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The Role of AI in Russia's Confrontation with the West

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TABLE OF CONTENTS

- 01 Executive Summary**
- 02 Introduction**
- 03 Russian Views on and Objectives for AI and Its Military Applications**
- 09 Russia’s Invasion of Ukraine and Its Impact on Russian Thinking and Development of AI**
- 13 Enablers of and Constraints on Russian AI R&D**
- 17 Implications of Russia’s AI Development**
- 20 Conclusion**
- 21 Appendix: Russia’s External AI Partnerships**

Executive Summary

Russian thinking about artificial intelligence (AI) development is consistent with that of other major powers that are seeking to respond to an evolving combat environment characterized by growing complexity and rapid technological change. Russia has made several pronouncements on the importance of AI in combat, yet it is often difficult to estimate whether the country's Ministry of Defense (MOD) actually has utilized AI-enabled systems and weapons, including on the Ukrainian battlefield. Western sanctions and export controls also have the potential to increase the headwinds that Russia faces in its ability to meet its AI objectives.

Presently, the Russian military establishment is investing in AI research, development, testing, and evaluation (RDT&E) seen as most relevant today and in future combat. These investments are shaped both by the understanding of where such emphasis is placed among likely competitors, such as the United States and NATO, and where resources should be allocated based on the ongoing complicated combat in Ukraine.

Russian military discourse emphasizes that in the long term, there will be an eventual point where technologies subsume and then replace human involvement in military operations—yet in the near term, Russian military thinking affirms that humans must remain firmly in the loop. Like many major military powers around the world, the Russian MOD is investing in the development and application of different types of uncrewed systems for the air, maritime, and ground domains. At this point, as a reflection of combat in Ukraine, improving uncrewed aerial vehicle (UAV) capabilities with AI as a mechanism for command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) is a key emphasis in both academic writing and research and development (R&D) across Russia's defense-industrial complex. The use of AI for data collection and analysis is also a significant part of the MOD's impending "intellectualized" warfare as a natural evolution from the current "digital" combat technology and systems

Russian thinking about artificial intelligence development is consistent with that of other major powers that are seeking to respond to an evolving combat environment characterized by growing complexity and rapid technological change.

development, with AI envisioned as a data analysis enabler and a decision-making aide to operators, commanders, and deployed forces.

According to public statements, the Russian government also places a significant emphasis on using AI in information and cyber operations. Russia also is likely to apply AI in its nuclear forces command, control, management, and use. However, Russia's invasion of Ukraine has exposed multiple deficiencies in its conduct of the war, given significant personnel and matériel losses and battlefield setbacks in 2022 and 2023. To address these challenges, the Russian government is accelerating a centralized approach to AI development and forcing greater cooperation between the country's military and civilian sectors. For its part, the military is enabling loitering munitions, aerial drones, and certain ground-based robotic systems with greater capabilities that include AI, while potentially using it in information and cyber operations.

Yet the war in Ukraine and the resulting international sanctions also are constraining Russia's AI development to a certain extent, with the Kremlin trying to offset such disadvantages. To mitigate the impact of Western economic pressure, Russia is pursuing import substitution and technological sovereignty programs aimed at

bolstering domestic high-tech R&D and manufacturing, as well as creating investment funds and programs for domestic AI companies and entrepreneurs, while also funding future workforce developments across the national

academic establishment. Russia also will rely on China for AI-related technological and policy developments, as U.S. and international pressure aims to close off certain technology cooperation and procurement avenues and outlets for Russia's domestic AI R&D.

Despite such constraints, Russia will retain certain AI capabilities that will pose challenges for the West. It is evident that despite the difficulties Russia is experiencing on the Ukrainian battlefield and at home as it tries to maintain domestic high-technology AI R&D, the Russian Federation is dedicating government, academic, industrial, and financial resources to ensure its AI development. Such efforts deserve close and continued scrutiny.

Introduction

Russian thinking about artificial intelligence (AI) development is consistent with that of other major powers that similarly are seeking to respond to an evolving combat environment characterized by growing multi-domain complexity and rapid technological change. As Russia increasingly operates in the air, sea, ground, space, cyber, and information domains, it views its ability to access, understand, manage, and act upon the massive amounts of data generated by multiple sources and systems as a key battlefield requirement. The Russian military's development of AI has been a decades-long path that has accelerated significantly in the past 20 years. Improvements in technology developments, access to international software and hardware, increasing global competition that has driven the Russian Ministry of Defense (MOD) to achieve real results, and Russia's gradual progress conceptualizing AI use in combat all have propelled Russian advances.

However, as the war in Ukraine has demonstrated, there is often a significant gap between Russian statements of its military capabilities and its real-world capacity. The same is likely to be true in terms of AI. Despite Russian pronouncements on the importance of artificial intelligence in combat in general, and for domestic weapons development in particular, it is difficult to estimate whether the MOD actually has utilized different AI-enabled systems and weapons on the Ukrainian battlefield. Moreover, Western sanctions and export controls only would increase the headwinds that Russia faces in its ability to meet its AI objectives. Russia is now excluded from certain well-established technological supply chains, causing numerous challenges, including the need to rapidly restructure domestic high-tech research, development, and implementation. The exodus of many Russian citizens in the aftermath of the invasion, many of whom included IT professionals, also may widen the gap between Russia's objectives and capacity.

Although Russia faces obstacles to its AI development, the Kremlin will seek to offset the challenges it faces. The Kremlin and the MOD clearly are determined to maintain military primacy in the post-Soviet space, to withstand the pressure from the United States and NATO, and to emerge victorious in the war against Ukraine. Within this context, the development of AI is a key national security priority in what the Kremlin sees as a civilizational mission toward which it will seek to mobilize Russia's entire national human and technological potential. Russia also can reach out to its allies

and partners for military-technological cooperation that persists despite U.S. and Western efforts to limit such engagements.

Given the myriad challenges and shortcomings that Russia faces, it will lag behind the United States and China in AI in the near to mid term. However, Russia's AI capabilities still create challenges that U.S. and international policymakers and defense planners must navigate. In other words, Russia will remain a capable power, whose AI capabilities pose real challenges that impact not just the battlefield, but the broader confrontation that Moscow sees itself as waging against the West. Moreover, Russia's military setbacks in Ukraine may perversely amplify the risks that AI poses to the West as the Kremlin seeks AI to supercharge its asymmetric tools. The more Russia sees itself as falling behind the West in high-tech development, the more vulnerable it may perceive itself to be, which may lead Moscow to accept greater risk in the way that it deploys AI to keep apace.

This paper assesses Russian thinking on AI and its likely development, including how the war in Ukraine is shaping this trajectory. To that end, Section 1 provides an overview of Russia's thinking about AI and its military applications and Moscow's goals and objectives in this realm. Section 2 focuses more specifically on how Russia's war in Ukraine is shaping Russia's thinking on and approach to its AI sector. Because the war is ongoing, it is too soon to provide definitive conclusions

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about how the conflict in Ukraine will influence Russia's AI trajectory. Moreover, it is difficult to assess the true state of Russia's military AI development, especially given the decreasing amount of publicly available data post-Ukraine invasion and the classified environment for the nation's military high-tech developments. Nonetheless, the paper offers preliminary assessments based on the sources described below that factor in how the war has increased the challenges Russia will face in further developing its AI sector. Section 3 articulates the constraints that Russia faces, as well as the efforts the Kremlin is likely to make to mitigate those challenges. Finally, Section 4 spells out the key implications of Russia's AI trajectory for U.S. policymakers and defense

planners. An appendix provides additional details on Russia's relations with external partners.

The paper's assessments are based predominantly on public statements, announcements, and analyses in the Russian-language media, including from a military-academic ecosystem that comprises practicing and retired Russian civilian and military scientists, researchers, academics, and officers. Several key Russian documents merit highlighting. Major developments in this space are guided by the MOD's *Creation of Prospective Military Robotics through 2025* comprehensive target program launched in 2014. This classified document is supposed to be the main guiding roadmap for the development of aerial, ground, and maritime robotics.¹ It no doubt discusses the development of autonomy and AI and likely is being edited, updated, or revised based on the ongoing invasion of Ukraine and the resulting trends and developments. Additionally, on July 26, 2022, the MOD adopted the *Concept of the Russian Armed Forces Activity in the Development and Use of Weapon Systems Using Artificial Intelligence Technologies*, an initia-

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tive that serves as one of the guiding roadmaps for AI adoption. This document was made public at the United Nations in March 2023.² These and other sources have made it possible to piece together the main elements of this MOD-affiliated AI ecosystem and related research, development, testing, and evaluation (RDT&E) programs and efforts.

Such sources offer a glimpse into Russian deliberations and debates on the role and utility of AI on the modern battlefield and help analysts understand what the Russians emphasize in terms of AI research and development (R&D). This public discussion across the MOD has been characterized by arguments that the future of war, in whatever form it takes, will be dominated by AI-enabled warfare. It is that underlying belief that has driven the Russian military to invest in the resources and knowledge needed to prepare for such wars. This paper sheds insight into Russian thinking and Moscow's priorities for the future.

Russian Views on and Objectives for AI and its Military Applications

The Russian military establishment is investing in AI RDT&E, concentrating on specific efforts seen as most relevant today and in future combat.

These investments are shaped both by the understanding of where such emphasis is placed among likely competitors, such as the United States and NATO, and where resources should be allocated based on the ongoing invasion of Ukraine. Specifically, the Russian military emphasizes using robotics and autonomous systems to maintain parity in R&D with leading nations including the United States, China, Israel, and, more recently, Turkey and Iran. This section outlines key themes of Russian thinking about AI, including in terms of command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) and robotics, data collection and intellectualized warfare, the information and cyber domains, and Russia's nuclear forces.

Russia perceives itself as engaged in a technological competition with major powers and fears falling behind.

