and devising an ethical and legal framework for the development of AI.²⁰⁹ In 2017, AI4People was the first global forum in Europe to address the social impact of AI.²¹⁰ It included European delegates from industry, academia, and government.²¹¹ In 2018, the EU issued the EU Declaration on Cooperation on Artificial Intelligence to obtain buy-in from member states to address the social, economic, ethical, and legal questions resulting from the development of AI.²¹² The motto of the Commission is “AI for good and for all.”²¹³ This type of consideration appears secondary in both China and the U.S.²¹⁴

Artificial Intelligence, at 1, COM (2019) 168 final (Apr. 8, 2019) [hereinafter *Communication from the Commission 168*]. The EU has a series of plans created under the purview of the Single Digital Market including, *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions on Coordinated Plan on Artificial Intelligence*, COM (2018) 795 final (Dec. 7, 2018) [hereinafter *Communication from the Commission 795*]; *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions on Completing a Trusted Digital Single Market for All*, COM (2018) 320 final (May 15, 2018); *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions on Artificial Intelligence for Europe*, COM (2018) 237 final (Apr. 25, 2018) [hereinafter *Communication from the Commission 237*].

²⁰⁹ Kruger, *supra* note 171.

²¹⁰ Abigail Beall, *It's Time to Address Artificial Intelligence's Ethical Problems*, WIRED (Aug. 24, 2018), https://www.wired.co.uk/article/artificial-intelligence-ethical-framework?utm_sq=fuov9lcnyt [<https://perma.cc/R9DE-E2T7>].

²¹¹ *AI4People, Europe's First Global Forum on AI Ethics, Launches at the European Parliament*, ATOMIUM EUR. INS. FOR SC., MEDIA AND DEMOCRACY, <https://www.eismd.eu/ai4people-europes-first-global-forum-ai-ethics-launches-at-the-european-parliament/> [<https://perma.cc/8JEP-JRCS>].

²¹² Eur. Comm'n, *supra* note 145.

²¹³ Press Release, Eur. Comm'n, *Artificial Intelligence: Commission Discusses Ethical and Social Impact with Philosophical and Non-Confessional Organisations* (June 18, 2018), https://europa.eu/rapid/press-release_IP-18-4160_en.htm [<https://perma.cc/V946-JS87>]. For a thorough report on the EU and member state initiatives on AI *see generally* ACCESS NOW, *MAPPING REGULATORY PROPOSALS FOR ARTIFICIAL INTELLIGENCE IN EUROPE* (2018), https://www.accessnow.org/cms/assets/uploads/2018/11/mapping_regulatory_proposals_for_AI_in_EU.pdf [<https://perma.cc/VV3T-SJEF>].

²¹⁴ “[China’s] plan called for international cooperation and the establishment of more comprehensive AI regulations and ethical norms, though it did not present any concrete proposals in this area.” Jeffrey Ding, *The Interests Behind China’s Artificial Intelligence Dream*, in *ARTIFICIAL INTELLIGENCE, CHINA, RUSSIA, AND THE GLOBAL ORDER* 43, 44 (Nicholas D. Wright ed., 2019). With respect to the American AI Initiative, Kate Crawford, codirector and cofounder of the AI Now Institute at New York University, indicated, “I’m skeptical that the passing mention of these protections will result in [sic] any serious efforts to build in appropriate legal, ethical, and policy safeguards to ensure that AI systems are deployed responsibly.” Kyle Wiggers, *AI Weekly: Trump’s American AI Initiative Lacks Substance*, VENTUREBEAT (Feb. 15, 2019, 11:35 AM), <https://venturebeat.com/2019/02/15/ai-weekly-trumps-american-ai-initiative-lacks-substance/> [<https://perma.cc/38DK-CH4Q>].

In 2018, the EU adopted the Coordinated Plan on Artificial Intelligence (the “EU Plan”).²¹⁵ The earlier European Strategy on AI focused on encouraging human-centric AI.²¹⁶ The more recent EU Plan provides financial investment commitments to private industry, coordination between academia and private industry, education and retention of qualified talent, and the development of ethical and security guidelines. Recently, a draft document of a “European Future Fund” indicated a desire to invest €100 billion in European tech companies to compete with those in China and the U.S.²¹⁷ The EU is also at the forefront of investigating the health concerns surrounding the installation of 5G small cells on light poles and buildings.²¹⁸

Although the EU does not want to see a fragmented AI policy, that looks to be the future in the EU. The great disadvantage that the EU has is its incredible amount of bureaucracy.²¹⁹ It will take years for it to approve a regulatory scheme.²²⁰ What can be viewed as either a positive or negative, the member states of the EU have individually set their course of AI development and are moving ahead.²²¹ What is clear is that each of these blocks—China, the U.S., and the EU—is proceeding individually and without coordination. Although the EU does not consider itself to be in a race with the U.S. and China for all things AI, it has announced its goal of

²¹⁵ *Communication from the Commission 795*, *supra* note 208, at 2. The seven steps to trustworthy AI include: human agency and oversight; robustness and safety; privacy and data governance; transparency; diversity, non-discrimination, and fairness; societal and environmental well-being; and accountability. *Communication from the Commission 168*, *supra* note 208, at 3.

²¹⁶ *Communication from the Commission 237*, *supra* note 208, at 12.

²¹⁷ Mehreen Khan, *EU Floats Plan for €100bn Sovereign Wealth Fund*, FIN. TIMES (Aug. 24, 2019), <https://www.ft.com/content/033057a2-c504-11e9-a8e9-296ca66511c9> [https://perma.cc/CDG2-ZMXV].

²¹⁸ See *infra* Section III.A.

²¹⁹ Colm Gorey, *If EU States Are to Lead AI, They Must Not Compete With Each Other*, SILICON REPUBLIC (May 14, 2018), <https://www.siliconrepublic.com/machines/eu-ai-usa-china> [https://perma.cc/U95C-3X7T].

²²⁰ The GDPR, first discussed in 2012, did not become applicable until 2018. *The History of the General Data Protection Regulation*, EUR. DATA PROT. SUPERVISOR, https://edps.europa.eu/data-protection/data-protection/legislation/history-general-data-protection-regulation_en [https://perma.cc/F6LV-HVJT].

²²¹ While the UK is seeking to create an ethics center, France is encouraging open source research. Nicholas Vinocur, *Macron's €1.5 Billion Plan to Drag France into the Age of Artificial Intelligence*, POLITICO (Mar. 27, 2018, 11:24 AM), <https://www.politico.eu/article/macron-aims-to-drag-france-into-the-age-of-artificial-intelligence/> [https://perma.cc/H4U5-GNED]. France is also seeking to leverage its collection of data due to state-run organizations to develop AI in specific industries such as the medical field. It is looking to create a centralized data agency to oversee how such data is used. *Id.* The EU Commission, however, is seeking to create an information infrastructure to encourage collaboration in the advancement of AI among its member states. Gabriela Zafir-Fortuna, *Policy Brief: European Commission's Strategy for AI, Explained*, FUTURE OF PRIV. F. (July 19, 2018), <https://fpf.org/2018/07/19/policy-brief-european-commissions-strategy-for-ai-explained/> [https://perma.cc/9FUR-7GQG].

becoming the leader in ethical AI.²²² The EU Commission has acknowledged, “[f]or the EU, it is not so much a question of winning or losing a race but of finding the way of embracing the opportunities offered by AI in a way that is human-centered, ethical, secure, and true to our core values.”²²³

It should be noted that although China appears to have a robust strategic plan for the economic development of AI and the EU for the ethical development of AI, the U.S. is in the very early stages of AI development and has years to go before AI applications (such as autonomous vehicles) are commonplace. The main thrust of the AI future depends on the actual installation of the infrastructure. It is this area where the world has hit a major roadblock.

5. *Considering 5G as Essential Infrastructure*

Our future is going to be “data-centric” . . . [a]nd 5G will form our infrastructure in the same way that roads and power grids formed our industrial infrastructure.²²⁴

The availability of and legal ability to use data to train machines are critical to advances in AI.²²⁵ Additionally, AI development and implementation will be affected by the availability of research talent and skilled workers, the accessibility of funding, and by the presence of or lack of a governmental strategic plan.²²⁶ While most people think about improving download speeds on their cell phones as the reason for the move to 5G, it is actually the foundation of the future globally connected digital society on which AI will run.²²⁷ AI is currently being used to automate processes, evaluate and produce decisions, and make predictions. As discussed in Part I, AI of the future will involve the widespread implementation of the Internet of Things (IoT), including autonomous vehicles, connected medical devices,

²²² LEVERHULME CTR. FOR THE FUTURE OF INTEL., A SURVEY OF THE EUROPEAN UNION’S ARTIFICIAL INTELLIGENCE ECOSYSTEM 10 (2019), http://lcfi.ac.uk/media/uploads/files/Stix_Europe_AI_Final.pdf [<https://perma.cc/8V2A-476R>].

²²³ Reynolds, *supra* note 175.

²²⁴ Vox Creative, *5G Is Close to Becoming the New Normal — and It’ll Change Everything*, RECODE (Oct. 18, 2018, 4:11 PM) (internal quotation marks omitted) (quoting Sandra Rivera, senior vice president and general manager of the Network Platforms Group at Intel), <https://www.recode.net/ad/17994626/5g-industry-communications> [<https://perma.cc/Y6GL-TMPL>].

²²⁵ See *supra* Section II.A.

²²⁶ See *supra* Section II.B.

²²⁷ There are any number of technologies that can facilitate AI and IoT including the potential of WiFi6. While 5G will be installed outdoors, WiFi6 will be used primarily for indoor wireless connectivity. This paper focuses on 5G because it is the most likely immediate source for the infrastructure needed for widespread AI and IoT applications. For an explanation of the differences between 5G and WiFi6 and their potential for integration, see Brandon Vigliarolo, *Wi-Fi 6 (802.11ax): A Cheat Sheet*, TECHREPUBLIC (Apr. 29, 2020, 10:32 AM), <https://www.techrepublic.com/article/wi-fi-6-802-11ax-a-cheat-sheet/> [<https://perma.cc/7J94-BKH5>].

and smart factories and cities.²²⁸ Thus, the practical application of advances in AI require that the infrastructure be in place in sufficiently broad physical areas so that data can be transmitted and processed at high speeds with low latency.²²⁹

5G is the fifth generation of wireless communications. A cell phone is a radio-powered mobile device. The device has an internal modem and antenna. Wireless technology sends data from the mobile device to a base station (cell tower) containing an antenna and telecommunication equipment to receive and transmit data. Wires then carry the data to the carrier's servers. These radio waves travel in designated spectrum bands. Just like you have to tune a radio station to a specific channel, wireless devices operate on set spectrum bands. 4G (LTE), for the most part in the U.S., operates on low-range bands that can travel long distances, permitting cell towers to be placed as far as one to two miles apart in suburban areas, up to twenty-two miles apart for Global System for Mobile Communications (GSM), and forty-five miles apart for Code Division Multiple Access (CDMA) and Integrated Digital Enhanced Network (IDEN) transmissions.²³⁰ With 5G, the distance between base stations is dependent upon the spectrum band assigned to the carrier. Radio waves, in which 5G will operate, fall between three kilohertz (kHz) and 300 giga hertz (GHz).²³¹ Low range bands generally operate

²²⁸ See JILL C. GALLAGHER & MICHAEL E. DEVINE, CONG. RSCH. SERV., R45485, FIFTH-GENERATION (5G) TELECOMMUNICATIONS TECHNOLOGIES: ISSUES FOR CONGRESS (2019), <https://fas.org/sgp/crs/misc/R45485.pdf> [<https://perma.cc/QM96-JX3D>].

