



THE OUTSIDER

Russia in the Race for Artificial Intelligence

Julien NOCETTI

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Abstract

When analyzing the global state of play around artificial intelligence (AI), Russia so far looks like an “outsider” compared to the two technological leaders, the United States and China. Yet, like the European Union, Russia exhibits two apparently contradictory but fundamental trends: it is trying to reap the benefits of technological interdependence—digital, scientific, financial etc.—while also protecting its internal market and thereby achieving the “technological sovereignty” it so ardently desires. Russia’s state-led approach is compounded by the same problems that afflict Russia in the conventional digital sector: lack of investment, weak integration into international scientific and normative networks, political pressure on private companies, dependence on global technological value chains and brain drain. Might these factors lead us to underestimate Moscow’s potential in AI? This paper argues that although these weaknesses are significant, continue to hold Russia back and threaten to amplify pre-existing asymmetries of power with the United States and China, Moscow intends to preserve niches of expertise that it can deploy in foreign policy and domestic governance. The Russian authorities have also handed big parts of AI development to the armed forces and the defense industry, as part of modernization plans and for asymmetric use.

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Introduction

Like all major innovations in technology, artificial intelligence (AI) has far transcended the scientific sphere to which it had been confined for more than half a century.¹ Though it is far from a new discipline, AI's dramatic development in recent times is due to rapid advances in machine learning that are opening up a wide array of potential applications, both civil and military. This context helps explain Vladimir Putin's use of hyperbole on 1 September 2017, when he said, before an audience of students in Yaroslavl, that "Whoever becomes the leader in AI will rule the world". In turn, the belief that AI has virtually unlimited potential, coupled with risks, is fueling fierce technological competition between world powers, particularly between the United States, the world's leader in technology, and China, the world's rising technological power.²

Compared with the USA and China, Russia has so far figured as an outsider in any analysis of the global implications of AI. Yet, like the European Union, Russia exhibits two apparently contradictory but fundamental trends: it is trying to reap the benefits of technological interdependence—digital, scientific, financial etc.—while also protecting its internal market and thereby achieving the "technological sovereignty" it so ardently desires.³

This adaptive approach calls for analysis to shift away from focusing only on the *development* of new technologies. In Russia, the publicity surrounding tests or launches of new autonomous weapon systems is as

Translated from French by Cameron Johnston.

1. Although the term "artificial intelligence" has entered common parlance, no commonly accepted definition exists as of 2020. One of the forerunners of the discipline, Marvin Minsky, defined it as the "the creation of IT programs that engage in tasks which are, for now, accomplished better by human beings because they demand sophisticated mental processes, such as: perceptual learning, the organization of memory and critical reasoning" (1956). In other words, an artificial intelligence is an information program that aims to accomplish tasks requiring a certain level of intelligence, at least as proficiently as a human. Potentially, all fields of human activity could come within reach: moving, learning, reasoning, socialization, creativity, and so on. See J. G. Ganascia, *Le Mythe de la singularité. Faut-il craindre l'intelligence artificielle?* [The myth of the singularity. Should artificial intelligence be feared?], Paris: Science Ouverte, 2017.

2. On this subject, see J. Nocetti, "Intelligence artificielle et politique internationale. Les impacts d'une rupture technologique" [Artificial Intelligence and International Politics: The Impacts of a Technological Rupture], *Études de l'Ifri*, Ifri, November 2019, available at: www.ifri.org.

3. For recent initiatives by the Russian authorities in digital sovereignty, see J. Nocetti, "La Russie en quête de son 'Internet souverain'" [Russia in search of its "Sovereign Internet"], *La Revue des médias*, National Audiovisual Institute, 21 June 2019, available at: <https://larevuedesmedias.ina.fr>.

much about wanting to display upgrades in technology as it is about accounting for the crucial importance of the strategic factor in the rhythm of technological change.⁴ As in the Soviet era, such announcements are meant to yield dividends in domestic and foreign policy.⁵ The recent example of the *Avangard* hypersonic glide vehicle is a good illustration.

The vast field of AI is not immune to these international changes. A global phenomenon with different national expressions, AI is yielding a battle of narratives as well as a struggle for technological superiority. In this respect, Russia is not at the forefront of the international debate. Moreover, like most great and medium-sized powers, Russia has been affected by the “AI nationalism”⁶ that has found expression in the drafting of national strategies. Signed by Vladimir Putin in October 2019, the National Strategy for the Development of Artificial Intelligence is meant to make Russia one of the countries that matters in this area and kick off Russian efforts to catch up, technologically and financially, in AI and advanced robotics.⁷ Nonetheless, the document is not the be all and end all of Russian AI: both fundamental research into AI as well as applications for the market continue to be monopolized by the Russian defense sector, which is using them to modernize its equipment and the operational art of its armed forces.

Russia’s state-led approach is compounded by the same problems that afflict Russia in the conventional digital sector: lack of investment, weak integration into international scientific and normative networks, political pressure on private companies, dependence on global technological value chains, and brain drain.

Might these factors lead us to underestimate Moscow’s potential in AI? This paper argues that although these weaknesses are significant, continue to hold Russia back and threaten to amplify pre-existing asymmetries of power with the United States and China, Moscow intends to preserve niches of expertise that it can deploy in foreign policy and domestic governance. It seeks thereby to maximize the political tools at the disposal of Russian decision makers. In the field of AI, the Kremlin has so far valued the flexibility enabled by Russia’s system of governance more highly than the competitiveness of Russian industry or the influence of

4. This is an idea put forward by D. Drezner, analyzing nuclear weapons and the internet in “Technological Change and International Relations”, *International Relations*, Vol. 22, No. 2, 2019, pp. 286-303.

5. On the coupling together of these two dimensions in the Soviet era, see B. Parrott, *Politics and Technology in the Soviet Union*, Cambridge: MIT Press, 1983.

6. The phrase is borrowed from I. Hogarth in “AI Nationalism”, *Ian Hogarth’s Blog*, 13 June 2018, available at: www.ianhogarth.com.

7. *O razvitii iskusstvennogo intellekta v Rossijskoj Federatsii* [On the Development of Artificial Intelligence in the Russian Federation], Presidential decree of the Russian Federation, 10 October 2019, available at: <http://publication.pravo.gov.ru>.

Russian science abroad. The paper concentrates on five main themes: the perceptions of, and debates surrounding, AI in Russia; the way in which civil governance around AI is structured; the driving force provided by the security and defense sectors; Russia's strengths and weaknesses in this area, and the implications of the technological partnership with China.

AI through Moscow's Eyes

Russia's pedigree

The history of Artificial Intelligence in Russia remains poorly understood: Cold War divisions, military secrecy and the publication of work solely in Russian inhibited the dissemination of Soviet work in the West. The same might be said of cybernetics. Given the quality of its teaching in mathematics and physics, however, the Soviet Union had its own history in AI, which developed in parallel with scientific research in the West. AI in Russia also passed through the phases of discovery and disappointment which punctuated the history of Western AI, a multi-disciplinary field that combines mathematical logic, computer science and neurobiology.

In the West, the 1950 article “Computing Machinery and Intelligence”, written by the British mathematician and cryptologist Alan Turing, and the creation by American researcher Marvin Minsky of the first computer based on artificial neural networks, stunned the scientific community. Shortly afterwards, in 1954, the Soviet mathematician and co-founder of cybernetics, Alexey Lyapunov, organized a pioneering seminar called “Robots and Thoughts”. These multi-disciplinary endeavors brought together neurologists, linguists, psychologists and mathematicians in an effort to make the computers of the future *think*. From 1945 onwards, in the midst of an encryption war, the Soviets, who had gained access to the encryption key for the Enigma machine⁸, set the Steklov Institute of Mathematicians in Leningrad the task of automating the solution of logical problems.

Between the 1960s and 1990, the mathematician Dmitry Pospelov was AI's central figure in the USSR. He sought to map knowledge and complex situations in networks, rather than using a linear approach like his Western counterparts. Over the course of the 1980s, his work culminated in the creation of more than 300 bespoke systems designed to accomplish certain tasks, such as maintenance, diagnostics and decision support.⁹ The REFAL programming language spread, competing with the Western LISP and PROLOG, and the AII (Artificial Intelligence Association) was formed,

8. On this subject, see S. Budiansky, *Code Warriors: NSA's Codebreakers and the Secret Intelligence War against the Soviet Union*, New York: Knopf, 2016.

9. V. Tarasov, « D.A. Pospelov—osnovopolozhnik iskusstvennogo intellekta v SSSR i Rossii » [D.A. Pospelov, pioneer of artificial intelligence in the USSR and Russia], Russian Association of Artificial Intelligence, 2005, available at: www.posp.raai.org.

bringing together more than 300 Soviet AI researchers. Pospelov continued his work at the Academy of Sciences after the breakup of the USSR, but his field of study was poorly understood by the new regime and out of step with the priorities of the post-Soviet transition: it fell into abeyance during the 1990s.¹⁰

A return to the debate on AI since 2010

At the beginning of the 2010s, after years of stagnation, a new phase opened up in global research on AI. The resulting leap forward was due to a take-off in machine learning and its derivative, deep learning, which itself depends on a combination of exponential increases in calculating power, sophisticated algorithms and, above all, expansion in the data sets being processed. The mixing and cross-pollination of digital technology, robotics and AI is already transforming economies and will have social and economic consequences over the medium term, both nationally and internationally, entrenching the position of the few dominant technology companies and widening inequalities. Is there a “Russian reading” of these inherently global processes?

In general, Russian debates about, and perceptions of, AI are quite similar to those in Western countries—mostly, they follow the twofold argument which guides debates on AI and its impacts.¹¹

AI and socio-economic modernization

Russia’s political and economic elites present AI as a collection of breakthrough technologies that should be harnessed by different sectors, from medicine, to education, to transport. The Russian authorities stress how AI can benefit the future of the country, spurring growth and diversification of the economy. The objective, though currently difficult to discern, may be twofold: to make Russia less dependent on rents from the energy industry and to turn AI into a homegrown enterprise. That is, to no longer consider AI a foreign import, for reasons of national prestige and security.