The emphasis on AI for national security has long been a staple of speeches and announcements among top Russian government officials, including President Vladimir Putin. In 2020, he identified the development of weapons with AI elements as one of five major MOD priorities for the near future in order to counter American and NATO advantages and threats.³ In a 2022 address at the AI Journey annual conference hosted by the Russian Federation, Putin noted that the AI competition among states is fierce, and that Russia's place in the world, along with the nation's sovereignty and security, depends on domestic AI R&D results.⁴ In November 2023, the Russian president said that a Western monopoly on high-tech advancements such as AI is "dangerous" for his country, again calling for domestic AI efforts to break the dependence on imported technologies.⁵ And in December 2023, Putin called for Russia's armed forces to adopt AI-based military weapons and robotic systems, a statement no doubt impacted by the ongoing war in Ukraine.⁶ Such Russian discourse is very much influenced by the perception that other leading military powers such as the United States, NATO, and China are investing considerable resources in military and civilian AI capabilities, and that Russia must be part of this technological race in order to avoid falling too far behind and be at a disadvantage in future conflicts.⁷

Russian military discourse emphasizes that in the long term, there will be a “singularity-like” point where technologies subsume and then replace human involvement in military operations.

In a recent analysis published during the war in Ukraine in the authoritative *Voennaya Mysl* magazine (Military Thought), high-ranking Russian military officers and academics argued that future active use of uncrewed and robotic systems and conducting combat operations with autonomous mobile formations eventually will become the norm on the battlefield.⁸ With the war in Ukraine as a backdrop, this analysis concluded that future management of a complex battlefield will be ensured by AI-based systems.⁹ In the medium to long term, the struggle in war will evolve from human-centric combat to one between and among technologies. In this almost-inevitable future, the winner in any conflict will possess the most advanced technologies scaled for mass production, including deterrent types of robotics and autonomous systems.¹⁰ Robotic warfare also is discussed as the answer to other Russian problems, namely as a way to offset potentially irreplaceable personnel losses, a topic discussed regularly among Russian military officials, MOD-affiliated academics, and military commentators. For example, during the Dronnitsa-2023 event organized by Russian volunteers working to aid military efforts in Ukraine, the mass-scale use of different types of robotic systems today and in the future was presented as an answer to Russia’s demographic problem and military manpower shortages.¹¹ At the very least, Russia’s massive personnel losses over the past two years in Ukraine should influence domestic technology developers and military decision makers to come up with technologies and strategies aimed at potentially minimizing such casualties in future combat.

In the near term, however, Russian military thinking posits that humans must remain firmly in the loop.

Despite the MOD discussion of robotic and autonomous systems possibly replacing human soldiers on future battlefields, the Russian military establishment still envisions that humans will be in the decision-making and command and control (C2) loop today and in the near future.¹² Russian government officials stated in 2020 that, while the introduction of AI technologies in military systems would not supplant humans, it will enhance Russia’s ability to obtain information, increase the speed and accuracy of data processing and transmission, increase the speed of decision-making, and improve control systems operations.¹³ In 2021, Russia’s Deputy Defense Minister

Yunus-bek Yevkurov stated that no matter how AI is used in combat, the final decision is “always up to the human commander.”¹⁴ And during Russia’s annual Army military expo and forum in August 2023, the Russian military leadership again confirmed that AI will not have “the right” to use weapons, since that this decision always will belong to a human.¹⁵ Moreover, the aforementioned *Concept of the Russian Armed Forces Activity in the Development and Use of Weapon Systems Using Artificial Intelligence Technologies* enshrines the centrality of the human role and responsibility in the development, testing, evaluation, and eventual use of AI-enabled weapons, although the document does not specifically spell out when or if the human role would have to give way to more advanced technologies.¹⁶ In fact, when human control may give way to AI weapons is a question still debated publicly—for example, some Russian military experts think that human intelligence will prevail over AI in controlling combat aircraft for another 30–50 years.¹⁷ Certain Russian high-level scientists think that next-generation combat aircraft will not become completely unmanned, since no AI can replace a pilot’s experience and intuition. In such a scenario, neural network technologies will automate aircraft control processes and will guide companion unmanned systems.¹⁸

Along with key documents and MOD statements pointing to the human-in-the-loop approach to developing and fielding AI-enabled military systems, there are multiple statements on record from current and former government officials that straddle the problem of identifying exactly where human control ends and machine-based decision-making in military systems begins. For example, a former director of Russia’s Space Agency, who currently supports drone, robotics, and high-tech development for the Russian military in Ukraine, remarked in early 2023 that future aviation and naval forces should be predominantly uncrewed and have significant autonomy, inevitably supplanting the traditional air and maritime forces, while aided by machine decision-making mechanisms.¹⁹ Yet in August 2023, he expressed concern about handing too much responsibility to AI when it comes to the use of military ground robots, air defense, and strategic nuclear forces, arguing that actual “automation” behavior is not fully known in dangerous and high-stress situations, thereby necessitating a final human decision.²⁰ This dichotomy is in fact a common feature in multiple public discussions among the Russian military and its affiliated institutions and individuals, with arguments for inevitable use of autonomous military systems overlapping with calls for maintaining human centrality in future war.

One of the main publicly discussed examples of human-centric combat operations is Russia's National Defense Coordination Center (NDCC), built in 2014 and tasked with continuous analysis and review of all Russian military and defense-industrial activity, domestically and internationally.²¹ In 2020, the MOD hinted it will use AI at the NDCC to assist in decision-making by collecting and analyzing the necessary information for human operators, as well as to assist in predictive analysis of critical situations.²² At the same time, the human operators and staff will have the final say in all decisions when aided by AI data analysis algorithms. In such circumstances, having an AI "assistant" analyze mass quantities of information in the shortest possible time to extract useful insights is crucial to the most optimal and correct decision. At the same time, there is no public record of NDCC further discussing the use and application of AI, likely due to a high-level classified environment at the Center.

In addition to the broader contours of Russian thinking about military applications of AI, Russian public documents and other sources provide more detailed insight into the specific battlefield functions that AI might fulfill.

C4ISR and robotics.

Like many major military powers around the world, the Russian MOD is investing in the development and eventual application of different types of uncrewed systems for the air, maritime, and ground domains. Improving uncrewed aerial vehicle (UAV) capabilities with AI as a key C4ISR mechanism is a key emphasis in both academic writing and actual R&D across Russia's defense-industrial complex. In 2021, the general director of one of the largest Russian aerial drone manufacturing enterprises argued that achieving advantages in AI development will define future success with uncrewed systems in general, and that the robotization of war has become a major trend across the MOD's efforts.²³

Likewise, in a 2021 speech, the head of the Military Academy of the Armed Forces General Staff noted that the "robotization" of all spheres of armed conflict and the development of AI for robotics will have the greatest effect on the Russian armed forces in the near term in order for the country meet its future challenges.²⁴ The ultimate speed and pace of such AI development and implementation is difficult to ascertain using public sources. Such statements were made without the possibility of foresight into the Russian military's performance in Ukraine, the stress of the long-term invasion on Russian personnel and the industrial base, the mass-scale human losses in key battles, and of the

rapid pace of military tactics and technologies' evolution on the battlefield. Today, most uncrewed weapons and systems across the Russian military still are remotely piloted and operated, as evidenced in the Ukrainian combat environment.

In general, Russian public documents reveal that MOD priorities for military UAVs include introducing AI elements into aerial drone control systems, along with swarm development and manned-unmanned teaming, similar to major global military trends.²⁵ Over the past several years, the MOD reportedly tested multiple ground and maritime robotic technologies that leverage AI for enhanced situational awareness and decision-making.²⁶ While the Russian MOD and its corresponding

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military institutions regularly announce certain AI technologies in tests or actual combat use—machine learning, computer/technical vision, group use and autonomous operations, natural language processing, and others—it is hard to estimate their efficacy and the veracity of such statements if only public data is reviewed.²⁷ Russian analysts commenting on the country's military AI R&D efforts point to the rapid development of technologies to control groups of robotic systems and to increase the autonomy of AI-enabled systems.²⁸ According to Russian military academics, the impending robotic "swarm" that is the eventual result of ongoing technological changes in warfare brought about by large-scale application of UAVs and related systems will be contingent on the development of algorithms for stable communication and data transmission among group members, along with software for communications capable of withstanding adversary countermeasures.²⁹

Public statements by the MOD's highest-ranking officials continue to offer insights into Russian AI priorities. In 2023, Alexander Osadchuk, head of the MOD's Main Directorate for Innovative Development, argued that AI could be given recognition tasks and assist in decision-making, remarking that neural networks are helpful for navigation. Perhaps as a reflection of the ongoing war in Ukraine, he also confirmed that intelligent chat bots and text, speech, and image recognition are tasks where AI already is proving effective.³⁰ Along

with combat goals previously mentioned that also include electronic warfare and radar capabilities, the MOD's plans for military robotics include logistics functions such as the delivery of ammunition to the front line, the transportation of military cargo, and medical evacuation tasks.³¹ On land and at sea, robotics also are envisioned for mining and demining operations; surface and subsurface intelligence, surveillance, and reconnaissance (ISR); and other missions that can potentially take a human out of a dangerous environment.³²

Data collection and intellectualized warfare.

