China's Techno-Utilitarian Experiments with Artificial Intelligence

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INTRODUCTION

Any article talking about China's journey with Artificial Intelligence (AI) has to begin with the board game Go. More specifically, the face-off between Lee Sedol, winner of 18 world titles and widely considered to be the greatest player of the past decade, and Google's DeepMind-AI-powered Alpha Go. In a now landmark match, Alpha Go didn't just trounce Lee Sedol 4-1, it displayed uniquely inventive tactical abilities, in a match that was watched by over 200 million people worldwide[1]. Go, a highly strategic game with more than 2,500 years of history in China and the East Asia region, has served as an essential game for intellectuals and thinkers in Chinese bureaucracy for centuries and plays a central role in military and strategic planning in China today. DeepMind's victory over Lee Sedol and then later over Chinese champion Ke Jie captured the minds of people all over the world, especially East Asia. In China it lit the ignition of the Chinese combustion engine that has since stayed in 6th gear, driving an ambition to first catch up to and then surpass all others as the world's leading AI power.

AI development is regularly framed as an arms race, which, although misleading because it ignores the significance of cross-border exchanges of talent and investment, does convey the very real sense of competition between countries to lead in this domain. There is a very real historical geopolitical dimension to this, as the Chinese Communist Party (CCP) believes it has been kept at arm's length by Western countries from access to the latest technology. Weaning off dependence on Western-built technology is as much a political and security imperative as it is an economic one. For China, AI is seen as a strategic technology that will help it

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1 "Innovations of AlphaGo," DeepMind, accessed 31 August 2018, https://deepmind.com/blog/innovations-alphago/.

achieve its core national economic, social, political, and military objectives, which will see the country transition to a developed, prosperous economy with the Party at the helm[2]. This was outlined as such when the State Council of China – the premier policy body – issued the "Next Generation AI Development Plan" in July 2017, which unambiguously called for China to become the number one global source of AI innovation by 2030.

The document notes China's recognition that ever since the first industrial revolution it has consistently played catch-up to the West, particularly the US, lagging behind in patents, talent, and scientific research. In AI, China wants to make the leapfrog to be a trailblazer. In the context of AI this means: breakthroughs in fundamental research, building a commercial ecosystem, cultivating and attracting the best talent, and setting global standards and norms. Prior to this plan, Chinese companies such as Baidu and Alibaba had already placed their bets on AI, while previous government plans had made references to AI.

This State Council plan sought to develop a "whole-of-nation-approach,"[3] creating an incentive structure for all stakeholders – entrepreneurs, students, scientists, investors, policy makers, and government bodies – to leverage China's strengths, better understand the technology and craft appropriate legal frameworks, grow the talent pool of AI engineers, and develop indigenous innovation that will enable this leapfrog. Fast forward to nearly two years, how big is China's AI industry in commercial terms?

According to the Tsinghua University Technology Policy and Research Institute's China AI Report (中国人工智能发展报告) the size of China's AI industry in 2017 is estimated to be RMB 23 billion (Euro 2.9 billion)[4]. But it is very difficult to accurately make such assessments because AI itself is a catch-all term for a number of different technologies and appliances[5], not to mention the difficulties in accessing data. An illustration of the disparity: the Tsinghua AI report counts 1,011 AI companies

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2 "Translation: Chinese Government Outlines AI Ambitions through 2020," New America, accessed 1 September 2018, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/translation-chinese-government-outlines-ai-ambitions-through-2020/.

3 Kania, Elsa, "China's Artificial Intelligence Revolution," The Diplomat, 27 July 2017, accessed 31 October 2018, https://thediplomat.com/2017/07/chinas-artificial-intelligence-revolution/.

4 清华大学正式发布《中国人工智能发展报告2018》, Tsinghua University Technology Policy Research Centre, "China AI Development Report 2018," http://www.sohu.com/a/241293549_680938, accessed July 2018.