10. D. Pospelov died in October 2019. “Tot, kto skazal Ia: umer osnovatel’ sovetsoj shkoly iskusstvennogo intellekta Dmitrij Pospelov” [He who said I: Dmitry Pospelov, the founder of the Soviet school of artificial intelligence has died], *Khabr*, 1 November 2019, available at: <https://habr.com>.

11. For example: I. Kaliaev, “Gonka za tsifrovym prizrakom” [Race after the digital ghost], *Ogonëk*, 24 June 2019, available at: www.kommersant.ru. It is worth noting that in Russia, key AI terms are translated literally from English and often mean the same thing as their American equivalents: *isskustvennyj intellekt* for artificial intelligence; *mashinnoe obuchenie* for machine learning; or *nejroset’* for neural network.

At the same time, sanctions that followed the annexation of Crimea have produced so-called “import substitution” drives in many sectors. Russia’s leaders acknowledge that their country remains dependent on technology imports, but they are reshaping and legitimizing their own AI agenda in an international environment marked by the return of protectionism, which is promoting AI nationalism.¹² In terms of domestic governance, certain leaders’ willingness to jump aboard the AI bandwagon can be read in two ways: as a public relations exercise—something that is by no means confined to Russia—and as a means by which they can express their loyalty to the Kremlin, thereby following a tradition of imitation that is deeply rooted in the behavior of the Russian political class.¹³

Economic circles and the big private companies share an optimistic reading of AI in creating value. Seen as the “nuclear energy of the future”, it is alleged that AI could increase the productivity of labor by 20-30%.¹⁴ As in Europe, the number of events related to AI has increased in Russia since 2018, helping to put the issue on the economic and political agenda, as well as generating hype. Regular conferences and debates are a crucial element of *soft power*, since they help to shape the narratives around a given issue. With each passing year, the number of panel discussions on digital and technological issues increases at the St Petersburg International Economic Forum, one of Russia’s windows on the wider world: in June 2019, 21 sessions addressed AI and its effects in different sectors—health, employment, recruitment—as well as its challenges, such as the impact on the middle classes, the regulation and transparency of algorithms, and training in mathematics. Only a tiny minority of the debates examined the geopolitical implications of the spread of AI.¹⁵ *AI Journey* is a two-day international conference that, since 2019, has brought scientists, developers and businessmen to Moscow, as well as having seven regional offshoots, including Novosibirsk, Tomsk and St Petersburg, which all have well-regarded technical universities.¹⁶

12. Interview with a Russian political scientist, December 2019. Also see S. Karelov, “Vpered i natsionalizm i natsionalizatsia” [Towards a nationalism and nationalization of AI], Russian International Affairs Council, 9 October 2018, available at: <https://russiancouncil.ru>.

13. This tendency was already visible in the case of the internet. See J. Nocetti, “Russie: le Web réinvente-t-il la politique?” [Russia: will the web reinvent politics?], *Politique étrangère*, Vol. 76, No. 2, Summer 2012, pp. 277-289.

14. A. Vediakhin, first Vice President of the board of Sberbank, in “Iskustvennyj intellekt—eto iadernoe toplivo dlia nashego budushchego” [Artificial Intelligence is the nuclear fuel for our future], *Kommersant*, 4 October 2019, available at: www.kommersant.ru.

15. Data collected by the author on the St Petersburg International Economic Forum. <https://forumspb.com>.

16. See Artificial Intelligence Journey, <https://ai-journey.ru>.

Russian society appears to regard AI as neither a threat nor a particular opportunity. In a recent poll, 54% of Russian respondents said they had a favorable attitude towards AI and robots¹⁷ but an earlier survey found that only 29% of Russians thought they understood the essence of AI. Nevertheless, a majority of respondents have either a neutral or positive attitude towards the use of AI, with many expecting that it will improve public services (administrative procedures, medicine, education). Fears that AI could destroy jobs are not widespread.¹⁸ The results of these polls contrast with public opinion surveys conducted in France and Great Britain, for example, whose citizens are less enthusiastic, and even anxious, about AI.

That said, the effects of the COVID-19 pandemic have fueled anxiety in Russia, as elsewhere, about digital technology for tracing and monitoring citizens. Videos and petitions warning people that they could be ‘chipped’ to allow the government to geo-locate them have spread widely, fanning conspiratorial thinking and clouding the public’s understanding of the technological issues at stake.¹⁹ Another, indirectly related, issue is that AI is often associated on the Russian-speaking internet with a welter of technology—5G, robotization, facial recognition—that is supposedly imposed on Russia from abroad. Such opinions are aired by some religious leaders, as well as by influential figures from the world of the arts.²⁰

AI as an issue, and tool, of sovereignty

Artificial intelligence is sometimes presented as a promethean technology; that is, as a tool with intrinsic power. This idea is less prominent in Russia than in the USA or China and is mainly discussed during conferences where speakers examine the role of AI in the international order. Russian experts in international relations frequently pay attention to US and Chinese AI strategies. The recent steps taken by the European Commission, such as the White Book on AI published in February 2020, have been

17. Iu. Krivoschapko, “Um za razum” [Mind for Mind], *Rossijskaia Gazeta*, 22 December 2019, available at: <https://rg.ru>.

18. A. Possypkina, “Bolee 10% rossiian zaiavili o nedoverii k isskustvennomu intellektu” [More than 10% of Russians said they do not trust artificial intelligence], *RBK*, 27 February 2020, available at: www.rbc.ru.

19. Genprokuratora poruchila zablokirovat’ fejki o chipirovanii i koronavirusu » [The Procurator General ordered fakes to be blocked on “chipping” and the coronavirus], *Vedomosti*, 13 May 2020, available at: www.vedomosti.ru.

20. See for instance M. Faustova, “RPTs namerena razobrat’sia s koronavirusnoj konspirologiej” [Russian Orthodox Church intends to deal with coronavirus conspiracism], *Nezavissimaia Gazeta*, 2 June 2020, available at: <https://www.ng.ru>.

followed closely.²¹ Russian diplomats and strategic thinkers are interested in Brussels' new position on AI, which differs from American and Chinese strategies in focusing on ethics.²²

In contrast to the EU's approach, some Russians regard AI mainly through the lens of security. They see AI, when harnessed to coercive or violent ends, as posing a threat to the established order. The 'malign uses of AI' are seen as part of the modernization of information and psychological warfare, which entails risks for Russia, as well as opportunities.²³ The variety of malign uses to which it may be put—drones, cyber-attacks, manipulation of crypto-currencies, use of bots during election campaigns—means that AI could be used aggressively on a massive scale and as part of an effort by Russia to better promote its positions abroad.²⁴

Russia's position remains unclear in this area. The hardening of Russian digital sovereignty since 2016 and the tension between Russia and the USA might presuppose that Russia's narrative on AI is anti-Western: for now, however, that is not the case. Debates in Russia center on the need to catch up technologically, which is essential if Russia is to maintain its status in the world. There is a general recognition at the highest level that Russia is being held back by not driving innovation. Some observers regard the fact that Russia has not shaped the AI industry as automatic proof that it is lagging behind, something Vladimir Putin may understand all too well.²⁵ His rousing prophecy, which he has repeated numerous times since September 2017, may therefore be designed to emphasize how urgent it is to make progress.

Putin has emphasized the importance of time when it comes to AI: “without the time to reach a satisfactory level of development, [the

21. On the first aspect, see, for instance, the conference organized by the Russian International Affairs Council in Moscow on 6 November 2018, entitled “Mezhdunarodnye i sotsial'nye posledstviia ispol'zovaniia tekhnologij iskusstvennogo intellekta” [International and Social consequences of the use of artificial intelligence technology], in particular the first session available on: www.youtube.com; and S. Karelov, “Vperedii II-nacionalizm i II-nacionalizatsiia”, *op. cit.* On the second aspect, see A. Federov, “Etichnyj isskusstvennyj intellekt' stanovitsia instrumentom politiki” [“Ethical” Artificial Intelligence becomes an instrument of politics], *Indeks Bezopasnosti*, PIR Tsentr, No. 3, Vol. 7, April 2020, available at: <http://pircenter.org>.

22. *Ibid.* Interview with two Russian political scientists, January and April 2020.

23. “Iskusstvennyj intellekt i bezopasnost': shto vo blago, a shto vo zlo?” [Artificial intelligence and security: what is good, what is bad?], interview with E. Pashentsev in *Mezhdunarodnaia Zhizn*, 21 October 2019, available at: <https://interaffairs.ru>.

24. D. Bazarkina and E. Pashentsev, “Artificial Intelligence and New Threats to International Psychological Security”, *Russia in Global Affairs*, Vol. 17, No. 1, January-March 2019, pp. 147-170.

25. “Operezhenie i est' monopoliiia” [A lead is a monopoly], interview with Olga Uskova, President of the company Cognitive Technologies, *Ogonëk*, 10 June 2019, available at: www.kommersant.ru.

country] may be destroyed”.²⁶ This statement should be interpreted in the context of the Huawei affair, which was unleashed by the White House in 2018 and ripped through technological supply chains. US sanctions deprived the Chinese company of access to various components manufactured in the USA and may have shown “what could happen [to Russia] if we do not act quickly to create our own manufacturing base for AI technologies—not only applications but also micro-processors and sensors”.²⁷ AI is therefore seen as a matter, and tool, of sovereignty. The fact that, since 2018, Russia was only the 30th country to adopt a national AI strategy, when it did so in October 2019, shows that it was slow off the mark. In fact, Russia’s goal may not be to become the “world leader” but to rank among the top five AI powers in the world, while maintaining and defending its “technological sovereignty”.²⁸ Lastly, the importance that is regularly placed on the quality of training in pure mathematics and programming, despite some setbacks since the Soviet era, aligns with the Russia’s AI strategy, which relies on human capital.²⁹

26. *Ibid.*

27. *Ibid.*

28. “Dlia uchastiia v mirovoj tehnologicheskoi gonke etogo nedostatochno’ [To take part in the global technological race, that is not enough], *Kommersant’ FM*, 3 June 2019, available at: www.kommersant.ru.