The use of AI for data collection and analysis is a significant part of the MOD envisioning the “intellectualized” warfare as a natural evolution from the current “digital” combat technology and systems development, with AI positioned as eventually serving as a decision-making aide to operators, commanders, and deployed forces. In this context, using AI in automated control systems and onboard systems' computers is presented to improve accuracy and speed at the tactical, operational, and strategic levels. Russia's ongoing development of heavy combat drones such as Okhotnik and Altius, which are reportedly equipped with AI for C4ISR, is indicative of this trend.³³ More recent announcements from the Russian military-industrial enterprises point to AI in UAVs' command and control, and to the use of AI in aerial drones to identify targets.³⁴ Russian military experts also point to the impending ability of combat aircraft pilots to direct multiple aerial drones with AI assistance, once this technology matures and becomes available.³⁵ Other planned and ongoing AI uses across the Russian military include the robotization of armaments and military equipment; reconnaissance, monitoring, and information support of forces; forecasting and threat analysis; cyberspace operations and information warfare; and logistics, along with other supporting activity dealing with large datasets and massive amounts of unstructured information.³⁶

Many debates on the development and use of AI across the Russian military and defense sectors now also take place among the civilian-run efforts that aid the Russian invasion of Ukraine, with ideas put forth by individuals with personal knowledge of the ongoing combat. The volunteer-organized Dronnitsa-2023 civil-military meet-up mentioned earlier, which brought together short-range (ISR and first-person view [FPV]) combat drone manufacturers, developers, and end users, featured debates on the opportunities and challenges of this type of data-driven warfare and the human role in it. Russian experts (many with direct Ukraine combat experience) speaking at the

event echoed key automation themes discussed by the MOD over the years, arguing that any military force today is becoming a machine built of people and operating based on algorithms. Dominance in a new type of technological war requires the development of an “inhuman” army, where the widespread use of “smart” mechanisms will eventually exclude a person from a large number of processes.³⁷ Therefore, the army of the future should not consist of people, but of man-machine systems where humans are operating in an increasingly automated environment driven by the need for large-scale data analysis for faster decision-making and battlefield reaction. To

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prepare for such an environment, people today need to be taught to interact with machines, and the machines (command and control systems, C4ISR elements, robotics and automated systems and processes) need to be “taught and trained” to interact with and be integrated with people-driven efforts.³⁸ The resulting man-machine systems also will have to be taught how to interact with other similar systems, to ensure that humans remain part of the ever-increasing battlefield complexity and are not totally excluded from key processes.³⁹

In reflections about data-driven warfare, Russian military writing that is summarized and translated by U.S.-based researchers points to developing and integrating AI systems for “optimal target distribution based on intelligence about the enemy, including data on troops, armaments, equipment, and their effectiveness.” Moreover, Russian military thinking considers “AI . . . allowing commanders to quickly identify and prioritize the destruction of targets, to plan subsequent troop activity, and to quickly respond to changing circumstances in real time.”⁴⁰ Additionally, these deliberations point to the MOD considering “prioritizing systems for processing and integrating information and intelligence that includes acoustic, optical, and electronic data to classify threats and to identify targets.”⁴¹

Information and cyber domains.

From Moscow's perspective, Russia currently is in a state of intense competition with the United States over the impact that information can have on a society in general, and on attitudes toward Russia and its leadership in particular. Much of this conflict occurs in cyberspace.⁴² Therefore, the Russian government, at least according to public statements, emphasizes using AI in information and cyber operations. As far back as 2018, Russian MOD officials announced that AI will help Russia to effectively counter threats in the information space and win cyber wars.⁴³ The Russian government is already using different AI programs domestically to identify what it designates as inappropriate and extreme content, prompting some domestic concerns from legislators and private-sector representatives about privacy and overly intrusive oversight by domestic intelligence services.⁴⁴

Although Russian public sources mention AI tools to make information confrontation more effective, they also recognize that the same tools, when in the hands of an adversary, could pose a threat to the psychological attitude of Russia's domestic population.⁴⁵ For instance, analysis in a 2021 Russian military periodical referred to digital technologies and AI as tools posing a threat to the country's sovereignty, prompting the need to keep foreign influence and information from affecting Russia's population.⁴⁶ Using AI and other computational tools to supercharge cyber intrusions and accelerate attacks on adversary infrastructure, organizations, and individuals already is potentially part of the ongoing confrontation with Ukraine and its Western allies.⁴⁷ It is likely that the MOD will build on such activity as new AI tools are developed and fielded, both in Russia and globally.

Most recently, the Russian MOD has been paying more attention to the emerging threat and promise of ChatGPT, large language models, and generative AI, given their ability to create realistic narratives and analyses that can be tailored to specific and niche audiences. In December 2023, the MOD's Information Department publicly warned that generative AI presents a clear and present danger to Russia's national security. For example, the MOD warned of the "informational impact on the population by replacing parents and teachers as children's teaching and influence agents, and raising entire Russian generations 'loyal' to Western countries and values as a result of access to public

information."⁴⁸ Other dangers highlighted by the Russian MOD included theft and manipulation of training data by Western intelligence agencies that may contain personal information, the growing effectiveness of deepfake videos to harm populations via social engineering methods, and the possibility and effectiveness of generative AI in cyberattacks.⁴⁹

The use of AI to generate realistic images and videos also is evolving rapidly, prompting global concern about the difficulty of distinguishing between real and fake content during the upcoming 2024 U.S. elections, and possibly raising fears of Russian use of this technology to target American voters.⁵⁰ As a whole, winning the confrontation in the information domain has long been a high priority for the Russian military establishment, and Russian documents indicate that AI and related technologies potentially could play a key role in advancing this goal. That said, it is difficult to obtain reliable information about the militarized use of AI in cyber and information operations, both because such activities are likely classified and because, without having access to the underlying technological resources, it is difficult to ascertain if AI is being used in these campaigns.

At the same time, Ukraine-based security experts have been vocal about Russia's potential uses of AI in misinformation and disinformation campaigns, arguing that generative technologies drastically lower the cost of producing textual and visual content, and require only basic digital skills to operate them.⁵¹ Such concerns include Russia's use of chat bots to supercharge social media campaigns against Ukraine, as well as improved cyberattacks against Ukraine's population and its economic and industrial assets.⁵² Western technology experts recently warned that Russian hackers allegedly used AI for research on satellite communication protocols, radar imaging technology, and scripting tasks. Such activity was apparently facilitated by large language models (LLMs) and "other forms of AI as another productivity tool on the [cyber] offensive landscape."⁵³ According to Western estimates, these technologies and concepts are used by Russia and other actors to "understand potential value to their operations and the security controls they may need to circumvent."⁵⁴ As public AI tools including LLMs and similar concepts continue to evolve, it is likely that they can be militarized by willing parties such as the Russian MOD and intelligence services to launch sophisticated attacks against their targets.

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Nuclear forces.

Based on publicly available information, Russia is likely to apply AI in its nuclear forces command, control, management, and use to better understand and analyze the threat landscape and the evolving crisis environment. Despite the largely classified nature of this work, several conjectures can be made about the use of AI in this military sphere. It is likely that this Russian activity would mirror similar actions by the United States, NATO, or Chinese nuclear forces when it comes to using AI. For instance, in the context of AI as a data-analysis tool, the Russian military potentially could use it to locate and analyze stationary and mobile targets for strategic conventional and novel nuclear strike capabilities, to possibly improve guidance and increase prospects of mission success, to analyze the correlation of forces and courses of action, and to support real-time analysis of political-military situations and conditions related to possible nuclear weapons use.⁵⁵

This type of data collection and analysis is likely conducted by the aforementioned NDCC. Moreover, in 2019, the Russian government announced a “Project Maven”-like plan to use AI to analyze satellite imagery.⁵⁶ This data potentially could be used in Russia’s non-strategic nuclear weapons guidance systems to automate guidance and improve accuracy, while being fed to the NDCC, with decisions subsequently routed to the relevant commands and units.⁵⁷ To enable additional crucial data analysis, natural language processing has the potential to automate translation from multiple foreign languages in regions of importance to the Russian MOD (for example the Middle East, Africa, or the former Soviet region), as well as to generate a common operational picture for the developing and unfolding crises and Russian forces’ positioning, resources, and logistics.⁵⁸

Other potential AI uses may include the MOD’s need to understand the effects of nuclear escalation in crisis scenarios and to mitigate the effects of accidental or even intentional nuclear weapons use. Given that AI-enabled modeling and simulation are gaining traction around the world, Russian military scientists and developers may be pursuing technological approaches similar to nuclear effects modeling.⁵⁹ Additional AI-enabled uses may include concepts to automate guidance and navigation for nuclear systems and hypersonic weapons the Russian military has developed over the past decade.⁶⁰

Moreover, the MOD could use advanced AI applications for early warning.⁶¹ Given Moscow’s concerns about Western air and missile attack and the ongoing testing and development of hypersonic systems, the Russian military may be pursuing AI capabilities for air and missile defense forces.⁶² The Russian Strategic Rocket Forces also may be exploring AI technologies for intelligent systems and weapons, such as onboard control systems, as well as expert systems and automation, in line with similar R&D in uncrewed systems described earlier.⁶³

As well, AI as a sensor fusion mechanism could enable nuclear launch order dissemination via the Soviet-built Perimetr system.⁶⁴ Perimetr was created to detect a nuclear attack in progress and launch a retaliatory nuclear strike in the event the political leadership is incapacitated and no longer can make crucial decisions.⁶⁵ The system is supposed to determine when a key person or group of people is or is not in control of the situation. According to open sources, if staff on duty somehow miss

Russia is likely to apply AI in its nuclear forces command, control, management, and use to better understand and analyze the threat landscape and the evolving crisis environment.

a nuclear strike on Russian territory, Perimetr requests a response and, if it is not received, concludes that relevant command and control posts, along with key infrastructure, may have been destroyed. Perimetr then calculates that irreparable harm was done to the Russian leadership and command and control chain, that key people no longer have control, and that a nuclear attack indeed has occurred. A decision then is automatically made to launch a retaliatory strike.⁶⁶ The system’s continued existence today implies the preference for semiautomatic, instead of fully automated, systems to meet the challenges of enormous stress, the pressure to understand the unfolding scenario in real time, and the possible lack of relevant information, along with emotions that affect human decision makers under stress. By removing the pressure for Russian leaders to decide whether to launch a nuclear attack on a short timeline under pressure, Perimetr is meant to reduce the risk of miscalculation on both sides and to avoid wrong decisions with enormous consequences.⁶⁷

Russia's Invasion of Ukraine and Its Impact on Russian Thinking and Development of AI

Russia's invasion of Ukraine has exposed multiple deficiencies in its conduct of the war, including concerns with weapons and systems availability and use, technology development, procurement and acquisition, personnel training and preparedness, and logistics and rear operations, among many others. Despite these problems and multiple setbacks and retreats at the hands of the determined Ukrainian opposition, Russia continues to grind away at the Ukrainian military while adopting several surprising approaches to enable it to stay in the conflict. Some of these adaptations have included importing long-range loitering munitions from allies such as Iran, using convicts in human waves to wear down Ukrainian forces, building extensive and multilayered fortifications, and using multiple commercial technologies adopted for military operations.

