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Headline or Trend Line?

Evaluating Chinese-Russian Collaboration in AI

CSET Issue Brief



AUTHORS

Margarita Konaev
Andrew Imbrie
Ryan Fedasiuk
Emily Weinstein
Katerina Sedova
James Dunham

Executive Summary

China and Russia have declared 2020 and 2021 as years of scientific and technological innovation cooperation, focusing on biotech, artificial intelligence, and robotics.¹ Both countries view AI as critical to their respective domestic and foreign policy objectives, and they are ramping up investments in AI-related research and development, though China's investments far outweigh Russia's. U.S. observers are watching this convergence between America's two key competitors with increasing concern, if not alarm. Some worry that alignment between Beijing and Moscow, especially in the areas of science and technology, could accelerate the development of surveillance tools to enhance authoritarian control of domestic populations. Others warn that deepening Sino-Russian cooperation will dilute the effects of sanctions on Russia. Still others fear that the strengthening partnership between China and Russia will undermine U.S. strategic interests and those of its democratic allies in Europe and Asia.²

Chinese and Russian sources are keen to publicize their "comprehensive strategic partnership of coordination for the new era," potentially underscoring the seriousness of their joint ambitions.³ Yet the scale and scope of this emerging partnership deserve closer scrutiny, particularly in the field of AI. To what extent are China and Russia following up on their declared intentions to foster joint research, development, and commercialization of AI-related technologies? In other words, how do we separate headlines from trend lines?

This issue brief analyzes the scope of cooperation and relative trends between China and Russia in two key metrics of AI development: research publications and investment. Our key findings are as follows:

Scope:

- **Research:** Between 2010 and 2019, Chinese and Russian researchers collaborated on 296 English-language, AI-related papers. This figure accounts for less than 0.1

percent of China's and about 2 percent of Russia's overall AI-related publication output over the same time period.

- **Investment:** Between 2016 and 2019, private AI investment between China and Russia totaled \$879 million across 12 deals; Beijing and Moscow concluded five additional AI investment deals of undisclosed value.

Trends:

- **Research:** In 2019, there were 14 times as many AI-related publications co-authored by Chinese and Russian researchers as there were in 2010, with collaboration notably increasing since 2016.
- **Investment:** From 2016 to 2021, the level of Chinese-Russian AI investment increased, but the majority of funding flowed from Russia to China.

Key Areas:

- **Research:** The top AI-related fields for joint research by Chinese and Russian scientists are pattern recognition, algorithm development, computer vision, machine learning, remote sensing, data mining, control engineering, and natural language processing.
- **Investment:** Chinese AI investments in Russia focus on internet services, telecommunications, robotics, and facial recognition. Russian AI investments into China focus on e-commerce, autonomous driving technology, and medical services/robotics.

Chinese-Russian AI Collaboration in Perspective:

- **Research:** Between 2010 and 2019, collaboration between U.S. and Chinese researchers produced nearly 129 times more AI-related publications than collaborations between Chinese and Russian researchers and 52 times more AI-related publications than collaborations between U.S. and Russian researchers. AI-related research collaborations

between the United States and Russia declined in 2019, which may reflect the impact of sanctions. While the number of U.S.-China AI-related research publications continued to increase through 2019, given the heightened tensions, data from 2020 and 2021 could show different trends.

- **Investment:** China-Russia AI investment levels are higher than U.S.-Russia AI investment, but much lower than U.S.-China AI investments. Recent trends, however, show declining levels of U.S. AI investment in both China and Russia over the 2018–2020 period, while Russian-Chinese AI investment has increased relative to 2016 levels. U.S. investment in China declined from \$13 billion in 2017 to \$1.3 billion in 2020; meanwhile, the United States invested a negligible amount in Russia. China-Russia investment increased from \$182 million dollars in 2016 to \$517 million in 2017, but then declined to \$100 million in 2018 and \$80 million in 2019. While 2020 saw no disclosed AI investment between China and Russia, investment levels already topped \$300 million by January 2021.

Our findings both confirm assessments of the expanding partnership between China and Russia and add an important caveat with regards to its scope and limitations. There has been a steady increase in AI-related research collaboration between the two nations and an even steeper rise since 2016. This upward trend mirrors the global expansion of AI research, propelled by increased computing power and the availability of large datasets. The overall number of joint Chinese-Russian AI-related publications, however, remains relatively low—whether as a share of each country’s scholarly output or compared with the number of papers researchers from China and Russia co-authored with researchers from the United States over the same period of time.

The AI-related investment data tell a similar story—an upward trend in Chinese-Russian investment deals over the past five years, but the overall value remains relatively low. Russia seems to be investing more in private AI companies in China than China invests in the Russian AI ecosystem. Yet the United States remains

Russia's primary destination for AI investment, and the value of U.S.-China AI investments is much greater than the sum of Chinese-Russian deals.

Two caveats are worth underscoring. First, these metrics provide insights only into specific aspects of a much broader relationship. Second, the time frame of our analysis and data limitations preclude definitive judgements. By focusing on collaborative research and AI-related investments, we seek to develop useful indicators for tracking progress in the Chinese-Russian high-tech partnership. Our findings expose gaps between Chinese and Russian aspirations and the reality on the ground, bringing greater accuracy and nuance to current assessments of Sino-Russian cooperation.

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Introduction

Shared antipathy toward the United States and convergent political, security, and economic interests are propelling what the U.S. intelligence community described in its most recent annual Threat Assessment as “increasing cooperation” between China and Russia.⁴ Signs of a burgeoning partnership are multiplying. The two countries conduct joint training and military exercises and sell weapons to one another. Collaboration extends to space, where China and Russia plan to build a new lunar scientific research station. Both countries vote in the United Nations Security Council to shield one another from international scrutiny of human rights abuses. To deepen economic ties, Russia furnishes specialized expertise in such fields as mathematics and computer science and supplies raw materials in the form of oil, gas, and precious metals; China provides capital, resources, and access to its large market. Beijing and Moscow also exchange talent, know-how, and investments to spur innovation, monitor and control their populations, and extend their influence globally.⁵

In a recent editorial, China’s state-owned *Global Times* proclaimed that “China-Russia cooperation has no upper limits.”⁶ Given the long, fraught, and at times contentious relationship between China and Russia, such declarations are ahistorical at best. Memories of the Sino-Soviet border clash in 1969 are distant but still keenly felt in some quarters. The asymmetry in power between Beijing and Moscow will likely grow in the coming years, as China’s economy surges ahead.⁷ Cultural disparities, protectionist instincts, and lingering distrust continue to hamper the relationship, despite myriad intergovernmental contacts and personal ties between Chinese president Xi Jinping and Russian president Vladimir Putin.⁸ Indeed, concerns over the theft of intellectual property, industrial espionage, and persistent cyber threats will set upper limits to Sino-Russian cooperation, notwithstanding public signaling to the contrary.⁹

Perhaps nowhere is the test case for Sino-Russian cooperation more consequential or more speculative in its claims than in artificial intelligence. President Xi sees AI as a “strategic handhold

for China to gain the initiative in global science and technology competition,” and the Chinese government reportedly spends billions each year on AI research.¹⁰ Though Russia lags behind China in AI capability, President Putin grasps its importance for Russia’s economic and strategic future.¹¹ In October 2019, Russia released its national AI strategy. While the strategy’s details and enforcement mechanisms remain unclear, the Russian government aims to boost research and development (R&D) efforts and overcome barriers related to data, talent, and computing power. It has since allocated more than \$200 million in AI subsidies through government-backed R&D centers for 2021-2023.¹²

When analyzing the evolving AI partnership between China and Russia, it is important to distinguish the signals from the noise. Both governments have trumpeted a series of high-tech initiatives, joint research centers, technology parks, and cooperative agreements.¹³ Based on public statements, the Russian and Chinese Academies of Sciences collaborate on AI-related research. Chinese and Russian companies are stepping up cooperation on joint development of AI products, such as autonomous vehicles, medical robotics, and facial recognition software. While some of these initiatives seem to be bearing fruit, many have yet to move past the exploratory or even the declaratory phase.

The mutuality of Chinese and Russian interests shapes and constrains their partnership in AI. Even as both countries invest in emerging technologies to advance their domestic and foreign policy goals, they also seek to preserve sovereignty, limit the flow of data across their borders, and protect national industries.¹⁴ The prominent role afforded to Chinese and Russian state-owned enterprises (SOE) in the execution of national AI priorities may further complicate the prospects for cooperation.¹⁵ The ability of China and Russia to balance these competing imperatives will determine whether their rhetoric matches reality in the years to come.

This issue brief presents an assessment of Chinese and Russian collaboration in two key areas for advancement in AI: research output and investment. For our examination of Chinese-Russian AI research ties, we analyze the number of AI-related research

papers authored jointly by Chinese and Russian scientists between 2010 and 2019, as well as key topics, trends over time, and institutions leading these collaborative efforts. We present data on AI-related research papers published in English and Chinese, amounting to a comprehensive assessment of research output. For the analysis of investment ties between China and Russia, we examine activity in the commercial sector by measuring Chinese and Russian equity investments in privately held AI companies. We draw on leading databases of private-sector AI transactions to gather data on Chinese investments in Russian firms and Russian investments in Chinese firms. As a baseline for comparison, we also assess U.S.-Russia and U.S.-China collaboration in AI research and investments over time.