²²⁹ "For autonomous car technology to be unlocked, many experts agree that large-scale adoption of 5G—the next-generation wireless technology—is required. The current 4G network is fast enough to online stream full HD content and play online games, but it can't support safer and smarter autonomous cars." Ralf Llanasas, *5G's Important Role in Autonomous Car Technology*, MACHINEDESIGN (Mar. 11, 2019), <https://www.machinedesign.com/motion-control/5g-s-important-role-autonomous-car-technology> [<https://perma.cc/4WF6-N6PM>]. Cars will be communicating initially through the base stations laced along the roadway. For information on the potential for "flying base stations," see Silvia Mignardi et al., *Trajectories and Resource Management of Flying Base Stations for C-V2X*, SENSORS, Feb. (II) 2019, at 3, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6412590/pdf/sensors-19-00811.pdf> [<https://perma.cc/LH8J-VBQ3>]. Current wireless carrier services and Internet Wi-Fi are insufficient to support the increase in data transmissions, needed speed, or low latency required for these developments. The way an autonomous vehicle works is that it is fitted with hundreds of sensors, each of which generates data moment-by-moment as the car is driving which must be processed in the moment. As explained in Part I, 5G provides superior transmission speed that when combined with edge computing can result in almost instantaneous decisions (such as whether the car needs to apply the brakes). For information on how self-driving cars work, see Mikael Fallgren et al., *5G Technologies for the Connected Car* (Aug. 2015) (unpublished manuscript), <https://nms.kcl.ac.uk/toktam.mahmoodi/files/5GCAR-VT-2018.pdf> [<https://perma.cc/74YV-9YRX>].

²³⁰ Bert Markgraf, *How Far Can a Cell Tower Be for a Cellphone to Pick Up the Signal?*, SMALL BUS. CHRON., <https://smallbusiness.chron.com/far-can-cell-tower-cellphone-pick-up-signal-32124.html> [<https://perma.cc/PQ5L-MNAS>].

²³¹ Tim Fisher, *5G Spectrum and Frequencies: Everything You Need to Know*, LIFEWIRE (Mar. 1, 2020), <https://www.lifewire.com/5g-spectrum-frequencies-4579825> [<https://perma.cc/H3HB-H7EV>].

between 300 megahertz (MHz) and three GHz. These frequencies are also used for TV, GPS, Wi-Fi, cordless phones, and Bluetooth. Lower frequencies mean lower speeds but longer distances.²³² Mid-range frequencies are considered the “sweet spot” for radio transmissions and occur between three GHz and six GHz.²³³ High range bands are over six GHz, with millimeter bands (mmWave) occurring above thirty GHz.²³⁴

In most of the world, including Europe and China, mid-range bands have been opened up (or reassigned from 4G), which can allow the installation of 5G equipment on current 4G towers in these sweet spot ranges.²³⁵ In the U.S., the recently-replaced Trump administration has only made mmWave ranges available for 5G auction.²³⁶ The U.S.’s lack of a strategic 5G rollout plan will greatly increase the cost of creating this infrastructure upon which AI will build, because the 5G cells cannot be placed on current cell towers and new, closely set base stations will need to be created as mmWaves have a short range and are impacted by solid objects and weather.²³⁷ By designating different spectrum bands for 5G than the rest of the world, the U.S. will eliminate itself from the global 5G market and

²³² *Id.*

²³³ Drew FitzGerald, *5G Push Slowed by Squabbles Over ‘Sweet Spot’ of U.S. Airwaves*, WALL ST. J. (June 20, 2019), <https://www.wsj.com/articles/5g-push-slowed-by-squabbles-over-sweet-spot-of-u-s-airwaves-11561038581> [<https://perma.cc/73M4-AMHQ>].

²³⁴ *Id.* In addition to faster transmission speeds, higher bandwidths permit more data that can be transferred at one time. Anisha Nandi, *What a 5G World Could Look Like: 3D Holograms, Faster AI – and New Security Concerns*, CBS NEWS (Feb. 28, 2019, 5:34 PM), <https://www.cbsnews.com/news/what-a-5g-world-could-look-like-3d-holograms-ai-new-security-concerns/> [<https://perma.cc/ZK8X-GDSM>].

²³⁵ Rosenworcel, *supra* note 191; see also Sascha Segan, *Trump’s FCC Is Auctioning the Wrong 5G Spectrum*, PC MAG. (Apr. 15, 2019), <https://www.pcmag.com/news/367777/trumps-fcc-is-auctioning-the-wrong-5g-spectrum> [<https://perma.cc/Z4DX-N6PF>] (explaining how current users of the mid-range bands are loathe to give them up).

²³⁶ “AT&T, Verizon and T-Mobile walked away with the lion’s share of the millimeter-wave (mmWave) spectrum licenses up for auction.” Mike Dano, *Here Are the Big Winners in the FCC’s 24GHz & 28GHz 5G Auctions*, LIGHT READING (June 3, 2019), <https://www.lightreading.com/mobile/5g/here-are-the-big-winners-in-the-fccs-24ghz-and-28ghz-5g-auctions/d/d-id/751903> [perma.cc/9V4N-Q3W3]. The FCC is opening up additional mmWave bands for auction in December 2019. Corinne Reichert, *FCC Raises \$2 Billion in Second 5G Spectrum Auction*, CNET (May 28, 2019, 2:46 PM), <https://www.cnet.com/news/fcc-raises-2-billion-in-second-5g-spectrum-auction/> [perma.cc/VVP5-D35E].

²³⁷ Fisher, *supra* note 231. Additionally, because carriers are building out their telecommunications structure on different frequencies, cell phones will be tied to carriers. In other words, a cell phone that operates on T-Mobile’s lower bandwidth will not operate on Verizon’s mmWave bandwidth. Kellen Barranger, *First 5G Phones Probably Won’t Work Between Carriers*, DROID LIFE (Sept. 17, 2018), <https://www.droid-life.com/2018/09/17/first-5g-phones-probably-wont-work-between-carriers/> [perma.cc/M2Z7-489C].

“will also be faced with mmWave device interoperability challenges and sub-6 infrastructure security concerns.”²³⁸

In addition to allocating the least desirable bandwidths to 5G and failing to fund the massive cost of this new infrastructure, the U.S. also has the problem of potential 5G equipment shortages.²³⁹ In 2018, China supplied 60% of total information, communications, and telecommunications equipment imports to the U.S.²⁴⁰ The main supplier of 5G network equipment is China-based Huawei.²⁴¹ The four companies that account for over two-thirds of the market are Sweden’s Ericsson, Finland’s Nokia, and China’s Huawei and ZTE.²⁴² With respect to telecom hardware, no U.S. company comes even close to the top four telecom equipment suppliers in the world.²⁴³ Because the U.S. government has effectively banned the use of Chinese-originated equipment, this presents significant issues for the rollout of 5G here.²⁴⁴ European carriers that have used Huawei, Nokia, and Ericsson 5G equipment have indicated that the European companies’ offerings are inferior to those of Huawei.²⁴⁵ The U.S. government policy around 5G seems to be one of reaction, rather than a planned, coordinated rollout.

While the U.S. has threatened to withhold intelligence from countries that do not ban Chinese components from the buildout of their 5G

²³⁸ Even if the United States were to restrict use of Chinese equipment suppliers domestically, the United States is not a big enough market in wireless to prevent China’s 5G suppliers from continuing to increase market share globally, resulting in significant pressure on a declining set of vendors that would serve the U.S. market. These vendors will in turn be unable to invest R&D towards future 5G offerings due to decreasing market share, limiting the number of competitive products and depriving DoD and U.S. industries of better and cheaper global supply chains.

MILO MEDIN & GILMAN LOUIE, DEF. INNOVATION BD., *THE 5G ECOSYSTEM: RISKS & OPPORTUNITIES FOR DoD* 4 (2019), https://media.defense.gov/2019/Apr/03/2002109302/-1-/1/0/DIB_5G_STUDY_04.03.19.PDF [perma.cc/Q24T-TUEZ].

²³⁹ Stu Woo, *Trade Fight, Curbs on Huawei Threaten 5G Growth in U.S.*, WALL ST. J. (May 28, 2019, 10:58 PM), <https://www.wsj.com/articles/trumps-china-feud-threatens-5g-growth-in-u-s-11559035804> [perma.cc/R8T8-YVUE].

²⁴⁰ WAYNE M. MORRISON, CONG. RSCH. SERV., IF10030, U.S.-CHINA TRADE ISSUES (2019), <https://fas.org/sgp/crs/row/IF10030.pdf> [perma.cc/B7MC-B7ZV].

²⁴¹ “There is no U.S.-based wireless access equipment provider today that builds those solutions,” said Sandra Rivera, a senior vice president at Intel who helps guide the chipmaker’s 5G strategy.” Brian Fung, *How China’s Huawei Took the Lead over U.S. Companies in 5G Technology*, WASH. POST (Apr. 10, 2019, 3:01 PM), https://www.washingtonpost.com/technology/2019/04/10/us-spat-with-huawei-explained/?noredirect=on&utm_term=.c0f5c0b2d6b1 [perma.cc/T7NY-RLGK].

²⁴² *Id.*

²⁴³ *Id.*

²⁴⁴ See *infra* pp. 46–48 (discussing trade war). This is especially problematic for rural areas, which already utilize Huawei and ZTE in their networks. Fung, *supra* note 241.