Russia's ability to adapt and learn from its shortcomings in Ukraine almost certainly will shape its thinking about the role of AI on the battlefield and the ways the MOD will prioritize resources for R&D of AI technologies. Given that the war is ongoing and may last well into 2025, it is too early to definitively predict the lessons Russia will draw about military AI approaches. So far, Russia's war in Ukraine has led to more centralized approaches to AI RDT&E and closer military and civilian cooperation, while revealing specific approaches to military technology development.

Accelerating Russia's centralized approach to AI development.

With the launch of sanctions against Russia in March 2022, Russian society looked to the state for long-term solutions and paths forward for the domestic high-tech ecosystem, and for funding and technology development in general. In practice, this meant adopting many centralized development pathways with the government at the epicenter of all relevant activity. While the Russian state was already the major entity in national AI and high-tech development prior to the Ukraine invasion, the government, and the MOD in particular, moved to create centralized structures for AI research, development, and use to streamline approaches, avoid duplication of efforts, and have better control over multiple efforts across the country. In September 2022, the Russian MOD launched the Department for Artificial Intelligence Implementation in Weapons Development.⁶⁸

Its official role includes managing AI-related technologies, incorporating efforts and lessons learned from the war, and prioritizing the initiatives that can be most useful to the warfighter, such as analyzing data for better battlefield management.

In 2022, the Russian media confirmed that this AI Department was using experience gained by Russian forces in Ukraine to increase the effectiveness of weapons, without providing additional details about its operations.⁶⁹ The AI Department's newly appointed director, Vasily Yelistratov, has affirmed that this effort will help develop weapons and systems with AI as a cross-cutting technology.⁷⁰ Despite the lack of public data on this department's operations, its effect on the Russian military writ large probably remains limited more than a year and a half after its launch. For example, during the aforementioned Dronnitsa-2023 event, several key civilian participants called for a unified AI service for the military to combine efforts by Russian companies involved in neural networks development. Such data, currently "scattered" among numerous efforts working to assist Russian forces in Ukraine, should be "centralized, assembled and analyzed."⁷¹ There probably would be no need to call for such an approach if the AI Department already had that authority. Still, its creation by the MOD points to a need for better AI RDT&E direction and guidance across Russia's military.

Forcing greater cooperation between the military and civilian sectors.

A key MOD sanctions survival tactic is the ability to cooperate with Russia's civilian AI R&D effort. This predates the war in Ukraine, with the head of the Russian MOD's Main Directorate for Research and Support of Advanced Technologies stating in 2020 that "the military is working in conjunction with the [Russian] Ministry of Education and Science to examine data access for civilian AI research and development," and that it was "important to transfer AI technologies from the civilian to the military sphere," and that "national projects' results could provide key data for the country's defense."⁷² While there is little public data on any Russian civilian AI efforts' official connection to classified military projects, significant achievements by the country's civilian high-tech sector to date include image recognition, computer vision, speech recognition, natural language processing, data analysis, and decision-making assistance in medical, financial, energy and retail markets. Such achievements may inform the MOD's own efforts to develop military concepts and systems.⁷³ Unlike the Western environment where government

and commercial activity is clearly delineated, the border between state and nonstate activity in Russia is much more blurred, with the Russian government funding and supporting many efforts that to date remain outside of the official MOD classified space.

A key development that points to the growing connections between state and private-sector activity in Russia is the September 2022 announcement by Deputy Prime Minister Dmitry Chernyshenko that the Russian government had launched a National AI Center for finding and analyzing effective AI solutions for business, science, and government.⁷⁴ This civilian center combines the resources of more than 2,000 participants in the national AI ecosystem, such as research institutes, technology corporations, communities, and developers. The National AI Center idea was first floated back in 2018, when the MOD cochaired an inaugural event on AI development in Russia and around the world, with participants proposing a centralized approach to national AI implementation.⁷⁵ Going forward, the cooperation between these civilian and military AI centers may define much of the national AI RDT&E.

Revealing Russian priorities for AI development.

While it is difficult to estimate the actual effect of Russian AI technologies in the war, the MOD's ongoing public debate is yielding clues about how its R&D ecosystem will allocate resources. In July 2022, the ERA Technopolis—one of the MOD's main R&D institutions built around military-public technology cooperation—hosted a discussion dealing with computer vision, pattern recognition, and the use of AI for weapons development.⁷⁶ The meeting addressed the application of AI in robotic and information systems and improvement of information systems via processing large datasets, emphasizing the practical use of such technologies across the Russian military.⁷⁷ In a follow-on 2023 meeting, ERA hosted the MOD's Department for Artificial Intelligence Implementation and other MOD officials to discuss the use of uncrewed aerial vehicles and the introduction of AI technologies in military systems, an event likely influenced by the war in Ukraine, with the discussion probably addressing how such systems are developed and fielded in the conflict.⁷⁸

The ongoing war in Ukraine has reinforced Russia's push to integrate AI into combat systems. With Ukraine hinting it will use AI in its combat drones and robotic systems, the Russian military has sought to respond by tapping into past and current projects in its R&D ecosystem. In 2022, the Russian media reported plans to

equip the country's reconnaissance and strike drones with a digital catalog to automatically recognize NATO military equipment provided to Ukraine.⁷⁹ This proposal called for an imagery catalog to help create a map with enemy locations directly onboard the UAV that then could be shared with command and control posts. Neural network algorithms were supposed to identify military equipment in a wide variety of battlefield conditions.⁸⁰ In February 2024, a Russian company in fact announced that it had developed a neural network for aerial drones that allegedly allows for accurate identification of military objects and equipment in Ukraine, including Leopard tanks, Bradley infantry fighting vehicles, and any other vehicles.⁸¹ Such announcements over the past two years point to Russian military intentions regarding AI for combat drones. More to the point, Russian Defense Minister Sergei Shoigu announced in February 2024 that his military will receive drones with artificial intelligence technologies, with deliveries to Ukraine taking place in the immediate future.⁸²

As a whole, the MOD has designated the development of AI for command and control as one of its three main priorities informed by combat in Ukraine, alongside further UAV and artillery development and improvements. Specifically, Alexander Osadchuk, head of the MOD's Main Directorate for Innovative Development, noted in August 2023 that going forward, AI use for decision-making and information analysis would be essential for fast and objective analysis of battlefield information. Given the priorities previously mentioned, the MOD is expected to dedicate significant resources to the R&D initiatives outlined earlier.⁸³

Already, the war in Ukraine is providing preliminary insights into ways Russia is using AI on the battlefield. There are multiple but unsubstantiated reports of the Russian military using AI in Ukraine for loitering munitions and aerial drones, uncrewed ground vehicles (UGVs) and robotic systems, and information/cyber operations.

LOITERING MUNITIONS AND AERIAL DRONES

There is at least some circumstantial evidence of AI use across the Russian military, though such claims cannot easily be verified from public sources. In June 2023, Russian-language media reported that the Lancet-3 loitering munition (one of Russia's most-used drones in this war) is using convolutional neural networks to classify and analyze the imagery and video content collected by this UAV while in flight.⁸⁴ Using such neural networks, a Lancet drone apparently can detect enemy targets for more accurate strikes. Another Russian loitering drone,

the KUB-BLA, also raised concerns from the international community in 2022 because of its onboard AI capacity to autonomously identify targets, but its relatively scarce and often ineffective use has not confirmed the drone's supposedly advanced capabilities.⁸⁵ Public claims like this often lack definitive proof without direct access to Russian technology, making it difficult to determine if in fact AI is used by the Russian military in such cases.⁸⁶ By early 2024, some public evidence of Lancet drone activity in Ukraine pointed to this UAV using a target lock ability for terminal guidance, although most other data showed a full human operation of this drone from start to finish—rather than onboard seek and destroy capabilities associated with more sophisticated AI features.⁸⁷ Regardless, such uses demonstrate the Russian military's willingness to experiment in combat for greater battlefield effectiveness.

The previously mentioned AI use in drones is technically feasible, as object recognition and terrain mapping are two functions that can be potentially carried out by a UAV's onboard computers using military or widely available civilian technology. Such capacity to use AI for certain independent actions allegedly permits the drone use during electronic warfare countermeasures that try to jam and interrupt signals between a drone and an operator. In fact, multiple Russian defense companies reportedly are working to integrate AI into different UAV platforms, such as the examples cited above. They also are marketing aerial drones with autonomous navigation, technical vision, and neural network-based object identification systems with the intent to test such technologies in combat in Ukraine.⁸⁸ For example, an "Admiral" vertical landing and takeoff drone that can carry two FPV combat drones was promoted in 2023 by its Russian developers with a digital control system that has a neural network-based technical vision mechanism for recognizing specified objects.⁸⁹ Another Russian defense enterprise was also promoting an AI target and object recognition system that apparently can be applied on an FPV-type drone, to work against targets that are protected by electronic warfare.⁹⁰

It also is likely that the implementation of this technology may no longer be limited to the realm of MOD-only enterprises, as the spread of commercial AI technologies is enabling rapid advances in aerial drone operations and concepts. In August 2023, a Russian volunteer effort that assembles and provides FPV-type military drones to Russian soldiers announced a homing system for its "Gadfly" model that is supposedly based on a neural network—this system apparently allows for the recognition and attack of both static and dynamic targets,

with a reportedly high accuracy rate.⁹¹ Other Russian volunteer efforts assisting the military in Ukraine also claim to integrate pattern and terrain recognition AI in their self-initiated projects developing FPV drones, which suggests a much lower technological threshold for integrating such technologies that likely use civilian AI applications.⁹² Still, Russian commentary on such AI-enabled FPV and similar drone types points to a technology still in development. A recent comment in Russian state media discussed such artificial intelligence as "raw and unfinished."⁹³ The explanation went as follows—for now, images of objects and potential targets entered into the program include armored vehicles, dugouts, and infantry positions. The drone then flies in "scanning" mode—it observes the area, "reads" the image, and looks for objects similar to what it has in its database.⁹⁴ If it finds objects similar to the stored images, it notifies the operator, is automatically fixed on the picture it tracks, and, upon the operator's command to confirm the target, begins to automatically turn toward it for a strike.

