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China's Artificial Intelligence Industry Alliance

Understanding China's AI Strategy Through Industry Alliances

CSET Data Brief

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Executive Summary

The Chinese leadership has put artificial intelligence (AI) front and center in China's industrial development. As part of this strategy, they have established industry alliances [产业联盟]—collaboration platforms involving local governments, academic institutions, and companies.

This data brief provides a high-level assessment of the role of industry alliances in China's AI strategy and closely examines one major group: the Artificial Intelligence Industry Alliance (AIIA) [中国人工智能产业发展联盟]. Through the AIIA, the Chinese government aims to foster collaboration among local governments, academic institutions, and companies. In some cases, the Chinese state uses the AIIA to "pick winners," choosing among favored companies in the AI industry to receive government subsidies.

In addition to its role of advancing China's industrial policy, the AIIA is notable as a diverse sample of companies active in the Chinese AI industry, ranging from well-known, publicly traded tech giants to obscure startups. This sample helps illuminate aspects of China's AI industry and provides a fuller picture of the distribution of AI activity in China.

We find that:

- AIIA members come from all over China. Roughly 71 percent of members are clustered in the four wealthiest, most populous first-tier cities, while 22 percent are scattered throughout "emerging new first-tier cities."

- Most AIIA industry members are diversified, typically large companies; a sizable minority are "pure play," AI-focused companies, which are predominantly startups and small enterprises.

- The alliance's AI-focused companies tend to specialize in AI applications for the commercial market. 63 percent of these companies focus on AI-driven business solutions and data storage and processing services.

These conclusions draw on open-source data, collected and annotated by CSET, on the AIIA's hundreds of members, including their websites, media coverage, and commercial databases. Further details on the dataset are provided in Appendix 1, and the full annotated dataset of AIIA members is available for download at CSET Github.

The Importance of Industry Alliances

China's central government is committed to building an efficient system for organizing innovation. According to the 13th Five-Year Plan, the Chinese Communist Party (CCP) aims to "establish an innovation network that integrates the efforts of government, enterprises, universities, research institutes, and end-users [政产学研用平台]."[1] Chinese leaders plan to continue this effort and further support companies in leading this innovation collaboration in the 14th Five-Year-Plan era.[2]

To help realize this commitment, the Chinese state uses industry alliances [产业联盟] to coordinate the activities of local governments, companies, and academic institutions consistent with its priorities. This type of innovation network is enshrined in the State Council's 2017 "New Generation Artificial Intelligence Development Plan" [新一代人工智能发展规划] (AIDP), which outlines ambitious AI development efforts under the Ministry of Science and Technology and relevant S&T departments through 2030.[3]

Since 2017, governments at the central, provincial, and local levels have established industry alliances to promote collaborative innovation in AI. The Chinese Institution of New Generation Artificial Intelligence Development Strategies, a state-affiliated research center, reports that the number of industry alliances in China's AI sector has doubled since 2017, reaching 190 in 2019.[4] Like the central government, local governments view industry alliances as an important tool for strategic emerging industries. For example, Guangdong province has supported these alliances, stating that they are "an important lever and vehicle for the government to integrate and optimize resources, improve and upgrade production chains, and promote industrial development."[5] Chinese analysts describe industry alliances as "linkers" [链接者] (i.e., relationship brokers) and consider regional and local alliances an important indicator for assessing which geographic areas in China are more competitive in AI.[6]

Industry alliances are not a new or uniquely Chinese phenomenon. China's government has closely studied similar arrangements in the

United States, the European Union, and Japan in an effort to replicate their strengths.[7] One example is the U.S. triangular alliance model that unites government agencies, universities, and private companies and has fueled American innovation since the start of the Cold War.[8] From international experience, Chinese researchers have concluded that industry alliances are best used to support strategic emerging industries, encourage basic research and development, and set common goals to solve national problems.[9]

However, unlike in other countries, Chinese leaders also seek to assert strong control over and unify private companies around the CCP and its objectives.[10] Xi Jinping has made it clear that "the Party is the leader of all."[11] Consistent with this mandate, China's industry alliance model is considerably state-driven and centrally planned.[12]

Typically, a government sponsor establishes the alliance, provides financial support and other policy incentives, and supervises the alliance's decision-making process.[13] Industry alliances may play a role in allocating government subsidies. For example, companies must participate in Hangzhou's local technology industry alliance to be eligible for certain city R&D subsidies.[14] Similarly, Wuhan's city government reserves some of its AI-related investment subsidies for projects with industry alliance participation.[15] In some cases, industry alliances also support CCP officials to launch "Party building" efforts, including by brokering agreements to incorporate Party officials and committees into the governance structures of their private-sector members.[16] A Guangzhou-based industry alliance has facilitated several such agreements between its private-sector members and state-owned enterprise members.[17]

China's Artificial Intelligence Industry Alliance (AIIA): A Case Study

To further understand the role that industry alliances play in implementing China's AI strategy, this data brief takes a closer look at the Artificial Intelligence Industry Alliance. The AIIA was established in October 2017 by a group of institutions[18] led by the National Development and Reform Commission, the Ministry of Science and Technology, the Ministry of Industry and Information Technology, and the Cyberspace Administration of China to further implement the AIDP and "'Internet Plus' and AI Three Year Implementation Plan" ["互联网+"人工智能三年行动实施方案].[19] The alliance marks the official launch of the State Council's AIDP and thus, China's AI ambitions.[20] Li Meng, vice minister of the Ministry of Science and Technology, reflected in 2017 that "the implementation of the 'New Generation Artificial Intelligence Development Plan' is a huge project for society, and the [ministry] will strongly support the AIIA playing an important role in implementing the plan."[21]

The AIIA works to "build a platform for cooperation between governments, industry, universities, research institutions, and end-users . . . and promote industrial cooperation and innovation."[22] The alliance convenes various activities to support members in their AI development, including public conferences and private workshops. According to a state-affiliated research center, the alliance hosted 40 AI-related conferences in 2019, second only to the more academically focused Chinese Association for Artificial Intelligence (41 conferences).[23] The alliance also organizes AI talent training programs. In 2019, the AIIA cooperated with Transwarp [星环科技], a big data and AI company, to establish an AI training academy in Shaanxi province.[24] In the same year, the alliance signed an agreement with Meritdata [美林数据], a data analytics company, to provide personnel training and cosponsor AI competitions.[25]

The alliance currently has 10 working groups—for example, standardization and promotion, policy and regulation, academic and intellectual property—which collect input from public and private partners and publish white papers on their respective topics.[26] For example, the alliance's December 2020 white paper

on intellectual property, produced in collaboration with Chinese government bureaus, top universities, and tech giants, reports on trends in AI patents and provides resources for companies to navigate China's intellectual property development.[27]

Findings

The alliance reports having 630 members, but its current membership list only includes 567 entities, organized in three tiers: vice-chairs of the board, board members, and ordinary members.[28] We extracted the membership list and compiled open-source data on each of the 567 named members from their websites, media coverage, and commercial databases. Appendix 1 provides further detail on the methodology and summarizes definitions and categories used for the annotation. The annotated list of the AIIA members as of March 26, 2020 is available for download at CSET GitHub.