5 According to the 3-year AI implementation plan issued by the National Development and Reform Council (NDRC), AI is: basic research in fields such as deep learning, the development of basic software and hardware such as chips and sensors, and applied research in areas like computer vision and cybersecurity.

in China, while the Beijing Municipal Commission of Economy and Information Technology in its White Paper "Beijing AI Industry Development White Paper" (北京人工智能产业发展白皮书) counts 4,000 AI companies, with Beijing alone home to 1,070. It is reasonable to settle on a number closer to the former, as efforts by the China Money Network[6] and think tank Yiyou[7] counted 1,122 companies and 922 companies respectively. For context, the number of AI companies globally is estimated to be anywhere between 3,465 to 4,925[8].

Given these numbers it is not surprising to see that China makes up a significant share of global funding in AI. China received 60% of global investments in AI between 2013 and 2018, according to the Tsinghua report, while a CB Insights report attributes 48% of worldwide AI investments in 2017[9] to China. That a lot of the investment took place in the past two years is reflected in the fact that 81% of the companies are between angel, seed, and Series A rounds, as per the China Money Network report cited above. According to the Tsinghua report the growth in the AI industry is expected to peak at 75% in 2018 and eventually decline to 40% by 2020[10]. For context: The State Council is aiming for China's "core AI industry" to reach RMB 10 trillion (Euro 1.2 trillion), the amount the sector needs to grow 25 times between 2018 and 2030[11].

Any talk of investment in technology in China has to mention Baidu, Alibaba, and Tencent, collectively referred to as BAT, but also now Huawei. None of them are strictly AI companies as defined above, but they are key architects driving research and development (R&D) and mergers and acquisitions and are of course, the owners of data. According to a huxiu.com report these four companies are linked, mainly through investments, to 65% of 190 Chinese AI companies surveyed. Each of these four companies focus their R&D and investments in areas that currently boast a competitive AI advantage due to their existing businesses and platform.

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[6] Using the definition "private companies with a core focus on AI technology".

[7] "Artificial Intelligence Research in China 2018," 亿欧_产业创新服务平台 Iyiou, August 2018, accessed 15 October 2018, https://www.iyiou.com/intelligence/reportPreviewH5?id=87240&&did=574.

[8] "China AI Top 50," China Money Network, 19 September 2018, accessed 15 October 2018, https://www.chinamoneynetwork.com/china-ai-top-50-2018.

[9] "AI 100: The Artificial Intelligence Startups Redefining Industries," CB Insights Research, 18 September 2018, accessed 24 September 2018, https://www.cbinsights.com/research/artificial-intelligence-top-startups/.

[10] 清华大学正式发布《中国人工智能发展报告2018》, Tsinghua University Technology Policy Research Centre, "China AI Development Report 2018," http://www.sohu.com/a/241293549_680938, accessed July 2018.

[11] Ibid.

Alibaba in retail, finance, and entertainment marketing; Baidu in search and AI applications, especially in autonomous vehicles, Tencent in education and social, and Huawei in hardware through its phones and AI chips.[12] Yet, increasingly so, public capital is important, most notably through Government Guidance Funds (GGF) (政府引导基金), which will be touched upon in more detail in the next section, and which have investments in several large and small AI companies.[13]

Finally, China has risen as a source for AI research by several quantitive measures. The number of AI papers published in China has seen a dramatic increase by 150% between 2007 and 2017 and now makes up 25% of the number of AI papers globally, according to the Stamford University published AI Index 2018. These papers are also being cited on average 44% more now than in 2000, suggesting a greater relevance, although for now China still lags behind Europe and the US who lead the way by measure of citation.

WHAT DO WE MEAN WHEN WE SAY AI?

Computer Vision, Natural Language Processing, and Voice Recognition are among the most important core machine learning-based technologies that have seen significant breakthroughs in application worldwide and this is the case in China as well. Facial recognition makes up 35% of all AI applications in China[14] and it is in this area that some of China's most well-known, and globally controversial, AI unicorns, such

[12] Qian Dehu, "Map to Understand China's AI Close-quarters Combat: Only Baidu and Huawei are Really Doing AI", https://docs.google.com/document/d/1IidRNebNblIouiZG2JjW7LqySbD-fI61Xx0uJVgZbp4/edit# (translation by Jeffrey Ding).