Both belligerents in this conflict are discussing the inevitable arrival of aerial drone swarms, given the large number of UAVs and drones operating in Ukraine around the clock. Connecting these individual drones in a group with onboard AI for C2 is the next logical step to enable large-scale strikes against fortified enemy positions to overwhelm air and electronic warfare defenses.⁹⁵ Russia's Lancet-3 producer already advertises "Product-53," the next iteration of its drone that allegedly can operate autonomously in a swarm and has an onboard data "catalog" for the identification and prioritization of targets.⁹⁶ In 2023, an official promotional video featured each Product-53 Lancet in a swarm identifying targets and exchanging data with the rest of the swarm members. This video may or may not be representative of actual functioning capabilities, but it is at least indicative of the intended direction of this manufacturer for future UAV development. There were indications in late 2023 that Product-53 already was undergoing limited testing in Ukraine, hinting that its mass-scale use may commence sometime in 2024.⁹⁷

UGVS AND ROBOTIC SYSTEMS

Another Russian potential claim to AI in combat involves the ongoing testing of the Marker combat UGV in Russia-occupied eastern Ukraine and in Russia proper. The Marker remains Russia's only publicly acknowledged and ongoing uncrewed vehicle project using computer vision, natural language processing, and autonomous navigation in potential combat.⁹⁸ The initial tests carried out in 2021 allegedly included a group of Marker vehicles

traveling autonomously across a forested terrain. It is not clear if this UGV is ready for a complicated Ukrainian battlespace following the announcements in February–March 2023 of its testing in the Donbas region of eastern Ukraine. A relatively large Marker platform may be easy prey for multiple UAVs prowling Ukrainian battlespace, where it can be tracked and then attacked by FPV-type drones. A more likely and realistic Marker UGV use is as a stationary platform for reconnaissance and surveillance drones tethered to the vehicle, with the UGV located at a relative distance from the frontline and possibly hidden from view, instead of an actual autonomous combat platform able to travel to self-identified target locations.⁹⁹

Recently, Marker’s manufacturer announced additional tests to enable this vehicle’s autonomous navigation in a difficult environment using automated target recognition.¹⁰⁰ There were also public claims that future Marker versions will be modified based on the overall lessons from Ukraine, although no further details have been provided so far.¹⁰¹ It is worth noting that initial Marker tests were carried out at a time when mass-scale FPV drone use was still relatively rare—since then, no vehicle remains safe on the Ukrainian battlefield from numerous FPV drones that make any movement and maneuver extremely difficult and dangerous.¹⁰² In fact, the Russian authorities tasked with Marker testing may have changed their plans altogether out of concern for losing a relatively expensive combat UGV prototype.

Such autonomous vehicle developments are no longer monopolized by large defense-industrial enterprises—many efforts across Russia’s volunteer community have manufactured a large number of FPV kamikaze drones for the military and now are calling for a similarly scaled effort to build a large number of small-sized, kamikaze-style, remote-controlled, and possibly even autonomous UGVs, which can potentially operate in swarms under the right conditions. That said, the development, production, and fielding of UGVs is more complex and costly than that of small FPV-type or ISR UAVs, and commercial technology is not yet as advanced in this space. There is still a wide gap between Russian UGV perceived capabilities prior to the Ukraine war and what has been employed in combat.

Prior to the war, Russia was one of the leading world powers in UGV concept R&D and demonstrations, particularly armed UGVs, developing a menagerie of systems, from the smaller Platform-M and Nerehta to midsized Soratnik to the large Uran-9 combat system. In practice, this Russian UGV lineup has been completely inconsequential in the Ukraine conflict, given small development numbers, lack of concepts and tactics for

using them in combined arms formations, and a presence of multilayered Ukrainian countermeasures such as the ever-present FPV drones that go after anything that moves on the battlefield. Moreover, the few UGVs that the Russian military is using, for example Uran-6, are in fact remote-controlled and are utilized in limited ISR and demining missions, with operators in close proximity.¹⁰³ The public claims about the Russian military’s UGV use in Ukraine also do not feature any of the key combat models developed prior to the 2022 invasion—for example, an October 2023 state media announcement featured claims of potential AI use in the previously unknown BR-1 and BRG-1 uncrewed ground vehicle platforms designed to lay mines and evacuate wounded personnel.¹⁰⁴ These small UGVs are a result of a joint project between Russian volunteers and the defense enterprise, and likely are present in very small numbers at the front. Likewise, the majority of aerial drones in the Russian arsenal are remotely piloted, with significant losses due to pilot error and other related causes including electronic warfare and air defense fratricide (friendly fire incidents).

INFORMATION/CYBER

Prior to the Ukraine invasion, there was global concern about Russia’s potential supercharging of its information warfare with AI. With the international community worried about Russia’s election interference and propaganda campaigns via new mediums such as social media, there were grounds for concern that the Russian military and intelligence departments could target Ukrainian and Western societies. The use of deepfakes was considered an especially egregious threat, given how such technology was proliferating commercially.¹⁰⁵ Considering Russia’s previous use of information and cyber weapons,

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the scaling and hyper-powering of these efforts with AI was considered the next logical step for the Russian government in using all available domains to advance its causes. While the Kremlin wants to use AI in information warfare, a gap remains between the military’s deliberations and practical results targeting Ukrainian society and the military.¹⁰⁶ The first public deepfake the Russian government used of Ukrainian President Zelensky was

quickly identified as fake and perhaps was indicative that using such technology for actual information operations is a more difficult feat. Yet the commercial AI-generated technology that can create ever-realistic visuals such as news anchors and onscreen personalities is evolving by leaps and bounds, resulting in a more believable interface that potentially can influence public opinion.¹⁰⁷ That is why international experts gathering data on the Russian deepfake attempts note that a key result from the Kremlin's efforts was potential distrust in real media sources, with targeted populations doubting the veracity of any information they viewed about certain conflicts out of concern that it may be fake.¹⁰⁸ This distrust may lead to a long-term, lingering effect of populations questioning the overall legitimacy of the information they receive, which may play into the Kremlin's hands when it comes to attempting to interfere in election processes worldwide, including in the United States.

Enablers of and Constraints on Russian AI R&D

Russia's war in Ukraine has exposed certain gaps between its military objectives and actual capabilities. The grinding war and international sanctions have increased the obstacles that Russia faces in meeting its military AI objectives. This section describes the factors that historically have enabled Russia's AI development, its increasing constraints, and steps Moscow is taking to mitigate those constraints.

Human capital and the broader technology ecosystem.

Historically, Russia has been proficient in scientific development and has touted its science, technology, engineering, and math (STEM) education as one of the strongest in the world, a key national security pillar, and a prerequisite for the country becoming a major high-tech power. As government support for national science education has ebbed and flowed since the collapse of the Soviet Union, many of Russia's best and brightest have often chosen to work abroad, in better financial, social, economic, and academic conditions. Still, Russia's remaining developers, scientists, and technicians continue to work on and implement AI products, whether in Russia proper or abroad.¹⁰⁹ The number of Russian academic studies and research on AI also may be many magnitudes smaller than in the United States and China, but Russia's technical potential that has built up over years and investments in select high-tech products and solutions nonetheless have produced AI

achievements in the financial, retail, scientific, medical, and other sectors even in the midst of sanctions.¹¹⁰

Of course, the Russian AI market remains comparatively small when compared with those of China, the European Union, or the United States, and its high-tech and AI ecosystems showed signs of trouble even before the February 2022 invasion.¹¹¹ A 2021 study commissioned by the Russian government identified several major impediments to Russia's AI developments, including a shortage of key personnel, weak venture investment market, low penetration of Russian products into foreign markets, dependence on imported products and services, slow introduction of products into business and government, as well as a weak connection between theory and practice (that is, taking ideas to the product stage).¹¹² The weak workforce development—despite a strong STEM background of many Russian university graduates—reflected an underdeveloped ecosystem where startups could not fund their ideas via supporting capital mechanisms, as it is often done in the West. The Russian government responded to such challenges by launching several funds and initiatives to promote domestic high-tech development, but the relatively short time span before the Ukraine invasion meant they did not have the time to generate the desired results.¹¹³

Russia's war in Ukraine is likely to exacerbate some of these problems. The following factors will constrain Russian AI development, complicating the country's ability to keep pace with leading AI powers today.

Exodus of the technology sector.

Many talented high-tech workers and entrepreneurs in the broader information and communication technologies (ICT) ecosystem that includes AI emigrated abroad at the start of Moscow's invasion of Ukraine. At least 70,000 and up to 100,000 tech professionals have left the country—bound for Europe, the United States, the Middle East, and several former Soviet republics.¹¹⁴ While some continued to work for Russian high-tech companies, many were employed by international companies, while others chose to seek entirely new ICT employment. Many remain abroad, though some have returned due to difficulties settling in new countries. This emigration will remain a long-term issue for the Russian high-tech industry in general. Speaking at the Army 2023 military forum, Deputy Prime Minister Chernyshenko remarked that it is necessary to train around 10,000 AI specialists a year for the domestic industry, and that the personnel gap in this industry remains very large.¹¹⁵ Earlier, Maksut Shadayev, the head of the Digital Development Ministry, said that the

shortage of IT developers in Russia was estimated at around 500,000 to 700,000 people, while Sberbank (Russia's largest banking and financial company) CEO German Gref estimated Russia's gap of IT personnel at over a million people.¹¹⁶ While these numbers may suggest a significant capacity gap, they may not reflect the current ICT reality built around a relatively small market in general, but instead may be indicative of the Russian government's own ambitions and plans in growing a domestic high-tech sector to the point where such significant workforce numbers may be needed.

Inability to access parts and data.