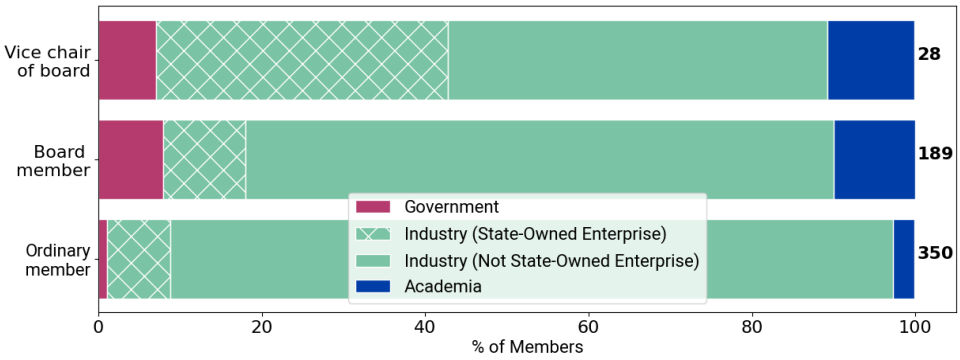
The Chinese state plays a dominant role in the AIIA

The AIIA has the strong interest and support of the Chinese leadership. High-level government agencies and prominent, authoritative actors have officially endorsed the organization.[29]

Formally, the AIIA is "driven by the market and dominated by companies."[30] And in fact, 511 of the AIIA's 567 named members are companies, with academic institutions (31) and government entities (21) accounting for the rest.[31] However, closer analysis suggests the AIIA is heavily influenced by government entities and government-affiliated members.

As shown in Figure 1, companies dominate all three of the alliance's membership tiers, but nearly half of the companies in the top-ranking "vice-chair" tier are Chinese state-owned enterprises (SOEs). In total, SOEs and government members together account for nearly half of the vice-chairs. SOEs do not necessarily follow all orders from above, but the central government controls the leadership of big, strategic SOEs, such as China Electronics Corporation [中国电子] and China Aerospace Science and Industry Corporation [中国航天科工集团], both of which are AIIA vice-chairs.[32] Other SOE vice-chairs include large information technology companies, such as INESA Corporation [上海仪电], as well as telecommunications companies, such as China Mobile [中国移动] and ZTE [中兴]. The proportion of SOEs and government members also decreases at lower membership tiers—19 percent in the board member tier and 9 percent in the ordinary member tier.

Figure 1: Government members and state-owned enterprises are disproportionately overrepresented in the AIIA leadership.



Source: CSET open-source research based on the AIIA membership list.

Because of the AIIA's state-dominated leadership structure, it is reasonable to assume the alliance's activities reflect the central government's priorities—potentially, more than "bottom-up" industry priorities, when they diverge. For example, China Aerospace Science and Industry Corporation, an AIIA vice-chair, worked with the alliance to host a competition promoting algorithm applications that rely on "military-civil integration and … artificial intelligence to tackle key problems."[33] The alliance has also advocated for AI chip standardization led by authoritative third-party platforms, such as the AIIA itself, over standards developed by private companies.[34] The alliance's broader focus on centralized standardization is consistent with the central government's view of how the market should operate in China.[35]

The Chinese government also uses the AIIA to distribute subsidies to AI companies, further demonstrating the tight ties between the state and the alliance. The AIIA hosts national competitions and picks promising AI companies to support financially. Finalists typically receive millions in RMB of venture capital financing, tax benefits, R&D subsidies, startup services, and even office space.[36] For example, iDeepWise [深思考人工智能], a company specializing in brain-inspired AI and deep learning, won first place in the AIIA's 2018 medical AI competition, receiving a 500,000 RMB (75,400 USD) cash reward, 6 million RMB (905,000 USD) of R&D subsidies over three years, and 20 million RMB (3 million USD) of investment

from a state-backed fund.[37] While these sums are not huge, they are potentially decisive for early-stage companies. Regardless of the sums, the awards reflect the alliance's role in aiding the Chinese authorities in implementing China's industrial policy, picking winners in the AI industry, and distributing government revenue to companies to help them achieve AI innovation.

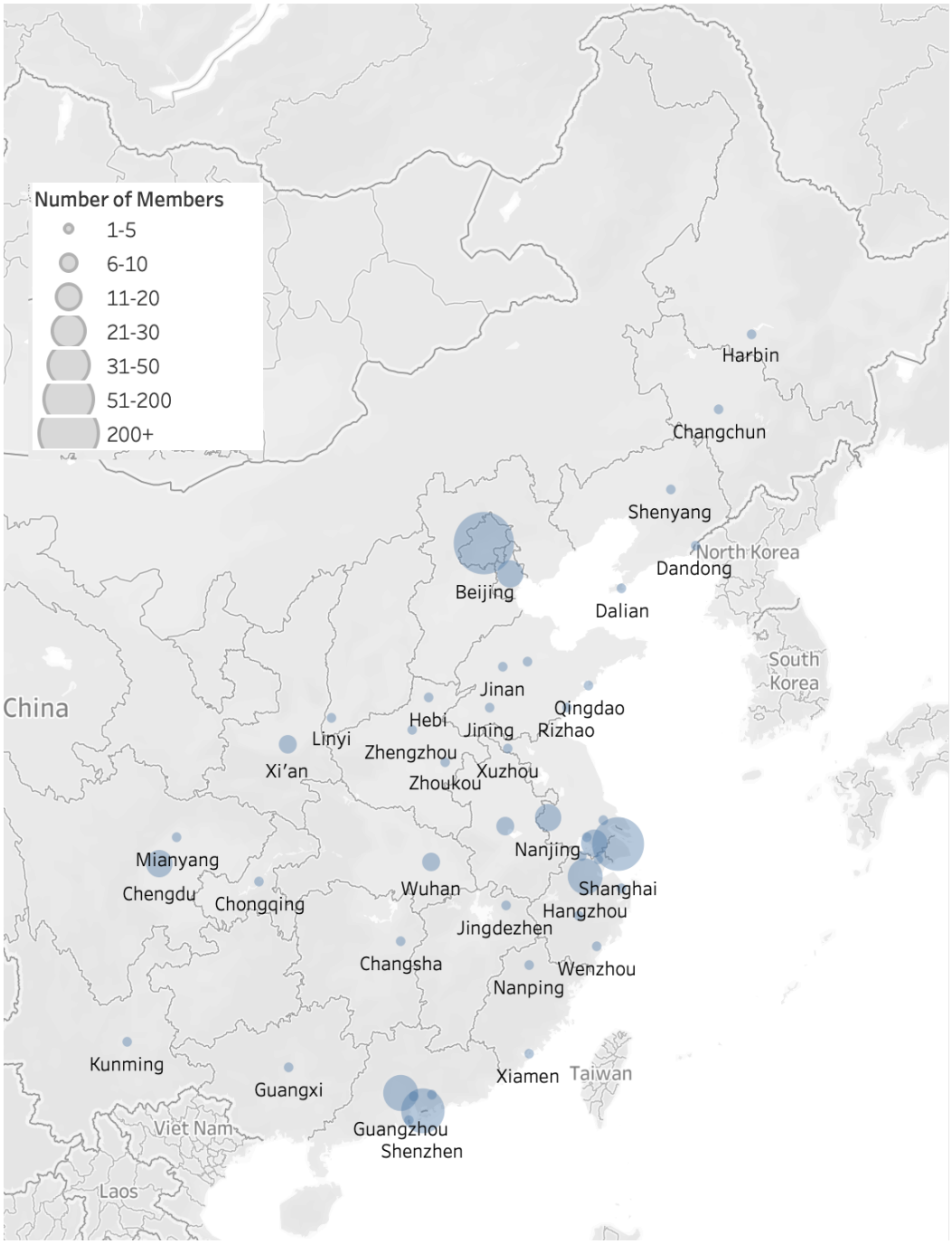
AIIA members are spread throughout China