[13] Ibid.

[14] 清华大学正式发布《中国人工智能发展报告2018》, Tsinghua University Technology Policy Research Centre, "China AI Development Report 2018," http://www.sohu.com/a/241293549_680938, accessed July 2018.

as Sensetime 商湯科技[15, 16], Megvi Face++[17], and Yitu 依图,[18, 19] have emerged. Natural Language Processing (NLP) and Voice Recognition make up 31% and 25% of AI applications in China respectively. Provincial-level and city-level government bodies are also important clients as they too seek to digitise or risk being outshone by a neighbouring district or province in areas ranging from better urban management to improving the quality and access of government services. The most controversial area is, of course, the use of these technologies to bolster security, which is resulting in heightened state surveillance. Examples include Yitu's technology being added to CCTV cameras across Shanghai to aid law enforcement[20]; Sensetime, which is now moving towards working more closely with the security apparatus in Xinjiang; and experiments with the use of big data collection and algorithmic policing that may take place within the arches of the Social Credit System, which is seeking to improve people's accountability in the face of the law. This reflects the dual-use edge of these technologies and China is at the forefront of applying AI in its law enforcement apparatus, unobstructed by significant legal obstacles or strong privacy protection concerns at the moment.

The Chinese private sector is responsible for China's technology sector success, especially for developing commercially successful applications around payments and e-commerce. However, the extent of the influence of the State, which can be read interchangeably with the CCP, on the future path of technology is on the rise. A flurry of laws and regulations on domestic Internet governance, coupled with the lofty State ambitions around AI, outlined above, have emboldened the strong nexus between the State and all stakeholders in the industry.

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15   SenseTime independently develops deep learning platforms, supercomputing centers, and a range of AI technologies such as face recognition, image recognition, object recognition, text recognition, medical image analysis, video analysis, autonomous driving, and remote sensing.

16   Russell, Jon, "China's SenseTime, the World's Highest-valued AI Startup, Closes $620M Follow-on round," TechCrunch, 30 May 2018, accessed 24 September 2018, https://techcrunch.com/2018/05/30/even-more-money-for-senstime-ai-china/.

17   Megvii Technology operates a face detection, recognition, and analysis platform for websites, mobile applications, and smart televisions.

18   "Yitu Technology," Crunchbase, accessed 24 September 2018, https://www.crunchbase.com/organization/yitu-technology#section-web-traffic-by-similarweb.

19   Yitu conducts fundamental research on Artificial Intelligence aimed at finding comprehensive solutions for machine vision, listening and understanding, and builds pan-industry solutions.

20   "Yitu Profile," Bloomberg, accessed 15 September 2018, https://www.bloomberg.com/profiles/companies/1510312D:CH-shanghai-yitu-internet-technology-co-ltd.

ECOSYSTEM BUILDING WITH CHINESE CHARACTERISTICS

The Chinese technological ecosystem is distinctive in a number of ways, but the role and influence of the Chinese government arguably sets it apart. It is able to develop and implement visions with the same control as the lead conductor of a complicated orchestra. Lee Kaifu notes in his new book *AI Superpowers*[21] that in China the government sets the tone by putting AI at the front and centre of the agenda, which subsequently energises and drives the entire ecosystem, including local governments, entrepreneurs, students, and universities alike.

The Central government has issued a number of plans and strategy documents (See Table 1 for a list of all Central-level plans related to AI) that have acted as a call to action for provincial-level governments. At least 15 of China's 31 provinces have issues AI development plans of their own. On the surface, these plans are very much in line with the Chinese tradition of Leninist central planning. Rogier Creemers, an authority on Chinese techno-legal issues, described the Next Generation AI plan as "Santa's list of desiderata and objectives, but with little insight into how these should be achieved other than by throwing money at the problem"[22]. One clue is the audience it is meant for, i.e., not people sitting in India or Germany, but party and government officials at all levels of the central and provincial governments. Matt Sheehan of Macropolo explains: "The hope is that if local officials cough up a sufficient number of these gifts – factories adopting smart robots, new research centers pursuing natural language processing, autonomous agricultural drone demonstration projects – they will eventually add up to the plan's headline goal: global leadership in AI"[23].