The sanctions imposed on Russia after its full-scale invasion of Ukraine in February 2022 have exposed a considerable degree of dependence by the Russian economy, its high-tech sector, and the military on imported products, goods, and services. This dependence is acutely felt in the broader national AI R&D ecosystem that relied on Western and Asian hardware, software, and microelectronics for domestic developments.¹¹⁷ Russian developers and researchers will struggle with the lack of access to quality foreign hardware and components, as well as blocked access to Western depositories of anonymized data to train algorithms.¹¹⁸ This data access may ebb and flow depending on the global community's willingness—for example, early in the Ukraine invasion, GitHub announced it was suspending accounts of Russian software developers and companies linked to entities sanctioned by the U.S. government. This resulted in the removal of accounts belonging to Sberbank Technology, Sberbank AI Lab, and the Alfa Bank Laboratory, including accounts of individuals who had ever been affiliated with these companies.¹¹⁹ Later on, GitHub stated it would continue providing access to Russian developers worldwide, perhaps as a way to ensure that those developers who left the country could still have access, while those who remained in Russia were blocked. Yet in December 2023, Russian developers were complaining that GitHub finally had closed many developments in computer vision for their public access, resulting in development delays.¹²⁰ This has accelerated efforts by Russia's Ministry of Digital Development to develop and launch its own version of GitHub to host public open-source projects, to be fully operational sometime in 2024.¹²¹ It is too early to judge the efficacy of such efforts, but developing a self-contained high-tech ecosystem outside of the massive amount of global data may have its own risks and benefits, depending on what content is generated, and who ends up using such information.

Isolation from the innovation ecosystem.

Since March 2022, it has become increasingly clear that the full-scale invasion of Ukraine may have a serious and long-term negative impact on Russia's international cooperation in AI, which will further hinder Russia's ability to innovate. Russia's evolving AI partnerships with the United States and Europe were suspended right after the invasion. In turn, the Russian government has been urging an eastward turn to further explore markets in China, India, the Middle East, and other regions. (Additional details on Russia's relations with external partners are provided in this report's appendix.) Many of these markets had been relatively unexplored by Russian companies, and the engagement with certain companies and countries may have more political than economic benefits. At the same time, Russia's high-tech relationship with China could expand, although it is unclear how Beijing will approach the relationship from a long-term perspective, given the ongoing global sanctions pressure on Russia and the prospect of the Ukraine war becoming a long-term conflict.

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Another major factor that has been holding back Russian AI development is the risk-averse culture that permeates the domestic business and industrial community. Russian innovators driving the domestic high-tech sector have publicly admitted that the Russian internal investment climate is not conducive to innovation due to a preference for state-funded grants and programs, and an aversion to high-risk startup ventures.¹²² In fact, taking risks on promising ideas and products as a key R&D strategy, as is prevalent in the West and other high-tech global spots, never had time to really take root in Russia, with state-connected large enterprises preferring the assurance of government-funded projects to the uncertainty of new ideas that potentially could upset the status quo. Given the workforce and resource constraints aggravated by the sanctions and the war in Ukraine, these preferences are unlikely to change in the near future.

Impacted economy and AI ecosystem.

Russia's growing isolation from major high-tech economies and markets may make it more difficult for the national economy to adapt to global trends, creating ever-greater structural deformations of the Russian economy and possibly increasing societal tensions. Russia is lagging the most developed countries in the pace of innovation-oriented economic growth, which is caused by the weak protection of technology entrepreneurs, the lack of financial resources, and the relatively small capacity of the domestic market for high-tech products, along with a low level of competition among Russian companies and the need to acquire ready-made tech solutions abroad via a number of legal, illegal or "gray" schemes. At the same time, Russia's growing cooperation with China may offset some of these challenges, but at the potential cost of greater dependence on Beijing's own technology developments, markets, and policies that are in turn impacted by the Chinese government's own long-term outlook on the war in Ukraine and other global crises.

Russian Efforts to Offset Challenges

There are no easy ways for Russia to overcome these obstacles. Russia's ability to innovate and meet its own stated objectives for AI will be constrained as a result of its war in Ukraine and challenges previously outlined. Nonetheless, the Kremlin will seek to offset the challenges it faces and find workarounds to the restrictions. Already, the imposition of high-tech sanctions following Russia's full-scale invasion of Ukraine prompted Moscow to, first, conduct a damage assessment of its high-tech ecosystem, and second, provide guidance and support to domestic R&D enterprises, institutions, and efforts across the civilian and military spheres.

A key determinant made by a number of government and industry officials was the need to end reliance on imports, however long that process might take.¹²³ Phrases such as "import substitution" and "technological sovereignty" became the war cries to rally the industry, developers, academia, end-users, and broader society in the face of sanctions.¹²⁴ Even when high-tech industry representatives insisted that complete technical sovereignty may not be possible, since no country today actually manufactures an entire lineup of the hardware and software needed, the Russian government still chose technological sovereignty as a nationalistic long-term policy. This effort now is aimed at reducing dependence on certain outside actors, and at developing the domestic industry that has long remained dormant due to lack of investment or underinvestment given the easy access to imported products.¹²⁵ In fact, in February 2024, President

President Vladimir Putin outlined the priorities of the country's scientific and technological development for the next decade, including the creation of domestic machine learning and artificial intelligence technologies.

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In 2022, at the beginning of the sanctions pressure, the Russian government adopted a revised roadmap for national AI development that reflected the challenges Russia faces.¹²⁷ This roadmap has scaled back funding and scope when compared with the original October 2019 AI roadmap that publicly announced Russia's national ambitions to become one of the leading AI powers.¹²⁸ Specifically, the Russian government planned to invest much less in AI, while recognizing that the domestic market for AI technologies would be smaller than originally proposed in 2019.¹²⁹ The Russian government also has sought to provide guidance to the domestic market, which has been experiencing significant turmoil almost two years into the war in Ukraine.

Therefore, in May 2023, the government adopted a vision of technological development through 2030 that would achieve "technological sovereignty" by advancing domestic R&D. The concept document provides for the creation of a production base for microelectronics, robotics, drones, and software.¹³⁰ One domestic effort worth a closer look is Baikal, the domestic maker of microchips, which recently launched a new division to develop a lineup of specialized chips for AI to decrease reliance on U.S.-based Nvidia Corporation products.¹³¹ While this effort may take up to three years, and possibly even longer, depending on the chip manufacturer's ability to meet its stated objectives, it is likely to be one of many such initiatives to attempt competition with global high-tech leaders while also propping up the domestic high-tech ecosystem.¹³² Moreover, the Russian government is supporting six AI research centers based in the nation's leading universities and scientific organizations, with public and private funding allocated for AI-related studies over the next four years.¹³³

At the same time, the Russian government continued to evaluate its progress in high-tech development,

pivoting and adopting new approaches as a reflection of its progress and the state of economic health due to sanctions. In September 2023, Putin further ordered his government to implement additional measures to support AI research, including the optimization of machine learning algorithms and the development of large language models.¹³⁴ Putin called on state-owned firms to accelerate AI efforts and technologies across the country, while ordering the government to support the development of supercomputers via benefits to domestic manufacturers. In November 2023, Russian Prime Minister Mikhail Mishustin instructed government ministries to develop updates to the AI development strategy that should become the basis of a new “Data Economy” national project.¹³⁵ Mishustin directed that by April 15, 2024, the Ministry of Economy, the Ministry of Digital Development, and the Ministry of Finance must determine a list of key indicators for the national AI development project. The Russian government also is developing and supporting undergraduate and graduate educational programs in AI to grow a future workforce, and is seeking to improve the qualifications of teachers from primary schools to university levels. These efforts are aimed at allowing for better implementation of new AI educational programs via better cooperation with domestic technology companies. In December 2023, the government announced a selection of six scientific and university-based organizations to receive government support for the development of AI research centers to work on specialized scientific research in AI and train industry specialists.¹³⁶ Still, such measures would take years to bear fruit in peacetime; how such goals will be accomplished during wartime and ongoing sanctions pressure remains to be seen.

Even with the less-than-desired performance of national AI companies, organizations, and initiatives, the Russian MOD will continue to rely on this cumulative knowledge base. In August 2023, Deputy Prime Minister Chernyshenko once again called for an expert assessment of the developed civilian IT solutions on behalf of the country’s military and to provide access for MOD experts to information about civilian AI products.¹³⁷ The MOD would like this cooperation to take place at its ERA Technopolis, with the nation’s leading companies and high-tech initiatives hosting their R&D labs on the ERA campus.¹³⁸

In addition to its own domestic actions, the Russian government also will rely increasingly on external partnerships to help mitigate Western restrictions and provide a lifeline for the sustainment of its AI developments. Even before the full-scale invasion of Ukraine

in February 2022, the Russian government considered international cooperation in AI as one of the key pillars of its own national AI development. Of all the countries, China remains the top choice for economic and high-tech cooperation. Although the depth of Russia and China’s future cooperation remains uncertain in the wake of Russia’s war in Ukraine, China has remained an important partner for the Kremlin.

Numerous public investigations and analyses point to China as a major source of microelectronics and other important products for Russia’s civilian and military high-tech sectors, including AI.¹³⁹ Many of the microchips and microelectronics that pass through China are intended for Russia’s defense-industrial sector, including for AI-related products and developments.¹⁴⁰ That said, most public sources do not provide any specific information on the extent to which Russian and Chinese militaries can share their more advanced products and efforts, such as algorithms that enable specific AI systems. However, in February 2024, Russia and China exchanged their assessments of the military application of artificial intelligence technologies, with this meeting apparently reaffirming the similarity of the two nations’ approaches to military uses of AI.¹⁴¹ This is likely one of many such meetings to take place in the coming years, as Moscow and Beijing are moving closer politically against the perceived threat of U.S. and Western actions.

Prior to Russia’s full-scale invasion of Ukraine, Chinese AI-related efforts in Russia included the launch of numerous joint projects and the work of international conglomerates such as Huawei, which played a significant role in Russia’s AI marketplace and its growing ecosystem.¹⁴² The company has engaged in research, product, and talent development with multiple Russian organizations and universities. Today, despite the international sanctions pressure, China still has long-term plans to cooperate with Russia in the ICT marketplace. Chinese government officials remarked in 2022 that their country was looking to strengthen cooperation with Russia in areas such as big data and cloud technologies.¹⁴³ One of the most significant benefits of this cooperation may be Russia’s access to the global data and information that is provided to and available in China, enabling some of Moscow’s R&D efforts to proceed uninterrupted.