Immediately after the establishment of the AIDP, ambitious local and provincial governments across China began implementing AI policies and pouring hundreds of billions of RMB into AI development.[38] China's most advanced economic regions often have enormous amounts of resources and support from the central government to pursue AI development. Many of the AIIA members are clustered in these wealthiest, most populous first-tier cities [一线城市].[39] Out of the 567 AIIA members, 439 (71 percent) come from the four first-tier cities. As shown in Figure 2, 244 (43 percent) of members are located in Beijing, 89 (16 percent) are in Shanghai, 36 (6 percent) operate in Shenzhen, and 30 (5 percent) are based in Guangzhou.[40]

However, 124 AIIA members (22 percent) are scattered throughout fourteen "emerging new first-tier cities" [新一线城市][41] including Hangzhou (25 members/4 percent), Suzhou (17 members/3 percent), Nanjing (17 members/3 percent), Chengdu (15 members/3 percent), Tianjin (12 members/2 percent), Xi'an (7 members/1 percent), Hefei (6 members/1 percent), among others. These formerly second-tier cities have been racing to be first-tier cities for years, including by supporting local ecosystems for AI development. For example, in Hefei, the Anhui provincial government and the Ministry of Industry and Information Technology jointly established China Speech Valley [中国声谷], an AI industrial base (home companies including iFlytek [科大讯飞]—an AIIA member), and set up a 5 billion RMB (740 million USD) fund to develop intelligent speech and other AI technology.[42]

The AIIA has also attracted 22 members (4 percent) from second-tier cities [二线城市][43] and 17 members (2 percent) from third-, fourth-, and fifth-tier cities.[44] Several members come from China's northeast rust belt, such as second-tier Harbin (3 members/<1 percent) in Heilongjiang province and Dandong (1 member/<1 percent) in Liaoning province. Both provinces have issued local AI development plans.[45] Joining industry alliances may allow small companies in these economically disadvantaged provinces to access potential investors and suppliers and expand the development space.[46]

Figure 2: The AIIA attracts members from all over China.



Source: CSET open-source research based on the AIIA membership list.

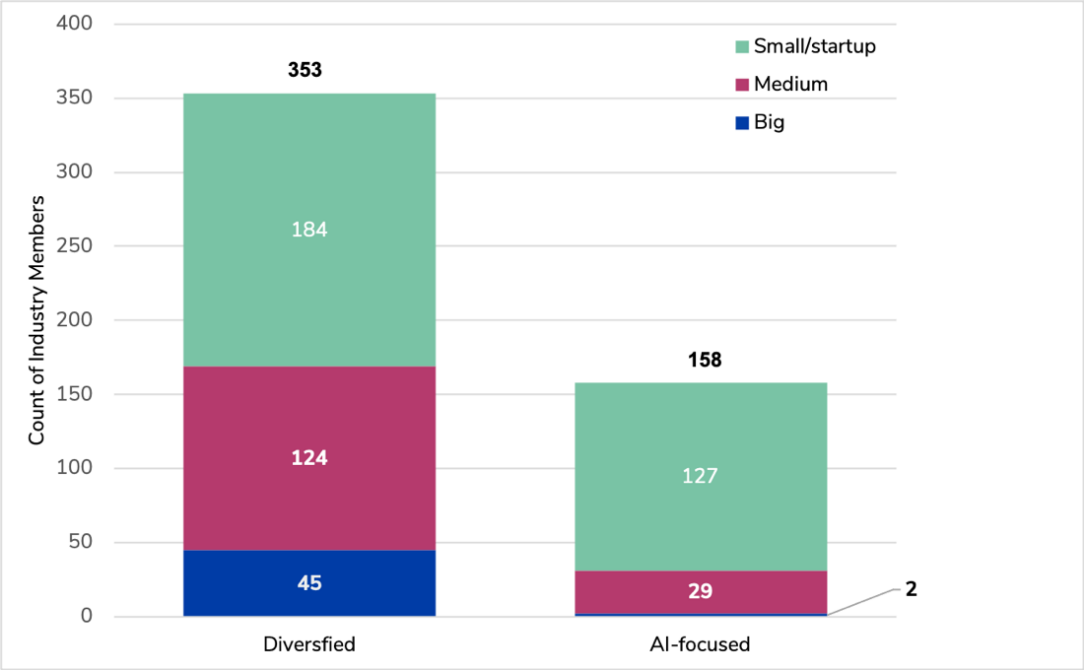
Note: This figure does not display two member organizations in Ürümqi, Xinjiang.

Most AIIA members are diversified companies with multiple product lines

To further study the AIIA member's business activity, we labeled each of the 511 industry members of the alliance "diversified" or "AI-focused" after reviewing their corporate websites and records in multiple investment databases.[47] Diversified companies refer to firms that oversee multiple lines of business and may have significant AI activity, while AI-focused companies are "pure play" firms that provide only AI-related products and/or services. In our analysis, diversified companies include many of China's AI titans, such as Baidu, Alibaba, Tencent, Huawei, and ByteDance, as well as companies with very little AI activity, such as Sinovation Ventures (an investment firm) and Phicomm (a device manufacturer). We categorize these members as diversified because their activities are not entirely focused on AI; for example, Alibaba engages in AI R&D but also operates e-commerce platforms, mobile payment systems, retail shops, among others.[48] Still, these companies are generally larger and able to devote significant capital and talent to AI R&D, even if they are not among China's well-known tech giants. Some may even become AI leaders. For example, PingAn Insurance [中国平安保险] has transformed into a leading technology company by establishing a subsidiary, PingAn Technology [平安科技], which has become a major player in AI and cloud computing.[49]

According to our annotation, nearly 70 percent of the AIIA's industry members are diversified companies. As shown in Figure 3, these diversified companies tend to be larger than AI-focused firms, which are predominantly startups and small enterprises. By joining the AIIA, these emerging companies may be able to access support from local governments, academic institutions, investors, and other stakeholders, helping them build capital and improve their products and/or services.[50]

Figure 3: Diversified companies dominate the AIIA industry membership and are larger than AI-focused companies, which are mostly startups.