To an extent, our findings corroborate existing assessments of Chinese-Russian collaboration: the two nations are growing closer. Over the past decade, and especially since 2016, Chinese-Russian research collaboration in AI-related fields has steadily increased. Collaborations between authors from institutions affiliated with the Chinese Academy of Sciences and the Russian Academy of Sciences were among the most prolific joint research endeavors, while other notable research collaborations include those between Skolkovo Institute of Science and Technology and Hangzhou Dianzi University; Skolkovo Institute of Science and Technology and East China University of Science and Technology; and ITMO University and Hangzhou Dianzi University. The Chinese telecom giant Huawei has also been ramping up its AI-related activities and partnerships with Russian universities and research institutions.

AI-related investment is also on the rise. Looking at 12 AI-related deals involving the two countries since 2016 and up to 2020, China has made \$324 million in private AI investments into Russia, while Russia has made \$555 million in private AI investments into China. Half of the value of overall Russian-Chinese AI investment is concentrated in two deals: the Russia-China Investment Fund (RCIF) investment in the Chinese AI company Megvii in 2017 and Alibaba's joint venture with the Russian internet company Mail.ru Group in 2019. In addition to the aforementioned 12 deals, Russia

and China concluded five AI investment deals of undisclosed value.

These trends notwithstanding, our findings suggest that the extent and scope of Chinese-Russian collaboration in AI may be overstated by both Chinese and Russian sources as well as U.S. observers. AI-related publications co-authored by Chinese and Russian researchers constitute only a fraction of each country's overall AI-related research output in English-language journals. From a comparative standpoint, research collaboration in AI-related fields between these two countries is also less frequent and productive than AI-related research collaboration between the United States and Russia and, especially, between the United States and China. Similar observations emerge from the analysis of investment data—between 2010 and 2020, the combined value of U.S. investment in private AI companies in China and Chinese investment in private AI companies in the United States amounted to \$35 billion, dwarfing the \$879 million worth of Chinese-Russian AI investment deals, which only trace back to 2016.¹⁶ Notably, the \$670 million overall value of U.S.-Russia AI investments is smaller than that of Chinese-Russian investment deals at \$879 million. The United States, however, remains Russia's largest destination for AI investment.

It is important to set these research and investment trends in their proper context. Tensions between the two countries aside, when accounting for funding levels and the volume and impact of published work, U.S. and Chinese AI researchers have far more incentives to cooperate with each other than to co-author with Russian researchers. Between 2010 and 2019, researchers from China have published 457,248 English-language AI-related papers, making China the world leader in AI-related research output. Researchers from the United States published 300,602 papers over the same period, coming in second worldwide. Russia, meanwhile, ranked 22nd in terms of overall research output, with 15,032 AI-related publications, trailing behind countries such as Iran, Malaysia, and Poland. Academic institutions publish the majority of AI-related research papers, and the United States is home to many of the world's leading universities.¹⁷ Chinese

universities do not have the same global reputation for excellence as U.S. institutions, but the Chinese government is pouring a massive amount of resources into STEM education and science and technology R&D, outpacing both government and private sector investments in Russia's academic and research institutions, in absolute as well as relative terms.

The United States and China similarly dominate the private AI investment market. In 2019, the United States accounted for 64 percent of the total disclosed investment value, with China a distant second at 12.9 percent of the global AI investment market.¹⁸ By contrast, Russia comprises only 0.04 percent of disclosed AI equity investment globally. The size, value, and dynamism of private AI markets lend perspective to assessments of trends in the field. While the data covered in this report suggests a growing but relatively limited partnership on AI between China and Russia, the trends can shift markedly with the appearance of new research collaborations or large AI investment deals. Analysts should assess ongoing trends with respect to the health of the overall research ecosystem and private investment markets in AI, both at the national and international levels.

It remains to be seen what impact sanctions, trade disputes, export controls, and growing tensions with the United States will have on Chinese-Russian collaboration in AI as well as on the research and investment ties between the United States and China and the United States and Russia. Thus far, our findings show mixed results.

Despite the worsening relationship between the United States and China, AI-related research collaboration continued to increase through 2019. China's AI investment into private AI companies in the United States has risen steadily from \$181 million in 2014 to \$2 billion in 2020. Yet U.S. investment into private AI companies in China is declining, from a peak of \$13 billion in 2017 to \$1.3 billion in 2020. When considering the U.S.-Russia dyad, collaborations between U.S. and Russian AI scholars dropped in 2019. Russian investment into private AI companies in the United States has declined, from a peak of \$393 million in 2018 to \$164 million in 2020. U.S. investment into private AI companies in

Russia, meanwhile, has remained flat, with a peak of \$3 million in 2018.¹⁹

In the remainder of this brief, we first assess the AI-related research ties between China and Russia and then examine AI-related investments between the two countries. While our findings indicate that AI-related collaboration between China and Russia in research and investment remains relatively limited in scope, we offer preliminary indicators and areas to watch for growing convergence that may undermine U.S. interests and those of U.S. democratic allies and partners.

Chinese-Russian Collaboration in AI-Related Research

International research collaboration drives scientific progress and tends to benefit all parties by producing more impactful publications and expanding networks. According to 2018 National Science Foundation (NSF) data, for example, among the 15 largest producers of science and engineering scholarly articles, most have high rates of international collaboration. The United States has a collaboration rate of 39 percent, which is slightly below the average collaboration rate for the largest 15 producers. China's and Russia's collaboration rates are lower, at 22 percent and 23 percent, respectively.²⁰

While recent political developments and growing tensions with the United States may be pushing China and Russia closer, scholarly collaboration between these two countries has been growing steadily over the past decade. According to data from Elsevier's Scopus database, the number of co-authored publications involving Chinese and Russian academics increased by 95.5 percent between 2013 and 2017.²¹ Previously, another study showed that between the years 2006 and 2015, Russia was also one of China's top research collaborators among the One Belt One Road Initiative countries, second only to Singapore. The key areas for Chinese-Russian scholarly collaboration include physics, chemistry, geosciences, and plant and animal sciences; in physics, the citation impact and the percentage of highly cited papers co-authored by Chinese and Russian researchers was very high.²²

These trends aside, China and Russia have not generally been important scientific partners for one another. The aforementioned 95.5 percent increase in the number of co-authored publications reflects the wider surge in Chinese research output and indicates a relatively low baseline for collaboration. Based on 2015 data on the number of joint publications in the Scopus dataset, for example, nearly half of Russia's joint publications were with scientists from the United States and Germany, while work with Chinese scientists accounted for less than 9 percent. For China, these patterns are even more stark: research collaborations with scientists in the United States represented 44 percent of China's total joint publications, while collaborations with Russian scientists accounted for just 1.5 percent.²³

Recent research from CSET shows that despite the rapid growth of Chinese research publications over the past 20 years, China's rate of international collaboration has remained flat. Countries such as the United States and Australia, on the other hand, have seen a significant rise in their rates of international collaboration.²⁴ As China's research output continues to climb, its international collaboration rate may increase as well. Alternatively, China may be following a deliberate strategy designed to limit collaboration in certain areas until the country has achieved a strong international position.²⁵ These broader patterns provide the context for assessing Chinese-Russian research collaboration in AI-related fields, as well as trends in collaboration between U.S. researchers and their Chinese and Russian counterparts.

Methodology and Scope

The following analysis draws on publications data covering collaborative Chinese-Russian AI-related research papers published between 2010 and 2019 in English and Chinese. For English-language publications, we identified collaborations between Chinese and Russian scholars by analyzing the institutional affiliations they reported in publications and pre-prints. If the affiliations of a paper's authors included an organization in each country, we included the paper in our analysis. We searched for such collaborations across three sources of

scientific literature: Microsoft Academic Graph, Digital Science Dimensions, and Clarivate Web of Science.²⁶ For publications in Chinese, we relied on the China National Knowledge Infrastructure.²⁷ Because CNKI does not sort by country of publication, we instead identified Chinese-Russian collaborations by searching for organizations with “Russia” and a number of major Russian cities in their name, since CNKI often includes the country or city name in Chinese for a foreign institution.

This report discusses joint Chinese-language publications separately from joint English-language publications because the two types of collaborations seem substantively different: the former is a joint research endeavor conducted in a language that is native to one side of the co-authorship while the latter is a research collaboration undertaken in a language foreign to both. As we discuss later in the report, English-language publications data and CNKI data on Chinese language publications also show different trends in Chinese-Russian collaborations.

To restrict our analysis to the development and application of AI, we applied the same classification method used in an earlier CSET report, “Russian AI Research 2010-2018.”²⁸ Rather than developing keyword-based queries or explicit criteria for AI-relevant research, we inferred a functional definition from papers in the arXiv.org repository, training a model to predict the categories that authors and editors assign to the site’s papers. Applying it to our broader corpus, we identified as AI-relevant the papers that would be likely to receive an AI-relevant categorization if uploaded to arXiv.org.²⁹

To complement this methodology, we attempted to collect data on Chinese-Russian AI-relevant research publications in Russian. We developed a set of Russian-language keywords that included a broad range of research approaches, models, techniques, applications, systems, and functions related to AI, and executed a query across Microsoft Academic Graph, Digital Science Dimensions, and Clarivate Web of Science. Our search, however, surfaced only one AI-relevant research paper published jointly by Chinese and Russian authors in Russian between 2010 and 2019.

As such, we limit our discussion to collaborative AI-related publications in English and Chinese.

Finally, the results from the analysis of the scientific literature are current as of February 19, 2021. Analyses conducted at different points in time will yield slightly different results because the aforementioned sources of scientific literature acquire publications data after some delay. For example, articles published in the second half of 2019 may not appear in the data until 2020. We focus our analysis on the period between 2010 and 2019 to minimize the effect of this phenomenon.