²⁴⁵ Trefis Team & Great Speculations, *Why Nokia Remains Muted About Prospects Despite Huawei’s Mounting Woes*, FORBES (Feb. 1, 2019, 11:15 AM), <https://www.forbes.com/sites/greatspeculations/2019/02/01/why-nokia-remains-muted-about-prospects-despite-huaweis-mounting-woes/#451a3620d613> [perma.cc/U672-5QFK].

infrastructure,²⁴⁶ Europe is in a tough spot, as much of the current infrastructure was built using components from Huawei and ZTE, both Chinese companies.²⁴⁷ Huawei alone provides telecommunications products in 170 countries.²⁴⁸ It already provides much of the network infrastructure in Europe with Vodafone, Deutsche Telekom, and BT Group.²⁴⁹ Additionally, Huawei's prices are about 30% lower than Eriksson and Nokia, which is very attractive to the EU.²⁵⁰

With respect to the U.S.'s warning about the risks to the EU by utilizing Chinese-originated equipment, Andrus Ansip, the European Commissioner for the Single Digital Market, has not recommended a ban on Huawei products and has pointed out that the Network and Information Systems Directive and Cybersecurity Act are designed to protect systems from the types of issues the U.S. has warned about.²⁵¹ The U.S. does not have a national cybersecurity law, and the few data protection laws it does have indicate that firms must utilize "reasonable measures" to keep data secure.²⁵² The EU will leave the decision on whose equipment to adopt to each individual country based on their own national security concerns.²⁵³ Arguing that Chinese equipment presents a security risk ignores that it may already be embedded in the supply chain.²⁵⁴ A 2017 U.S. Department of Defense Report noted that vulnerabilities in weapon systems exist currently because

²⁴⁶ Using evidence obtained by U.S. government surveillance under a Foreign Intelligence Surveillance Act (FISA) order, the U.S. government has brought charges against Huawei, presumably for espionage. Ironically, Reuters reported that the evidence was obtained by collecting information from electronic devices carried by Chinese telecom executives traveling through airports. Brendan Pierson & Karen Freifeld, *By Spying on Huawei, U.S. Found Evidence Against the Chinese Firm*, REUTERS (Apr. 4, 2019, 12:09 PM), <https://www.reuters.com/article/idCAKCN1RG29T-OCATC> [<https://perma.cc/QBU8-Q2QW>].

²⁴⁷ Huawei and ZTE combined represent 41% of the market share of telecommunications equipment in the world. Jason Tan, *Huawei Now World's Largest Telecom Equipment-Maker*, CAIXIN (Mar. 19, 2018, 4:59 PM), <https://www.caixinglobal.com/2018-03-19/huawei-now-worlds-largest-telecom-equipment-maker-101223256.html> [<https://perma.cc/M5NA-XFXV>].

²⁴⁸ Fred Kaplan, *Trump Is Right About Huawei*, SLATE (Mar. 20, 2019, 5:41 PM), <https://slate.com/news-and-politics/2019/03/trump-huawei-security-threat.html> [<https://perma.cc/4VCB-2FFG>].

²⁴⁹ *Id.*

²⁵⁰ Iris Deng, *Huawei's 5G Gear Seen as a Bargain in Many European Capitals Even Though Polish Arrest Lifts Security Stakes*, S. CHINA MORNING POST (Jan. 14, 2019, 5:41 PM), <https://www.scmp.com/tech/big-tech/article/2182005/huaweis-5g-gear-seen-bargain-many-european-capitals-even-though-polish> [<https://perma.cc/K7BE-USVE>].

²⁵¹ Foo Yun Chee & Robin Emmott, *Exclusive: EU to Drop Threat of Huawei Ban but Wants 5G Risks Monitored - Sources*, REUTERS (Mar. 22, 2019, 3:07 PM), <https://www.reuters.com/article/technologyNews/idCAKCN1R32K3-OCATC> [<https://perma.cc/6RBV-UTBN>].

²⁵² Houser & Voss, *supra* note 38, at 90.

²⁵³ Chee & Emmott, *supra* note 251.

²⁵⁴ Kaplan, *supra* note 248.

“almost all were developed, acquired, and fielded without formal protection plans.”²⁵⁵ In other words, due to multiple sources of components, software upgrades, electronic communications, and all of the differing entry points for malicious intervention, any risk already exists.

Although the EU is taking a cautious approach due to the U.S.’s call for it to exclude Chinese-made equipment in its 5G infrastructure, the EU is actually in a better position than the U.S. with respect to the rollout. Unlike the U.S., the EU has created a multi-stage 5G deployment strategic plan, which includes pilots in cities across the EU.²⁵⁶ Also, unlike the U.S., the EU has created standards for 5G spectrums as well as for equipment, allowing for interchangeability of components.²⁵⁷ Additionally, it has the advantage of two of the top four telecommunication equipment suppliers in the EU (Nokia and Ericsson). The 5G industry is further helped by the availability of local chipmakers, such as UK-based ARM, Germany-based Infineon Technologies AG, and Austria-based AMS AG.²⁵⁸

Both the U.S. and the EU will have an issue trying to build off of an infrastructure composed of 4G equipment made by Huawei with non-Huawei 5G equipment.²⁵⁹ Huawei equipment is not interoperable, meaning Eriksson 5G equipment cannot be added to existing Huawei 4G

²⁵⁵ DEF. SCI. BD., DEP’T OF DEF., DSB TASK FORCE ON CYBER SUPPLY CHAIN 1 (2017), <https://www.hsdl.org/?view&did=799509> [<https://perma.cc/CR3K-LZ8H>]. The DoD recommends strengthening lifecycle protection policies and the active searching for vulnerabilities to mitigate the risk of malicious insertion of defects into of its weapons system. *Id.* at 5.

²⁵⁶ *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on 5G for Europe: An Action Plan*, at 8–9, COM (2016) 588 final (Sept. 14, 2016), <https://ec.europa.eu/digital-single-market/en/news/communication-5g-europe-action-plan-and-accompanying-staff-working-document> [<https://perma.cc/WB28-HJ3Y>].

²⁵⁷ Colin Blackman & Simon Forge, Pol’y Dep’t for Econ., Sci. and Quality of Life Pol’ys, *5G Deployment: State of Play in Europe, USA and Asia*, PE 631.060, at 10–11 (Apr. 2019), [https://www.europarl.europa.eu/RegData/etudes/IDAN/2019/631060/IPOL_IDA\(2019\)631060_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2019/631060/IPOL_IDA(2019)631060_EN.pdf) [<https://perma.cc/5CRB-E5L9>].

²⁵⁸ Stefan Nicola & Natalia Drozdiak, *European Chipmakers to Keep on Supplying Huawei After Trump Ban*, BLOOMBERG (May 20, 2019, 6:32 AM), <https://www.bloomberg.com/news/articles/2019-05-20/european-chipmakers-drop-as-huawei-ban-cripples-supply-chain> [<https://perma.cc/769E-FV3B>].

²⁵⁹ Huawei’s executive director, Ryan Ding, speaking at the Global Mobile Broadband Forum in London last October explained the ability of linking 4G and 5G equipment with Huawei’s 4G/5G kit, “such as an uplink and downlink decoupling that can achieve co-coverage of 4G and 5G using C-band spectrum, and the ability to offer end-to-end solutions meant it was an ideal partner for operators.” *Huawei Has 22 Commercial 5G Contracts; U.S. Government Warns Allies About the Company*, IEEE COMSOC: TECH. BLOG (Nov. 23, 2018), <http://techblog.comsoc.org/2018/11/23/huawei-has-22-commercial-5g-contracts-u-s-government-warns-allies-about-the-company/> [<https://perma.cc/53MD-N9J9>].

equipment.²⁶⁰ This gives China an enormous advantage as Huawei's telecommunications equipment can be found in 29% of the world's telecommunications infrastructures.²⁶¹ Deutsche Telekom out of Germany has indicated that if Huawei is banned in Europe, it could delay the deployment of 5G by up to two years.²⁶² As of the June 2019, Huawei had entered into fifty commercial contracts for the installation of 5G equipment outside of China.²⁶³

Conversely, the Chinese reliance on American-made chips will impact the rollout of 5G there. The three companies working on advanced 5G chips are Anokiwave, Edgewater Wireless, and Barefoot Networks out of the U.S. and Canada.²⁶⁴ Sixteen percent of Huawei's spending on components went to the U.S. in 2018.²⁶⁵ Analyst Charlie Dai indicated that even though Huawei has been stockpiling inventory, it will be difficult to roll out 5G globally if Huawei is cut off from U.S. parts due to the current ban.²⁶⁶ Former President Trump issued an executive order on May 16, 2019, which added Huawei to a trade blacklist; consequently, U.S. companies will be unable to transfer hardware, software, and technical services to Huawei.²⁶⁷ The Commerce Department, however, has delayed enforcement of the ban through August 19, 2019, to prevent telecom blackouts.²⁶⁸ The trade ban does not just hurt

²⁶⁰ Kate Fazzini & Ari Levy, *AT&T CEO Says Huawei Needs to Be 'Interoperable' in Europe, Where It Has Dominant Market Share*, CNBC (Mar. 27, 2019, 7:03 PM), <https://www.cnbc.com/2019/03/27/att-chief-european-countries-should-consider-dangers-of-huawei.html> [<https://perma.cc/3DHK-ANTS>].

²⁶¹ Mike Robuck, *Report: Despite Security Concerns, Huawei Flourishes in Telecom Equipment Market*, FIERCETELECOM (Mar. 4, 2019, 2:32 PM), <https://www.fiercetelecom.com/telecom/report-despite-security-concerns-huawei-flourishes-telecom-equipment-market> [<https://perma.cc/FJ88-GE6M>].

²⁶² Joe Panettieri, *Huawei: Banned and Permitted in Which Countries? List and FAQ*, CHANNELE2E (Dec. 20, 2020), <https://www.channele2e.com/business/enterprise/huawei-banned-in-which-countries/> [<https://perma.cc/YA9E-ZCD3>].

²⁶³ Rita Liao, *Huawei Says Two-Thirds of 5G Networks Outside China Now Use Its Gear*, TECHCRUNCH (June 25, 2019, 9:01 PM), <https://techcrunch.com/2019/06/25/huawei-wins-5g-contracts/> [<https://perma.cc/8LL9-TPQJ>].

²⁶⁴ Susan Rambo, *5G Silicon: 3 Chips with Big Ideas*, RCR WIRELESS NEWS (May 12, 2018), <https://www.rcrwireless.com/20180512/5g/20180511-wireless-5g-silicon-3-chips-with-big-ideas-tag41-tag99> [<https://perma.cc/LGT2-N3XS>].