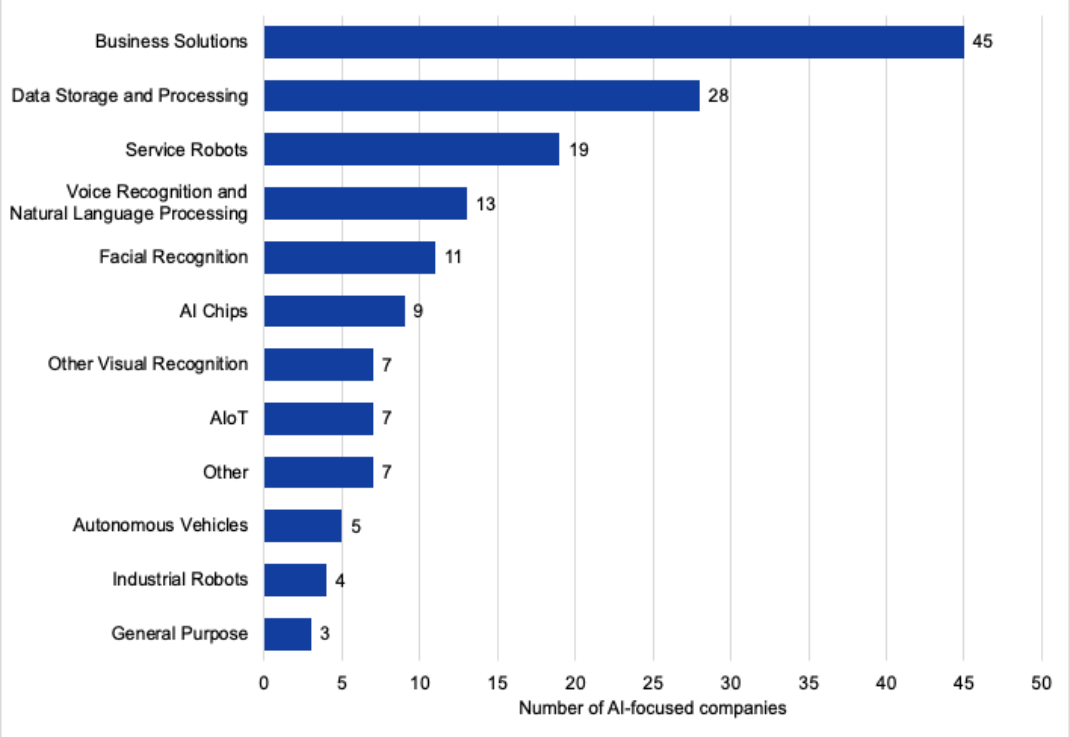


Source: CSET open-source research based on the AIIA membership list.

The AIIA's AI-focused companies specialize in commercial AI applications

To better understand AIIA members' activities in AI, we sorted the 158 AI-focused members of the alliance into groups based on their key products and services. (Appendix 2 explains our process in greater detail.) According to our annotation, 45 (29 percent) of the AIIA's 158 AI-focused companies specialize in business solutions such as AI-enabled consulting and marketing services.[51] Other leading commercial AI applications include data storage and processing (18 percent) and service robots (12 percent). Finally, many companies develop AI tools that are potentially used for surveillance, including voice recognition and Natural Language Processing (8 percent), facial recognition (7 percent), and other visual recognition (4 percent) systems. In the aggregate, only a handful of Chinese AI-focused companies seem to focus on developing general-purpose AI tools and frameworks (2 percent).[52]

Figure 4: Distribution of AI-focused companies, by key product/service



Source: CSET open-source research based on the AIIA membership list.

Most of these leading application areas are consistent with the central government's priorities. The "Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry" [促进新一代人工智能产业发展三年行动计划] sets out targets for AI industry development in a range of specific product categories, including intelligent service robots, video image identification systems, data processing, smart home products, and intelligent unmanned aerial vehicles, among others.[53] One notable exception, however, is AI-enabled business solutions. Despite the central government's long-term vision, the alliance's industry members are still most active in this area where the market opportunities are global.[54]

Conclusion

China's government hopes to integrate AI efforts of local governments, academic institutions, and companies as well as consolidate the state's guiding role in China's AI industry development. Our findings confirm the state's commitment, illuminate the intended role of industry alliances in this effort, and document the role of the state in the leading AI alliance.

The Chinese government clearly sees industry alliances playing an important role in implementing China's AI strategy, but their impact on China's AI development remains uncertain, especially at this early stage. Many of China's industry alliances in the artificial intelligence sector were established after the release of the State Council's "New Generation Artificial Intelligence Development Plan" in 2017.[55]

Whether or not it proves successful, though, China's Artificial Intelligence Industry Alliance remains an important unit of analysis for observers of China's AI industry. The AIIA's membership brings together hundreds of important players in the Chinese AI sector: state and nonstate actors; AI researchers and integrators; and AI-focused and diversified companies. As the AIIA continues to draw financial support from the Chinese government, and the alliance identifies and nurtures promising actors in the AI industry all across China, the United States and its allies should pay close attention to the alliance's membership and activities, particularly those that seek to capture markets abroad.

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Appendix 1: Summary of Variable Definitions and Statistics

We acquired a list of the AIIA membership from its website and manually populated the following fields for each member organization using open-source information from members' websites, media coverage, and commercial databases.[56] The table below explains each field and provides summary statistics. The full annotated dataset is available for download at CSET GitHub.

Variable	Definitions and Annotation Methodology	Summary Statistics	Example Input
For all members			
Name	Name of the member organizations as written on the AIIA's website.	Includes 567 observations.	Alibaba (China) Co., Ltd. [阿里巴巴（中国）有限公司]
Common name	Name of each member as publicly known in Chinese and English, if different from the name listed on the AIIA website.	Includes 567 observations.	Alibaba [阿里巴巴]
Tier	Position in the alliance, according to the AIIA website; select from vice-chair of the board [副理事长单位], board member [理事单位], and ordinary member [普通会员单位].	Includes 28 vice-chairs, 189 board members, and 350 ordinary members.	Vice chairs of the board

Type	Organization type; select from government, academia, industry, and other/unknown. Government members are government entities at any level of administration - national, provincial, or local. Government-affiliated members (e.g., state-affiliated think-tanks and industry alliances that are jointly established by government entities and academia and/or industry members) are counted as government, while state-owned enterprises are not. Academia members include universities. For-profit companies are categorized as industry organizations.	Includes 21 government members, 31 academia members, 514 industry members, and 1 other/unknown.	Industry member
Website	Website of each member, where available.	Includes 511 members with a website and 57 members with no website.	https://www.alibabagroup.com/en/global/home?spm=a2
Crunchbase URL	Link to the organization's record in the Crunchbase dataset, where available.	Includes 231 members that are in the Crunchbase database, and 336 that are not.	https://www.crunchbase.com/organization/alibaba