Chinese-Russian AI-Related, English-Language Research Collaboration: Output, Trends, and Institutions

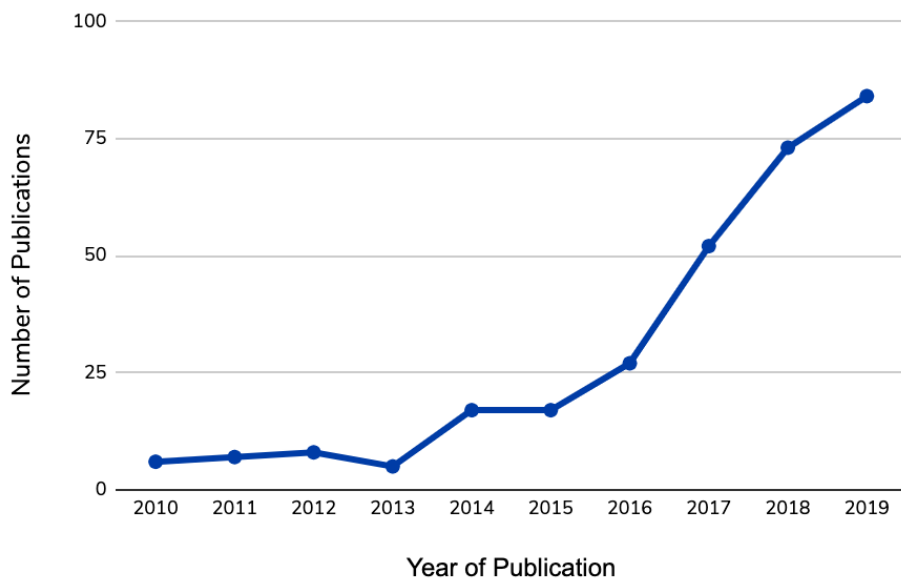
Between 2010 and 2019, we identified 296 English-language, AI-related research papers co-authored by at least one Chinese and at least one Russian author. This figure accounts for about 2 percent of total Russian AI-related publications and less than 0.1 percent of Chinese AI-related publications for the same time period. In other words, Chinese-Russian collaboration in AI-related fields constitutes only a fraction of each country's overall research output in English-language journals.

There are a number of explanations for this relatively low number of joint Chinese-Russian AI-related research publications. Most basically, research conducted and published in English requires both sides to work in a language other than their native tongue. Scientists from non-English speaking countries also generally have a harder time publishing in English-language journals. While China has recently outpaced the United States in the number of AI-related research papers, Russia is significantly behind due to a combination of factors, including lower spending on R&D, problems in developing, attracting, and retaining talent, and a range of bureaucratic hurdles to international research collaboration and publishing.³⁰ Although Russia has been implementing a series of reforms and initiatives, such as Project 5-100, designed to increase its scientific scholarly output in international journals, buttress international collaboration, and

raise the global rankings of its top universities, the aforementioned challenges persist.³¹ Finally, as previously noted, China and Russia have not traditionally been important research partners for one another; Russian scientists have predominantly collaborated with European counterparts, while Chinese scientists have primarily looked toward the United States for joint research opportunities.

Despite the relatively low overall number of publications produced jointly by Chinese and Russian researchers, as Figure 1 shows, there has been an increase in collaborations over the past decade, and especially since 2016. More specifically, in 2019, there were 14 times more AI-related publications co-authored by Chinese and Russian researchers than there were in 2010.

Figure 1: Chinese-Russian AI-Related Research Publications in English, 2010-2019.



Source: Microsoft Academic Graph, Digital Science Dimensions, and Clarivate Web of Science.

In terms of key areas of focus, Chinese and Russian researchers have produced joint papers in pattern recognition, algorithm development, computer vision, machine learning, remote sensing, data mining, control engineering, and natural language

processing.* Table 1 shows the top 10 AI-related research fields for joint Chinese-Russian publications, as well as Chinese and Russian research output individually.

Table 1: Top AI-Related Research Fields: Chinese-Russian, Chinese, and Russian.

Chinese-Russian Top Collab. Fields	No. of Papers	Top Fields: China	No. of Papers	Top Fields: Russia	No. of Papers
Pattern recognition	29	Pattern recognition	38,315	Linguistics	1,021
Computer vision	20	Computer vision	37,996	Computer vision	884
Algorithm development	20	Algorithm development	28,497	Algorithm development	804
Control theory	14	Data mining	21,311	Pattern recognition	674
Machine learning	14	Control theory	14,841	Machine learning	499
Remote sensing	11	Machine learning	14,400	Control theory	494
Data mining	9	Math. optimization	10,878	Data mining	474
Control engineering	7	Control engineering	8,266	Control engineering	440
NLP	6	Simulation	8,127	NLP	402
Other AI research	69	Other AI research	98,620	Other AI research	3,222

Source: Microsoft Academic Graph, Digital Science Dimensions, Clarivate Web of Science, and CNKI.

The top collaborative fields are similar to the top 10 fields for research by Russian scientists, except for remote sensing, which is on the list for collaborative papers but not on the list of Russian

* “Other AI research” refers to the “Artificial Intelligence” subject field denoted by Microsoft Academic Graph. Publications in this field represent AI research not otherwise classified. This could include basic research that does not fall into a different field because it is not application-specific (e.g., not computer vision research), theoretical work related to AI, or applied research in a subfield too small to result in the creation of a distinct, comparable Microsoft Academic Graph field.

papers; and linguistics, which is on the list of Russian papers but not in the top 10 areas for collaborative research.³² These areas are also similar to the top areas of focus for Chinese researchers, except for remote sensing and natural language processing, which appear among the top areas for collaborative research but not the top areas on the Chinese publications list, and mathematical optimization and simulation, which appear in the top 10 areas for Chinese publications but not on the collaborative list. Natural language processing is a joint area of research and a top area of Russian research but not a top 10 area for Chinese researchers.

Remote sensing is the one area where Chinese and Russian researchers have published together that does not appear in either China's or Russia's top 10 areas for AI-related publications individually. As a whole, countries with more satellites tend to produce more articles on remote sensing.³³ The United States and China, for instance, operate the most satellites in orbit and were ranked first and second, respectively, in the number of remote sensing publications according to data from 1991 to 2015.³⁴ While Russia has the third largest arsenal of satellites in the world, it has been far less productive than the United States or China in terms of remote sensing research publications. The collaboration in AI-related remote sensing research between China and Russia could also be an artifact of shared borders and, in turn, shared interest in land cover and use, vegetation, and climate change in these border regions.

In addition to trends and topics, we also identified the key institutions that Chinese and Russian researchers listed as their affiliation on this set of 296 collaborative AI-related publications. Table 2 presents the top 10 of the most prolific collaborative institution pairs by publication count.

Table 2: Top 10 Chinese-Russian Institutional Collaborations in AI-Related Research 2010-2019.³⁵

Russian Entity	Chinese Entity	No. of Papers
Russian Academy of Sciences	Chinese Academy of Sciences	15
Skolkovo Institute of Science and Technology	Hangzhou Dianzi University	12
Skolkovo Institute of Science and Technology	East China University of Science and Technology	12
ITMO University	Hangzhou Dianzi University	11
Kazan Federal University	Shanghai Jiao Tong University	10
Moscow State University	Zhejiang University	9
Don State Technical University	Beijing Jiaotong University	9
National Research Centre - Kurchatov Institute	Chinese Academy of Sciences	9
Russian Academy of Sciences	China Aero Geophysical Survey and Remote Sensing for Land and Resources	8
Skolkovo Institute of Science and Technology	Guangdong University of Technology	8

Source: Microsoft Academic Graph, Digital Science Dimensions, Clarivate Web of Science, and CNKI.

As Table 2 illustrates, collaborations between authors listing an affiliation to the Chinese Academy of Sciences and the Russian Academy of Sciences have yielded the highest number of AI-related joint research papers between the years 2010-2019. The Russian Academy of Sciences oversees 550 scientific institutions and research centers and reportedly employs more than 55,000 researchers.³⁶ Previous CSET research shows that RAS also produces the most AI-related publications in Russia.³⁷ The Chinese Academy of Sciences oversees 12 branches, more than 100 research institutions, three universities, more than 130 state key laboratories, and over 270 research observation stations in the field. It houses more than 71,000 formal employees as well as over 64,000 postgraduate researchers.³⁸

Given the number of researchers and research institutions affiliated with both CAS and RAS and considering that researchers

often have more than one affiliation, there is no straightforward way to track the formal collaborative agreements between the two academies that led to the AI-related publications we identified—if such formal agreements even exist in the first place. It is, however, notable that CAS and RAS have signed a 2018 agreement to strengthen science and technology cooperation in the fields of physics, astrophysics, chemistry, biological sciences, nanotechnology, medicine, and agriculture, as well as a 2019 agreement to deepen cooperation on polar research, laser science, deep-sea research, space science, geophysics, the ecological environment, neuroscience, and more.³⁹ While these agreements do not directly reference collaboration on AI, research related to AI can be conducted in each of the aforementioned disciplines and fields.