29. ‘Rossijskaia shkola iskusstvennogo intellekta nahoditsia na mirovom urovne, a po nekotorym napravleniiam—operezhaet ego’ [The Russian school of artificial intelligence is of a world standard and in some areas, better], *Kommersant’ Nauka*, 23 December 2019, available at: www.kommersant.ru.

The Development of a Civilian AI Strategy

The National Strategy for AI (2019)

In October 2019, Vladimir Putin endorsed a national strategy for artificial intelligence, ending two years of speculation about the authorities' slowness to acknowledge the issue.³⁰ Putin spoke publicly about AI several times in 2019, besides presenting the strategy: his speech on domestic policy before the Federal Assembly in February, which highlighted the challenge of bringing Russia up to speed; a report on progress in implementing the national strategy, delivered at School 21 in May (see below); his speech opening the *AI Journey* conference in Moscow in November, in which he presented the broad outlines of the Russian approach and again compared AI to a “source of colossal power”.³¹

The Russian strategy contains the following definition of artificial intelligence:

“A collection of technological solutions that allow one to simulate human cognitive processes (including self-learning and the search for solutions without using a previously-supplied algorithm) and to get results, when accomplishing concrete tasks, that are at least comparable with those of the human intellect”.³²

Financially, the Presidential decree increases the budget devoted to AI from \$1.3 to \$6.1 billion, without distinguishing between civilian and military spending or stating which organizations will receive the funds. The document sets out some broad and uncontroversial principles (protection of human rights and fundamental liberties, security, transparency, integrity of the innovation cycle), while also underscoring Russia's

30. ‘O razvitii iskusstvennogo intellekta v Rossijskoj Federatsii’ [On the Development of artificial intelligence in the Russian Federation], Decree of the President of the Russian Federation, 10 October 2019, available at: <http://publication.pravo.gov.ru>.

31. ‘Poslanie Prezidenta Federal’nomu Sobraniu’ [Presidential address to the Federal Assembly], Kremlin.ru, 20 February 2019, available at: <http://kremlin.ru>; S. Shmakov, “90 milliardov rublej na razvitie iskusstvennogo intellekta” [90 billion roubles for the development of AI], *Khabr*, 16 June 2019, available at: <https://habr.com>; “Konferentsia po iskusstvennomu intellektu” [Conference on artificial intelligence], Kremlin.ru, 9 November 2019, available at: <http://kremlin.ru>.

32. “O razvitii iskusstvennogo intellekta v Rossijskoj Federatsii”, *op. cit.*

ambition to “become one of the world leaders” in AI, partly through teaching designed to reinforce the country’s strengths in science, engineering and mathematics, as well as through the availability of coding expertise.

The strategy has little to say about international competition in AI and when it does, it addresses the issue more in economic than in geopolitical terms: the two world leaders in global AI are seeking to cement their domination and secure competitive advantages over the long term. Despite Putin’s aspirations to exercise global leadership, his strategy is mainly focused on domestic matters.

The document gives prominence to research into, and development of, AI-enabled economic and financial applications, in industry, the service sector and healthcare, but applications related to security and defense are not mentioned. This is an important omission: the defense sector is always working on modernizing the country’s armed forces and developing sensitive AI applications in command and control systems, military robotics and drones (see below). Although these applications are missing from the decree, they lurk behind every recommendation from public-private partnerships to accessing finance and training specialists. On the surface, this strategy is mainly a civilian one and it outlines two priorities: the economy, via Russia’s industries, and the social sphere, including healthcare, education and public services. It places human development at the center, by insisting that training in fundamental and applied research is of a high quality.

In terms of regulation, the strategy proposes simplifying access to data, without specifying which data, establishing conditions and procedures for testing AI, reducing the barriers to exporting non-military applications and developing the ethics of AI (but without suggesting what this might look like or who Russia might partner with internationally). The first point is significant and indicates that the strategy prioritizes access to quality data in the development of AI. To this end, it calls for data (including sound, voice, medical, weather and industrial data, as well as data from surveillance systems) to be saved on updated or newly-created Russian databases in order to satisfy the requirements of those organizations developing AI. When the strategy talks of “priority access to public platforms”, it means access “for the Russian authorities”. This marks a major difference with other AI strategies, including the American one: whereas the US federal government makes public data accessible for American AI developers, the Russian strategy ensures that the state retains access to public data. “Public” is defined vaguely here, as opposed to the data collected by the state.

The State and Sberbank take center stage

This contrast shows that Russia's AI strategy is centered on the state. By underscoring the central role of the state, which was inherited from the Soviet Union, the strategy relegates the private sector to a secondary role: in Russia, 67% of the financing for R&D came from the federal budget in 2018, whereas private sources accounted for 79% in China, and 77% in the USA.³³

This emphasis on public over private investment is reflected in Russia's poor standing in international league tables: in 2019, Russia came 46th out of 129 countries in the *Global Innovation Index*, and 24th for the quality of its universities. It ranks 43rd out of 141 countries in the *Global Competitiveness Index*, between Slovakia and Cyprus, and 29th out of 194 in the *AI Readiness Index*, between Iceland and Portugal.³⁴ Russia is also going backwards in terms of investment in R&D (global and not exclusive to AI): it devotes four times less of its Gross Domestic Product (GDP) to R&D than Israel and South Korea and only half as much as France.³⁵

The strategy is working to a deadline of 2030, with a progress report due to be delivered in 2024. It will be implemented by a variety of bodies acting in coordination. Within government, the commission for digital development will be a driving force. The National AI Strategy has also been included in the national project "Digital Economy", which is being overseen by the Ministry for Digital Development. This national project consists of 13 federal projects that were launched in May 2018 and are meant to modernize the Russian economy over the medium term. Outside government, a new body will be set up coordinate the business community and research organizations.

In addition, Sberbank, the biggest bank in Russia, which had prepared the draft of the National Strategy, is set to become the commercial "center of AI development" in Russia. In a sign of the central role assigned to the bank (52% of which is owned by the Russian state), its CEO German Gref, has said that Sberbank is no longer a retail bank but an "artificial

33. "Principaux indicateurs de la science et de la technologie" [Main indicators for science and technology], OECD, 2019, available at: <https://stats.oecd.org>.

34. *The Global Innovation Index*, WIPO, Cornell University and INSEAD, 2019, available at: www.globalinnovationindex.org. *The Global Competitiveness Index*, World Economic Forum, 2019, available at: www3.weforum.org. *AI Readiness Index*, Oxford Insights et International Development Research Centre, 2019, available at: <https://ai4d.ai/wp-content>.

35. S. Karelov, "Kakim budet mesto Rossii v mire realizovannykh II-strategij?" [What will Russia's place be in a world where AI strategies have been implemented?], Russian International Affairs Council, 7 November 2019, available at: <https://russiancouncil.ru>.

intelligence company”.³⁶ Certain observers speculate that Russia’s AI policy has given the state such an important role so that it can acquire a monopoly on this new strategic resource. The partnership with Sberbank may be motivated by an alignment of interests: facing a stagnating economy, Sberbank may wish to exploit unprecedentedly large quantities of data and thereby diversify into new areas. Meanwhile, the Kremlin may be seeking to extract as much information as possible on Russian voters.³⁷ By establishing a new platform with public funds, German Gref is setting himself up as the “commercial director” of Russian AI. The Kremlin will be able use both AI and metadata to carry out much more precise targeting of voters than that undertaken by Cambridge Analytica during the 2016 US Presidential election.³⁸

This desire for control in domestic policy can also be seen in the spread of facial recognition devices across Russia, particularly in the capital. Moscow has become a national laboratory: by January 2020, it hosted a vast network of 175,000 facial recognition cameras installed by the Russian company NtechLab, which is part of the conglomerate Rostec and known for its controversial software FindFace.³⁹ Russia, like many other countries, tends to treat technology as a solution to manifold problems: this approach, which assumes that problems ranging from security, to transport, to health, can be resolved by technology, such as apps or virtual reality, has been magnified during the Covid-19 pandemic.⁴⁰ For instance, Sberbank launched an on-line test for Covid-19 based on AI algorithms (SberCovid) as well as a disinfecting robot; the Moscow government created a QR-code to monitor how closely Muscovites were abiding by official instructions on movement; and schools in Russia will be equipped with CCTV cameras that can recognize faces and will be linked to a device called “Orwell”, developed by NtechLab.

36. E. Tofaniuk and N. Uskov, “German Gref: “Transformatsiia Sberbanka—eto vechnyj protsess” [German Gref: “Transforming Sberbank is a perpetual process”], *Forbes.ru*, 22 November 2019, available at: www.forbes.ru.

37. K. Gaaze, “Kremlin Analytica: Russian Elite Sets Sights on AI”, Moscow Carnegie Center, 14 August 2019, available at: <https://carnegie.ru>.

38. *Ibid.* Also see Iu. Tishina, “Iskusstvennyj intellekt potreboval l’got” [AI demanded privileges], *Kommersant’*, 13 August 2019, available at: www.kommersant.ru.

39. S. Iastrebova, “Meriia Moskvyy vybrala tekhnologii dlia sistemy poiska i raspznavaniia lits” [The Moscow mayoralty has chosen technology for its facial detection and recognition system], *Vedomosti*, 28 January 2020, available at: www.vedomosti.ru.