²⁶⁵ Brenda Goh & Karen Freifeld, *U.S. Eases Curbs on Huawei; Founder Says Clampdown Underestimates Chinese Firm*, REUTERS (May 20, 2019, 3:42 PM), <https://www.reuters.com/article/us-huawei-tech-usa-license-idUSKCN1SQ27T> [<https://perma.cc/H22N-4TYV>].

²⁶⁶ Sherisse Pham, *Huawei Could Be the First Big Casualty of China's Clash with America*, CNN BUS. (May 21, 2019, 9:16 AM), <https://www.cnn.com/2019/05/21/tech/huawei-us-china-clash/> [<https://perma.cc/3WYY-JGT8>].

²⁶⁷ Lily Kuo, *'There Will Be Conflict': US Has Underestimated Huawei, Says Founder*, THE GUARDIAN (May 20, 2019, 11:29 PM), <https://www.theguardian.com/technology/2019/may/21/there-will-be-conflict-huawei-founder-says-us-underestimates-companys-strength> [<https://perma.cc/YE5X-BRT6>].

²⁶⁸ Goh & Freifeld, *supra* note 265. There is also concern that the blacklist could result in \$56.3 billion in lost sales by U.S. companies that export to China. *Id.*

China; “U.S. firms could lose up to \$56.3 billion in export sales over five years from stringent export controls on technologies involving Huawei or otherwise, the Information Technology & Innovation Foundation said in a report. Missed opportunities threatened as many as 74,000 jobs, the foundation said.”²⁶⁹

In addition to a shortage of chips needed for its 5G installations due to the ban by the U.S., China also faces an issue with high-end electronic processors (AI chips).²⁷⁰ China is very reliant on foreign-made chips.²⁷¹ The main suppliers of chips to companies in China are U.S.-based Intel and AMC.²⁷² Intel has recently developed a chip that can process data 1,000 times faster than typical Central Processing Units (CPUs).²⁷³ In 2017, China controlled less than 1% of the global chip market.²⁷⁴ However, as part of its Made in China 2025 Plan, but mostly out of necessity due to the U.S. trade ban, it is aggressively seeking to become proficient in developing chips, and

²⁶⁹ *Id.*

²⁷⁰ Reinhardt Krause, *In AI Technology Race, U.S. Chips May Be Ace-In-The-Hole vs. China*, INV.'S BUS. DAILY (Nov. 27, 2017, 10:55 AM), <https://www.investors.com/news/technology/ai-technology-u-s-chip-stocks-vs-china/> [https://perma.cc/QSE4-A64M].

²⁷¹ In 2018, “China imported integrated circuits worth about \$260 billion—more than the value of crude oil imported by China.” Frank Fang, *Huawei's Reliance on Foreign Technologies Illustrates Shortcomings in China's Chip-Making Industry*, THE EPOCH TIMES (Jan. 27, 2019), https://www.theepochtimes.com/huaweis-reliance-on-foreign-technologies-illustrates-shortcomings-in-chinas-chip-making-industry_2708502.html [https://perma.cc/JR3F-KUUW].

²⁷² *China Aims to Kick Intel and AMD out of the Semiconductor Market*, GLOBAL VILLAGE SPACE (July 26, 2020), <https://www.globalvillagespace.com/china-aims-to-kick-intel-and-amd-out-of-the-semiconductor-market/> [https://perma.cc/3WG9-HRRN].

²⁷³ Martin Giles, *Intel's New AI Chips Can Crunch Data 1,000 Times Faster than Normal Ones*, MIT TECH. REV. (July 16, 2019), <https://www.technologyreview.com/f/613964/intels-new-ai-chips-can-crunch-data-1-000-times-faster-than-normal-ones/> [https://perma.cc/8KNP-FYQX]. While Intel is focusing on creating smaller, faster AI chips, it is moving out of the 5G-smartphone modem-chip business. Intel and Qualcomm were the only external suppliers of the components. As a result, the maker of the iPhone has agreed to purchase Intel's modem chip business for \$1 billion. Chaim Gartenberg, *Apple Reportedly in Talks to Buy Intel's 5G Modem Business for \$1 Billion*, THE VERGE (July 22, 2019, 5:54 PM), <https://www.theverge.com/2019/7/22/20706244/apple-intel-5g-modem-business-1-billion-reports-sale-qualcomm> [https://perma.cc/YA4H-4RH3]. Huawei, on the other hand, internally sources 54% of its modem chips and obtains an additional 22% from Qualcomm. Stephen Nellis, *Samsung, Huawei Supply Majority of Own Modem Chips, Qualcomm Says*, REUTERS (Jan. 4, 2019, 6:11 PM), <https://www.reuters.com/article/us-qualcomm-tech/samsung-huawei-supply-majority-of-own-modem-chips-qualcomm-says-idUSKCN1OZ00F> [https://perma.cc/UFV4-J92D]. Although Apple is working on developing its own modems, Qualcomm was the first to develop such technology. This technology was also the focus of a lawsuit between Apple and Qualcomm, which was settled in 2019. Mark Gurman & Ian King, *Here's Why Apple Just Spent \$1 Billion to Buy Intel's Modem Business*, TIME (July 25, 2019), <https://time.com/5635699/apple-intel-modem/> [https://perma.cc/MJ7A-P6ZB].

²⁷⁴ Cheng Ting-Fang, *China Seeks Chip Self-Sufficiency in Face of US Export Control Fears*, NIKKEI ASIA (Sept. 17, 2018, 8:52 PM), <https://asia.nikkei.com/Economy/Trade-war/China-seeks-chip-self-sufficiency-in-face-of-US-export-control-fears> [https://perma.cc/GR7G-A5E3].

to reduce its reliance on the U.S.²⁷⁵ Companies such as Taiwan-based chipmakers MediaTek and Taiwan Semiconductor Manufacturing Company, Korea-based Samsung and SK Hynix, and Japan-based Tokyo Electron, will initially be the likely alternatives.²⁷⁶ Although China began investing in this industry in 2014, it is still about ten years behind the U.S.²⁷⁷ This presents the greatest obstacle to 5G technology rollout in China.²⁷⁸ Although neither China nor the U.S. will admit this, neither can afford to lose the other without delaying 5G installation.

III. WITH INDUSTRY IN CHARGE ETHICAL CONSIDERATIONS ARE BEING FORGOTTEN

All three blocks have differing concerns around AI. While the U.S. fears losing its position as a tech leader and is attempting to roll out 5G as quickly as possible, less attention is being paid to the risks of loss of privacy, automated decision-making, surveillance, and health concerns. In the EU, a cautious approach is being taken to the development of AI, with the creation of regulations and standards for such technologies with an intentionally

²⁷⁵ Arjun Kharpal, *China Is Ramping Up Its Own Chip Industry Amid a Brewing Tech War. That Could Hurt US Firms*, CNBC (June 4, 2019, 7:14 AM), <https://www.cnbc.com/2019/06/04/china-ramps-up-own-semiconductor-industry-amid-the-trade-war.html> [<https://perma.cc/T642-QHHQ>].

While China has made immense investments in science and technology, and while these are producing results, it is still dependent on Western technology. This is particularly true for semiconductors. China's dependence on foreign semiconductors has worried Beijing for decades. China suspects that Western semiconductors contain "backdoors," intentional vulnerabilities that can be exploited for intelligence and military purposes. In 2016, President Xi Jinping said, "the fact that core technology is controlled by others is our greatest hidden danger." Vice Premier Ma Kai said at the 2018 National People's Congress, "We cannot be reliant on foreign chips."

JAMES A. LEWIS, CTR. FOR STRATEGIC & INT'L STUD., *LEARNING THE SUPERIOR TECHNIQUES OF THE BARBARIANS: CHINA'S PURSUIT OF SEMICONDUCTOR INDEPENDENCE 1* (2019), https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/190115_Lewis_Semiconductor_v6.pdf [<https://perma.cc/XW4F-ZDTQ>].

²⁷⁶ See Joe McDonald, *China Struggles to Curb Its Reliance on US Buyers, Suppliers*, AP NEWS (Aug. 27, 2018), <https://apnews.com/03a0aee8e38742fc9f0050335211838d> [<https://perma.cc/T5VE-CHJ9>]; see also Eustance Huang, *Demand for Memory Chips in Asia Might Be Picking Up Soon, Analysts Say*, CNBC (Feb. 12, 2019, 10:16 PM), <https://www.cnbc.com/2019/02/13/demand-for-memory-chips-in-asia-might-be-picking-up-soon-analysts-say.html> [<https://perma.cc/SBZ9-NGCW>].

²⁷⁷ Edward White, *China's Ability to Make Computer Chips Still 'Years Behind' Industry Leaders*, FIN. TIMES (Jan. 21, 2019), <https://www.ft.com/content/a002a9e4-1a42-11e9-b93e-f4351a53f1c3> [<https://perma.cc/3FJB-2XNF>].

²⁷⁸ However, China's strategic plan—Made in China 2025—acknowledges the need to reduce reliance on foreign-produced chips, and as a result, China has begun funding local semiconductor manufacturing facilities in addition to seeking sources outside of the U.S. See John VerWey, *The Health and Competitiveness of the U.S. Semiconductor Manufacturing Equipment Industry* 12–14 (Off. of Indus., Working Paper No. ID-058, 2019), https://www.usitc.gov/publications/332/working_papers/id_058_the_health_and_competitiveness_of_the_sme_industry_final_070219checked.pdf [<https://perma.cc/DQ2V-KAGY>].

slower timeline for 5G installation. While the EU has acknowledged that AI can bring enormous benefits, the concerns are that in sensitive areas, such as political campaigns, human resource management, and the criminal justice system, AI presents a real problem due to the “black box” issue.²⁷⁹ China’s society is the most likely to quickly embrace developments in AI and is moving in concert with its strategic plans.²⁸⁰ However, competing to win may prevent necessary safeguards from being implemented. The EU report on AI sums it up as: the U.S. sees AI for profit, China sees it for control, and the EU sees it for society.²⁸¹

A. 5G Safety

A major obstacle to the rollout of 5G is the public’s concern over safety of the small cells that will need to be installed much closer together than cell towers for 3G and 4G are currently placed.²⁸² 5G transmissions on higher broadbands have a limited range and cannot pass through solid objects.²⁸³ This could require small cells in urban areas to be placed 500 feet or less apart, most likely on telephone poles or lampposts. Current cell towers can be located up to forty-five miles apart.²⁸⁴ The Environmental Health Trust has recommended a moratorium on 5G installations until such devices have been proven safe to humans and the environment.²⁸⁵ The concern is that the density of placements and the proximity to homes present dangers due to the increased radiation from the “small cells, distributed antennae system, and microcells.”²⁸⁶ Belgium has delayed signing on Brussels as a test city for 5G

²⁷⁹ Eur. Comm’n, *The Future of European AI Is Being Written Now*, EUROPA (May 12, 2018), <https://ec.europa.eu/jrc/en/news/future-european-ai-being-written-now> [<https://perma.cc/PL9Z-S9C9>].