Another noteworthy relationship that has led to joint AI-related research publications is between ITMO University and Hangzhou Dianzi University. The partnership between these two institutions includes student and staff visits and a joint summer school that also features Alibaba Cloud Academy courses.⁴⁰ In 2018, the two universities also established the Hangzhou Dianzi University-ITMO Joint Institute in Hangzhou, China. The joint institute runs two undergraduate programs, one in automation and another in computer science and technology, as well as two Masters programs, one in control engineering and another in computer technology.⁴¹ In 2020, the National Natural Science Foundation of China funded two joint projects between Hangzhou Dianzi University and ITMO University: Project #234: “Research on Trajectory Control and Autonomous Navigation in Multi-robot Formations,” and Project #232: “Artificial Intelligence Methods for the Agile Development of Industrial Robots.”⁴²

In addition to collaborations between Chinese and Russian universities, there are also AI-related research publications linked to private companies, such as Huawei. For example, among the 296 English-language AI-related research papers we identified, authors affiliated with Huawei Technologies were part of 17 collaborations that included researchers from Huawei Technologies, Russia (five); Skolkovo Institute of Science and

Technology (four); Russian Academy of Sciences (two); St. Petersburg Institute for Informatics and Automation (an RAS institution) (two); Moscow Institute of Physics and Technology (two); and National Research University-Higher School of Economics (two). Below, we take a closer look at Huawei's presence in Russia, focusing specifically on its AI-related activities and partnerships with Russian universities and RAS research institutions.

Huawei's AI-Related Activities and Partnerships in Russia

Huawei has been operating in Russia since 1996, setting up its first local joint venture with Beto Konzern and Russia Telecom in 1997.⁴³ Despite initially struggling to establish itself, by 2003, Huawei supplied more than 50 percent of the broadband products market in Russia.⁴⁴ Over the past few years, in response to growing tensions between the United States and China, and especially following its addition to the U.S. Department of Commerce's Entity List in 2019, Huawei has been expanding its presence in Russia.⁴⁵ The Russian government seems to welcome this expansion, arguing that Huawei's training programs, local research centers, and promises to jointly develop or share emerging technologies will help Russia avoid a brain drain and promote local innovation.⁴⁶

In 2001, Huawei opened its first research training program in Russia in collaboration with the Moscow Technical University of Communications and Informatics, establishing its first R&D center in Moscow the following year. Today, Huawei reportedly maintains eight R&D centers across Russia—five in Moscow, and one in each of Saint Petersburg, Nizhny Novgorod, and Novosibirsk.⁴⁷ These R&D centers appear to be hiring locally, as the majority of job postings are in Russian, not Chinese.⁴⁸

According to the Huawei website, the company has 15 Russian partner universities.⁴⁹ The main areas for cooperation with these and other universities include: development of algorithms for 5G communication networks; development of algorithms for image, video and sound processing; development of algorithms to support the evolving direction of the Internet of Things; development of

artificial intelligence algorithms; big data processing algorithms; and distributed computing and data storage algorithms.⁵⁰

One of the pathways to collaboration with universities is through the establishment of joint labs. In 2020, the Moscow Institute of Physics and Technology established a joint laboratory with Huawei Russian Research Institute, focusing on “research and development in the field of artificial intelligence and deep learning.”⁵¹ The Skoltech-Huawei Innovation Joint Lab is another example, which was set up in 2018 to focus on “artificial intelligence including machine learning, neuron networks, computer vision, language processing, and recommendation systems.”⁵² The Skoltech Master of Science in Internet of Things and Wireless Technologies is also associated with the joint Skoltech-Huawei lab.⁵³ While seemingly separate from the joint lab, the Skoltech Laboratory for Quantum Information Processing also claims to have ongoing multi-year collaboration agreements with Huawei.⁵⁴

In addition to its partnerships with Russian universities, Huawei touts joint projects with Russian Academy of Sciences institutions, including the Institute for Information Transmission Problems (IITP), the Institute for System Programming, and the Marchuk Institute of Numerical Mathematics.⁵⁵ The collaboration with RAS IITP seems to be focused on 5G, including “designing and studying innovative algorithms for cellular networks” that improve network efficiency.⁵⁶

Huawei is also one of the international tech companies to establish a presence in Siberia’s Akademgorodok—an “academic town” known as one of the key science and technology hubs in Russia and home to Novosibirsk State University and the Siberian Branch of RAS.⁵⁷ In 2020, Novosibirsk State University announced that the three RAS Institutes of the Siberian Branch—the Sobolev Institute of Mathematics, the Institute of Computational Mathematics and Mathematical Geophysics, and the A.P. Ershov Institute of Informatics Systems—signed a memorandum of understanding with Huawei-Russia and the Mathematical Center in Akademgorodok. The agreement aims to promote cooperation in

science, research, and education in the areas of math, AI, big data, and high-performance computing.⁵⁸

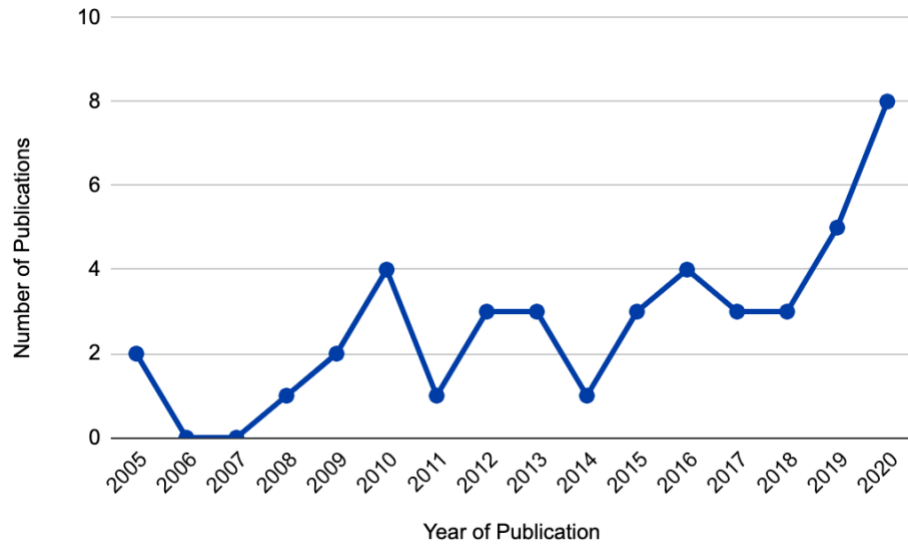
Huawei's ties to this region reflect the shifting focus to technology innovation in the mid-2000s. Since the Russian government began reinvesting in Akademgorodok and the region's network of academic and research institutions, international tech companies have also sought to expand their presence and capitalize on the high concentration on talent, relative intellectual freedom, and openness to international collaboration.

Huawei's partnerships with Russian universities and research institutes are likely to bring an influx of funds to these institutions. Russian science is chronically underfunded by the state, while research and development investments from the business sector are even scarcer. But with funding comes influence.⁵⁹ It is therefore possible that increased R&D investment from Huawei and potentially other Chinese companies would allow them to set the agenda for the partnerships with Russian universities and research institutions, and leverage the outputs of collaborative research to advance China's broader goals in AI.⁶⁰

Chinese-Russian AI-Related Publications in Chinese

In addition to the English-language papers, our search of CNKI also identified 43 AI-relevant papers co-authored by Chinese and Russian researchers and published in Chinese between 2005 and 2020. Figure 2 shows the annual distribution of these Chinese-language papers.

Figure 2: Chinese-Russian AI-Related Research Publications in Chinese, 2005-2020.



Source: CNKI.

While the previously discussed English-language publications data shows a steady increase in collaborative research between Chinese and Russian scientists, the Chinese language publications data shows no consistent upward or downward trajectory, aside from the uptick in joint publications after 2018. With respect to key institutions involved in collaborative work, 16 papers (37 percent) were co-authored by researchers affiliated with the Russian Academy of Sciences.⁶¹ Only three papers (7 percent) were written by researchers at the Chinese Academy of Sciences, in contrast to our English language data in which CAS is the top Chinese contributor.

It is also worth noting that five papers were co-authored by Chinese researchers affiliated with organizations on the U.S. Department of Commerce’s Entity List, including Beihang University, Harbin Institute of Technology (HIT), Harbin Engineering University (HEU), and Beijing University of Posts and Telecommunications. Beihang, HIT, and HEU are three of China’s Seven Sons of National Defense, and Beijing University of Posts and Telecommunications was deemed by the U.S. government to

directly participate in advanced weapons and systems research for China's People's Liberation Army (PLA).⁶² Two of these five papers were written by the same co-authors from Beihang University and the Moscow Aviation Institute and focus on control engineering and modeling of pilot behavior.⁶³ Although these papers were both written in 2010, the two organizations appear to maintain close ties. In 2020, the schools launched a joint professional MA program in aeronautical engineering.⁶⁴

Several papers also include information about the agencies funding the research. Eleven of the 43 CNKI papers were funded by the National Natural Science Foundation of China (NSFC), which is subordinate to China's Ministry of Science and Technology.⁶⁵ This arrangement is not surprising, considering that NSFC is a massive foundation that funds more than 18,000 research projects each year and has a budget of \$4.9 billion.⁶⁶ Three additional projects were funded by China's 973 Project, otherwise known as the "National Basic Research Program," which aims to improve China's capacity for basic research and indigenous innovation.⁶⁷

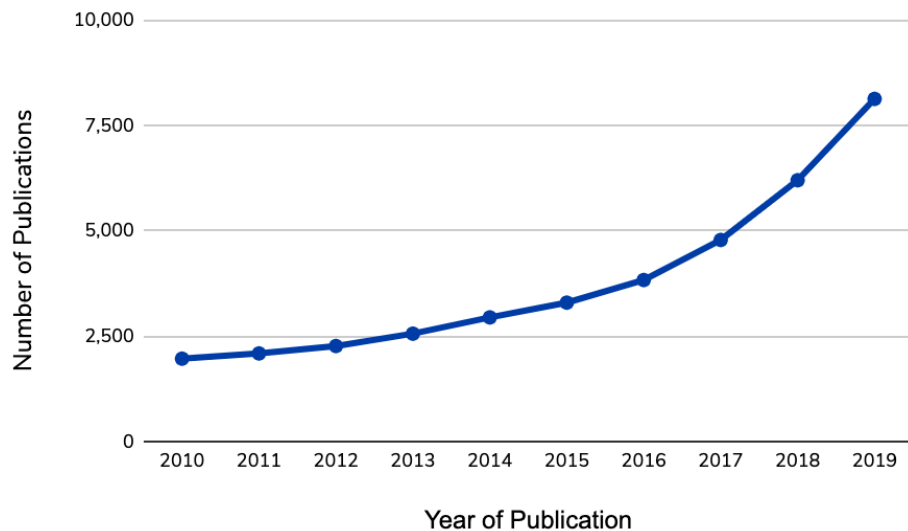
Comparing Chinese-Russian, U.S.-Chinese, and U.S.-Russian AI-Related Research Collaborations

Chinese and Russian researchers collaborate with U.S. researchers much more frequently than they do with each other. Between 2010 and 2019, we identified approximately 38,153 AI-related publications co-authored by U.S. and Chinese researchers, compared with 736 publications co-authored by U.S. and Russian researchers, and the aforementioned 296 English-language papers co-authored by Chinese and Russian researchers. In other words, collaboration between U.S. and Chinese researchers produced nearly 129 times more AI-related publications than collaborations between Russian and Chinese researchers and 52 times more AI-related publications than collaborations between U.S. and Russian researchers.