40. E. Morozov, “The Tech “Solutions” for Coronavirus Take the Surveillance State to the Next Level”, *The Guardian*, 15 April 2020, available at: www.theguardian.com.

From Theory to Reality: a Militarized AI

Artificial intelligence is increasingly perceived as the “strategic facilitator” of the 21st century and the next domain for military “disruption”. Regularly compared to earlier transformative technologies such as nuclear and cyber, AI poses a very real conceptual challenge. More than a purely military area of innovation, AI denotes a group of technologies that have dual civilian and military uses. It therefore comes as no surprise that global competition in this field is connected to military superiority. In the USA and China, as well as Russia, massive investment is preparing the ground for increasing technological sophistication of their armed forces, while official debates assume a strategic context in which AI is being “militarized”. Moscow’s interest lies in upgrading its military equipment while also pursuing asymmetric tactics whereby AI serves as a tool of information warfare to compensate for Russia’s conventional inferiority relative to NATO.

The centrality of the Ministry of Defense in AI Innovation

The Russian military started to use the term artificial intelligence in 2017, after the Ministry of Economic Development organized a roundtable of that name at the *Army 2017* Military-Technical Forum.⁴¹ Since then, no event held by the Ministry of Defense has failed to include AI. 2018 was punctuated by numerous initiatives which helped to give shape to a national strategy. In March, for instance, the ministries of Defense, Education and Sciences held an AI conference, in cooperation with the Russian Academy of Sciences, and published a ten-point development plan in its wake.⁴² Although not all of the recommendations relate to the military, most of them align with the agenda of the armed forces, such as the training of high-quality experts. Other recommendations, such as that

41. See “Nauchno-delovaia programma Mezhdunarodnogo voenno-tekhnicheskogo foruma ‘Armiia-2017’” [Scientific-Business programme of the International military-technical forum ‘Army 2017’], Ministry of Defense, 22-26 August 2017, available at: <http://army2017.mil.ru>.

42. “Konferentsiia “Iskusstvennyj intellekt: problemy i puti ikh resheniia—2018” [Conference “Artificial Intelligence: problems and avenues for solving them—2018”], Ministry of Defense, 14-15 March 2018, available at: <http://mil.ru>.

AI wargames be held, suggest a wish to direct internal debates towards the “military” aspects of AI, in the broad sense of the term.⁴³

The US’s Defense Advanced Research Projects Agency (DARPA) appears to serve as a model, with the state providing capital to finance experimental projects. These yield breakthroughs in civilian technology that can also be applied to the military. Russia has chosen to prioritize facial and voice recognition, imagery and neural networks. Pilot projects in these areas are being undertaken by the Russian Ministry of Defense’s Main Directorate for Scientific Research and Engineering Support for Advanced Technologies, as well as the Foundation for Advanced Research. The latter was founded in October 2012 at the behest of Defense Minister Shoigu, and its annual budget is only 2% of DARPA’s (around \$60 million compared to \$3 billion). It pursues the goal set out by Shoigu’s predecessor Anatoly Serdyukov, to modernize the Russian military. Envisaged as Russia’s answer to DARPA, the Foundation is meant to allow Russia to catch up technologically with the United States. It contains 46 laboratories and concentrates its efforts on 15 “advanced projects”. So far, it has developed specific applications in image recognition, modelling of how human learning processes can be applied to training and in the extraction of critical information from *big data*. Since 2015, however, it has concentrated its efforts on military robotics and this focus has only intensified since the summer of 2018, when Deputy Prime Minister Yuri Borisov, who is responsible for the defense and space industries, became President of the Foundation’s Board of Directors.

AI and/or robotics?

Before proceeding further, it is worth noting that, in Russia as elsewhere, AI is often confused with the automation that arises from the use of robots (avoidance of obstacles, automatic navigation etc.). Artificial intelligence and automation are two different things, but they are closely connected and often discussed together: “AI” refers to a system’s ability to determine the best way for an action to achieve its objectives, while “automation” denotes the freedom of a system to accomplish its objectives. AI can facilitate automation because intelligent systems can be given greater latitude. For example, the Russian military encyclopedia recognizes this nuance when it describes the three successive generations of fighting robots⁴⁴; third-generation “intelligent” robots, so-called because they contain control systems based on AI, are still in the prototype phase. Until 2018, however, what is now thought of as belonging to the field of AI was associated with robotics.

43. *Ibid.*

44. “Boevoy robot” [Fighting Robot], Encyclopedia, Ministry of Defense, available at: <http://encyclopedia.mil.ru>.

In September 2015, the Ministry of Defense backed an action plan to automate 30% of its military platforms by 2025. The program made it a priority to “design driverless vehicles in the form of automated systems, as well as solutions for military use in variable environments”.⁴⁵ A year later, the government adopted a national strategy for scientific and technological development that endorsed the armed forces’ drive to accelerate the automation and digitization of its military equipment and doctrine.⁴⁶

From 2025 onwards, military robotics will underlie all developments in weapon systems and artificial intelligence for the armed forces and security services. An alliance with industry should facilitate this change. This is the role allotted to the ERA “technopolis”, which has brought together almost 600 researchers and 12 companies on its campus in Anapa, near Krasnodar.⁴⁷ ERA was opened in June 2018 and 80 research bureaus announced that they would soon establish themselves there, bringing the total to 2000 researchers. ERA is supposed to be the key-stone for all the inter-ministerial initiatives in AI, as well as in other strategic areas such as cyber-security and nano-technology. ERA will also bring together innovative technology developed by civilian incubators such as Skolkovo in Moscow and start-ups like NtechLab, in facial recognition, and Zyfra, in data analysis. ERA is clearly inspired by the clusters of military research facilities developed in China, but the less-than-stellar performance of Skolkovo in terms of public-private technology partnerships raises some doubts about its future success.⁴⁸ Lastly, some observers lament the fact that, at present, military robotics is driving the development of AI in Russia, to the detriment of civil industrial research.⁴⁹

Playing catch-up in technology

Beyond these issues of resources and governance, Russia’s armed forces and defense industry have begun a long-term effort to close the technology gap, compared with China and the USA. As part of this effort, AI represents a means to an end rather than an end in itself. The armed forces’ priorities

45. A. Stepanov, “Otsy F.E.D.O.R.a” [The fathers of FEDOR], *Nasha Versiia*, 13 September 2018, available at: <https://versia.ru>.

46. *Strategiia nauchno-tehnologicheskogo razvitiia Rossijskoj Federatsii* [Scientific-technological development strategy of the Russian Federation], Presidential Decree of the Russian Federation, 1 December 2016, available at: <http://online.mai.ru>.

47. I. Sidorkova, “Voennoe Skolkovo: zachem Shoigu stroit tekhnopolis v Anape” [A military Skolkovo: why Shoigu is building a technopolis in Anapa], *RBK*, 13 March 2018, available at: www.rbc.ru. Also see I. Elkov, “Nasha ERA: v voennom tekhnopolise v Anape sozdaiut kiborgov s iskusstvennym intellektom” [Our ERA: military technopolis in Anapa builds artificially intelligence cyborgs], *Rossijskaia Gazeta*, 19 February 2019, available at: <https://rg.ru>.

48. Interview with a Russian military analyst, April 2020.

49. A. Neznamov, “Robototekhnika i II v Rossii: razrabotki est’, a zakonodatel’stva—poka net’ [Robotics and AI in Russia: developments but no legal framework], Russian International Affairs Council, 4 April 2019, available at: <https://russiancouncil.ru>.

include incorporating AI components in various weapon systems, such as electronic warfare systems, air defense, guided missile systems and drones.⁵⁰ Many such platforms have been developed and tested over the last five years, notably in Syria, where Russia's military tactics have undergone a number of notable changes.⁵¹ Russia's ambitions can also be seen in some major industrial projects such as the T14 Armata main battle tank (in reality, a crew-less, remotely operated platform), the Su-57 multi-role fifth-generation fighter jet, and automated systems for intelligence gathering, surveillance of sensitive areas, logistics and fire support.

A crucial element of Russia's approach relates to the automation of the battlefield: Russia's military leaders hope that soldiers can be replaced on the front line by semi-autonomous and remotely-operated military platforms. In the land domain, the first Russian fighting robots appeared a decade ago and were able to mirror human activities in a way that suggested that the logic of land warfare might change fundamentally. In 2017, the Kalashnikov group, 51% of which belongs to Rostec, announced that it had developed an automated combat module, based on neural network technology, that could identify targets independently and then make appropriate decisions. Experiments have already been conducted with automated grenade launchers, mortars and disposable drones, which should be able to accomplish tasks independently, with minimal input from human operators.⁵² Most of the major players in the Russian military-industrial complex—Sukhoi, Vega, Uralvagonzavod etc.—have been developing such technologies.⁵³

Nevertheless, judging Russia's progress in military AI remains difficult because Russian officials are keen to showcase the supposed capabilities and performance of these strategic systems but have not necessarily proved how effective they actually are. Another source of difficulty is the dual civilian-military nature of AI.

50. K. Tigrov, "V Minborony rasskazali o primenenii iskusstvennogo intellekta v VS RF" [Ministry of Defense talks of using AI in the Russian Armed Forces], *Zvezda*, 15 March 2018, available at: <https://tvzvezda.ru>.

51. See D. Adamsky, "Moscow's Syria Campaign: Russian Lessons for the art of Strategy", *Russie.Nei.Visions*, No. 109, Ifri, July 2018. For a critical reading of the evolution in Russian strategic culture, see P. Baev, "Transformation of Russian Strategic Culture: Impacts from Local Wars and Global Confrontation", *Russie.Nei.Visions*, No. 118, Ifri, June 2020, available at: www.ifri.org.