²⁸⁰ See Raffaele Filieri et al., *The Importance of Enhancing, Maintaining and Saving Face in Smartphone Repurchase Intentions of Chinese Early Adopters: An Exploratory Study*, 30 INFO. TECH. & PEOPLE 629, 630 (2017), <https://www.emerald.com/insight/content/doi/10.1108/ITP-09-2015-0230/full/html> [<https://perma.cc/5DS4-VYYV>].

²⁸¹ See Joint Rsch. Ctr., Eur. Comm’n, *Artificial Intelligence: A European Perspective*, EUR 29425 EN, at 56–60 (2018), <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113826/ai-flagship-report-online.pdf> [<https://perma.cc/8F92-5KRD>].

²⁸² *Closing the Digital Divide – Fiber vs. Wireless*, 5G ? IOT (Aug. 2018), <https://whatis5g.info/fiber-vs-wireless/2018/08/closing-the-digital-divide-fiber-vs-wireless/> [<https://perma.cc/Y9PD-GAAL>].

²⁸³ *Understanding the 4G to 5G Transition: 5G Transition Will Not Be as “Black and White” as Earlier Transitions*, RED CHALK GRP. 2, <https://www.redchalk.com/wp-content/uploads/2017/05/Industries-Telecommunications-Understanding-the-4G-to-5G-Transition.pdf> [<https://perma.cc/ULV3-QQ8D>].

²⁸⁴ Markgraf, *supra* note 230.

²⁸⁵ *What You Need to Know About 5G Wireless and “Small” Cells*, ENV’T. HEALTH TR., https://ehtrust.org/wp-content/uploads/5G_What-You-Need-to-Know.pdf [<https://perma.cc/2AF3-HXYE>].

²⁸⁶ *5G and the IoT: Scientific Overview of Human Health Risks*, ENV’T HEALTH TR., <https://ehtrust.org/key-issues/cell-phoneswireless/5g-networks-iot-scientific-overview-human-health-risks/> [<https://perma.cc/VM66-W4LC>].

installation because of the difficulty in testing the amount of radiation the small cells will emit. Switzerland is working on a radiation monitoring system, which will also delay the rollout.²⁸⁷ A number of cities in California have also stopped the installation of the small cells.²⁸⁸ The 2018 European Commission on Health, Environmental and Emerging Risks lists 5G technologies as a risk to public health and the environment.²⁸⁹ In the UK, disputes between local governments and telecoms have slowed installation because of the fees the governments wish to charge the telecoms for access to lampposts.²⁹⁰ In the U.S., both the Food and Drug Administration and the Federal Communications Commission have indicated that adverse health outcomes are not likely.²⁹¹ This conclusion conflicts with the two recent studies demonstrating that “non-ionizing radiation emitted by cell phone networks” does increase the risk of cancer in animals.²⁹² Although China has not indicated that 5G does or does not propose a health threat, it is of note that most of the reports are concerned with the risks from mmWaves, which

²⁸⁷ Aaron Pressman, *Health Concerns May Slow Rollout of Super-Fast 5G Mobile Networks*, *Analyst Warns*, FORTUNE (May 22, 2019, 6:30 AM), <http://fortune.com/2019/05/22/health-concerns-5g-cellphones-cancer/> [<https://perma.cc/7XCY-3AQL>].

²⁸⁸ *How to Oppose 5G “Small Cell” Towers*, EMF SAFETY NETWORK, <http://emfsafetynetwork.org/how-to-oppose-small-cell-5g-towers/> [<https://perma.cc/AY6W-MQ4G>]; see also Danny Crichton, *Bay Area City Blocks 5G Deployments over Cancer Concerns*, TECHCRUNCH (Sept. 10, 2018, 10:20 AM), <https://techcrunch.com/2018/09/10/bay-area-city-blocks-5g-deployments-over-cancer-concerns/> [<https://perma.cc/2XWJ-8Y64>].

²⁸⁹ Sci. Comm. on Health, Env’t and Emerging Risks, Eur. Comm’n, *Statement on Emerging Health and Environmental Issues*, at 14 (Dec. 20, 2018), <https://midsafetech.files.wordpress.com/2019/02/scheer-report-emerging-concerns-2018-russell-mentioned.pdf> [<https://perma.cc/LUE7-KE7C>].

²⁹⁰ Matthew Weaver, *Revealed: 5G Rollout Is Being Stalled by Rows over Lampposts*, THE GUARDIAN (May 19, 2019, 11:37 AM), <https://www.theguardian.com/technology/2019/may/19/revealed-5g-rollout-is-being-stalled-by-rows-over-lampposts> [<https://perma.cc/6A5E-DBJ9>].

²⁹¹ *Scientific Evidence for Cell Phone Safety*, U.S. FOOD AND DRUG ADMIN. (Feb. 10, 2020), <https://www.fda.gov/radiation-emitting-products/cell-phones/current-research-results> [<https://perma.cc/PX5N-3R7M>]. The FCC ruled 5G technology to be safe on August 7, 2019. Marguerite Reardon, *FCC Deems Cellphones with 5G Tech Safe*, CNET (Aug. 8, 2019, 2:23 PM), <https://www.cnet.com/news/fcc-deems-5g-safe/> [<https://perma.cc/KNG5-KTSK>]. The FCC has not updated its cell phone standards since 1996, which may explain why its current safety standards do not reflect any risks. Marguerite Reardon, *Is 5G Making You Sick? Probably Not*, CNET (July 30, 2020, 5:00 AM), <https://www.cnet.com/news/5g-phones-and-your-health-what-you-need-to-know/> [<https://perma.cc/L7XH-A8ZB>] [hereinafter Reardon, *Is 5G Making You Sick*].

²⁹² Charles Schmidt, *New Studies Link Cell Phone Radiation with Cancer*, SCI. AM. (Mar. 29, 2018), <https://www.scientificamerican.com/article/new-studies-link-cell-phone-radiation-with-cancer/> [<https://perma.cc/LBQ8-U3YN>]. Any release of energy from any source is considered radiation. The higher the frequency, the greater potential for harm. Ionizing rays, such as x-rays, are very harmful and can cause cancer with too much exposure. 5G waves are considered non-ionizing, but many cell phone carriers will be installing small cell, which operate at higher levels (known as mmWaves) than 3G and 4G. This means that the risk of harm is increased by using these higher frequencies, but because testing has not yet been done on 5G transmissions, studies do not confirm this at this time. Reardon, *Is 5G Making You Sick*, *supra* note 291.

will be the foundation of the 5G infrastructure in the U.S. but not in the EU or China.

B. Surveillance

Although a detailed discussion of all of the opportunities for 5G and AI surveillance are beyond the scope of this paper, a few items of note are explained here. First, there is concern that Huawei will allow the Chinese government to spy on any communications sent through Huawei's equipment.²⁹³ This is the reason given for the U.S. ban of the use of 5G equipment made by Huawei.²⁹⁴ Although the U.S. has discouraged the EU from adopting Huawei equipment for its 5G installation, as discussed above, several countries, including Portugal, Italy, and Germany, have indicated a willingness to upgrade their Huawei 4G systems to 5G, suggesting that there is no direct evidence of spying by Huawei and that security measures in place are an effective deterrent.²⁹⁵ Many note that it is possible that the U.S.'s position has less to do with security concerns and more to do with economic ones.²⁹⁶ Regardless of what company from what country provides the equipment for 5G, any online network is subject to hacking and secret surveillance.²⁹⁷ Due to the Snowden disclosures, the world is already familiar with the U.S.'s National Security Agency's (NSA) surveillance of mass communications.²⁹⁸ It has also been reported that telecommunications companies in the U.S. are freely providing metadata to the U.S. government without a warrant.²⁹⁹

There is also concern about the potential for surveillance as AI sensors become widespread.³⁰⁰ Numerous scholars have explained how "smart

²⁹³ Sue Halpern, *The Terrifying Potential of the 5G Network*, NEW YORKER (Apr. 26, 2019), <https://www.newyorker.com/news/annals-of-communications/the-terrifying-potential-of-the-5g-network> [<https://perma.cc/65JQ-TV4V>].

²⁹⁴ *Id.*

²⁹⁵ *Id.*

²⁹⁶ *Id.*

²⁹⁷ *Id.*

²⁹⁸ See generally GLENN GREENWALD, *NO PLACE TO HIDE: EDWARD SNOWDEN, THE NSA, AND THE U.S. SURVEILLANCE STATE* (2014) (discussing in detail the history of the Snowden disclosures). For more information, see Margaret Hu, *Taxonomy of the Snowden Disclosures*, 72 WASH. & LEE L. REV. 1679, 1684–86, 1691 (2015).

²⁹⁹ Paul Wagenseil, *US Senator Says Wireless Carriers Helping Trump Build 'Surveillance State'*, TOM'S GUIDE (Aug. 12, 2019), <https://www.tomsguide.com/news/us-senator-says-wireless-carriers-helping-trump-build-surveillance-state> [<https://perma.cc/C5B4-SP5Q>].

³⁰⁰ In 2015, China's national police force—the Ministry of Public Safety (MPS)—called for the creation of an "omnipresent, completely connected, always on and fully controllable" national video surveillance network. MPS and other agencies stated that law enforcement should use facial recognition technology in combination with the video cameras to catch lawbreakers. One IHS Markit estimate puts the number of cameras in China at 176 million today, with a plan to have

cities” will have the potential to further erode privacy protections due to the increase in government surveillance activities that ubiquitous sensors represent.³⁰¹ This concern is more prevalent in the EU and the U.S. As mentioned above, residents in China have a lower expectation of privacy due to their culture. While residents of the U.S. indicate a desire for privacy protections, their actions demonstrate a willingness to share their personal data without much regard to how it is used or where it is shared.³⁰² The EU is especially concerned about increased surveillance.³⁰³ Scholars have also brought attention to the possibility that authoritarianism will be advanced through AI by the use of “surveillance, censorship, disinformation, and cyberattacks.”³⁰⁴

Artificial intelligence is already being used in China for surveillance and censorship by its government.³⁰⁵ Although Chinese culture generally accepts the tradeoff of privacy for security and access to a greater extent than the U.S. and certainly more than the EU, the extent to which government is guiding behavior is of concern. The risk this technological capability presents is its export to authoritarian regimes or its unregulated use to manipulate elections, as the Russian government has been accused of, or engage in cyber-attacks, such as the WannaCry ransomware attack which

450 million installed by 2020. One hundred percent of Beijing is now blanketed by surveillance cameras, according to the Beijing Public Safety Bureau.