When looking at trends over time, AI-related collaborations between Chinese and Russian scientists (Figure 1), U.S. and

Chinese scientists (Figure 3), and U.S. and Russian scientists (Figure 4) have all increased since 2010, and especially since 2016. As previously noted, in 2019, there were 14 times more AI-related publications co-authored by Chinese and Russian researchers than there were in 2010. This upward trajectory notwithstanding, the baseline number of joint publications for China and Russia was smaller than the number of papers co-authored by researchers from the United States and Russia and only a fraction of the number of joint papers produced by researchers from the United States and China. The United States and China publish significantly more AI-related research papers than Russia. It is therefore important to contextualize trends in collaborative output in terms of the broader publications landscape, both baseline numbers for each dyad and overall publication output for each of the three countries.

Figure 3: U.S.-Chinese AI-Related Research Publications, 2010-2019.

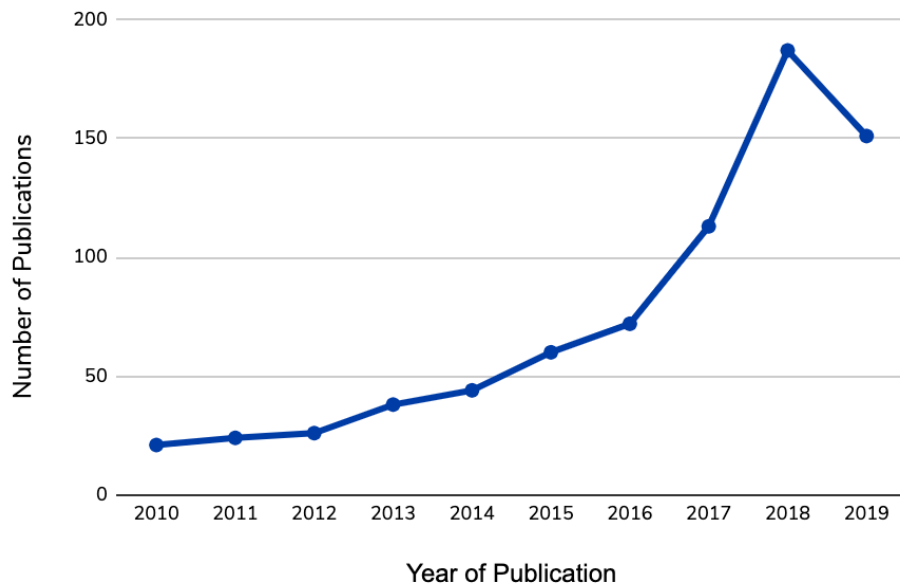


Source: Microsoft Academic Graph, Digital Science Dimensions, and Clarivate Web of Science.

As Figure 3 shows, AI-related research collaboration between U.S. and Chinese researchers has been growing at a steady pace since 2010, with a notable increase since 2016. In 2010, U.S. and Chinese researchers co-authored 1,975 AI-related papers. Over

the past decade, this number has more than quadrupled, reaching 8,138 joint publications in 2019. Despite tensions between the United States and China and rising concerns about research security, there has been no drop in collaborative research output in 2018 or 2019, although data from 2020 and 2021 could indicate otherwise.

Figure 4: U.S.-Russian AI-Related Research Publications, 2010-2019.



Source: Microsoft Academic Graph, Digital Science Dimensions, and Clarivate Web of Science.

The number of AI-related research publications co-authored by U.S. and Russian scientists has increased more than sevenfold, from 21 joint papers in 2010 to 151 papers in 2019. As Figure 4 illustrates, since 2010, there has also been a steady increase in AI-related collaborative publications produced by U.S. and Russian researchers, with notable growth between 2016 and 2018, and a

drop in 2019, perhaps signifying the impact of sanctions or the deterioration of relations between the two countries.*

These patterns in collaboration on AI-related topics reflect broader trends in scientific research and co-authorships among the United States, China, and Russia. Based on 2018 NSF data, Chinese and Russian researchers co-authored 2,457 publications in science and engineering. This total is significantly less than the 55,382 publications co-authored by U.S. and Chinese researchers, and the 4,881 publications co-authored by U.S. and Russian researchers that year. According to a recent study of U.S.-China research ties, “from the years 2014 to 2018, there has been a continuous rise of co-authored science and engineering journal publications that include U.S. and China co-authors, with an all-time high in ... 2018, with 175,665 articles. This number represents roughly 10 percent of all U.S. and 9 percent of all China science and engineering article publications from 2014 to 2018.”⁶⁸ NSF data from 2018 also shows that nearly 44 percent of China’s internationally co-authored articles in science and engineering were with a U.S. co-author.⁶⁹ Meanwhile, in terms of U.S.-Russia research ties, while the United States seems to be one of Russia’s top research collaborators, Russia is not one of the top countries for research collaboration for the United States.

While statements from high-level representatives from China and Russia, media reports, and expert analysis all point to the establishment of new scientific partnerships and expansion of academic ties, assessing the scope and output of collaborative research is a more complicated task. Bibliometric data is not a perfect indicator of collaborative research—it does not capture classified research or joint research that does not yield publications in journals and conference proceedings. That said, the culture of AI research is generally open and collaborative, with researchers often sharing their data, algorithms, and results on open web platforms such as GitHub and arXiv.org. Our analysis, therefore,

* As previously noted, because of the delay in the collection of publications data, publication counts for 2019 may increase slightly over time.

offers a comprehensive assessment of AI-related research output, and as a whole, publications data in both English and Chinese suggests that AI-related research collaboration between China and Russia has been relatively scarce over the past decade. The situation, however, could change if the two nations commit resources and talent to this area; in the conclusion, we outline potential developments that may signal closer collaboration.

Chinese-Russian AI-Related Investments

Since the turn of the century, the private sector has been the primary source of innovation in AI.⁷⁰ Governments that harness the fruits of this innovation are more likely to prosper economically and benefit strategically. The United States boasts a vibrant innovation ecosystem and the world's largest investment market in privately held AI companies. U.S. AI companies attracted 64 percent of disclosed investment in 2019, with China a distant second at 12.9 percent. Meanwhile, private Russian AI companies attracted only 0.04 percent of global disclosed investment value.⁷¹ China's AI market declined over the 2018-2020 period but remains significantly ahead of the Russian AI market in terms of venture capital investments, deal counts, and transaction value.⁷²

To better understand the evolving partnership on AI between China and Russia, we analyzed activity in the commercial sector by measuring Chinese and Russian equity investments in privately held AI companies. As a baseline comparison, we also measured U.S. investment into private AI companies in China and Russia, and Chinese and Russian investment into private AI companies in the United States.

Methodology and Scope

Our estimates rely on prior CSET research into AI investment trends globally and information from Crunchbase, a leading private investment data aggregator.⁷³ We supplemented this approach by compiling popular lists of the top 25 Chinese and Russian AI startups. We performed keyword searches in English, Chinese, and Russian to track news coverage, press releases, and

joint announcements of Sino-Russian investments in these startups.

While this methodology offers a baseline for comparison, our findings confront several limitations. Crunchbase is an English-language service and likely undercounts Chinese- and Russian-bound investments. Many Chinese and Russian investment deals are concluded under the auspices of state-owned enterprises and lack publicly disclosed values. Public data on Chinese and Russian AI investment flows are therefore incomplete and uneven. In addition, our formal analysis ends in 2020 and may not capture recent developments in the growing AI partnership between China and Russia.

Despite these limitations, our findings provide a reasonable starting point for evaluating commercial AI activity between China and Russia. Through Crunchbase, we initially found just four Chinese AI-related investments in Russian firms and zero Russian investments in Chinese firms. We broadened our Crunchbase search results and used keywords to search manually for reporting about investments into any of the 50 top AI startups in China and Russia.⁷⁴ We discovered an additional eight investments in AI companies through these practices, yielding a total of 12 China-Russia AI investment deals with known values. The lack of transparency involving deals with state-owned enterprises presents challenges for any comprehensive assessment of commercial AI activity. While our analysis does not cover all investment activity between China and Russia, we implemented several additional checks to account for potential gaps and limitations in our approach.