52. R. Fakhrutdinov, "Vojna mashin: Rossiia sozdaet gruppirovki boevykh robotov" [War of the Machines: Russia creates groups of fighting robots], *Gazeta.ru*, 23 November 2019, available at: www.gazeta.ru.

53. A. Galanina, D. Liudmirskij, R. Krecul, "Oruzhie razuma: rossijskij put' k voennomu iskusstvennomu intellektu" [Weapon of the mind: the Russian path to military AI], *Izvestia*, 22 November 2018, available at: <https://iz.ru>.

Strategic consequences

The race towards “intelligent weapons”, which has been described many times in recent years, may be underway.⁵⁴ Russia, China and the United States have all embarked on developing and deploying semi-autonomous and autonomous maritime weapon systems on a large scale. The strategic objective is to “net”, control and defend vast maritime zones, both on the surface and under water. In this way, automation is becoming a decisive factor in the power that Russia can project in the air, maritime, land and cyber domains. This new pattern distinguishes today’s world from the post-1945 international order in the sense that no actor is able to gain ultimate superiority in military technology and impose it on the rest of the world. Debates on such issues are taking place among Russian experts, some of whom believe military AI will produce a new generation of asymmetric responses, that could exacerbate global instability. For example, there are no international rules governing the use of naval drones.⁵⁵

At the international level, however, Russia strongly opposes any treaty that would regulate the use of lethal autonomous weapon systems such as killer robots, AI-guided missiles or armed drones. Moscow’s diplomatic activity in this area aligns with that of the US and led, in autumn 2018, to the blocking of any movement towards a ban or moratorium on these weapon systems. The Russian authorities remain unwilling to broach the ethical problems thrown up by AI, seeing them as a potential operational and strategic constraint. They prefer to hand this task to the scientific community instead.⁵⁶ On both counts, Russia’s reticence is connected to its lack of scruples about using lethal autonomous weapons.

Disinformation and more disinformation

When harnessed to AI, disinformation and subversion can become more dynamic, increasing the confusion about authenticity, altering the practice of asymmetric warfare and making such activity harder to attribute.⁵⁷ Recent experience has shown Russia to be a skilled operator in this area,

54. E.M. Geist, “It’s Already Too Late to Stop the AI Arms Race—We Must Manage It Instead”, *Bulletin of the Atomic Scientists*, Vol. 72, No. 5, 2016, pp. 318-321; J. Haner, D. Garcia, “The Artificial Intelligence Arms Race: Trends and World Leaders in Autonomous Weapons Development”, *Global Policy*, Vol. 10, No. 3, September 2019, pp. 331-337.

55. V. Koziulin, “Iskusstvennyj intellekt v voennoj sfere: ugrozy i novaia gonka vooruzhenij” [AI in the military sphere: threats and a new arms race], PIR-Tsent, November 2018, available at: www.pircenter.org.

56. F. Morgan, et al., *Military Applications of Artificial Intelligence. Ethical Concerns in an Uncertain World*, Santa Monica, RAND Corporation, 2020, p. 95; K. Krivotulova, “Riski slishkom vysoki” [The risks are too high], *Lenta.ru*, available at: <https://lenta.ru>.

57. J. Nocetti, “Intelligence artificielle et politique internationale [...]” *op. cit.*, pp. 25-26.

combining cyber operations with actions designed to produce a cognitive effect.⁵⁸ In March 2018, Deputy Defense Minister Yury Borisov declared that expertise in AI was needed to effectively counter Russia's adversaries in the information and cyber domain.⁵⁹

AI specialists also have an interest in cyber-space due to the relative absence of physical limits. Cyber conflict could soon feature automated attacks and cyber weapons that reproduce themselves. AI will probably lead to breakthroughs in both offensive and defensive cyber because it will allow cyber vulnerabilities to be found and remedied more quickly. Exercises and simulations are almost certainly going on in this area in Russia, even if it remains difficult to say more due to their sensitivity.

AI-enabled asymmetric warfare is not a Russian innovation: the skill involved in Moscow's recent information operations lay less in technical sophistication than in profound opportunism in the service of political objectives. The Russian actors involved did not need to create their own infrastructure and did little more than resort to digital tools and services used by the general public. At the same time, they exploited little-noticed flaws in the economic model of the big digital platforms and recognized how they could manipulate algorithms designed for targeted advertising, for political purposes.

Three potential opportunities will open up as AI comes to have a greater impact on the functioning of the digital economy. First, advances in machine learning will make fake media content fast, cheap and easy to produce. AI-enabled audio and video distortions ("deep fakes") are already available through apps like FaceApp or Zao. As the barriers to entry for such tools diminish, their attraction to resource-strapped agencies will increase. Although most Russian disinformation still remains "static" - the spreading of distorted information, memes, adverts—potential advances in AI could make disinformation more dynamic and harder to defend against. Second, progress in affective computing and natural language processing will make it easier to manipulate human emotions and extract sensitive information without resorting to classic piracy. Third, it will be possible to precisely target a certain group with deep fakes and other manipulative

58. For a detailed reading of Russian cyber activity during the Ukraine conflict, see A. Greenberg, *Sandworm: A New Era of Cyberwar and the Hunt for the Kremlin's Most Dangerous Hackers*, New York: Doubleday, 2019. To trace the digital influence operations attributed to Russia, see T. Rid, *Active Measures: The Secret History of Disinformation and Political Warfare*, New York: Farrar, Strauss & Giroux, 2020.

59. 'Razvitie iskusstvennogo intellekta neobkhodimo dlia uspehnogo vedeniia kibervojn' [The Development of AI is necessary for the successful waging of cyber-war], Russian Ministry of Defense, 14 March 2018, available at: <https://function.mil.ru>.

content because of improvements in the networks for distributing such content.⁶⁰

Russia will probably not be the driving force behind any of these looming dangers. It will adapt to the rapid evolution of the world's digital landscape and strengthen its expertise in the applications of AI—such as vocal and facial recognition—which offer strategic openings that it would not have obtained via conventional routes.

60. A network for distributing content is a geographically dispersed network of proxy servers and data centers that quickly provide web content to users. J. Nocetti, "Typologie et évaluation de la prochaine génération d'outils de guerre informationnelle" [Typology and assessment of the next generation of information warfare tools], working document.

Brains, Data and Chips: Russia's Strengths and Weaknesses in AI

The race towards AI is not simply a question of resources. It is also a battle between models that connect the different aspects of AI—particularly its three pillars of data, calculating power and the suitability of algorithms—into a powerful tool capable of shaping the international system. In this respect, Russia suffers from several weaknesses, related to its weak hold over a range of material and immaterial factors crucial to AI—the harnessing of data, the ability to design its own advanced electronic components—and its ability to train but, most importantly, retain and attract “brains”.

The paradoxes of Russian expertise in AI

A solid educational base but a modest scientific impact on the world

It is well known that mastering AI demands high-quality science.⁶¹ Paradoxically, Russia's expertise in basic research is both a strength and a vulnerability. The Russian authorities are keen to showcase the recent performance of the Moscow Institute of Physics and Technology (MIPT) where they have funded the creation of a national center for artificial intelligence, which is meant to coordinate Russia's expertise in this area.⁶² MIPT teams have won several prizes, including ones financed by Google and Amazon, and they opened a joint research laboratory with Huawei in March 2020—a sign that they are highly regarded.⁶³

The issue of advanced training in AI should also be seen alongside the issue of governance. Like cyber, AI has, over the last decade, become a “resource” that it pays to control. Symbolically, the hype around AI and its

61. J. Nocetti, “Intelligence artificielle et politique internationale”, *op. cit.*, pp. 29-30.

62. “MFTI stal centrom NTI po napravleniiu Iskusstvennyj intellekt” [MFTI becomes the national center for coordinating AI], MFTI, 29 December 2017, available at: <https://mipt.ru>.

63. “MFTI i Huawei otkryli sovmestnuiu R&D-laboratoriiu po razrabotke tekhnologij iskusstvennogo intellekta” [MFTI and Huawei open their own R&D laboratory to develop AI technology], MFTI, 5 March 2020, available at: <https://mipt.ru>.

strategic importance makes it an ideal means by which a political figure or head of a state enterprise can display his or her loyalty to the federal authorities. In material terms, AI opens up prospects for growth and economic opportunity in new areas. If it is too early to talk of a “clan struggle” to monopolize AI, two recent developments are worth underlining. On the one hand, School 21 was founded in partnership with Sberbank to train specialists in algorithms, robotics, information security and AI. The school welcomed Putin to its Moscow premises in May 2019 for his presentation on Russian policy towards AI.⁶⁴ On the other hand, an institute dedicated to AI was launched this year within Moscow State University (MGU), in partnership with the Innopraktika Foundation. Its Director is Katerina Tikhonova, Vladimir Putin’s younger daughter. The Institute has been endowed with \$59 million and benefited from support from the Russian Direct Investment Fund. The bosses of Russia’s biggest public consortiums (Rostec, Rosneft, Rosatom, Gazprom, Inter RAO etc.) sit on its Board of Directors.⁶⁵

Moreover, by drawing on the system of higher education inherited from the Soviet Union, the authorities can be sure of still having a solid education base. Nonetheless, the difficulty in replacing professors has a baleful effect, as does the lack of cooperation between university laboratories and the private sector.⁶⁶ This latter weakness can be seen in Russia’s modest contribution to the world’s patents in algorithms and AI. The quality and quantity of scientific publications are fundamental to a country’s technological attractiveness. Publications and patents are, in reality, impossible to separate from each other. Russia comes 14th in the world for registering patents, between Austria and Spain and far behind the United States and China.⁶⁷

These facts are reflected in the main international rankings: the Shanghai Ranking puts only one Russian university in the world’s top 300—MGU at 93rd in 2020—while the Times Higher Education puts it lower, at 189th. In computer science, MGU remains the highest rated university in Russia, but it has slipped down the world league tables from 43rd in 2017 to 101-125 in 2020.⁶⁸

64. “Soveshchanie po voprosam razvitiia tekhnologij v oblasti iskusstvennogo intellekta” [Session on the development of technology in the area of AI], Kremlin.ru, 30 May 2019, available at: <http://kremlin.ru>.