Anna Mitchell & Larry Diamond, *China's Surveillance State Should Scare Everyone*, THE ATLANTIC (Feb. 2, 2018), <https://www.theatlantic.com/international/archive/2018/02/china-surveillance/552203/> [<https://perma.cc/8GQ4-9F5M>].

³⁰¹ Lilian Edwards, *Privacy, Security and Data Protection in Smart Cities: A Critical EU Law Perspective*, 2 EUR. DATA PROT. L. REV. 28, 28 (2016) (discussing issues in the creation of smart cities such as the lack of consent for the processing of personal data, the potential “privatisation” of data, and the storage of such data in the cloud); see Torin Monahan, *The Image of the Smart City: Surveillance Protocols and Social Inequality*, in HANDBOOK OF CULTURAL SECURITY 210, 211 (Yasushi Watanabe ed., 2018) (exploring the impact of distributed sensor networks, video surveillance, and predictive analytics by cities); Janine S. Hiller & Jordan M. Blanke, *Smart Cities, Big Data, and the Resilience of Privacy*, 68 HASTINGS L.J. 309, 330–31 (2017) (explaining the privacy issues with smart city surveillance and data collection and the need to update law).

³⁰² Benjamin Agi & Nicolas Jullien, *Is the Privacy Paradox in Fact Rational?* (Jan. 25, 2018) (unpublished manuscript), <https://ssrn.com/abstract=3109695> [<https://perma.cc/7ECK-3K2Z>].

³⁰³ Nora Ni Loideain, *EU Law and Mass Internet Metadata Surveillance in the Post-Snowden Era*, MEDIA & COMMUN., 2015, at 53, 54–55, <https://www.cogitatiopress.com/mediaandcommunication/article/view/297> [<https://perma.cc/J7NF-XUGF>].

³⁰⁴ Feldstein, *supra* note 17.

³⁰⁵ *Freedom on the Net 2018 – China*, *supra* note 74 (explaining how censorship has tightened in China in connection with the Next-Generation Artificial Intelligence Strategy and how advances in surveillance technology, especially facial recognition, have led to prosecutions of activists, dissidents, and journalists).

was facilitated by code developed by the U.S. NSA.³⁰⁶ It is unlikely that any set of standards regarding government surveillance will emerge, given the current political environment.

C. AI Risks

Because China and the U.S. are viewing AI as a race, they are negligently moving forward without acknowledging or addressing the risks. Little effort has gone into the creation of ethical standards and international agreements on use by either. Europe, on the other hand, is spending most of its ramp-up time in this regard but only recently determined that its industry is falling behind in actual development.³⁰⁷ Studies disagree on whether AI will eliminate or create jobs,³⁰⁸ but there is a need to understand, at the very least, what skills should be taught in the school system to meet the eventual AI revolution.³⁰⁹ One of the greatest concerns associated with the fourth industrial revolution is inequality.³¹⁰ Although it is beyond the scope of this paper to discuss how these risks will manifest, these issues should be addressed prior to forging ahead with AI development in order to win a “race.” These include risks with automated decisions,³¹¹ human rights,³¹²

³⁰⁶ Alex Ward, *Microsoft Says It Notified Nearly 10,000 Customers that They Were Cyberattack Victims*, VOX (July 17, 2019, 5:00 PM), <https://www.vox.com/2019/7/17/20697851/microsoft-russia-iran-north-korea-10000-election> [<https://perma.cc/TR7K-Q6JA>].

³⁰⁷ Elizabeth Schulze, *EU Drafts Plan for Hundred Billion-Dollar Fund to Take on US Tech Firms*, *Reports Say*, CNBC (Aug. 26, 2019, 2:57 AM), <https://www.cnbc.com/2019/08/23/eu-drafts-plan-for-fund-to-take-on-big-us-tech-companies-reports-say.html> [<https://perma.cc/3749-CZC9>].

³⁰⁸ Saheli Roy Choudhury, *A.I. and Robotics Will Create Almost 60 Million More Jobs than They Destroy by 2022*, *Report Says*, CNBC (Sept. 17, 2018, 1:01 AM), <https://www.cnbc.com/2018/09/17/wef-machines-are-going-to-perform-more-tasks-than-humans-by-2025.html> [<https://perma.cc/2K2H-7AX9>]; see also Edward Felten et al., *The Occupational Impact of Artificial Intelligence: Labor, Skills, and Polarization* (Sept. 8, 2019) (unpublished manuscript), <https://ssrn.com/abstract=3368605> [<https://perma.cc/96ES-HXJQ>]; Kathleen Walch, *Is AI a Job Killer or Job Creator?*, FORBES (Nov. 24, 2019, 1:00 AM), <https://www.forbes.com/sites/cognitiveworld/2019/11/24/is-ai-a-job-killer-or-job-creator/?sh=d48d19a37e8a> [<https://perma.cc/4TZX-Y584>].

³⁰⁹ Andrew Chen, *How AI Curriculum Can Prepare Students for Success in a New World*, GETTING SMART (Feb. 26, 2019), <https://www.gettingsmart.com/2019/02/how-ai-curriculum-can-prepare-students-for-success-in-a-new-world/> [<https://perma.cc/2DQA-4P9C>].

³¹⁰ This provision is in no way meant to address the myriad of issues with the AI race but suggests where one might begin. Schulze, *supra* note 1.

³¹¹ Han-Wei Liu et al., *Beyond State v. Loomis: Artificial Intelligence, Government Algorithmization and Accountability*, 27 INT'L J.L. & INFO. TECH. 122 (2019) (suggesting governance proposals for improving the accountability of AI-facilitated decisions by governments).

³¹² FILIPPO RASO ET AL., BERKMAN KLEIN CTR., ARTIFICIAL INTELLIGENCE & HUMAN RIGHTS: OPPORTUNITIES & RISKS (2019), https://cyber.harvard.edu/sites/default/files/2018-09/2018-09_AIHumanRightsSmall.pdf? [<https://perma.cc/467H-ZL32>] (discussing criminal justice risk assessments, credit scores, diagnostics, content moderation, recruiting and hiring, and essay scoring issues impacting human rights).

programming ethics into autonomous vehicles,³¹³ autonomous weapons,³¹⁴ social and political manipulation,³¹⁵ invasion of privacy,³¹⁶ destabilization of the financial system,³¹⁷ product safety, liability and consumer protection,³¹⁸ proxy discrimination,³¹⁹ and cybercrime and cyberwarfare.³²⁰

One particular risk is that AI systems are especially valuable in assisting authoritarian regimes. A failure to seek agreement now on international standards and limitations for the use of AI could lead developments down a path that could endanger global safety.³²¹ Although some point to China's social credit score as an example of a repressive regime, others see it as filling a void in Chinese society in alignment with Chinese culture.³²² A positive step with respect to at least a local level of acknowledgement was taken in May 2019, when the Beijing AI Principles were released, which

³¹³ Simon Chesterman, *Should We Regulate A.I.? Can We?* (Mar. 21, 2019) (unpublished manuscript), <https://ssrn.com/abstract=3357618> [<https://perma.cc/7ZNR-JCXC>].

³¹⁴ Nicholas W. Mull, *The Robotization of Warfare with Lethal Autonomous Weapon Systems (Laws): Mandate of Humanity or Threat to It?*, 40 *HOUS. J. INT'L L.* 461 (2018).

³¹⁵ Karl Manheim & Lyric Kaplan, *Artificial Intelligence: Risks to Privacy and Democracy*, 21 *YALE J.L. & TECH.* 106 (2019).

³¹⁶ *Id.*

³¹⁷ Jón Danielsson et al., *Artificial Intelligence and Systemic Risk* (June 27, 2019) (unpublished manuscript), <https://ssrn.com/abstract=3410948> [<https://perma.cc/2RFX-J23B>].

³¹⁸ Gabriele Mazzini, *A System of Governance for Artificial Intelligence Through the Lens of Emerging Intersections Between AI and EU Law*, in *DIGITAL REVOLUTION – NEW CHALLENGES FOR LAW 245* (Alberto De Franceschi & Reiner Schulze eds., 2019).

³¹⁹ Anya E.R. Prince & Daniel Schwarcz, *Proxy Discrimination in the Age of Artificial Intelligence and Big Data*, *IOWA L. REV.* 1257 (2020).

³²⁰ Martina Kunz & Seán Ó hÉigeartaigh, *Artificial Intelligence and Robotization*, in *OXFORD HANDBOOK ON THE INTERNATIONAL LAW OF GLOBAL SECURITY* (Robin Geiß & Nils Melzer eds., 2018) (forthcoming 2020).

³²¹ Feldstein, *supra* note 17, at 24–25; *see also* BEN SCOTT ET AL., *STIFTUNG NEUE VERANTWORTUNG, ARTIFICIAL INTELLIGENCE AND FOREIGN POLICY* (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3103961 [<https://perma.cc/BD7T-47A3>]; SHAZEDA AHMED ET AL., *DEPT OF DEF., AI, CHINA, RUSSIA, AND THE GLOBAL ORDER: TECHNOLOGICAL, POLITICAL, GLOBAL, AND CREATIVE PERSPECTIVES, A STRATEGIC MULTILAYER ASSESSMENT (SMA) PERIODIC PUBLICATION* (2018), https://nsiteam.com/social/wp-content/uploads/2019/01/AI-China-Russia-Global-WP_FINAL_forcopying_Edited-EDITED.pdf [<https://perma.cc/CAS6-3ZV8>]; *Why China's AI Push is Worrying*, *THE ECONOMIST* (July 27, 2017), <https://www.economist.com/leaders/2017/07/27/why-chinas-ai-push-is-worrying> [<https://perma.cc/2534-P5XW>].