We provide case studies of two of the largest AI-related investments: Alibaba's joint venture in 2019 with Mail.ru Group, a Russian internet company that operates social networking sites, email services, and internet portals; and the 2017 Russia-China Investment Fund (RCIF) investment in the Chinese AI company Megvii. In the course of our research, we observed five additional investment deals with unknown values, bringing the total count to 17 China-Russia AI investment deals. We also noted several other forms of cooperation that we did not code as investments,

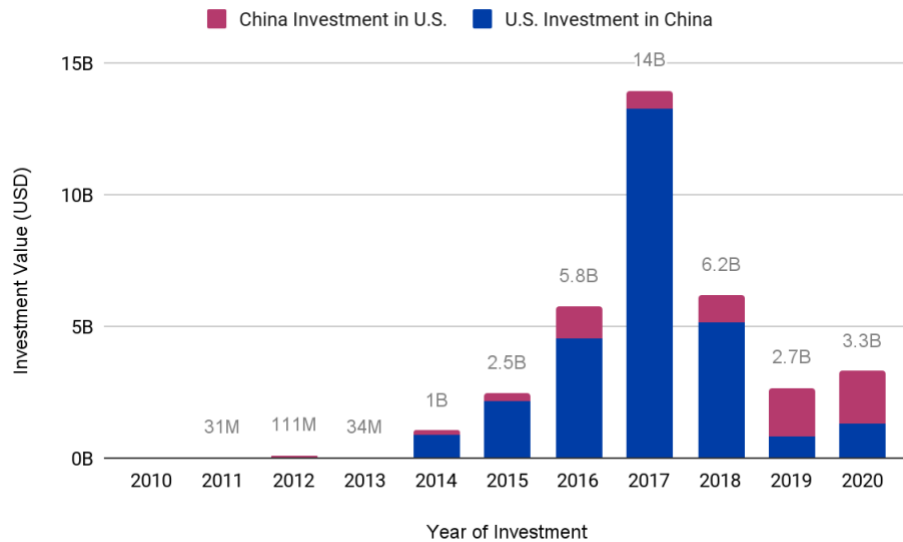
including strategic cooperation agreements and joint product development. While deals involving state-owned enterprises and other undisclosed transactions raise the level of uncertainty in our findings, we cross-referenced our data sets with press releases and other joint statements and cooperative agreements between Russian and Chinese firms.

Comparing U.S., Chinese, and Russian AI Investment Activity

The value of AI investments between the United States and China far exceeds that of any other pair of countries in the world. In 2019, U.S. companies attracted \$25.2 billion, or 64 percent of total disclosed AI investment value; China was the second largest market, with \$5.4 billion, or 12.9 percent of the global total.⁷⁵ Between 2010 and 2020, U.S. firms struck 270 investment deals in Chinese AI companies, and Chinese firms made 323 such investments in the U.S. AI private market, for a combined total value of more than \$35 billion. Over time, U.S. investment into private AI companies in China has declined from a peak of \$13 billion in 2017 to \$1.3 billion in 2020; whereas China's AI investment into private AI companies in the United States has risen steadily from \$181 million in 2014 to \$2 billion in 2020.⁷⁶

This baseline of U.S.-Chinese AI investment serves as a yardstick against which to measure other international partnerships. Although the level of AI investment between China and Russia seems to be increasing, it remains substantially lower than that of the United States and China.

Figure 5: Value of Known U.S.-China Private AI Investment, 2010-2020.



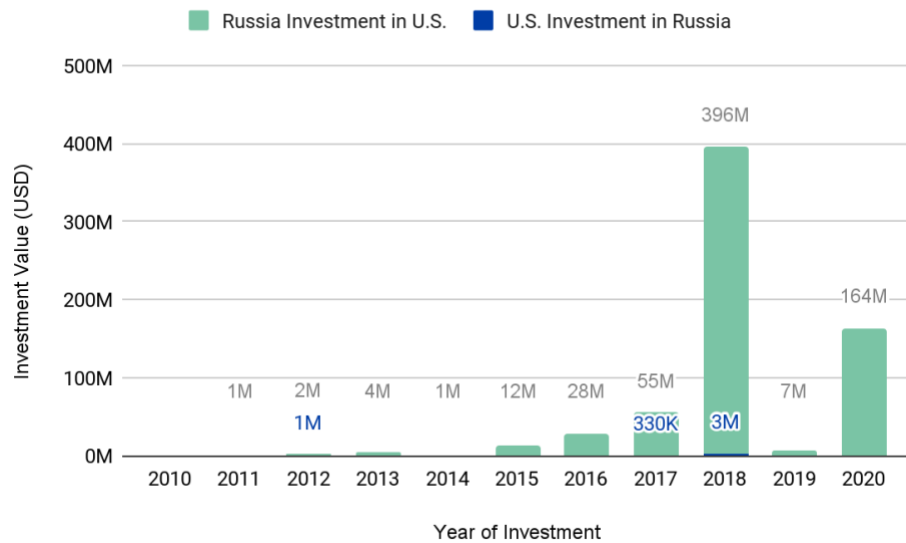
Source: 593 investments into AI companies captured in Crunchbase, 2010-2020. Note: Numbers in grey convey the total bilateral investment figures for each year.

By comparison, the value of U.S.-Russian private AI investment is far smaller. While conclusive figures are difficult to establish, Russia's investment market in privately held AI companies was estimated at \$172.5 million in 2019, according to private analytics company IDC.⁷⁷ Between 2010 and 2020, U.S. firms struck 9 investment deals with Russian AI companies, whereas Russian firms made 48 such investments in the United States. The combined value of all known private sector agreements between the two countries amounted to \$670 million during that period. In terms of relative trends over time, Russian investment into private AI companies in the United States declined from a peak of \$393 million in 2018 to \$164 million in 2020. U.S. investment into private AI companies in Russia has remained flat, with a peak of \$3 million in 2018.

Although the total value of U.S.-Russian AI investment is much smaller than that of U.S.-Chinese AI investment, it is worth noting that the United States remains Russia's largest international destination of AI investment, with Russian investments amounting

to \$666 million of the total \$670 million bilateral value. By comparison, over the same time period, Russian firms invested \$555 million into Chinese private AI companies.

Figure 6: Value of Known U.S.-Russia Private AI Investment, 2010-2020.

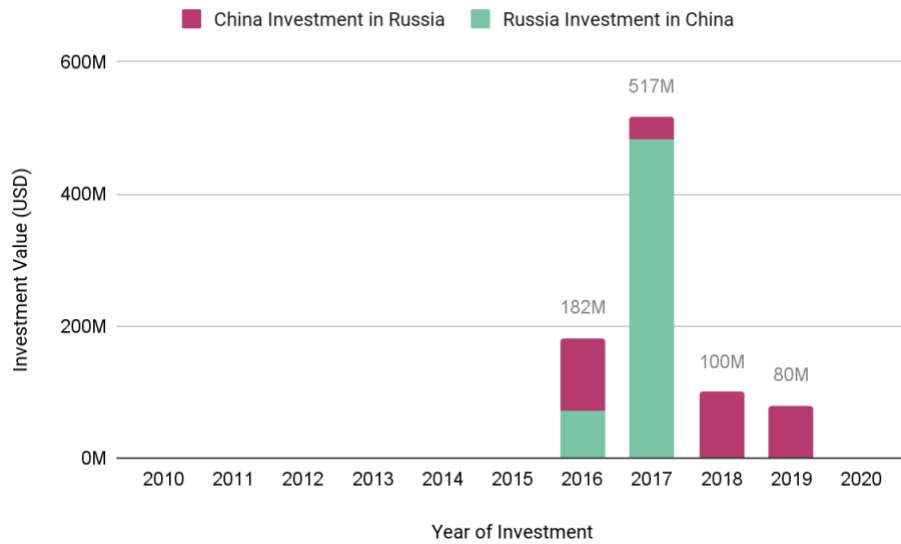


Source: 57 investments into AI companies captured in Crunchbase, 2010-2020.
 Note: Numbers in grey convey the total bilateral investment figures for each year.

Evaluating Known Chinese-Russian AI Investments

All investments into Chinese and Russian AI companies in our data set were concluded between 2016 and 2019. Taken collectively, they amounted to \$879 million, with more than half of all value arriving from two large deals with China’s Megvii and Russia’s Mail.ru Group discussed below.

Figure 7: Value of Known China-Russia Private and Sovereign Wealth Fund AI Investments, 2010-2020.



Source: 12 deals identified in Crunchbase and through manual queries for the top 50 AI startups in China and Russia. Note: New investment deals in 2021 have already exceeded \$300 million.

The Russia-China Investment Fund and Megvii

Since its founding in 2011, Megvii has emerged as a central player in China’s efforts to develop its homegrown AI market and lessen reliance on U.S. open-source frameworks. The company is also at the forefront of China’s growing surveillance system. Its flagship product, Face++, is one of the world’s largest open-source computer vision platforms and powers face scanning systems across a range of sectors.⁷⁸ These include phone and consumer Internet of Things (IoT) devices as well as Smart City and Smart Community management solutions for city governments to aid policing, monitor urban residential communities, and streamline logistics in more than 100 municipalities across China, encompassing 38 percent of the country, as detailed in the company’s prospectus.⁷⁹

Megvii’s role in providing facial recognition technology to the Chinese state has put it in the crosshairs of U.S. export controls. Megvii and Huawei have filed joint patents and tested a

surveillance system with the capability to target ethnic minorities. Advertising for the system claimed that it features a camera with the capability of scanning faces in a crowd and estimating individuals' age, sex, and ethnicity. This camera could allegedly trigger a "Uyghur alarm" to government authorities when it identifies members of the oppressed Muslim minority group.⁸⁰ Mounting concerns about the company prompted the Trump administration to add Megvii to the U.S. Department of Commerce's Entity list in 2019, blocking its access to U.S. technology.⁸¹

While this decision threatened its future sales abroad, Megvii is showing no signs of slowing down at home. The company is one of China's four "AI dragons" alongside SenseTime, Yitu, and CloudWalk.⁸² It has absorbed \$1.4 billion in capital through multiple rounds of funding. Along with Foxconn, Ant Group, SK Group, China Reform Holdings Corporation, and Sunshine Insurance Group, RCIF funded Megvii's second largest round of financing in a 2017 Series C deal worth \$460 million.⁸³ Megvii's largest infusion of venture capital, worth \$750 million, came in a 2019 Series D round from the Bank of China and Alibaba Group, among others. By August 2019, Megvii was on track to raise nearly \$1 billion in its initial public offering (IPO) on the Hong Kong Stock Exchange. But the Trump administration's restrictions on the company thwarted the IPO.⁸⁴ Megvii was back for another try in March 2021, filing for an IPO on the Shanghai Stock Exchange and planning to raise at least 6 billion yuan (\$922 million).