65. A. Krechetova, “Katerina Tikhonova vozglavila Institut iskusstvennogo intellekta MGU” [Katerina Tikhonova heads MGU’s AI Institute], *Vedomosti*, 28 February 2020, available at: www.vedomosti.ru. Also see <https://innopraktika.ru>.

66. Interview with an IMEMO researcher, March 2020.

67. France is 11th. See *Artificial Intelligence*, “Technology Trends 2019” report, World Intellectual Property Organization, 2019, p. 86, available at: www.wipo.int.

68. *Times Higher Education World University Rankings*, 2017, 2018, 2019, 2020. MGU’s rankings are available at: www.timeshighereducation.com.

Harnessing Russian expertise

The situation of Russian university teaching cannot alone explain this poor performance. Stiff competition has developed since the early 2000s in university training for computer science and the hard sciences, which has made capturing the best brains a priority for digital economies. Training up talent has also come to mean attracting highly qualified experts and preventing a brain drain. Both are difficult for Russia and they have become a major vulnerability for the country, as predicted since the end of the Soviet period.⁶⁹ If the pace of emigration slowed during Vladimir Putin's first two terms and was low during the presidency of Dmitry Medvedev, the brain drain accelerated after 2012 and reached a peak in 2014-2017, mainly due to the deterioration of the economic and political environment after 2014.⁷⁰ A survey in 2018 found that 57% of Russians under 30, and 46% of the whole working-age population, would like to work abroad.⁷¹ The total number of researchers in Russia has declined continuously. Work published by the OECD reveals that 2005 and 2016, Russia "lost" more than 140,000 researchers, contrary to global trends.⁷² In high-tech sectors, the consequences are visible, with half of the 1300 enterprises in Russia's military-industrial complex short of workers. The average age of specialists in Russia's defense industry is over 50, while under-30s make up only 4% of the workforce.⁷³

Most of the talent that has left Russia has found a home in Silicon Valley, Israel or Great Britain, while Russian investment often targets starts-ups that were founded by compatriots abroad. The example of Silicon Valley is indicative: since the end of 2017, Sberbank has acted to accelerate promising projects and, with the help of the Internet Initiative Development Fund and the FortRoss venture capital firm, it has launched a platform to help Russian tech entrepreneurs develop in California. Distrust persists in America, however, about giving Russian engineers access to

69. For example: A. Korobkov and Zh. Zaionchkovskaia, "Russian Brain Drain: Myths vs Reality", *Communist and Post-Communist Studies*, Vol. 45, No. 3-4, Sep-Dec. 2012, pp. 327-341; L. Rakhmatulina and K. Babenko, "Problema utechki mozgov v Rossii" [The problem of brain drain in Russia], *Evrazijskij Soiuz Uchenykh*, Vol. 14, No. 5, 2015, pp. 50-51; T. Naumova, "Russia's 'Brain Drain'", *Russian Social Science Review*, Vol. 39, No. 2, 1998, pp. 49-56.

70. T. Lomskaia, "Utechki mozgov" iz Rossii usililas" [Brain drain from Russia increases], *Vedomosti*, 23 January 2018, available at: www.vedomosti.ru.

71. R. Strack, *et al.*, "Russia Faces a Talent Conundrum", Boston Consulting Group, June 2018, available at: www.the-network.com.

72. "Main Science and Technology Indicators", OECD, 2019, available at: <https://stats.oecd.org>.

73. V. Tsevtkov, "Oboronno-promyshlennyj kompleks Rossii: problemy i perspektivy razvitiia" [Russia's military-industrial complex: problems and development prospects], presentation at the conference "Ekonomicheskij potentsial promyshlennosti na sluzhbe oboronno-promyshlennogo kompleksa" [The Economic potential of industry at the service of the military industrial complex], Financial University Under the Government of the Russian Federation, Moscow, 9-10 November 2016, p. 7, available at: www.ipr-ras.ru.

sensitive data.⁷⁴ The emigration of Russian tech employees to Israel has reached new heights since Israel started to aggressively market itself within Russia as a “start-up nation”.⁷⁵ As a result, some of the world’s best AI and cyber security firms, like Technion in Haifa or the Weizmann Institute, are overflowing with researchers of Russian origin.⁷⁶

It is also worth noting the “internal brain drain”, another phenomenon that is not unique to Russia. When a laboratory is opened or a research chair established in Russia (most often in Moscow), the world’s great digital and telecoms companies often hire Russian scientists and programmers. Nine Russian universities, four of them in Moscow, have launched a partnership with Microsoft to finance Masters courses in AI.⁷⁷ The South Korean company Samsung also opened an AI center in Moscow in 2018 at the intersection between applied research—computer vision, deep learning, robotics etc.—and the stimulation of Russian technical communication (it organizes competitions in pure mathematics, finances projects etc.).⁷⁸ As for the Chinese company Huawei, which has been working in Russia for a long time, it is deepening its presence, against the backdrop of US sanctions against it. Its two R&D centers in Moscow and St Petersburg will hire more than 1,000 experts in AI and telecoms networks and the company is also forging numerous academic partnerships, including on 5G.⁷⁹ Until now, the authorities have done nothing to prevent this type of investment. “Rather than see young talent leave Russia, they far prefer to watch the Russian economy prospering while keeping a wary eye on the activity [of these actors on Russian soil]”.⁸⁰

Aside from this method of retaining talent, Russia is largely failing to keep its best brains, despite official claims to the contrary. The state’s major role in financing AI often translates into low salaries. On average, a developer’s salary in Russia is only 25% of what it would be in America.⁸¹ The low level of qualified immigration into Russia continues to hold back its tech industry: in 2017 and 2018, the number of immigrants into Russia

74. J. Dunn, “A New Breed of Russian Startups Make Their Debut in Silicon Valley”, *Tech Times*, 13 June 2019, available at: www.techtimes.com.

75. Interview with a Russian journalist, May 2020.

76. Interview in Tel Aviv, January 2020.

77. L. Bulanov, “V devyati rossijskikh vuzakh startovali masterskie programmy pri podderzhke Microsoft” [Nine Russian universities have started masters programmes with support from Microsoft], *Khabr*, 20 September 2019, available at: <https://habr.com/ru/>.

78. “AI Center—Moscow”, <https://research.samsung.com>.

79. See K. Jukova, “Huawei usilivaet rossijskij tsentr razrabotki” [Huawei reinforces Russian development center], *Vedomosti*, 14 August 2019, available at: www.vedomosti.ru ; “Huawei i MFTI otkryvaiut nabor na masterskuiu programmu v oblasti setej 5G” [Huawei and MFTI start recruiting for a Masters program in 5G networks], MFTI, 20 April 2020, available at: <https://mipt.ru>.

80. Interview with a Russian economic journalist, April 2020.

81. ‘Tech Entrepreneurship Ecosystem in the Russian Federation’, OC&C Strategy, 2018, p. 11, available at: www.occstrategy.com.

declined significantly.⁸² By contrast, more than half of engineers and developers in Silicon Valley are immigrants.⁸³

Electronics, robotics and computing: playing catch up

It is not possible to make AI products without the help of components. Among these, semiconductors stand out⁸⁴: they are becoming ever smaller, are becoming more commonly used and now constitute a highly globalized industry. They also have strategic implications due to tensions between China and the USA. In the last two years, industrial and geopolitical questions have become intertwined: China is pursuing automation and trying to make its chips as technologically sophisticated as American ones, while the USA wants to remake global value chains in this industry and tighten its control over critical components for its digital weapons.

In this complex ecosystem, Russia is a second-string player. The Russian electronic component industry, which largely supplied the defense, space and nuclear industries, saw its production nosedive after the breakup of the Soviet Union.⁸⁵ The proportion of electronic equipment produced and consumed in Russia declined by around 12%: in OECD countries, domestic production accounts, on average, for 70-80% of domestic needs.⁸⁶ The 2000s saw Russia retreat still further as the gap with the United States and China grew: by 2016, 80% of IT in Russia was reportedly imported⁸⁷, reinforcing the idea that Russia had missed out on a revolution in these fields.⁸⁸ Russia accounted for just 0.44% of the global production of chips in 2009⁸⁹ and its share increased only slowly thereafter, never surpassing 3% in the 2010s and falling again after 2014 and the West's imposition of

82. "Ezhemesiachnyj monitoring sotsial'no-ekonomicheskogo polozheniia i samochuvstviia naseleniia (2015-2018)" [Monthly monitoring of the socio-economic state and wellbeing of the population (2015-2018)], Institute for Social Analysis and Forecasting, RANEPa, December 2018, pp. 41-44, available at: www.ranepa.ru.

83. F. Manjoo, "Why Silicon Valley Wouldn't Work without Immigrants", *The New York Times*, 8 February 2017, available at: www.nytimes.com.

84. Solid bodies that allow electrical conductivity, semi-conductors are fundamental to all electrical components in IT and telecoms devices, TVs, automobiles and domestic appliances.

85. T. Dzhililov, N. Pivovarov, "Istoriia sovetskoi elektronnoi promyshlennosti (konets 1950-kh-1960-e gody)" [History of the Soviet electronic industry (late 1950s-1960s)], presentation at the 4th international conference on information technology in Russia and the former Soviet Union (SORUCOM), Zelenograd, 3 October 2017.

86. V. Borisov, "Rossijskaia elektronika v XXI veke: globalizatsiia i natsional'nye interesy" [Russian electronics in the 21st century: globalization and national interests], Presentation at the 9th conference on the history of technology and museums, Moscow, 6-8 December 2016.