³²² Yu-Jie Chen et al., *"Rule of Trust": The Power and Perils of China's Social Credit Megaproject*, 32 *COLUM. J. ASIAN L.* 1 (2018) (explaining the risks of China's Social Credit System incorporating artificial intelligence tools, such as facial recognition and predictive policing); *cf.* Genia Kostka, *China's Social Credit Systems and Public Opinion: Explaining High Levels of Approval 1* (July 23, 2018) (unpublished manuscript), <https://ssrn.com/abstract=3215138> [<https://perma.cc/TX56-LA27>] (“While one might expect such knowledgeable citizens [in China] to be most concerned about the privacy implications of [Social Credit System] SCS, they instead appear to embrace SCSs because they interpret it through frames of benefit-generation and promoting honest dealings in society and the economy instead of privacy-violation.”).

include a call for “the construction of a human community with a shared future, and the realization of beneficial AI for humankind and nature.”³²³ These principals were created by a coalition of stakeholders from government, industry, and academia in China and “focus on benefitting all of humanity and the environment; serving human values such as privacy, dignity, freedom, autonomy, and rights; continuous focus on AI safety and security; inclusivity; openness; supporting international cooperation and avoiding a ‘malicious AI race’; and long-term planning for more advanced AI systems, among others.”³²⁴ While the AI Initiative indicates that “[t]he United States must foster public trust and confidence in AI technologies and protect civil liberties, privacy, and American values in their application in order to fully realize the potential of AI technologies for the American people,” it does not provide any explanation on how this would be accomplished.³²⁵

The final risk that needs to be addressed is that of cyber warfare. The main government sponsored initiative for AI in the U.S. is for the military. The Defense Advanced Research Projects Agency (DARPA) has pledged \$2 billion for its “AI Next” campaign.³²⁶ When people think of AI uses by the military, they automatically jump to killer-robots. It is important to remember that technology can be used for good, bad, or neutral (efficiency) purposes. AI can be used to assist with training systems, surveillance analytics, logistical support, the use of unmanned vehicles, and aircrafts to carry supplies, all of which can all be used without threatening lives.³²⁷ AI can also be employed to decrypt military communications and to hack into weapon systems, distributed denial of services, and cyber-attack utilities and other infrastructures. The real concern is not that other countries may be working on these types of technologies, because most assuredly they are; rather, the concern is that there is no understanding of what the future of war will look like or how to respond in kind when it is not just state actors engaging in cyberwarfare but also individuals and groups hostile to an administration.³²⁸ This is an area in which international institutions and

³²³ *AI Policy – China*, *supra* note 202.

³²⁴ *Id.*

³²⁵ Exec. Order No. 13,859, 3 C.F.R. 254 (2020).

³²⁶ *DARPA Announces \$2 Billion Campaign to Develop Next Wave of AI Technologies*, DEF. ADVANCED RSCH. PROJECTS AGENCY (Sept. 7, 2018), <https://www.darpa.mil/news-events/2018-09-07> [<https://perma.cc/W98U-AMZH>].

³²⁷ DANIEL S. HOADLEY & KELLEY M. SAYLER, CONG. RSCH. SERV., RL45178, ARTIFICIAL INTELLIGENCE AND NATIONAL SECURITY (2020), <https://fas.org/sgp/crs/natsec/R45178.pdf> [<https://perma.cc/9FUF-FZCU>].

³²⁸ CATHERINE A. THEOHARY & JOHN W. ROLLINS, CONG. RSCH. SERV., R43955, CYBERWARFARE AND CYBERTERRORISM: IN BRIEF (2015), <https://fas.org/sgp/crs/natsec/R43955.pdf> [<https://perma.cc/ST9S-XN4Y>].

agreements would be of enormous benefit.³²⁹ Much like the 1968 Nuclear Non-proliferation Treaty (NPT) with 191 signatories,³³⁰ countries could agree that the risks are not worth the potential harms of weaponizing AI for assured mutual destruction. Some argue that even if countries agree to stop developing autonomous weapons, countries could still secretly violate such agreements. However, bringing this issue out in the open and agreeing to a set of principles, at the very least provides a system of checks and balances to monitor the development of such technologies. As the NPT was set to be reexamined in 2020, but it is still important to get around a table to promote cooperation and peaceful uses of AI.

IV. RECOMMENDATIONS

Although each region's strengths and weaknesses have been touched on, the current situation is highly complicated. The interdependence of these regions remains unacknowledged and the U.S. and China are moving at full tilt without regard to how their trajectory will impact the world.³³¹ Given the impact that AI will have in areas beyond where the technology is created, attention to the sweeping societal and economic effects must be addressed. While arguments can be made to name China or the U.S. the winner, each will have difficulty advancing by shutting out the other. However, it is the U.S. that risks losing its position due to its failure in policy with respect to

³²⁹ See *infra* Part IV.

³³⁰ *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*, UNITED NATIONS OFF. FOR DISARMAMENT AFFS., <https://www.un.org/disarmament/wmd/nuclear/npt/> [<https://perma.cc/TB46-SZYX>].

³³¹ Engaging in trade war ignores the interdependency of these two regions in terms of components and technology. Additionally, government surveillance is not limited to China. The U.S. uses Section 702 of the Foreign Intelligence Surveillance Act to spy on foreign entities and Section 215 of the Patriot Act to spy on domestic entities. See Pub. L. No. 95-511, § 702, 92 Stat. 1783 (1978), *amended by* Pub. L. No. 110-261, § 101(a)(2), 122 Stat. 2438 (2008); Pub. L. No. 114-23, § 301, 129 Stat. 278 (2015); Pub. L. No. 115-118, §§ 101(a)(1), (b)(1), 103(a), (b)(5), 104, 205(a)(6), 132 Stat. 4, 6, 10, 12, 13, 21 (2018); *see also* Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act ("USA PATRIOT ACT") of 2001, Pub. L. No. 107-56, § 215, 115 Stat. 272, 287 (2001) (codified as amended at 50 U.S.C. § 1861(a)(1)). The answer is not restricting the installation of hardware but rather greater transparency by governments monitoring telecommunications and acting to reduce the impact of such monitoring. Loideain, *supra* note 303, at 53 (The protection of the right to privacy "is key to ensuring that the oversight of State powers that permit the covert surveillance of communications for legitimate purposes (such as the prevention of terrorism and serious crime) is adequate and transparent. Moreover, without the robust scrutiny of independent judicial review, the principles and safeguards that ensure the effective application of this human right are at risk from becoming more illusory than real."); Dongfeng Fang et al., *Security for 5G Mobile Wireless Networks*, 6 IEEE ACCESS 4850 (2017), <https://ieeexplore.ieee.org/abstract/document/8125684> [<https://perma.cc/88EG-PZ6X>] (explaining a proposed security architecture that could address 5G security concerns from both industry and academia and provide future research directions).

5G. Regardless, it is imperative that all countries come to an agreement on how to proceed responsibly.³³²

First, the AI race narrative must be discarded. With the U.S. seeking to shut out the spread of Chinese technology, not only is industry in these two regions impacted, but the EU is also caught in the middle. The U.S. and China must acknowledge their interdependence and work to responsibly advance AI, addressing health, safety, and fairness issues. Rather than isolating researchers from one another, funding must be dedicated to the responsible development of AI. While the EU is well on its way to meeting this goal, global agreement must be obtained on its trajectory and standards.

Second, the education of future workers on technology and AI must be made a priority. Those with the technical expertise to develop, install, and program AI and infrastructure are in short supply.³³³ While China³³⁴ has taken the initiative in training along with the EU,³³⁵ the U.S. has no educational policy and certainly has dedicated no governmental money to developing this needed workforce. Because many types of AI can be developed from remote locations, workers can come from anywhere.³³⁶ “Public policies have to work in partnership at international and national levels to create an ecosystem of AI that serves sustainable development.”³³⁷ The needs for digital literacy cannot be overstated. The key is to establish a set of competencies that will help meet the needs of employers in AI regardless of which countries they reside in.³³⁸ While there is disagreement on whether AI

³³² The following suggestions are in no way an exhaustive list of everything that must be settled on, but rather a beginning point to get off the wrong track that the U.S. and China seem to be blindly heading down.

³³³ See *supra* Section II.B.2.

³³⁴ Meng Jing, *China Looks to School Kids to Win the Global AI Race*, S. CHINA MORNING POST (May 3, 2018, 6:00 AM), <https://www.scmp.com/tech/china-tech/article/2144396/china-looks-school-kids-win-global-ai-race> [<https://perma.cc/7NA9-MA5X>].

³³⁵ MICHEL SERVOZ, EUR. COMM’N, *THE FUTURE OF WORK? WORK OF THE FUTURE!* (2019), <https://ec.europa.eu/digital-single-market/en/news/future-work-work-future> [<https://perma.cc/8GKW-TJH3>].

³³⁶ Lan Xuezhao, *How AI Might Create More Work Opportunity*, FORBES (June 6, 2018, 2:04 PM), <https://www.forbes.com/sites/lanxuezhao/2018/06/06/how-ai-might-create-more-not-less-work-opportunity/#20bae0275699> [<https://perma.cc/PC6J-SEEZ>].

³³⁷ *The Challenges and Opportunities of Artificial Intelligence in Education*, UNESCO (Mar. 7, 2019), <https://en.unesco.org/news/challenges-and-opportunities-artificial-intelligence-education> [<https://perma.cc/CMD5-9MLY>].

³³⁸ Francesc Pedro et al., *Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development* 18 (United Nations Educ., Sci. and Cultural Org., Working Paper on Education Policy No. 7, 2019), https://unesdoc.unesco.org/in/documentViewer.xhtml?v=2.1.196&id=p::usmarcdef_0000366994&file=/in/rest/annotationSVC/DownloadWatermarkedAttachment/attach_import_58d82938-6e6c-4580-87ad-0e06deb8e1dd%3F_%3D366994eng.pdf&locale=en&multi=true&ark=/ark:/48223/pf0000366994/PDF/

will decrease jobs or increase jobs, if the U.S. does not take action to increase the digital literacy of its workforce, new jobs will be taken by those residing in other countries.

Third, the lack of interoperability of 5G systems must be addressed with agreed-upon, worldwide standards for components and software.³³⁹ As explained, because some of Europe's 4G systems rely on equipment provided by Chinese manufacturers whose components are not interchangeable with those made by Nokia and Eriksson, this creates a situation where one manufacturer can control the pace and location of 5G installation.³⁴⁰ It is in everyone's interest to increase speed and reduce latency for AI implementation.³⁴¹ As developing nations become more technologically advanced, new markets will open, which will buoy the economies of all three blocks.³⁴² If China is able to set these standards for 5G due to its BRI tour, the EU will either need to match China's standards or risk selling to a much smaller market. However, the situation is much worse for the U.S., as not only does it lack a major 5G equipment supplier, it is also dedicating a spectrum different from the rest of the world on which to build its infrastructure.³⁴³

Fourth, countries must come together for the development and adherence to international ethical standards for the development of AI.³⁴⁴ Currently, the EU has taken the lead with EU initiatives exploring and

366994eng.pdf#292_19%20Working%20Paper%2011_E.indd%3A.6418%3A140
[https://perma.cc/B7CY-V67G].

³³⁹ See *supra* Section III.C, regarding lack of standards in 4G technology's impact on cell phone use outside originating area.