Location (city-level)	The Chinese city, province-level municipality, or special economic zone in which the organization is headquartered.	Includes 564 observations. See above analysis for the geographic distribution of the AIIA members.	Hangzhou
Location (provincial level)	The Chinese province, autonomous region, or province-level municipality in which the organization is headquartered, where applicable.	Includes 564 observations.	Zhejiang
For industry members only			
Estimated size	The annotator's best estimate of the size of the organization's workforce. "Small/startup" companies have fewer than 50 employees, "medium" companies have between 51 and 249 employees, and "large" companies have more than 250 employees.	Includes 47 large companies, 153 medium size companies, and 311 small/startup companies.	Large

Estimated focus	A variable with two possible values: diversified and AI-focused. A diversified company may be active in AI, but its business portfolio is diverse. An AI-focused company only provides products/services involving AI technology. Values are assigned according to the annotator's best judgment based on review of company websites and investment databases.	Includes 353 diversified companies and 158 AI-focused companies.	Diversified
Industry Affiliations	Member's industry tag as listed in the Crunchbase and Aiqicha [愛企查] investment databases.	Includes 511 total observations.	Association, B2B, E-Commerce, Information Technology, Infrastructure, Internet, Shopping
Key products	Industry member's best-known products, in the judgment of the annotator.	Includes 511 total observations.	Core commerce, Cloud computing, Digital media and entertainment, Innovation initiatives

AI product/service category	For AI-focused companies, the company's product/service category, as assigned by the annotator based on Industry Affiliations and key products, taken as a whole (See Appendix 2 for more details).	Includes 153 total observations. See above analysis for distribution of AI-focused companies, by AI product/service.	N/A
State-owned enterprise	Whether the company is overseen by the State-owned Assets Supervision and Administration Commission of the State Council (SASAC) (as indicated on the SASAC website)[57] or include state-affiliated entities as stockholder(s) as listed in Qichacha [企查查] (Chinese private and public companies database).	Includes 57 state-owned enterprises and 455 not state-owned enterprises.	No
Not Chinese company	Whether the company is a subsidiary of an organization headquartered outside China.	Includes 483 Chinese companies, 27 foreign companies, and 1 joint-venture company.	No

Public company	Whether the company is publicly traded.	Includes 71 public companies and 440 non-public companies.	Yes

Appendix 2: AI product/service categories of AI-focused companies

We assigned each AI-focused company an AI product/service category based on their Industry Affiliations (as defined in Appendix 1) and key products that best describe the company as a whole. The following table provides further details on the categories used to classify AI-focused companies in this paper. The notes illustrate key AI features each category of product/service contains.

Category	Notes	Example Firms
AI Chips	Includes developers of computing hardware (e.g., semiconductors and other specific integrated circuits).	Cambricon [寒武纪], Bitmain [航天大道], Corerain [鲲云科技]
Business Solutions	Includes AI-related consulting services, AI-enabled marketing, and other AI-enabled business services.	JD Cloud & AI [京东云], 12 Sigma [图玛深维]
AIoT	Includes AI-enabled applications for the Internet of Things (a combination of networks, devices and data).	Terminus [特斯联], Pensees [澎思], AIWinn [爱华盈通]

Autonomous Vehicles	Includes manufacturers of AI-enabled vehicles and autonomous driving software developers.	Pony.ai [小马智行], UISEE [驭势科技], TuSimple [图森未来]
Data Storage and Processing	Includes providers of cloud computing services that aggregate, store and process data for users in various industries.	Shuzhi.AI [数知科技], Hydata [海云数据], OneFlow [一流科技]
Facial Recognition	Includes AI-enabled technology for face analysis.	SenseTime [商汤科技], MEGVII [旷视], CloudWalk Technology [云从科技]
Industrial Robots	Includes robots in industrial settings, including manufacturing facilities.	Yuanshan AI [远舢智能], Siasun [新松机器人], Shanghai Fanuc [上海发那]
General Purpose	Includes the development of algorithms and the use of deep learning and brain-inspired AI with learned abilities that may be extended to other tasks and sectors.	iDeepWise [深思考人工智能], ReadSense [阅面科技], R2.ai [机颖智能]
Other Visual Recognition	Includes other image analysis systems such as surveillance technology and video recognition.	Deepwise [深睿医疗], Moviebook [影谱科技], Interjoy [盛开互动]

Service Robots	Includes commercial use robots that perform useful tasks for humans, not in industrial settings.	Roobo [儒博科技], GI AI [泛化智能], Puppy Robot [小狗]
Voice Recognition and Natural Language Processing	Includes voice and text recognition to produce content in human languages.	YITU (依图科技), iFlyTek (科大讯飞), d-Ear Technologies (得意音通), AISpeech (思必驰)
Other	Includes those unfit in the above categories.	SIMINICS [星秒科技], HiScene [亮风台]

Endnotes

[1] "The 13th Five-Year Plan for Economic and Social Development of the People's Republic of China," National Development and Reform Commission, https://en.ndrc.gov.cn/policyrelease_8233/201612/P020191101482242850325.pdf.

[2] "Proposal of the CCP on Formulating the 14th Five-Year Plan for Economic and Social Development and of the Prospective Goals" [中共中央关于制定国民经济和社会发展第十四个五年规划和二〇三五年远景目标的建议], *Xinhua News* [新华社], November 3, 2020, available at http://www.gov.cn/zhengce/2020-11/03/content_5556991.htm (archived at https://perma.cc/LN5Y-PTJV); full translation is available at the Center for Security and Emerging Technology, https://live-cset-georgetown.pantheonsite.io/wp-content/uploads/t0237_5th_Plenum_Proposal_EN.pdf.

[3] "Notice of the State Council on Issuing the Next Generation Artificial Intelligence Development Plan" [国务院关于印发新一代人工智能发展规划的通知], State Council of the People's Republic of China, July 2017, http://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm (archived at https://perma.cc/7HQX-UW5N); full translation is available at Graham Webster, Rogier Creemers, Paul Triolo, and Elsa Kania, "Full Translation: China's 'New Generation Artificial Intelligence Development Plan' (2017)," New America, August 1, 2017, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/ ("Promote domestic advantageous enterprises, sectoral organizations, scientific research bodies, higher education institutes, etc., to jointly establish the AI Industry and Technology Innovation Alliance of China.").

[4] There were 83 industry alliances in 2017, 117 in 2018 and 190 in 2019; Liu Gang [刘刚], "China's Artificial Intelligence Technology Industry Development Under New Challenges and Opportunities" [新挑战和机遇下的中国人工智能科技产业发展], Chinese Institution of New Generation Artificial Intelligence Development Strategies [中国新一代人工智能发展战略研究院], June 24, 2020, http://www.nkear.com/UploadedFiles/file/2020%E4%B8%AD%E5%9B%BD%E6%96%B0%E4%B8%80%E4%BB%A3%E4%BA%BA%E5%B7%A5%E6%99%BA%E8%83%BD%E7%A7%91%E6%8A%80%E4%BA%A7%E4%B8%9A%E5%8F%91%E5%B1%95%E6%8A%A5%E5%91%8A_.pdf (archived at https://perma.cc/GZ5V-6SWG).