87. S. Tolkachev, A. Teplyakov, "Import Substitution in Russia. The Need for a System-Strategic Approach", *Problems of Economic Transition*, Vol. 60, No. 7, 2018, pp. 545-577.

88. A. Wilson, "Computer Gap: The Soviet Union's Missed Revolution and Its Implications for Russian Technology Policy", *Problems of Post-Communism*, Vol. 56, No. 4, 2009, pp. 41-51.

89. "Russian Semiconductor Industry: Current Situation and Perspectives", *Sistronics*, June 2011, available at: www.semiconrussia.org.

sanctions.⁹⁰ In 2013, the Vice President of the Russian Union of Engineers described the national electronics industry as being “in a state of advanced obsolescence”.⁹¹ Russia’s leaders subsequently began to address the problem: in 2016, Putin set the goal of increasing the production in Russia of sophisticated civil and dual-use electronic components.⁹² And yet, by 2018, these still only accounted for 27% of Russian consumption.⁹³

Two years later, and with the technological rivalry between China and the USA having intensified, advanced semiconductors in Russia are part of a movement to catch up technologically and to make the sector “sovereign”. Producing one’s own components is one of the prerequisites for digital sovereignty.⁹⁴ In January 2020, the new Prime Minister Mikhail Mishustin oversaw the approval of the “Strategy for the Development of the Russian Electronic Industry until 2030”.⁹⁵ The strategy sets out three stages: a first phase of import-substitution, followed by a phase of promoting Russian technology on international markets and, finally, an attempt to achieve technological dominance. The strategy is highly ambitious and exemplifies the worldwide trend towards protectionism in technology, which flies in the face of geo-economic constraints such as the destabilization of supply chains, as well as technological ones, such as the miniaturization of ever-more-sophisticated chips. As in China, the problem is less about having the appropriate skills and more about the ability to build the ecosystem that is needed to use semi-conductors. Nevertheless, some recent events point to a pro-active approach, such as the recent purchase of a controlling stake in the Russian company Syntacore. Syntacore is the founder of an international consortium which is developing an open source processor architecture designed to rival world leaders such as Intel.⁹⁶

Russia’s share of the world robotics industry is also small. The country does not feature in the top five markets in the world for industrial robots. The low density of robots in Russian industry—four robots for every 10,000 workers in 2017, compared to 710 per 100,000 in South Korea—points to an obvious potential for growth. The number of such robots

90. A. Volostnov, “Microelectronics Market Overview”, Presentation at the SemiExpo 2019 Conference, Moscow, 14 May 2019, available at: <http://semiexpo.ru>.

91. V. Gutenev, “Radio uzhe ne lovit” [The radio is no longer catching], *Rossiiskaia Gazeta*, 16 April 2013, available at: <https://rg.ru>.

92. “Poslanie Prezidenta Federal’nomu Sobraniuu” [Presidential Address to the Federal Assembly], Kremlin.ru, 1st December 2016, available at: <http://kremlin.ru/events>.

93. A. Volostnov, “Microelectronics Market Overview”, *op. cit.*

94. A. Berzukov, “Mirovye pole boia” [A worldwide battlefield], *Izvestia*, 9 November 2017, available at: <https://iz.ru>.

95. *Strategy for the Development of the Electronic Industry until 2030*, Government of the Russian Federation, 17 January 2020, available at: <http://government.ru>.

96. Beforehand, Huawei may have wished to acquire Syntacore. I. Korolev, “Postavchchik ‘zheleza’ dlia ‘zakona Iarovoj’ kupil rossijskogo razrabochika mikroprotsessornykh iader” [Supplier of ‘iron’ for the Yarovaya law buys Russian micro-processor manufacturer], CNews.ru, 5 November 2019, available at: www.cnews.ru.

increased from 703 in 2017 to 1007 in 2019. Moreover, Russia faces the same problem with homegrown production as it does in other areas, with only 4% of purchased robots having been produced in Russia. Added to this are the lack of experience of Russian companies, as well as the fact that technical universities tend to be focused on robot design and engineering, not on commercial applications.⁹⁷ Lastly, the cost of investment in robots and the absence of qualified staff to maintain them represent two other obstacles to their development.⁹⁸

Another area where the AI race is playing out is in computing power. A “battle for the supercomputers” has been underway now for several years and is a matter of both prestige and industrial know-how. Rival powers, particularly the USA and China, are engaged in bitter competition to develop and harness the best supercomputers. Russia is not absent from this or from the field of quantum computing: indeed, Russia was a contender in the early 2000s before fading away due a lack of investment. In 2017, the combined performance of the best 50 supercomputers in Russia generated less computing power than each of the best nine supercomputers in the world, considered separately.⁹⁹ Crucial to the future of AI because they will allow ultra-fast modelling of various indicators (security, health, environment etc.), supercomputers are the focus of a government program to make up the 5-10 year lag between Russia and the most advanced powers.¹⁰⁰ Rosatom is trying to come up with a Russian quantum computer by 2024, while Sberbank announced in 2019 that its supercomputer, which was developed jointly with the American company Nvidia, was the 29th most powerful in the world.¹⁰¹

Data: international isolation and national desires

Paradoxically, Russia’s relative isolation is both a strength and a weakness. Russia is one of the few countries to have developed its own platforms complete with whole ecosystems, such as VK, Yandex and Mail.ru. This isolation limits the extent to which American and Chinese companies can

97. A. Skrynnikova, “Bol’she vsego robotov v Rossii pokupaet avtoprom” [Most robots in Russia are bought by the automobile industry], *Vedomosti*, 19 September 2019, available at: www.vedomosti.ru.

98. A. Duel’, “Robot prositsia iz kletki” [The robot asks to leave his cage], *Rossijskaia Gazeta*, 25 April 2020, available at: <https://rg.ru>.

99. M. Feldman, “Top-500 Meanderings: Russia’s New Supercomputing Rankings Reflect Sluggish Growth in HPC There”, *Top500.org*, 7 April 2017, available at: www.top500.org.

100. Q. Schiermeier, “Russia Joins Race to make Quantum Dreams a Reality”, *Nature*, 17 December 2019, available at: www.nature.com.

101. See Z. Mamed’iarov, “Bor’ba za kvantovoe prevoskhodstvo” [The Struggle for Quantum Superiority], *Ekspert*, No. 40, 30 September 2019, available at: <https://expert.ru>; M. Iushkov, “Superkomp’iuter Sberbanka popal v top-30 mirovogo rejtinga” [Sberbank’s super-computer is amongst the top-30 in the world], *RBK*, 19 November 2019, available at: www.rbc.ru.

harvest data. Having its own infrastructure allows Moscow to adopt stringent laws, such as the one passed in 2015 which forces foreign digital platforms to keep the data of Russian citizens on Russian soil. Companies such as VK were initially developed without state interference and they came to develop a strategic character that attracted the interest of the authorities. The drive to create a “sovereign internet”, begun a decade ago and sharply accelerated since 2019, has resulted in a “taming” of Russia’s digital companies, which have been forced to collaborate with the government.¹⁰² This process means that personal and industrial data in Russia is being exploited at a quasi-national level. Currently, there is no legal framework in Russia for regulating big data, whose mastery will be a crucial advantage in the global competition for AI.

There are three implications worthy of analysis. The first is a result of Russia’s relative digital isolation, coupled to its demographic problems: in absolute terms, little data is produced and exploited in Russia. This is a problem since data is the raw material of AI systems: *machine learning* involves “training” larger and larger datasets to become efficient and avoid algorithmic biases.

Second, Russia is poorly integrated into cross-border exchanges of data. Its lack of respect for intellectual property rights discourages foreign companies from setting up there.

Third, the lack of a real internal market in data in Russia may in fact be deliberate. Data represents such an economic and political prize that the main “oligarchs” work to prevent a unified market from forming so that they can seek ownership over data pertaining to whole sectors of the economy.¹⁰³ This is particularly true of data relating to transport, health and education, which are coveted, respectively, by the Rotenberg family, Rosatom, Rostec, and Rostelecom. In the absence of laws governing the protection of personal data in Russia, similar to the General Data Protection Regulation (GDPR) in the European Union, the rules are not clear and the law on personal information is modified by numerous amendments pushed by companies like Megafon and Mail.ru, which belong to Alisher Usmanov.¹⁰⁴ This third tendency could be strengthened by the rollout of 5G networks and the increasing pervasiveness of facial recognition systems in Moscow and St Petersburg, which will allow much deeper inter-connectivity between the data that feeds the AI systems.

102. See J. Nocetti, “La Russie en quête de son ‘Internet souverain’” [Russia in search of its Sovereign Internet], *op. cit.*

103. A. Prokopenko, “Tsifrovye otkupa. Kak Kreml’ razdaet monopolii na bol’shie dannye” [Digital monopolies. How the Kremlin is granting monopolies on big data], Carnegie Moscow Center, 2 October 2018, available at: <https://carnegie.ru>.

104. *op. cit.*

The Ambiguities of Cooperation with China

Though often seen as bombastic, Putin's statements in 2017 were designed to position Russia in relation to China, at a time when Beijing is asserting itself politically and strategically over AI. Two months beforehand, the Chinese leadership had unveiled an \$148 billion plan to make China the world leader in AI by 2030, provoking an international contest with the USA. If Chinese-US bipolarity in technology and digital affairs is already a reality, Russia is lagging behind. Yet cooperation in technology has become a priority in the bilateral relationship between Moscow and Beijing.