For their part, the Russian scientific community and the government in general have indicated publicly the desire to learn from China’s experience, especially when it comes to commercializing their ideas and concepts. The Russian Academy of Sciences especially was dedicated to such efforts by publicly discussing the shortcomings in the nation’s academic and research

communities that were overcome by their Chinese counterparts.¹⁴⁴ Because of this, Chinese language courses are expected to become mandatory across most Russian universities specializing in science and technology.¹⁴⁵ In fact, the Moscow Institute of Physics and Technology, Russia's main AI RDT&E educational institution, recently has opened a center for Russian-Chinese cooperation with Beijing Polytechnic Institute "to create educational and research projects in the field of theory and practice of teaching Chinese and Russian languages."¹⁴⁶ Along with learning to take their product to market, the Russian government also is learning from China's experience in population management and oversight, including facial recognition, voice recognition, and smart city technologies that enable large-scale monitoring.¹⁴⁷ In fact, Moscow already is implementing facial recognition technologies as part of payment systems across the retail and public sectors.¹⁴⁸ Russia also is promoting AI in medical diagnosis, touting this as one of its AI successes, and potentially can share that knowledge and technology with China.¹⁴⁹

Despite China's place in the global high-tech ecosystem, there is a growing Western trend to limit dependency on Chinese high-tech products, goods, and services. When coupled with the pressure to limit Russia's access to AI-related services and products, including microelectronics, the evolving relationship between Moscow and Beijing could grow into a more substantial cooperation between the two countries—a relationship that both see as a larger civilizational struggle against the collective West.¹⁵⁰ The long-term effect of this relationship is difficult to predict, considering that both countries view themselves as key and distinct emerging epicenters in a multipolar environment. At the same time, as long as the United States maintains pressure on both countries, there is room for Moscow and Beijing to cooperate on select issues that include AI-enabled military, industrial, national security, and law enforcement products.

Implications of Russia's AI Development

It is difficult to predict how the Russian military will change in the aftermath of the war in Ukraine, and the extent to which Russia will be able to continue its military modernization efforts. Not only will Moscow struggle to confront the challenges previously discussed, but the war in Ukraine has highlighted structural, organizational, and cultural weaknesses across the Russian defense establishment that may hinder the

Russian military's ability to implement AI across its forces, systems, and future missions. Nonetheless, the Russian government understands how important AI is, not just to the future of war but also to the Russian economy and societal development writ large. It therefore will pursue mitigation strategies and remain focused on sustained development in key areas. In the short to medium term, the most likely scenario is that Russia will remain a capable power whose AI capabilities will present a unique set of challenges for the United States and its allies.

Sanctions, talent shortages, and impacted domestic high-tech capabilities are certain to limit Russia's ability to develop and field AI-enabled systems. The negative effects of these factors, however, will not necessarily become worse over time if Russia accelerates investment in domestic production capacity and strengthens collaboration with China and other technologically advanced countries not beholden to the United States. For Russia today, being blocked from accessing Western technologies, markets, and collaboration opportunities is not the same as being an international pariah state, since plenty of countries and companies across the former Soviet space and in Africa, the Middle East, South Asia, and Southeast Asia still do business with Moscow.¹⁵¹ Therefore, it is too early to assume that ongoing Western sanctions will negatively affect Russia's high-tech sector and future capacity for developing and/or adopting certain technologies. This section summarizes some of the key implications of Russian military AI for the United States and its allies and partners.

Russia is a good enough power with AI capabilities that impact the battlefield.

Although significant breakthroughs in AI are unlikely to originate in Russia, given the reality of its current military predicament in Ukraine, Moscow is likely to sustain gradual progress on certain technologies and principles that can aid its large-scale war. Russia's current standalone projects where AI supposedly has been utilized or would play a significant role, such as decision-making or command and control in advanced unmanned aerial or ground combat forces, likely will remain limited in scope until enough resources are reallocated to force restructuring and general rebuilding of military capabilities impacted by the war.

Therefore, the most impactful AI development in Russia will involve software capacity such as data analysis rather than hardware such as the previously discussed robotics and autonomous systems. Should the Russian military field AI command and control

for swarms of relatively cheap, inexpensive ISR and combat drones, such as numerous quadcopter, FPV, and small fixed-wing-type UAVs operating over Ukraine, it actually may gain a measure of control and advantage over the hotly contested Ukrainian battlefield.

The Russian military's widespread use of commercial technology such as Chinese-made DJI quadcopter drones is also indicative of certain flexibilities and adaptations not normally associated with the more rigid, vertical Russian military force structure. Such commercial, off-the-shelf technology is having a significant tactical impact in the war. Therefore, the MOD's willingness and ability to rapidly scale up commercial technology use should not be discounted, as the war is likely to stretch into 2025 and potentially beyond.

Russia will build on its strength in developing software products.

Before Russia's invasion of Ukraine, Russian developers and government officials touted the country's strength in developing software products and flagged this area as one with potential for tremendous growth. Although a large contingent of top IT and software developers have left since 2022, a critical number remain and can facilitate the Russian government's attempts to steer its high-tech sector toward greater domestic product development and technology implementation.

This talent pool is likely to be an asset to the Russian government, its security services, and even the military as they apply such talent toward executing

cyber operations such as ransomware attacks and digital surveillance.¹⁵² This talent pool also may fuel the MOD's attempts to capitalize and apply AI and high-tech products generated by the civilian, non-military sector. The success of Russia's import substitution efforts, however, will rely on domestic software experts lessening dependence on imported products and developing domestic alternatives that can function within the Russian ecosystem—thus reducing the country's dependence on international high-tech cooperation. Russia's strength in software development also makes it attractive to China, which is eager to exploit a ready talent pool for its own products and services.

Artificial intelligence is emerging as an enabler and a complementary capability in combat rather than a technology capable of replacing humans.

Russian AI will be a supplementary technology in combat for the foreseeable future.

Russian official statements about proposed AI military uses highlight the gap between hypothesized applications of emerging technologies and concepts, R&D efforts, and the practical application of weapons and systems in a complex operational environment against a peer adversary. The war in Ukraine has demonstrated that AI and advanced military robotics cannot replace humans in the most essential combat tasks. While advanced drones and other high-tech capabilities can degrade the adversary to a certain point, ultimately the war in Ukraine demands that territory be captured and held. In this case, conventional tactics and capabilities such as massed infantry, artillery, electronic warfare, and mechanized forces backed by UAVs for ISR and combat tasks are key. Therefore, in Ukraine and subsequent wars, AI and advanced robotics are unlikely to replace human fighters at a significant level, as some Russian military academics and theoreticians proposed earlier.

Artificial intelligence is emerging as an enabler and a complementary capability in combat rather than a technology capable of replacing humans. This pattern is going to hold for quite some time, even with more advanced AI applications aiding in the decision-making cycle that involves both human and non-human elements such as advanced algorithms and autonomous systems.

In missions where adversary forces and systems have to be neutralized or at the very least degraded, AI-enabled systems can be key to developing a better understanding of enemy technologies, tactics, and the battlefield environment. That said, previous wars fought by the United

States have demonstrated that overwhelming high-tech superiority over low-tech adversaries, including in Afghanistan and Iraq, is only part of the overall effort, which also necessitates holding territory and influencing populations. Additionally, the October 7, 2023, attack by Hamas forces on Israel's military and civilian targets exposed certain faults and gaps in depending on fully electronic and AI-enabled surveillance systems instead of also relying on human overwatch of key security points and areas.¹⁵³

Ultimately, even if AI-enabled drone swarms take to the skies over Ukraine, they will not be able to capture and hold territory. Similarly, U.S. concept developments to defend Taiwan against the People's Republic of

China are about holding and defending actual territory and potentially expelling the adversary from captured land—which again puts human-centric forces against peer formations, notwithstanding the effect of modern air force, missile, and naval capabilities to degrade the opposing military. Therefore, it is likely that the Russian military-academic debate on the role of AI may feature less of the belief expressed years ago by the Deputy Director of Russia's Advanced Research Foundation (Russia's DARPA-like organization) that human fighters eventually would be supplanted by military robots. Instead, the debate will focus on a more practical, realistic assessment of AI as a data analysis and a decision-support tool for faster, more advantageous reactions to the still-human-centric battlefield environment.

AI will amplify Russia's nonconventional tactics.

Russia will rely on asymmetric means to counter what it sees as its more capable U.S. and NATO adversaries. AI, in an asymmetric role in the information and cyber domains, will be a significant complementary tool to the Russian military. While its previous AI efforts against Ukraine cannot be deemed “successful,” attempts to use AI to speed up and multiply attacks on adversary infrastructure while targeting populations worldwide with unique and tailored datasets have significantly complemented Russia's ongoing conventional-type, casualty-intensive combat in Ukraine. Future applications may be scaled up, especially during election cycles in the West, where societies are already deeply polarized and may be divided both online and in the physical environment. In such cases, Russia does not need to “win,” but only to undermine or splinter the relatively unified Western response to its actions. The war in Ukraine is a testbed for such approaches, with a growing roster of voices in the U.S. political establishment already calling for a lessening American support and military aid for Ukraine.

Russia is likely to use AI for deception.

Russian efforts to use AI for deception most certainly will involve the information domain, given its key importance for domestic stability and as an asymmetrical tool to respond to Western or adversary actions. Likewise, developing advanced technologies capable of deceiving potential adversaries is high on the Russian MOD agenda, including technologies such as the *Surrogat* underwater autonomous vehicle that the Russian press alleges can reproduce a signal from an arbitrary submarine, mimicking it spuriously. Understanding and

impacting adversary decision-making space by seeking to influence and affect the information environment before, during, and after a crisis is also likely one of the main MOD priorities, potentially via the aforementioned NDCC and other methods and tactics.

Russia is more willing to experiment on the battlefield with untested technology.