One phenomenon that captures this approach is the government-backed fund of funds known as GGFs first mentioned above. The first GGF was an experiment by the Beijing Municipal government in 2002, following official recognition by the NDRC in 2008, there are estimated to be between 800-1,000 of these funds across

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[21] Lee Kaifu, *AI Superpowers*. Lee Kaifu is Chairman and CEO of Sinovation Ventures.

[22] Creemers, Rogier, "China's Plan to 'Lead' in AI: Purpose, Prospects, and Problems," New America, accessed 15 September 2018, https://www.newamerica.org/cybersecurity-initiative/blog/chinas-plan-lead-ai-purpose-prospects-and-problems/.

[23] Sheehan, Matthew, "How China's Massive AI Plan Actually Works," MacroPolo, 13 February 2018, accessed 15 September 2018, https://macropolo.org/chinas-massive-ai-plan-actually-works/.

China,[24] set up largely at the provincial and city level, aiming to raise subsidiary funds with an aggregate fundraising total of RMB 5.3 trillion (Euro 671 billion)[25]. While not aimed exclusively at spurring innovation in technology, a large number of these funds are aimed at areas such as big data, high-tech manufacturing, chipsets, etc.[26] Governments have long attempted to play a role in stimulating innovation, the major rationale being that private firms may under-invest in R&D activities. GGFs are unique to conventional government efforts to stimulate innovation in that apart from grants or subsidies, they invest in companies, taking an equity share. There is very little evidence or any publicly available impact assessments on whether these GGFs are an efficient use of State capital and are able to spur innovation, or whether this public capital is simply crowding out private investors rather than creating an additionality effect, or whether capital is truly being deployed to high-risk areas with low private returns. GGFs are a tool in China's attempts to build up a commercially viable indigenous semiconductor industry, a sector notorious for its extremely high market-entry barriers and high-risk capital investment, and some of the largest GGFs are especially prominent here, such as Guangdong Integrated Circuit Industrial Investment Fund, Shanghai Integrated Circuits Industry Investment Fund (RMB 50 billion/Euro 633 million), and China State-Owned Assets Venture Investment Fund (RMB 200 billion/Euro 2.5 billion), which is an investor in Cambricon, a unicorn chipset manufacturer. Time will tell as to how successful these State-led efforts are at growing the ecosystem and spurring innovation. So far, no GGF has made a successful exit.

In November 2018 the Ministry of Industry and Information Technology (MIIT) announced an open call for applications via a website, http://www.aibest.org.cn, for companies from across the country, with the goal to select a maximum of five companies from 17 distinct technical areas to "break bottlenecks in AI development, set up industry benchmarks, cultivate an innovation development army, and accelerate national AI industry development, and deepen integration with the

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[24] He xie and Peng, 何杰 彭兴庭. 政府引导基金运行中存在的三大矛盾五大风险, Hexun, 11 August 2017, accessed 29 December 2018, http://funds.hexun.com/2017-08-11/190401279.html.

[25] "China's $798B Government Funds Redraw Investment Landscape, Here Are The Largest Funds You Must Know," China Money Network, 31 October 2017, accessed 1 November 2018, https://www.chinamoneynetwork.com/2017/10/31/chinas-798b-government-funds-redraw-investment-landscape-largest-funds-must-know.

[26] Ibid.

real economy"[27]. This effectively creates a national team of AI champions, presumably alongside Baidu, Alibaba, Tencent, iFLYTEK and Sensetime, handpicked by the Ministry of Science and Technology to develop open innovation platforms in four areas[28].