[5] "Notice on Printing and Distributing the Guidelines on Promoting the Establishment of Strategic Emerging Industry Alliances of Guangdong Province" [关于印发推动组建广东省战略性新兴产业联盟的指导意见的通知], Department of Industry and Information Technology of Guangdong Province [广东省经济和信息化委员会], March 20, 2012, available at

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[7] Ren Jiqiu [任继球] and Zeng Yao [曾耀], "Draw Lessons from International Experience to Promote the Innovative Development of China's Industry Alliance" [借鉴国际经验推动我国产业联盟创新发展], *China Development Observation* [中国发展观察], February 2, 2017, http://www.chinado.cn/?p=4821 (archived at https://perma.cc/4PG2-XFBA).

[8] See National Security Commission on Artificial Intelligence, *Interim Report* (Washington, DC: November 2019), 24, https://drive.google.com/file/d/153OrxnuGEjsUvlxWsFYauslwNeCEkvUb/view; see e.g., Walter Issacson, "How America Risks Losing Its Innovation Edge," *Time*, January 3, 2019, https://time.com/longform/america-innovation/.

[9] Ren and Zeng, "Draw Lessons from International Experience."

[10] "The General Office of the Central Committee of the Chinese Communist Party (CCP) Issued the Opinion on Strengthening the United Front Work of the Private Economy in the New Era" [中共中央办公厅印发《关于加强新时代民营经济统战工作的意见》], *Xinhua News* [新华社], September 15, 2020, available at http://www.gov.cn/zhengce/2020-09/15/content_5543685.htm (archived at https://perma.cc/4RLB-3VQ9); English translation is available at https://www.csis.org/analysis/chinese-communist-party-targets-private-sector ("Optimize the structure of the representative team and appropriately incline toward strategic emerging industries, high-tech industries, advanced manufacturing, modern service industries, modern agriculture, and other fields. Cultivate and grow a team of private economy practitioners who unswervingly follow the Party and devote themselves to development.").

[11] "Xi Jinping: In the Study of the Party, the Government, the Military and the People, and in the East, the West, the North, and the South, the Party Leads Everything" [习近平：党政军民学，东西南北中，党是领导一切的], *The Paper* [澎湃新闻], January 30, 2016, https://www.thepaper.cn/newsDetail_forward_1427461_1 (archived at https://perma.cc/2N7K-PQUN).

[12] Chen Xiangzi [陈享姿] and Guo Liping [郭丽萍], "Analysis on the Lessons Drawn from International Experience to Promote China's Industry Alliance

innovation" [借鉴国际经验推动我国产业联盟创新分析], *Modern Economic Information* [现代经济信息], no. 1 (January 2019): 385 ("For the R&D cooperative alliance, the government can actively provide financial support, and it can also increase coordination, adopt incentive policies, and stimulate innovation. For other industry alliances with clear objectives, it can participate in the entire management process, and can also adopt macro-control measures and raise the management standards of enterprises. Through active guidance, it helps industry alliances form a positive environment.").

[13] Ren and Zeng, "Draw Lessons from International Experience"; Chen and Guo, "Analysis on the Lessons Drawn from International Experience."

[14] "The General Office of Hangzhou Municipal People's Government Issued a Notice on Several Policies to Accelerate the Establishment of World-Class Software Cities to Boost the Development of Digital Economy" [杭州市人民政府办公厅关于印发加快国际级软件名城创建助推数字经济发展若干政策的通知], Hangzhou General Office of the People's Government [杭州市人民政府办公厅], September 25, 2018, http://www.hangzhou.gov.cn/art/2018/10/24/art_1510980_16085.html (archived at https://perma.cc/VTG8-FWAY).

[15] "Notice on the Issuance of Certain Policies and Implementation of Rules for Promoting the Development of Artificial Intelligence Industry" [关于印发促进人工智能产业发展的若干政策及实施细则的通知], Wuhan East Lake High-Tech Development Zone Administration Network [武汉东湖新技术开发区政务网], May 10, 2019, http://www.wehdz.gov.cn/zwgk_53/zcfg/zcfgfqgfxwj/202001/t20200119_897931.shtml (archived at https://perma.cc/8CBX-4586).

[16] "Management Committee of Three Kingdoms Creative Park: Build a '1+3+3+N' Working Mechanism and Explore New Ways for Party Building to Lead the Development of Functional Zones" [三国创意园管委会：构建"1+3+3+N"工作机制 探索党建引领功能区发展新路径], Management Committee of Three Kingdoms Creative Park [三国创意园管委会], December 3, 2020, http://wuhou.ljcd.gov.cn/show-613-16746-1-25.html (archived at https://perma.cc/6VVZ-BTUH) ("Relying on industry alliances and composite Party committees, establish Party-building alliances, and build and improve the Party-building joint conference system."); Li Rong [李荣], "New Exploration of Shanghai Industrial: 'Industry Alliance + Party Building Alliance'" [沪上工业园区新探索："产业联盟+党建联盟"], *Xinhua Finance* [中国金融信息网], January 14, 2021, available at http://finance.sina.com.cn/jjxw/2021-01-14/doc-ikftpnnx6893217.shtml (archived at https://perma.cc/MWA3-M2AN) ("'Party-building alliance'... will be based on outstanding . . . enterprises. It will make the 'red gene' of Party building promote an industrial 'development dividend.'" – Quotation from Gu Huiwen, member of the Standing Committee of the Jiading District Party Committee in Shanghai and director of the Jiading District Propaganda Department).

[17] "State-owned Enterprises and Private Companies 'Party Building Marriage'" [国企民企"党建联姻"], *Nanfang Daily* [南方日报], August 14, 2020, http://epaper.southcn.com/nfdaily/html/2020-08/14/content_7898921.htm (archived at https://perma.cc/H987-A982).

[18] The institutions include the China Academy of Information and Communications Technology, the China Electronics Standardization Institute, among others. "About the Alliance" [联盟介绍], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], http://www.aiiaorg.cn/index.php?m=alliance&c=index&a=about (archived at https://perma.cc/ADE6-KNCC); "Testin Has Officially Joined China's Artificial Intelligence Industry Alliance (AIIA) to Jointly Promote the Development of AI Industry" [云测正式加入中国人工智能产业发展联盟（AIIA），共促AI产业发展], *China Daily* [中国日报], September 9, 2019, https://tech.chinadaily.com.cn/a/201909/06/WS5d721defa31099ab995de7d5.html (archived at https://perma.cc/G2QL-VYB8).

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[22] "Testin Has Officially Joined China's Artificial Intelligence Industry Alliance (AIIA) to Jointly Promote the Development of AI Industry."

[23] Liu Gang, "The Development of China's Artificial Intelligence Technology Industry under New Challenges and Opportunities," The Fourth World Intelligence Congress, June 24, 2020, http://www.nkear.com/UploadedFiles/file/WIC%20Report%202020-PPT.pdf (archived at https://perma.cc/3BPV-56RR). The Chinese Association for Artificial Intelligence is an academic association under the Ministry of Civil Affairs, dedicated to intelligence science and technology. "About CAAI," Chinese

Association for Artificial Intelligence, https://en.caai.cn/index.php?s=/Home/Article/index/id/2.html (archived at https://perma.cc/H2A2-S56S).