In September 2018, under the auspices of the Russian and Chinese sovereign wealth funds, a new Russo-Chinese fund was created to invest in new technologies, and it was given \$100 million for phase one. It has placed the financing of technology projects on a more regular footing and focuses on research in AI.¹⁰⁵ Russian and Chinese leaders regularly congratulate themselves on the benefits of their cooperation in AI applications—like facial recognition, natural language processing and computer vision—and in advanced robotics. It is in this latter field that cooperation is most consensual and exchange the most (organization of rotating conferences, hosting scientists, signing agreements etc.). Certain symbolic areas of cooperation are about displaying the strength of the bilateral relationship, such as the facial recognition camera developed jointly by Russia's NtechLab and the massive Chinese video-surveillance firm Dahua Technology, which was presented in May 2019.¹⁰⁶ Many other joint projects have sprung up. In general, it is Chinese companies that are making efforts to open up markets. Since 2018, the Russia-China relationship in this area has gone beyond just rhetoric: technology parks have been created with mixed teams, like the ones in Novosibirsk and Harbin, a technology incubator has been launched that is dedicated to young Russian and Chinese entrepreneurs and Russian entrepreneurs have

105. "RICF and Tus-Holdings Expand Comprehensive Cooperation in the Technology & Innovation Sector", Russia-China Investment Fund, Vladivostok, September 2018, available at: <http://rcif.com>.

106. S. Iastrebova, P. Kantyshev, A. Nikol'skij, "Politsejskie testiruiut kompaktnye kamery dlia raspoznavaniia lits" [Policemen test compact cameras for facial recognition], *Vedomosti*, 21 May 2019, available at: www.vedomosti.ru.

been invited to present their projects in front of Chinese investors at the St Petersburg International Economic Forum.¹⁰⁷

Huawei remains the key Chinese player in AI in Russia. The company has had a presence on Russian soil since the second half of the 1990s but has intensified its efforts since 2015, when a new agreement was signed that strengthened the strategic partnership between Moscow and Beijing.¹⁰⁸ The five years since then have seen the rise of China's 'New Silk Road' project. The project's technological element is designed to help Chinese tech firms ramp up their activities in AI, big data, 5G networks and so-called "safe cities".¹⁰⁹ If Alibaba was the first Chinese mega-firm to conclude a big agreement in Russia, by forming a joint venture with the Russian Direct Investment Fund, Megafon and Mail.ru, Huawei has also stepped up its presence in response to the imposition of US sanctions against the company in May 2019. Since then, the Chinese company has acquired facial recognition technology from the Russian company Vocord for \$50 million, forged new academic partnerships with AI research centers in Moscow and announced at AI Journey that it sought to build an "AI ecosystem" in Russia by 2025 by quadrupling its R&D expertise there. In March 2020, the company Shenzhen and Sberbank agreed to launch a cloud-computing joint venture. Its name, SberCloud.Advanced, is something of a ruse so that Huawei can continue its activities in Russia without falling foul of US sanctions.¹¹⁰ Above all, Huawei is seeking the right to build Russia's 5G network. To this end, it is lobbying intensely and portraying itself as a 'national' actor helping to develop Russia's technology ecosystem.¹¹¹ The Russian government appears to have not yet decided whether to grant this privilege to Huawei. Nevertheless, the wider context of Western sanctions on Russia, and a Russian risk assessment that ranks China as a lesser threat than the West, makes it feasible that Huawei will succeed.¹¹²

107. K. Shchopin, "Rossiia i Kitaj ob'ediniat innovatsionnyj potentsial" [Russia and China unite their potential for innovation], *Rossijskaia Gazeta*, 1 November 2018, available at: <https://rg.ru>; "Rossijskogo-kitajskij molodezhnyj biznes-inkubator" [Business incubator for Russian-Chinese youth], see <http://rcybi.ru>; "Best Russian AI Startups to Present Projects at SPIEF-2019", TASS, 22 April 2019, available at: <https://tass.com>.

108. On the rise of Huawei in Russia, see P. Karasev, "Kradushchij tigr: kak Huawei stala liderom rossijskogo rynka" [Crouching tiger: how Huawei became leader of the Russian market], *RBK*, 2 October 2018, available at: www.rbc.ru.

109. See T. Eder, R. Arcesati, J. Mardell, "Networking the Belt and Road—The Future is Digital", MERICS, 28 August 2019, available at: www.merics.org. The concept of "safe city" denotes a hyper-connected city that uses urban data and surveillance technology (cameras and "intelligent" sensors) in the interests of public security.

110. A paradoxical aspect of the Russian authorities' ambitions for digital sovereignty is that SberCloud will be a direct rival of the Russian Yandex Cloud and Mail.ru Cloud.

111. Interview with a Russian analyst, April 2020.

112. *Ibid.* See the interview given to *Vedomosti* by the Deputy Prime Minister Yury Borisov, 1st September 2019, available on: www.vedomosti.ru.

Nonetheless, the perception that China's technological power is growing divides in Russia. Beyond questions of economics, part of the Russian elite has jealously watched how Beijing has controlled its population through algorithms and is copying its example, under the principle that what "works" in China must be replicable in Russia. Hence the spread of facial recognition systems across the country. However, this argument seems to contradict Russian complaints against China. The first relates to respect of intellectual property rights: if Russian complaints at Chinese theft were long confined to the military-industrial complex, they now target theft of patents for "civilian" technology by Chinese industries.¹¹³ Russian reservations about the protection of intellectual property were provoked recently by Russo-Chinese cooperation in medical robotics that was being applied to the space domain.¹¹⁴ Russian experts appear to consider any sharing of AI innovation in the military as a red line which they will not cross. A second grievance relates to China harnessing Russian expertise in AI, an issue that has been addressed publicly by the President of the Russian Academy of Sciences.¹¹⁵ Other worries concern the disaggregation of data produced in Russia, the leaking of intellectual property and the absorption of Russian talent by Chinese companies. Less often given voice, these worries are nonetheless critical since they are intrinsic to Russia's sovereignty.¹¹⁶

Implicit in these considerations is the possibility of a growing asymmetry in technology between Moscow and Beijing, which, in the medium term, could have repercussions for Russia's strategic autonomy. Russia's elites take this threat seriously and point to the cynicism underlying China's aspirations. In the view of the Director of the 'Safe Internet League', a pro-governmental organization, China does not regard Russia as a country to be reckoned with when it comes to AI, for three main reasons: it is not very attractive technologically; young Chinese entrepreneurs remain focused on the West despite the current tensions; and the continued brain drain from Russia to the USA and Europe.¹¹⁷ More broadly, the absence of Russian competitors to the Chinese giants¹¹⁸, the weakness of Russian venture capital in the face of Chinese financial muscle

113. Interview with a representative of Russian industry, December 2019.

114. 'Ekspert otsenil sotrudnichestvo Rossii i Kitaia po meditsinskoj robototekhnike' [An expert evaluates Russo-Chinese cooperation in medical robotics], *RIA Novosti*, 23 August 2019, available at: <https://ria.ru>.

115. "Glava RAN prisval peresmotret' printsipy nauchnogo sotrudnichestva s Kitaem" [The President of the Russian Academy of Sciences calls for the principles underlying scientific cooperation with China to be reexamined], *TASS*, 24 September 2019, available at: <https://nauka.tass.ru>.

116. Interview with a Russian expert in digital affairs, December 2019.

117. A. Annenkov, "Na tekhnologicheskoi karte mira nas dlia Kitaia ne sushchestvuet" [On the technological map of the world, we do not exist for China], *Digital Russia*, 3 December 2019, available at: <http://d-russia.ru>.

118. Including Baidu, Alibaba, Tencent, Huawei et Xiaomi.

and Russia's irrelevance in the international organizations that set technological standards all underly a Russian technological dependence on China that will only grow in the decades to come.

Conclusion

This overview of the use of artificial intelligence in Russia allows several fundamental trends to be distinguished. First, despite Russia appearing to be isolated in the face of Western sanctions, it is not completely isolated in technology terms. Russian knowledge and expertise are being exchanged, military innovations are being tested in operations abroad, particularly in Ukraine and Syria, and the links that have been forged with China in highly specialized fields of technology are extremely strong. Russia's isolation is therefore only relative, so it retains some degree of sovereignty in the realm of technology. Nevertheless, the partnerships that Russia has built with Chinese *and* American counterparts, despite the tensions between them, undermine the idea that Russia can be sealed off technologically, even though this has become a political priority for the Kremlin.

In 2020, however, it is fair to ask “is there a ‘Russian path’ to AI”? To answer in the affirmative would be simplistic, such is the speed at which the technology is changing and the extent to which its use, both by leaders and the population, depends on complex and shifting factors. Deep down, the realization that Russia is not at the forefront of AI shows through in public debate. A paradoxical position flows from this, in which bombast is tempered with caution, ambition with moderation, and which questions the growing decorrelation between Russia's economic power—in decline—and its politico-diplomatic power—in strong growth¹¹⁹.

Second, Russia's weaknesses cannot be overcome unless great efforts are made across multiple key industries—including digital technology and electronics—and only if the socio-political system evolves away from state direction, a fortress mentality and weak intellectual property rights. Is Vladimir Putin not trying to convey this sense of urgency when he talks of the “impossibility of preserving the future of [Russian] civilization without [mastering] artificial intelligence”?¹²⁰ In addition, although it is an egalitarian force in international politics, AI will increase economic inequality: herein lies an opportunity, but also a real risk, that Russia could decouple from the global economy, to the benefit of both Washington and Beijing.

119. The author thanks Agathe Demarais for pointing out this decorrelation.

120. V. Putin's interview to the *Russia 24* channel, registered on 18 September 2019 and broadcast on 17 May 2020, available on YouTube: www.youtube.com.

Third, the constraints that have already been mentioned, coupled with the assured modernization of the Russian military and the authorities' confidence in their tools for waging information warfare, raise questions about Russia's future place in the global geography of AI and its ability to reinvent itself in an international system that is in the process of being dismantled. Last but not least, new financial constraints caused by the Covid-19 pandemic will no doubt shed a different light on Russia's future strengths and weaknesses.

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