Yet, if this top-down approach to building the ecosystem may lean more towards waste rather than innovation and efficiency, or stifle market competition, China's approach towards adopting technology, which Lee Kaifu classifies as techno-utilitarian, may serve to give China a competitive advantage compared to Western countries in developing AI. This is already visible with the speed with which the government has moved to adopt AI in government services as outlined above. This can also be extended to Chinese consumers, who are known to be quick adopters of new technologies, for instance, digital payments or bike sharing, with concerns about privacy a much lower priority. Can this lead to a first mover advantage in AI?

It is illustrative to home in on specific industries or domains. Autonomous driving is a case in point. The first company to go to market may not be the one that is the first to develop the technology but the one that operates in a country that is the first to develop a nation-wide regulatory framework that allows autonomous vehicles to legally drive on the road. An interesting example here is the New Xiongan District being built in Hebei province, 80 miles outside Beijing. Among many novel features, the Chinese government, in partnership with Baidu, builder of Apollo, an open source platform for autonomous vehicles, used by BMW and Bosch, plans to build a road system designed for autonomous vehicles[29]. Another important area which requires not just technology but a strong private-public partnership is urban governance. For instance, Alibaba Cloud's City Brain, currently being tested in cities such as Hangzhou and Suzhou, is among the global leading platforms enabling the creation of Smart Cities through the collection of data and real-time insights.[30]

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[27] MIIT, 新一代人工智能产业创新重点任务揭榜工作方案, "Work plan for key projects for the development of next generation of AI," 11 November 2018, accessed 27 November 2018, http://www.miit.gov.cn/n1146295/n1652858/n1653018/c6492065/content.html.

[28] "SenseTime Becomes the 'National Open Innovation Platform for Next-Generation Artificial Intelligence on Intelligent Vision'", 9 September 2018, accessed 27 November 2018, https://www.sensetime.com/news/719.html.

[29] USA, LLC Baidu, "Baidu and Xiongan New Area Sign Strategic Agreement to Develop Smart City," GlobeNewswire News Room, 20 December 2017, accessed 25 September 2018, https://globenewswire.com/news-release/2017/12/20/1267217/0/en/Baidu-and-Xiongan-New-Area-Sign-Strategic-Agreement-to-Develop-Smart-City.html.

[30] https://www.alibabacloud.com/et/city.

Ultimately this brings the discussion to the fundamental questions of how societies approach AI and the values it wants to build into the technology, which are informed more by the socio-political DNA of a culture than by the technology itself.

GOVERNANCE AND PRIVACY: IDEAS AND APPROACHES

Discussions about ethics, societal impact, future of work, and governing algorithms are increasingly becoming a part of the global AI discourse. These are difficult futuristic questions with no easy answer and China is not different in this case. And just as in most countries, the Chinese people too are most concerned about job losses and societal risks. At the recently held World AI Conference in Shanghai, President Xi Jinping raised the need to "develop laws, safety, employment, ethics, and governance of AI from all aspects" and noted that this would "require deep cooperation with all countries"[31]. Jeffrey Ding, a researcher at the Future Humanity Institute in Oxford, notes that, the world needs to shift its attention from whether China is having these discussions to what the substance of the discussions are.

In China, questions about ethics, unlike in most democracies, are not framed around the individual but instead the collective. In an interview with this author, Rogier Creemers explains: "China does not share those concerns [of the West] because its 'OS' [operating software] is not built on the State as the facilitator of the individual good, which lies at the heart of the liberal democratic idea of the State and citizenship....So the question about algorithms in China is very likely not going to be about whether they violate anyone's specific individual rights or not, but rather, whether or not they contribute to the solution of the identified socio-economic problems. This is where the question of fairness might get a look in: not from an identity or class-based perspective, but more from a classically Leninist approach."[32]

China too is looking both inwards and also outwards for values and a philosophical framework to approach AI. Professor He Huaihong, a professor of Chinese philosophy at Peking University, has argued that China needs to rebuild its social ethics based on Confucian values in the face of rapid changes and developments in

[31] The Paper, "习近平致2018世界人工智能大会的贺信 (Xi Jinping Address at WAIC)," https://m.thepaper.cn/newsDetail_forward_2448320, 20 September.