Measured against the totality of investments into Megvii, Russia's contribution appears modest. RCIF was just one of six investors funding the \$460 million Series C round. In addition, the RCIF received equal portions from the Russian Direct Investment Fund, a sovereign wealth fund established in 2011, and the Chinese Investment Corporation, meaning that Russia funded only 50 percent of RCIF's contribution to Megvii's Series C round.⁸⁵ While actual percentages of contributions to the funding round are difficult to ascertain, one could assume that each of the six investors may have contributed equal parts. This estimate would

make RCIF's contribution worth around \$76.7 million and Russia's portion just \$38.3 million. Out of \$1.4 billion venture capital investments thus far, and notwithstanding RCIF's potential participation in Megvii's upcoming IPO, Russia's investment contribution will have been around 2.7 percent. In short, even when looking at the highest value deals, investments made through joint Russian-Chinese funds account for a fraction of what it takes to get an AI company's IPO off the ground.

Alibaba's Joint Venture in 2019 with Mail.ru Group

AliExpress Russia is a joint venture between China's Alibaba and Russia's Mail.ru. Launched in 2019 and valued at around \$2 billion, AliExpress Russia claims it will provide a single destination for online shopping, gaming, instant messaging, and mobile banking for Mail.ru's hundreds of millions of registered users.⁸⁶ As Mail.ru Group CEO Boris Dobrodeev noted in a statement, "[T]his partnership will enable us to significantly increase the access to various segments of the e-commerce offering, including both cross-border and local merchants. The combination of our ecosystems allows us to leverage our distribution through our merchant base and goods as well as product integrations."⁸⁷ Such claims are noteworthy in their ambition and scope, but merit scrutiny in light of the incentives to overstate planned cooperation and development. While Mail.ru is a dominant player in Russian social media, its presence in online banking and commerce is insignificant.

In terms of ownership, the venture involves Alibaba, Mail.ru Group, the Russian telecommunications firm MegaFon, and the Russian Direct Investment Fund. Alibaba will invest \$100 million and hold a 48 percent stake, with the remaining ownership divided among MegaFon (24 percent), Mail.ru (15 percent), and RDIF (12.9 percent).⁸⁸ The venture mirrors broader trends in e-commerce toward integration and consolidation of services.⁸⁹ AliExpress Russia aims to grow Russia's e-commerce market, solidify business ties between Russia and China, and expand e-commerce flows between the two countries. The extent to which this joint venture will realize such ambitions remains to be seen. For

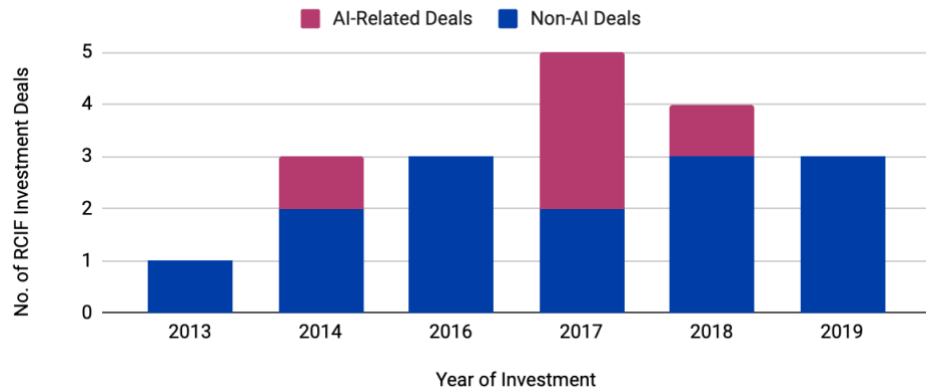
example, AliExpress is the 9th largest online commerce company in Russia, well behind market leaders.⁹⁰

Mail.ru is part of “AI Alliance Russia,” a cooperation agreement between RDIF, Russia’s largest bank Sberbank, the Russian oil company Gazprom, the Russian internet company and search engine Yandex, and the Russian telecommunications group MTS.⁹¹ Though short on details regarding organizational structure, resourcing, and enforcement, the AI Alliance seeks to develop Russia’s AI market, accelerate development of AI products and services, and deepen linkages between the Russian business community and research organizations charged with implementing Russia’s national AI strategy. AliExpress Russia aims to contribute to these goals by expanding the e-commerce market in Russia and increasing cross-border sales with China, laying the foundation for greater cooperation on AI products and services. While such deals may improve the commercial AI ecosystems of both countries and strengthen business ties between Russian and Chinese firms, the geopolitical implications in the near-term are unclear. Analysts will need to track the potential for large e-commerce deals to bolster the talent base and facilitate access to data in ways that could advance Sino-Russian progress in AI with concrete security and foreign policy implications.

Other Sovereign Wealth Fund Investments with Unknown Value

In addition to the 12 deals captured in Figure 7, we identified five investment deals where Chinese or Russian firms had invested in AI companies, but for which we lacked information about the value of the arrangement. In four of these five cases, RCIF was the investor backing the deal.⁹² Established in 2012 by both countries’ sovereign wealth funds, RCIF’s growing portfolio illustrates how the Sino-Russian relationship is tightening across multiple sectors. The fund today manages \$2.5 billion in assets, having received \$500 million from Saudi Arabia in 2017. Its founding signaled both nations’ desire to strengthen cross-border investment activity, a trend that has extended to the AI industry.

Figure 8: Number of Investment Deals Disclosed in RCIF’s Public Portfolio, 2013-2019.



Source: 21 deals published in RCIF’s public investment portfolio.⁹³

Since 2013, RCIF has made 21 major investments in Chinese and Russian companies that range in focus from children’s toys to autonomous vehicles. At least six of these deals have been substantially related to Chinese and Russian AI development, but only the value of its 2017 and 2021 investments in Megvii and DiDi are publicly known.

DiDi. In 2014, RCIF found its first AI-related investment in DiDi, a Chinese rideshare company modeled after Uber. Shortly after the infusion of capital, DiDi acquired its main homegrown competitor, Kuaidi, and bought Uber China, solidifying its dominant position in the Chinese ridesharing industry.⁹⁴ The value of RCIF’s 2014 investment in the company has not been publicly disclosed. Since then, DiDi has emerged as a world leader in autonomous driving and AI more broadly, and now competes with U.S.-based companies Waymo and Uber. In January 2021, RCIF announced a second investment specifically in DiDi’s Autonomous Driving division valued at \$300 million, the largest investment RCIF has made thus far, and the second largest AI investment deal between China and Russia.⁹⁵

Rostec City. 2017 marked RCIF’s most active investment year to date, inaugurated with a major investment in Rostec City, a technology park in the heart of Moscow. Spearheaded by Russian defense SOE and electronics giant Rostec, the park is expected to

showcase “smart city” technologies designed to autonomously regulate traffic, adapt power consumption, and recognize the faces and movements of its inhabitants.⁹⁶ Moscow’s Smart City 2030 strategy focuses explicitly on AI.⁹⁷ Smart city technoparks are a staple of several Chinese cities and often viewed as proving grounds for emerging surveillance technologies.⁹⁸

Nio. In October 2017, RCIF and the China Investment Corporation jointly invested in Nio, an early-stage electric vehicle company headquartered in China. With shareholders including Chinese AI giants Tencent and Baidu, Nio—“China’s Tesla”—quickly came to focus on autonomous driving.⁹⁹ Its first car model, a fully electric, fully autonomous sedan, was unveiled in January 2021.¹⁰⁰

NetEase Cloud Music. Known for its web portal and other internet services, NetEase is a well-established Chinese internet company that also runs a personalized music recommendation system. Its product includes some social media features and collects data on users’ music preferences to connect friends and peers.¹⁰¹ In November 2018, RCIF contributed an unknown amount of funds to a financing round worth \$600 million.¹⁰²

Other Forms of Cooperation

Beyond investments, we identified several other forms of corporate partnerships between Chinese and Russian AI companies. While not indicative of the same commitment as cash-in-hand, Russian and Chinese companies have signed strategic cooperation agreements related to AI development, and some have jointly developed surveillance products to be marketed in both countries. Mutual cooperation agreements range from boosting trade to bring existing products into Chinese and Russian markets to pursuing joint research and development of new products.