³⁴⁰ Douwe Korff et al., *Boundaries of Law: Exploring Transparency, Accountability, and Oversight of Government Surveillance Regimes* (Univ. of Cambridge Fac. of Law, Research Paper No. 16/2017, 2017), <https://ssrn.com/abstract=2894490> [https://perma.cc/6JD9-EPLD]; DOLCERA, 5G NETWORK EQUIPMENT: HUAWEI VS. THE REST, AND WHAT HAPPENS NEXT (Feb. 10, 2020), <http://dl.icdst.org/pdfs/files3/362d3b7cafe6f15bfa0a17983cdf9a6.pdf> [https://perma.cc/C9JK-A6K6].

³⁴¹ Self-driving cars, medical devices, smart homes, smart factories, IoT. Developing countries will be especially positively impacted by AI. Sameer Maskey, *AI For Humanity: Using AI to Make a Positive Impact in Developing Countries*, FORBES (Aug. 23, 2018, 7:30 AM), <https://www.forbes.com/sites/forbestechcouncil/2018/08/23/ai-for-humanity-using-ai-to-make-a-positive-impact-in-developing-countries-2/#29619baf1b08> [https://perma.cc/8PF9-LJ9X].

³⁴² Oheneba Ama Nti Osei, *The 5G Revolution Is Coming to Africa*, AFRICA REP. (Apr. 5, 2019, 1:06 PM), <https://www.theafricareport.com/11461/the-5g-revolution-is-coming-to-africa/> [https://perma.cc/TZR7-RSH2].

³⁴³ Scott Fulton III, *How China, Brexit, and the US Derailed Global 5G Wireless*, ZD NET (Aug. 16, 2019, 2:37 PM), <https://www.zdnet.com/article/how-china-brexit-and-the-us-derailed-global-5g-wireless/> [https://perma.cc/8L6K-HNRR]; see generally MEDIN & LOUIE, *supra* note 238, at 3–4.

³⁴⁴ In 2016, the Obama administration met with representatives from the European Parliament and the UK House of Commons to discuss AI and the "Good Society." Corinne Cath et al., *Artificial Intelligence and the 'Good Society': The US, EU, and UK Approach*, 24 SCI ENG'G ETHICS 505 (2018). While the paper acknowledges the need to expand on these discussions, we seem to be moving away from international cooperation.

making recommendations on AI Ethics.³⁴⁵ There are also a number of organizations and institutes making recommendations,³⁴⁶ but with the current lack of cooperation among nations, and the U.S. move away from the World Trade Organization, no binding regulations are being considered at this time.³⁴⁷ Most of the initiatives on AI ethics come from the private sector in both academia and industry.³⁴⁸ Racing to “win” at AI will circumvent this needed step.

Fifth, the U.S. government needs to get up to date on technology. All three branches of the U.S. federal government are embarrassingly behind the times with respect to how technology works.³⁴⁹ Members of all branches have displayed stunning ignorance of the law as well, failing to understand the legislative framework and current limitations of privacy and data security law.³⁵⁰ While it is unlikely that a federal set of laws can be created, at the very least, the U.S. can incorporate minimal protections on consumer data and begin enforcing the laws to address the massive governmental collection of data, surveillance activities and lack of appropriate security measures.³⁵¹ The U.S.’s reliance on private industry to fund AI is bad policy.³⁵² Steps must be taken to allocate spending on the responsible development of AI. The U.S.’s increasing military budgetary allocation is completely misplaced. All

³⁴⁵ ANDREA RENDA, CTR. FOR EUR. POL’Y STUD., ARTIFICIAL INTELLIGENCE: ETHICS, GOVERNANCE AND POLICY CHALLENGES (2019), <https://ssrn.com/abstract=3420810> [<https://perma.cc/2JB8-BAKU>] (setting forth “44 recommendations on how to design and promote lawful, responsible and sustainable AI and how to approach future policy and investment decisions with the aim of positioning Europe in the driver’s seat to address the most disruptive technology transition of our times”).

³⁴⁶ The Organization for Economic Cooperation and Development (OECD) issued guidelines in 2019 that formed the basis of non-binding G20 AI principals in June 2019. Angela Daly et al., *Artificial Intelligence, Governance and Ethics: Global Perspectives* 10 (The Chinese Univ. of H.K. Fac. of L., Research Paper No. 2019-15, 2019), <https://ssrn.com/abstract=3414805> [<https://perma.cc/EV4K-WX3B>].

³⁴⁷ *International AI Ethics Panel Must Be Independent*, NATURE (Aug. 21, 2019), <https://www.nature.com/articles/d41586-019-02491-x> [<https://perma.cc/T274-CAYG>].

³⁴⁸ Kaveh Waddell, *AI’s Uneasy Coming of Age*, AXIOS (Mar. 22, 2019), <https://www.axios.com/ai-ethics-stanford-hai-coming-of-age-4b302a62-510b-4c69-a95d-507199e578d3.html> [<https://perma.cc/W9DD-S47Y>].

³⁴⁹ See Sean Burch, *‘Senator, We Run Ads’: Hatch Mocked for Basic Facebook Question to Zuckerberg*, THE WRAP (Apr. 10, 2018, 1:49 PM), <https://www.thewrap.com/senator-orrin-hatch-facebook-biz-model-zuckerberg/> [<https://perma.cc/R9U7-RDTE>].

³⁵⁰ Tim Hwang, *The Government’s Failure to Keep Up with Technology Is Hurting All of Us*, GOV’T EXEC. (Dec. 6, 2017), <https://www.govexec.com/management/2017/12/governments-failure-keep-technology-hurting-all-us/144345/> [<https://perma.cc/EFB6-WY7F>].

³⁵¹ See Houser & Sanders, *supra* note 30 (detailing how the federal government circumvents federal law on privacy and data security).

³⁵² Kaveh Waddell, *A Power Shift in AI Funding May Hobble the U.S.*, AXIOS (July 4, 2018), <https://www.axios.com/power-shift-artificial-intelligence-funding-government-51f9a28a-0da5-4787-b84f-a69c9b9c92da.html> [<https://perma.cc/R5TL-VJJU>].

the airplanes, aircraft carriers, bombs, and walls are no defense to future cyber warfare. Not only should funding be provided for commercial and social AI, but also for cyber-defense and detection.³⁵³ The U.S. military's reliance on open source software and private industry has put them years, if not decades, behind China.³⁵⁴ While the U.S. complains of China's firewall, it fails to acknowledge how it reduces access by bad actors.³⁵⁵

Finally, the U.S. must open up midrange spectrum for 5G telecommunications and provide support for the build-out of the infrastructure for both urban and rural areas. The rural areas will be left out of the 5G revolution if they do not have access to the high speeds and low latency that 5G will provide. By operating in a different spectrum from the rest of the world, the U.S. risks creating components that are not marketable abroad. Additionally, relying on mmWaves will cost billions due to the density of installation required to address the lower range of data transmission that these waves provide. Because companies in the U.S. have sold over much of their telecommunication equipment manufacturers to foreign companies, this industry needs to be reinvigorated by investment from the U.S. government. In the short term, the U.S. needs to reconsider its position on sourcing hardware from China. The current restrictions do not enhance security but will drastically increase the cost and slow down the installation of the 5G infrastructure.

CONCLUSION

AI has the potential to spur efficiencies in just about every industry, improve medical diagnostics, reduce automobile fatalities, and address social inequality. As nations seek to compete with one another to win the so-called race, they are actually delaying future developments in AI with their lack of cooperation. It is exceedingly dangerous to run without looking where you are going or at whom you might run over. Despite reports to the

³⁵³ Remington Tonar & Ellis Talton, *A Lack of Cybersecurity Funding and Expertise Threatens U.S. Infrastructure*, FORBES (Apr. 23, 2018, 8:00 AM), <https://www.forbes.com/sites/ellistalton/2018/04/23/the-u-s-governments-lack-of-cybersecurity-expertise-threatens-our-infrastructure/#30a21d1e49e0> [https://perma.cc/NCT5-955N].

³⁵⁴ JOHN F. SARGENT JR. ET AL., CONG. RSCH. SERV., R45403, THE GLOBAL RESEARCH AND DEVELOPMENT LANDSCAPE AND IMPLICATIONS FOR THE DEPARTMENT OF DEFENSE (2018), <https://crsreports.congress.gov/product/pdf/R/R45403/4> [https://perma.cc/2NSY-X722].

³⁵⁵ We are not suggesting that the U.S. similarly incorporate data localization requirements for all industries, but rather that it consider the benefits and costs at the very least with respect to citizen data maintained by the government. See, e.g., Jessica Baron, *Cyber-Sovereignty and China's Great Firewall: An Interview with James Griffiths*, FORBES (Apr. 8, 2019, 9:15 AM), <https://www.forbes.com/sites/jessicabaron/2019/04/08/cyber-sovereignty-and-chinas-great-firewall-an-interview-with-james-griffiths/#3592b405747b> [https://perma.cc/2NYP-HU9N].

contrary, we are at the very beginning of AI advancements, many of which cannot come to fruition until after transmission and processing speed is greatly increased and latency is reduced, as would be the case with 5G. Rather than trying to race one another, nations must be willing to acknowledge their interdependency, work together, and use their knowledge to create a worldwide set of standards and ethical framework by which to abide. The U.S. is especially at risk due to its failure of policy in supporting a 5G infrastructure.

All three regions have advantages when it comes to AI. The EU has recently come out with a checklist for the ethical development of AI and is on the forefront of the responsible development of AI. The U.S. has the commercial framework due to private industry, with Silicon Valley and other rising tech hubs. Advances in semiconductors in the U.S. outpace any country in the world. China, on the other hand, has the advantage with a national strategy for AI, 5G networking equipment, and massive amounts of data, which has given it the lead in facial and voice recognition technology. The firms that create and commercialize 5G are at an advantage when it comes to setting standards. The U.S. has taken a wrong turn by hampering trade, banning 5G equipment, and designating the least useful spectrum for 5G, which will not only harm the installation of its infrastructure, but will also prevent it from having a role in the future of 5G outside of the U.S. Standards must be agreed upon so that components are interchangeable and countries are not beholden to one supplier.

Racing to win will prioritize speed over intentionality. Instead of AI for social good, AI could be created without safeguards or ethical considerations. Although the potential benefits are enormous, so are the risks. As the past has demonstrated, collaboration across borders increases technological progress, advancing all economies. It is also the right time to involve not just computer scientists and engineers, but also social scientists and legal ethicists, paying considerable attention to the diversity of those setting the standards and intentions for AI. What happens today with respect to AI will have a lasting worldwide effect on the future of our nations and society as a whole. Now is not the time to head off in different directions. Everyone will lose unless these nations realize the only way to win the race is together.