[32] Lewis, Dev, "Dev Lewis," Digital Asia Hub, 14 August 2017, accessed 15 September 2018, https://www.digitalasiahub.org/2017/08/14/interview-with-dr-rogier-creemers-ai-social-credit-algorithmic-governance-cybersecurity-vpns-cross-border-dataflows/.

Chinese society[33]. Baidu became the first Chinese company to join the Partnership on AI while other companies are increasing their efforts to engage with leading American and European research institutes.

The issue of data protection and the need to balance it with the needs of data-hungry Machine Learning systems is also a fundamental pain point. China has long been a thriving ground for data theft, enabled by lax data protection standards and a population (and government) still unaware or unable to stem the tide. The Cybersecurity Law (2017), which is now more than a year in implementation, places strict restrictions on the flow of cross-border data as well as sets higher data protection standards, the effect of which is already being seen with violating companies being flagged. China's main standards body also passed the Personal Information Security Specification (not a binding law), said to have been modelled on the European Union's General Data Protection Regulation (GDPR)[34], which raises the bar for Chinese companies to protect their users' data, given rising concerns about misappropriation of personal information by the private sector. The law also seeks to create a framework for managing data with the rise of smart cities and big data systems.

How to balance the need to innovate with the need to protect personal data? A commentary published by the *People's Daily* captured the dilemma as such: "The updating and iteration of technology is an important force pushing forward societal progress, and people should not 'give up eating for fear of choking' because of privacy issues, but the development of artificial intelligence also cannot come at the cost of sacrificing privacy"[35].

CONCLUSION

In just a short span of time, China has begun to channel a significant amount of capital to seed the building of a commercial ecosystem and to spur the adoption of AI in several industries, including government services. This has seen China dominate recent global investment in AI as well as contribute to the second-most number of

[33] Ding, Jeffrey, "How China Seeks to Govern AI," Medium, 5 September 2018, accessed 15 September 2018, https://medium.com/@ChallengesFnd/how-china-seeks-to-govern-ai-baf1c0cd1a54.

[34] "China's Emerging Data Privacy System and GDPR," China's Emerging Data Privacy System and GDPR | Center for Strategic and International Studies, 23 October 2018, accessed 1 November 2018, https://www.csis.org/analysis/chinas-emerging-data-privacy-system-and-gdpr.

[35] Caiyinghao, 蔡映洁, *People's Daily*, 27 August 2017, accessed 15 September 2018, http://opinion.people.com.cn/n1/2017/0823/c1003-29487792.html.

AI companies across the world, with this trend looking to continue into the next few years as a number of Chinese unicorn companies grow and mature. The number of AI patents filed by China is rising fast[36], as are academic papers published by Chinese researchers. However, as China's own AI plan, which looks more than a decade to 2030, suggests, the "AI race" is more a marathon than a sprint, with several fundamental issues that will need to be addressed, as much in the realm of politics as in the laboratory.

There are two critical winds of change in international relations. First is the unmistakable convergence between technology and politics. Technology companies and their platforms are impacting elections and national discourses, the scale and real-world impact of cybersecurity attacks continues to rise, and governments are moving to create laws and frameworks to set governance standards that reframe how people use technology. China is a major actor in each one of these areas. This is intertwined with the second critical trend – China's rise as the second largest economy and challenger to the United States-led order. The geopolitical shifts and political decisions made by countries and societies will shape the future technology leadership.