Russia’s Promobot, China’s FN Holdings, and Beijing Huanuo Exiang. In 2019, Russian robotics firm Promobot, one of the largest robotics manufacturers in Europe, signed a cooperation agreement with Chinese company “FN Holdings,” creating a joint project team that will develop a linguistic base in Chinese and coordinate joint

research related to healthcare service robots—a deal that’s estimated to bring Promobot \$2 million.¹⁰³ Another cooperation agreement with Beijing Huanuo Exiang (REX), a Chinese trading company, aims to bring Promobot’s products on to the Chinese entertainment and services market.¹⁰⁴

China’s UBTech and Russia’s LANIT Group. Deepening cooperation in educational robotics, UBTech Robotics and Russian technology giant Laboratory of New Information Technology (LANIT) signed a partnership agreement in 2019, agreeing to bring AI-enabled humanoid robots into the Russian market.¹⁰⁵ In addition to industrial applications such as inspecting hazardous facilities, the joint venture will localize and adapt Chinese robots for Russian service and educational sectors to serve as virtual assistants, museum guides, and training references for educational institutions.¹⁰⁶

China’s Fitsco and Russia’s Cognitive Pilot. Advancing cooperation in smart cities and the autonomous transportation sector, Shanghai Fuxin Intelligent Transportation Solutions Company (Fitsco) and Cognitive Pilot, a Russian autonomous vehicle company, partnered in 2020 to develop an AI-based computer vision system for autonomous trams in China.¹⁰⁷ The collaboration includes joint research and development, testing and commercialization of products to support China’s push for smart public transport, as well to modernize transport systems in Southeast Asia and Russia.¹⁰⁸

China’s Dahua Technology and Russia’s NtechLab. Dahua Technology and NtechLab, two leading providers of surveillance technologies, joined forces in 2019 to develop a wearable camera with facial recognition capabilities for law enforcement.¹⁰⁹ The product is the culmination of Dahua’s two-year foray into the Russian market through its subsidiary, Dahua Technology Rus.¹¹⁰ The camera incorporates Dahua’s wearable video device and NTech’s FindFace algorithm that can recognize emotions in addition to facial features, age, and gender, and process data on the device, enabling faster identification in near real-time.¹¹¹

China's Vinci Group and Russia's Jovi Technology. Deepening cooperation in the IT sector, the software development firm Vinci Group and the blockchain company Jovi Technologies partnered in 2019 to develop AI-enabled digital commerce solutions for small businesses.¹¹² The collaboration combines Vinci's expertise in encrypted mobile communications platforms with Jovi's focus on blockchain to develop integrated applications that advance AI-enabled business solutions in both nations.¹¹³

Conclusion

An axis of convenience or deepening partnership? A Faustian bargain or durable entente?¹¹⁴ The lexicon of Sino-Russian relations obscures as much as it clarifies. China and Russia are growing more aligned in their interests, actions, and strategies, and there are clear indications of closer diplomatic, economic, military, and technological ties. Yet the scale and scope of this emerging partnership deserve careful scrutiny, particularly in the field of artificial intelligence.

This issue brief outlined and analyzed Chinese-Russian collaboration in AI-related research and investment. Our findings align with previous assessments of Sino-Russian cooperation in new technologies, tracing an upward trend in the number of AI-related research publications as well as growing investment in the AI ecosystems of these countries. At the same time, the scope of this partnership still lags behind the breadth and depth of ties between the United States and China.

The data on joint AI-related research and investment highlight the limits of Chinese-Russian collaboration. The power asymmetry between the two nations inevitably complicates this partnership. More specifically, it remains unclear whether China sees Russia as a true partner suitable for joint ventures and collaboration on equal terms. For instance, in 2019, the president of the Russian Academy of Sciences expressed concern that in regards to Russia, "China has shifted from a policy of importing technology to a policy of importing brains," offering Russian scientists not only better salaries but the opportunity to carry on their research in China.¹¹⁵ Yet as the exact contours of this partnership continue to

take shape, China may proceed to acquire Russian technology, through licit and illicit means. Recent CSET research shows that China's science and technology diplomats—those individuals stationed in PRC embassies and consulates around the world to monitor scientific and technological breakthroughs and track investment opportunities for the Chinese government—seem particularly interested in Russia, especially in early-stage technology projects developed by Russian government-backed researchers.¹¹⁶

Convergence between America's two key competitors, especially around critical technologies like AI, has significant implications for U.S. national security and global leadership. While this report has focused on AI-related research and investment linkages, there are additional dimensions to Chinese-Russian cooperation in AI, with experts highlighting areas such as dialogues and exchanges, the development of science and technology parks, joint competitions, and the expansion of academic cooperation.¹¹⁷ Talent development and exchanges are worth tracking in particular, especially if Chinese companies like Huawei continue to expand and deepen their partnerships with Russian universities and research institutions. Notably, the Russian Embassy in China recently claimed that the number of Chinese students in Russian universities has doubled over the past five years, reaching about 48,000 students in 2020; the number of Russian students in Chinese universities has increased by 36 percent, standing at 20,000.¹¹⁸

Still, Russia is not a top destination for Chinese students, nor is China for Russian students. In contrast, there were about 372,531 Chinese students enrolled in U.S. universities during the 2019-2020 academic year, accounting for 35 percent of the total number of international students.¹¹⁹ Moreover, the majority of top-tier AI researchers who received undergraduate degrees in China go on to study, work, and live in the United States.¹²⁰ Roughly 30 percent of international students pursuing a Ph.D. in AI-relevant fields such as computer science and electrical engineering in the United States are from China.¹²¹ That said, talent exchanges in particular, and Sino-Russian cooperation more generally, will likely deepen if the

United States' relationships with both countries continue to deteriorate.

While we are reluctant to put forth policy recommendations on the basis of findings related to only two dimensions of the multifaceted Chinese-Russian partnership, we offer the following list of indicators that watchers of China and Russia should track closely as cooperation between these two nations continues to unfold.

Research:

- *Formalization and proliferation of research relationships:*
 - Chinese and Russian universities, research institutions, and private companies increasingly formalize their research ties through multi-year agreements with designated funding.
 - Chinese and Russian universities and research institutions establish additional joint research centers, joint undergraduate and graduate degree programs, summer schools, and other ventures.
- *Increased volume and quality of collaborative AI-related publications:*
 - The share of collaborative publications as part of overall publications for both China and Russia grows.
 - The citation impact and the percentage of highly cited AI-related papers co-authored by Chinese and Russian researchers increases.
 - Joint Chinese-Russian university research centers produce more and higher impact research.
 - Huawei research centers in Russia and partnerships with universities produce innovative and internationally recognized work.

- *Partnerships between defense research institutions and other entities of note to U.S. national security:*
 - Chinese companies and institutions listed on the Entity List increasingly collaborate on AI-related topics with Russian universities and research institutions.
 - Research institutions affiliated with the Russian Ministry of Defense, or located in the ERA technopolis, increasingly collaborate with Chinese counterparts on AI-related research.

Investment:

- *Increased disclosed investment values and deal counts in relative and absolute terms:*
 - Increases in the disclosed value and deal count of joint Chinese and Russian AI investments.
 - The percentage of joint AI investment between China and Russia surpasses the level of U.S.-China AI investment or occupies a majority share of China's and Russia's overall AI investment portfolios globally.
 - China and Russia develop additional products or establish additional joint AI ventures and innovation funds, on the order of RCIF or larger.
- *Hidden values or breakthrough developments:*
 - Drop-offs in disclosed investment values or deal counts that indicate a greater role for state-owned enterprises, deliberate obfuscation, or increasing lack of transparency in joint AI investments.
 - Investments leading to groundbreaking AI products and innovations in the areas of autonomous vehicles, smart cities, facial recognition, telecommunications,

large language models (natural language processing), or AI-enabled military applications.

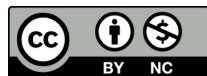
- Increase in data sharing agreements, exceptions to data localization laws, and other signs of mutually preferential treatment to attract AI companies and talent.
- *Proliferation of investments in areas of concern:*
 - Significant growth in assets under management of RCIF's AI investment portfolio, with a focus on autonomous vehicles, smart cities, facial recognition, telecommunications, large language models (natural language processing), or AI-enabled military applications.
 - Increases in Chinese and Russian joint AI investments in facial recognition, such as the RCIF investment in Megvii, or growing partnerships between Russian firms and China's four "AI dragons": SenseTime, Yitu, CloudWalk, and Megvii.
 - Collaboration in AI development between Chinese and Russian state-owned defense companies, such as China Electronics Technology Corporation and Rostec.
 - Implementation of existing corporate partnerships and development of new strategic cooperation agreements, such as the agreement between China's Dahua Technology and Russia's NtechLab to develop surveillance capabilities or between China's Fitsco and Russia's Cognitive Pilot to advance smart city and autonomous vehicle technologies.

Authors

Margarita Konaev is a research fellow at CSET, where Andrew Imbrie is a senior fellow, and Ryan Fedasiuk and Emily Weinstein are research analysts. Katerina Sedova is a research fellow with CSET's CyberAI, and James Dunham is a data scientist at CSET.

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Appendix

Table 1A: Top Russian and Chinese Organizations in CNKI Dataset.

Top Russian Orgs in CNKI Dataset	No. of Papers	Top Chinese Orgs in CNKI Dataset	No. of Papers
Russian Academy of Sciences	16	Chinese Academy of Sciences	3
Bauman Moscow State Technical University	4	Beihang University	2
Moscow State University	3	China Earthquake Administration	2
Moscow Aviation Institute	2	Chinese Academy of Social Sciences	2
Russian Academy of Natural Sciences	2	Harbin Institute of Technology	2
Pavlov State Medical University	2	Institute of Geographic Sciences and Natural Resources Research	2
		Institute of Remote Sensing and Digital Earth	2
		Nanjing University	2
		South China University of Technology	2
		Tsinghua University	2
		Xinjiang Medical University	2

Source: CNKI.

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