[24] Zekun Wang, "Transwarp Cooperate with AIIA to Promote The Big Data and AI Technology in Shanxi Province," EqualOcean, March 19, 2019, https://equalocean.com/news/201903191584; Stefanie Yeo, "Meet the startup that created its own 'university' to answer Asia's AI talent shortage," *Tech in Asia*, May 31, 2020, https://www.techinasia.com/meet-startup-created-university-answer-asias-ai-talent-shortage.

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[26] "Artificial Intelligence Industry Alliance (AIIA)" [中国人工智能产业发展联盟], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], http://www.aiiaorg.cn/uploadfile/2020/0721/20200721031100933.pdf (archived at https://perma.cc/5Q2V-LVRZ).

[27] "'The White Paper on Intellectual Property Rights of China's Artificial Intelligence Industry' Was Released, and Baidu's AI Hardcore Strength is Recognized Again" [《中国人工智能产业知识产权白皮书》正式发布，百度AI硬核实力再获认可], Jiangxi Network Radio and Television Station [江西网络广播电视台], March 5, 2021, available at https://cn.chinadaily.com.cn/a/202103/05/WS6041fceca3101e7ce9742833.html (archived at https://perma.cc/66RU-ZXG3); "White Paper on Intellectual Property Rights of China's Artificial Intelligence Industry" [中国人工智能产业知识产权白皮书（2020）], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟] (December 2020): v-x, available at https://web.archive.org/web/20210406222722/http://www.zhonglun.com/UpLoadFile/c/%E4%B8%AD%E5%9B%BD%E4%BA%BA%E5%B7%A5%E6%99%BA%E8%83%BD%E4%BA%A7%E4%B8%9A%E7%9F%A5%E8%AF%86%E4%BA%A7%E6%9D%83%E7%99%BD%E7%9A%AE%E4%B9%A62020%20%E5%8F%91%E5%B8%83%E7%89%88.pdf; Some organization contributors include the Intellectual Property Center of the Chinese Academy of Information and Communications Technology, the Institute of Automation, Chinese Academy of Sciences, Shanghai Jiaotong University, Baidu, Tencent, and Huawei.

[28] "About the Alliance." Since its establishment, AIIA has continued to accept membership applications. The discrepancy could be simply bureaucratic. Two members (e.g., IDM Technology and Xiaoyi) appear to have multiple roles, and one member is listed twice. "AIIA Organizational Structure" [AIIA组织架构],

Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], http://aiiaorg.cn/index.php?m=alliance&c=index&a=structure (archived at https://perma.cc/WMQ5-GZK4).

[29] Sun Mengyao [孙梦垚] and Zhang Lijuan [张丽娟], "China's Artificial Intelligence Industry Alliance was Established and the Development of Artificial Intelligence in China Has Entered a New Stage" [人工智能产业发展联盟成立 我国人工智能发展进入新阶段], *China Aviation News* [中国航空报], October 26, 2017, http://www.cannews.com.cn/2017/1026/167521.shtml (archived at https://perma.cc/7P6W-WSZW) ("The establishment of China's Artificial Intelligence Industry Alliance comes at just the right time....The alliance should play a leading role, and a role as a link to industry, to build a big platform for cooperation on and development of artificial intelligence in China." – Quotation from Luo Wen, vice minister of the Ministry of Industry and Information Technology); "Promote a Linkage Between Artificial Intelligence Production and Financing and Build a Good Development Environment Altogether" [促进人工智能产融对接，共筑良好发展环境], Ministry of Industry and Information Technology [中华人民共和国工业和信息化部], December 16, 2019, https://www.miit.gov.cn/jgsj/kjs/jscx/gjsfz/art/2020/art_f4222183fc9d4f569e61979f42901021.html (archived at https://perma.cc/7U2F-USYQ) ("The government and the Alliance serve as a platform and matchmaker for finance and enterprises, promoting in-depth exchanges and cooperation between the two sides." – Quotation from Zhu Xiumei, deputy director general of the Science and Technology Department of Ministry of Industry and Information Technology); Liu Bochao [刘博超], "Where is China's New Generation of Artificial Intelligence" [我国新一代人工智能新在哪], *Guangming Daily* [光明日报], June 11, 2018, http://epaper.gmw.cn/gmrb/html/2018-06/11/nw.D110000gmrb_20180611_1-12.htm (archived at https://perma.cc/9V4N-XNUE) ("Other countries may have industry promotion or government advocacy, but China is the first to support the formation of an AI ecosystem [生态链] of industry, academia and government [through industry alliances], and its advantages are also unique." – Quotation from Pan Yunhe, vice president of the Chinese Academy of Engineering).

[30] "China Unicom Was Elected as the Vice Chairman of China's Artificial Intelligence Industry Alliance."

[31] Three industry members are repeated. One member is other/unknown.

[32] Arthur Kroeber, *China's Economy: What Everyone Needs to Know* (Oxford University Press; 2nd edition, 2020), 133-134.

[33] "China's Artificial Intelligence Industry Alliance 'AIIA' Cup Artificial Intelligence Aerospace Science and Industry Final Tournament was Held in Beijing" [中国人工智能产业发展联盟"AIIA"杯人工智能巡回赛航天科工站决赛在京举办], *Xinhua* [新华网], October 13, 2018, http://www.xinhuanet.com/tech/2018-10/13/c_1123554244.htm (archived at https://perma.cc/T7GC-WUGQ).

[34] The AIIA argues that the standardization launched by private companies will fail to get recognition in the industry. "The Evaluation of AIIA DNN Benchmark v0.5 was Officially Launched, and 'Core' Evaluation was Used to Boost the Development of the Industry" [AIIA DNN benchmark v0.5评估正式启动，用"芯"测评，助力行业发展], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], December 17, 2018, http://aiiaorg.cn/index.php?m=content&c=index&a=show&catid=2&id=40 (archived at https://perma.cc/7N8S-7VNX).

[35] The Chinese state tolerates a "decisive" market but also sees its "dominant" role in the economy as crucial for the pursuit of strategic development objectives. Kroeber, *China's Economy*, 77-78; see e.g., "Xi Jinping is trying to remake the Chinese economy," *The Economist*, August 15, 2020, https://www.economist.com/briefing/2020/08/15/xi-jinping-is-trying-to-remake-the-chinese-economy.