This issue is already flaring up as 5G technology edges closer to commercialisation. The Chinese company Huawei has emerged as a leader in developing the technology; yet, it is facing resistance in many important countries, with Australia recently banning Huawei from participating in the bidding of its national 5G networks, and the US unambiguously urging its allies to do the same[37]. The opaque relationship Chinese companies have with the State has been a long-standing national security concern for many countries, further amplified by an uptick in CCP branches set up within technology companies[38], or new laws such as the Cybersecurity Law (2017), which requires Chinese companies to share data and open up source codes under the pretext of national security. At this moment Germany has set up a cybersecurity lab to exclusively review Huawei's source code before it is given the green light to bid in Germany's 5G network infrastructure build-out. The outcome of this process will have a significant say on whether Chinese telecommunication

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36 Huang, Echo, "China Has Shot Far Ahead of the US on Deep-learning Patents," Quartz, 2 March 2018, accessed 25 September 2018, https://qz.com/1217798/china-has-shot-far-ahead-of-the-us-on-ai-patents/.

37 *Wall Street Journal*, "Washington asks allies to drop Huawei," accessed 27 November 2018, https://www.wsj.com/articles/washington-asks-allies-to-drop-huawei-1542965105?tesla=y.

38 Chen Qin Ching, *People's Daily*, "Technology companies strengthen CPC committee role in management, development," 21 November 2018, accessed 27 November 2018, http://www.globaltimes.cn/content/1128433.shtml.

companies are able to build 5G networks in major developed countries. Which leads to the next question: Can Chinese technology companies truly become global giants without truly being global or catering to developed countries?

The domination of Chinese companies is still mostly felt only within China's borders. With the exception of Southeast Asia, Chinese internet companies have a negligible global presence compared to their American counterparts. Many have begun going global, but like their counterparts in energy and infrastructure, are focused on catering to emerging markets. Chinese AI companies will struggle to match American giants like Google, Facebook, and Amazon, without access to data from around the world. This brings the discussion back to China's competitive advantages and innovative capabilities.

Can China make breakthroughs in fundamental research, whether in AI or technologies such as Quantum computing? China is spending large amounts on research and development, including in Quantum computing, but there are few quantitative assessments that suggest that this funding is significantly pushing the innovation needle forward. Despite becoming one of the world's leading filers of patents, both domestically and internationally, evidence suggests that a large percentage of these patents are not leading to commercial use and are not renewed. Research ecosystems and university systems in Western Europe and the US are still the benchmark for research and attract the world's best talents.

All these questions reflect the complexity around assessing AI and indicators of its success. China's size, economic power, and ambition suggest that it has the important characteristics to be a very important power in the AI realm. China may come to lead in several industries, as it does now for example in mobile payments, but it may not necessary result in Chinese companies taking this technology to the rest of the world. Any deterministic claims of global dominance are off the mark and still too early, with many future flash points around technology, politics and economics that may affect this. As are claims about the kind of society that China wants to build for itself using AI. The Chinese society is still relatively new to digitisation and faces similar problems that many other societies do when negotiating its relationship with technology. China's AI ecosystem will be a product of China's domestic political system and economic realities and therefore unlikely to look like the West. Yet there will be lessons and models from China's approach that will be valuable for ecosystems around the world and it is important that these differences do not prevent an open exchange of ideas and discourses and that China is allowed to play its role in the global decision making on the future of AI.

Table 1

Policy	Agency	Content	Year
Make in China 2025	China State Council	Push forward Smart Manufacturing	May 2015
Guiding Opinions concerning Vigorously Moving Forward the "Internet Plus" Plan	China State Council	AI as one of Internet Plus' 10 Key Points	July 2015
Outline of the 13th Five-Year Plan for the National Economic and Social Development of the People's Republic of China	China State Council	Includes AI in the Outline	March 2016
"Internet Plus" and AI: 3 Year Implementation Plan	National Development and Reform Council (NDRC)	Pushing for development of AI applications	May 2016
13th Five-year Plan for Scientific and Technological Innovation	China State Council	Development of AI-based methods driven by big data	July 2016
Government Work Report (2017)	China State Council	AI enters into the government work report for the first time	March 2017
New Generation Artificial Intelligence Development Plan	China State Council	Three-phase plan for China to become the world's leading AI innovation centre by 2030	July 2017
3-Year New Generation Artificial Intelligence Development Implementation Plan	Ministry of Information Industry and Technology (MIIT)	Action plan for integrating AI into the real economy	December 2017

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