[36] "Registration for the 2020 Zhejiang Cup Global Artificial Intelligence Competition is Open Soon; Let's Move Ahead with 2020 AI!" [2020之江杯全球人工智能大赛报名通道即将开启，2020AI有你前进吧！], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], June 29, 2020, http://aiiaorg.cn/index.php?m=content&c=index&a=show&catid=2&id=272 (archived at https://perma.cc/B85M-BXFR) (The total amount of award is 2.6 million RMB.); "Semifinal Result of 2019 AIIA Cup Artificial Intelligence Competition • Medical Special Competition is Out! 12 Projects Made it to the Final" [2019AIIA杯人工智能大赛•医疗专项赛复赛结果出炉！12个项目闯入决赛], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], September 30, 2019, http://www.aiiaorg.cn/index.php?m=content&c=index&a=show&catid=4&id=173 (archived at https://perma.cc/UU38-F4QU) (Winning teams receive tens of millions of RMB of policy support from a state-sponsored industrial park, which includes cash reward, R&D subsidies, and start-up loans, among others.).

[37] "2018 AIIA Cup Artificial Intelligence Tournament—the Country's Highest Level Medical Artificial Intelligence Competition Determines the First Prize!" [2018AIIA杯人工智能巡回赛——全国最高级别的医学人工智能比赛决出一等奖！], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], September 30, 2018, http://aiiaorg.cn/index.php?m=content&c=index&a=show&catid=4&id=88 (archived at https://perma.cc/TR6U-JJN3).

[38] Matt Sheehan, "How China's Massive AI Plan Actually Works," MacroPolo, February 12, 2018, https://macropolo.org/analysis/how-chinas-massive-ai-plan-actually-works/; Jaqueline Ives and Anna Holzmann, "Local governments power up to advance China's national AI agenda," Mercator Institute for China Studies, April 26, 2018, https://merics.org/en/analysis/local-governments-power-advance-chinas-national-ai-agenda.

[39] China's tier-city classification is primarily based on cities' Gross Domestic Product, population, and governance. First-tier cities have GDP over 300 million USD, a population over 15 million people, and are directly controlled by the central government. See generally, "Urban legend: China's tiered city system explained," *South China Morning Post*, https://multimedia.scmp.com/2016/cities/.

[40] Two members with multiple roles in the alliance are counted once.

[41] "Hefei, Foshan Enter China's List of Emerging First-Tier Cities," *Yicai Global*, May 29, 2020, https://www.yicaiglobal.com/news/hefei-foshan-enter-china-list-of-emerging-first-tier-cities (archived at https://perma.cc/3597-MUK2).

[42] "Anhui Province New Policy Supports the Development of 'China Sound Valley' and the Establishment of a 5 Billion RMB Industry Development Fund" [安徽新政策支持"中国声谷"发展 设立50亿元产业发展基金], *Xinhua News* [新华社], September 14, 2017, http://www.gov.cn/xinwen/2017-09/14/content_5225132.htm (archived at https://perma.cc/W6VK-7SK5).

[43] Second-tier cities have GDP between 68 billion USD and 299 billion USD, a population of 3 to 15 million people, and are provincial capital cities and sub-provincial capital cities. See generally, "Urban legend: China's tiered city system explained."

[44] The location of two members is unknown. For a complete list of cities in each tier, see "Hefei and Foshan are Promoted to Emerging New First-tier Cities! Latest 1-5 Tier Cities was Released in 2020 (Complete List Attached)" [合肥、佛山晋升新一线城市！2020最新1-5线城市排名发布（附完整名单)], Emerging New First-tier City Research Institute [新一线城市研究所], May 29, 2020, https://www.yicai.com/news/100648666.html (archived at https://perma.cc/9PPJ-SH9G).

[45] Ives and Holzmann, "Local governments power up to advance China's national AI agenda."

[46] "The Industry Alliance Model Has Great Significant to the Three Parties of RFID in China" [产业联盟模式对中国RFID三方借鉴意义], Forward Looking Industry Research Institute [前瞻产业], September 3, 2009, http://www.qianjia.com/html/2009-03/09_21748.html (archived at https://perma.cc/2LAY-Y8ST).

[47] See Appendix 1 for detailed discussion.

[48] See, e.g., Chris Walton, "Alibaba's New Retail Could be What Makes American Retail Great Again," *Forbes*, August 8, 2018, https://www.forbes.com/sites/christopherwalton/2018/08/08/alibabas-new-retail-could-be-what-makes-american-retail-great-again/?sh=4be7b0bf6079; Jane Zhang, "Alibaba Invests an Additional US $3.3 Billion in its Logistics Arm Cainiao, Raising Take to 63 PCT," *South China Morning Post*, November 8,

2019, https://www.scmp.com/tech/big-tech/article/3036965/alibaba-invests-additional-us33-billion-its-logistics-arm-cainiao.

[49] "Interview with Xiao Jing, Chief Scientist of PingAn Group: The Ubiquitous Financial AI" [专访平安集团首席科学家肖京：无处不在的金融AI], *China Finance* [中国金融杂志], September 15, 2020, available at https://finance.sina.com.cn/money/insurance/bxdt/2020-09-15/doc-iivhvpwy6859185.shtml (archived at https://perma.cc/YBG7-YAN9).

[50] "AIIA Investment and Financing Group Assisted Suzhou Artificial Intelligence Investment and Financing Matching Conference" [AIIA投融资组助力苏州人工智能投融资对接会], Artificial Intelligence Industry Alliance [中国人工智能产业发展联盟], April 15, 2019, http://aiiaorg.cn/index.php?m=content&c=index&a=show&catid=2&id=97 (archived at https://perma.cc/LMQ4-W74F); See generally, "Promote a Linkage between Artificial Intelligence Production and Financing and Build a Good Development Environment Altogether."

[51] One company is repeated, and another is both an ordinary member and board member; they are counted once.

[52] U.S. AI companies more often focus on general purpose applications. See e.g., Zachary Arnold, Ilya Rahkovsky, and Tina Huang, "Tracking AI Investment: Initial Findings from the Private Markets" (Center for Security and Emerging Technology, September 2020), 21, https://cset.georgetown.edu/research/tracking-ai-investment/.

[53] "Three-Year Action Plan for Promoting Development of a New Generation Artificial Intelligence Industry (2018-2020)" [促进新一代人工智能产业发展三年行动计划（2018-2020年)], Ministry of Industry and Information Technology [工业和信息化部], December 13, 2017, http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057497/n3057498/c5960779/content.html, translation is available at Paul Triolo, Elsa Kania, and Graham Webster, "Translation: Chinese government outlines AI ambitions through 2020," New America, January 26, 2018, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/translation-chinese-government-outlines-ai-ambitions-through-2020/.

[54] Michael Chui, Nicolaus Henke, and Mehdi Miremadi, "Most of AI's Business Uses Will Be in Two Areas," *Harvard Business Review*, July 20, 2018, https://hbr.org/2018/07/most-of-ais-business-uses-will-be-in-two-areas.

[55] Liu, "China's Artificial Intelligence Technology Industry Development Under New Challenges and Opportunities."

[56] Extracted on March 26, 2020. "AIIA Organizational Structure."

[57] “A Directory of State-owned Enterprises” [央企名录], State-owned Assets Supervision and Administration Commission of the State Council [国务院国有资产监督管理委员会], June 5, 2020, http://www.sasac.gov.cn/n4422011/n14158800/n14158998/index.html (archived at https://perma.cc/DAH3-XLXV).