Russia will continue to be driven by a sense of vulnerability and concern about falling behind the United States, China, and other powers in some technology areas. As such, the Kremlin is likely to be more accepting of risk in some situations, including decisions about the acceptable deployment of AI and autonomous systems. Additional factors may push the Russian military to experiment with untested technologies—whether manufactured in Russia or imported from abroad. These factors include mounting casualties in Ukraine, critical deficiencies in the domestic defense-industrial base, and delays in getting proven equipment to the frontlines. Already, the testing, evaluation, and iteration timelines of the previously mentioned alleged Russian experiments with AI-enabled FPV and one-way attack drones have been shortened to weeks and mere days at the frontlines by units and developers working outside of official MOD R&D structures and departments.

Still, there is far from a unanimous Russian view on acceptable levels of risk. On the one hand, some Russian developers of domestic robotic systems discuss minimizing risks when fielding brand new systems, followed only after a lengthy testing cycle by the military.¹⁵⁴ On the other hand, however, some voices across Russia's high-tech and government communities already are predicting that Russia may field Terminator-like robotic systems, assuming that the final step is taken to teach the machine to make the right decisions on its own.¹⁵⁵ Whether such sentiment is widespread across the entire MOD is unclear, given that many of Russia's military robotics developments are siloed, and no significant cooperation between multiple efforts is evident. At the same time, despite the deliberations discussed earlier, there are at least some who are ready to field an autonomous military machine once the necessary datasets are loaded and machine learning algorithms enable the vehicle to adapt on the fly.

Russia's official position on the lethal autonomous weapon systems (LAWS) discussion at the United Nations is one of non-interference from the international community in domestic affairs, including the freedom to develop whatever robotic systems a nation sees fit for its goals.¹⁵⁶ For years, the UN debate has tried to forge a

consensus on banning such weapons, with the Russian position described here remaining constant in the face of international pressure. It is not clear whether the Russian military already has a LAWS-like system, but the way Russia approaches the discussion of such developments should be carefully scrutinized.

Headwinds to international cooperation with Russia.

In 2023, in order to lessen dependence on Western-origin technologies and policies, the Russian government articulated a global strategy of closer engagement with China and other allies via a number of organizations and venues where Moscow has a central role, such as the Brazil, Russia, India, China, and South Africa (BRICS) organization and Shanghai Cooperation Organization.¹⁵⁷ Even prior to its invasion of Ukraine, Russia had criticized the G7 organization as outdated and unable to meet global challenges without China and India as members, portraying it as a tool of U.S. foreign and military policy.¹⁵⁸ Following its invasion of Ukraine, the Russian government has highlighted the country's desire to be independent from many processes where it thinks the United States and the West play a key role, and instead is working toward creating a multipolar environment where Russia can stake an equal and influential position.¹⁵⁹ Putin stated publicly in 2023 that Russia must be in the vanguard of nations developing AI and at the forefront of research into neural technologies.¹⁶⁰

On the one hand, such nationalistic statements could indicate that Russia may be unlikely or reluctant to be a part of international cooperation processes such as discussions on the control of AI in which the United States and its allies may have a key role. Such venues are seen by Moscow as advantageous to Western policies and as undermining Russia's ability for independent action. However, Putin signaled in December 2023 that unrestricted AI development may be as dangerous as unrestricted nuclear weapons development in the 20th century, necessitating a dialogue among global leaders on possibly limiting AI uses.¹⁶¹ Putin reaffirmed this sentiment in February 2024, when he discussed Cold War-era nuclear arms control treaties as a guide to international dialogue on fast-developing AI, indicating the need to negotiate "at the inter-state level on how we will regulate this [technology]."¹⁶² Such an outlook on the evolving foreign policy environment may impact how Russia and the United States reach a consensus on key topics involving emerging technology such as military AI.

Conclusion

This paper offers an overview of main themes and developments related to Russian AI in the military and civilian domains. Given the large international body of work dedicated to this topic, this paper should be treated as part of the ongoing research and analysis of these issues. Presently, the Russian government is initiating a significant undertaking to jump-start its domestic high-tech development, to adapt to global sanctions, and to continue R&D of AI-enabled weapons and systems in the midst of the ongoing war in Ukraine.

Considering the significance of AI for its government and armed forces as both a tool and a policy concept, Russia should be expected to continue investing resources in such technologies. Some of these efforts may deliver results in the short to near term, others may be impacted by domestic and international developments, both under and outside of the Kremlin's control. It is clear that the invasion of Ukraine and prolonged warfare have activated processes such as import substitution, technological sovereignty, and domestic high-tech restructuring for which the Russian government may not have been adequately prepared.

It also is likely that some of the military processes and initiatives described in this paper may get an accelerated timeline for development and implementation, given how quickly the use of AI tools and technologies is spreading in the Ukrainian military, and across other military forces as a reflection and a result of the war in Ukraine.¹⁶³ The Russian government is also demonstrating it can be adaptable to major challenges, although the timeline for such adaptation may vary greatly from one AI-related effort to another. The key takeaway is that the Russian government understands the importance of AI not just to the future of war, but to the overall Russian economy, society, and global competitiveness. The ongoing conflict in Ukraine is forcing a significant restructuring and redevelopment of the Russian efforts described here, and how the Russian government, military, and society react to such challenges deserves close scrutiny.

Appendix: Russia's External AI Partnerships

Over the next several years, Russia should be expected to increase its focus on building new partnerships with countries that have not subscribed to the international sanctions regime. Expansion into the Middle East, Southeast Asia, and Latin America is particularly likely to become a focus for commercial Russian companies in the AI field looking to replace lost markets in Europe and North America. This appendix provides examples of some of the more important Russian international AI partnerships, based on the Center for Naval Analyses report *AI and Autonomy in Russia*.¹⁶⁴

- Across the former Soviet space, Russian facial recognition and related technologies were marketed to Central Asian countries. Such companies are likely to maintain their presence there for the near future, despite competing Chinese firms that can undermine Russia's market share in the long term.¹⁶⁵ At the same time, Russia and Belarus are exploring closer cooperation in high-tech and especially AI within the framework of their ongoing political, economic, strategic, and defense cooperation.¹⁶⁶
- Russian AI cooperation with the United States was limited prior to February 2022. Between 2014 and 2022, U.S. sanctions allowed limited interactions with Russia's large state-run corporations that are on the Western sanctions lists. Prior to 2022, the deterioration of the U.S.-Russia political relationship had a significant negative effect on the MIT-Skoltech partnership that was formed to develop high-tech products and services. MIT remained an integral part of Skoltech until March 2022, when it withdrew from the partnership following Russia's invasion of Ukraine.¹⁶⁷
- Russia's AI cooperation with Europe has been constrained by Western sanctions on technology transfer to Moscow, security issues that make both sides cautious about revealing their vulnerabilities, a lack of trust on cooperation in technology due to fear of hacker attacks, along with a sense of economic competition.¹⁶⁸ Prior to the invasion of Ukraine, several areas of cooperation included the use of AI in "mega science" projects such as particle physics and the International Space Station. Healthcare R&D, smart cities, and smart infrastructure were discussed as potential areas for cooperation, since they could be kept separate from more sensitive security issues.¹⁶⁹
- Russian technology companies also have established partnerships with counterparts in the Middle East. The leading partner for Russia in the Middle East is the United Arab Emirates. Partnerships in the United Arab Emirates include both academic and commercial ventures.¹⁷⁰ In February 2024, Russian banking officials reaffirmed the significance of the United Arab Emirates for Russia's Middle East efforts to find partners for AI development and implementation.¹⁷¹ Moscow also is working on establishing technology and high-tech partnerships with Saudi Arabia.¹⁷²
- Russia's cooperation with Israel has been facilitated by a 2010 bilateral agreement that calls for growing industrial R&D cooperation. Through this mechanism, the Russian nanotechnology innovation institution Rusnano Group and the Israel Innovation Agency have set up a grant mechanism for teams comprising both Russian and Israeli partners. While Russian tech leaders may see joint scientific R&D as a key area in developing Russia-Israel bilateral cooperation,¹⁷³ this relationship may be severely tested by the ongoing war between Israel and Hamas that has the potential to impact the larger Middle East region.
- Russia's efforts to expand collaboration in AI to other parts of the world are limited, focused primarily on the marketing of Russian AI products. India recently has become the focus for Russian AI efforts.¹⁷⁴ Beyond this, there is little high-tech cooperation with New Delhi, though Russian corporations such as VisionLabs and Gazprom Neft have sought to expand their presence in the country through joint ventures in AI-based solutions for areas such as transportation and hydrocarbon extraction. Russian analysts believe Russian companies have expanded their presence in India significantly, but often do so covertly, such as through Indian partners, in order to avoid sanctions.¹⁷⁵
- Russia has made limited efforts to penetrate AI markets in Latin America and Africa. Latin America is considered a potentially lucrative market, especially for apps that help Spanish speakers learn English. A Russian company has developed an app aimed at children for this purpose, using an AI-based voice assistant, that is being marketed in Mexico and Chile, with plans to expand to other Latin American countries.¹⁷⁶ Additionally, the Russian government is seeking to use the BRICS organization to enhance AI cooperation among the organization's members and beyond.¹⁷⁷ In 2023, BRICS announced the creation of

an AI study group and called for increased cooperation in managing that technology—specifically, to develop governance frameworks and standards to make AI technologies more secure, reliable, controllable, and equitable.¹⁷⁸

- Russian ventures in Africa remain limited, with a focus on commercial sales of AI-enabled products and the education of African students at Russian STEM higher educational institutions.¹⁷⁹ In terms of sales, Russian AI technologies are in demand in mining and other natural resource extraction industries in Africa.¹⁸⁰

1. “The Ministry of Defense Approved a Program for the Development of Military Robots [Минобороны утвердило программу по созданию военных роботов],” *Lenta.ru*, December 4, 2014, <https://lenta.ru/news/2014/12/04/robots>.
2. K.V. Vorontsov, “Speech by Deputy Head of the Russian Delegation K. V. Vorontsov during the Thematic Discussion on the Section ‘Conventional Arms’ in the First Committee of the 77th Session of the UN General Assembly [Выступление заместителя руководителя российской делегации К.В.Воронцова в ходе тематической дискуссии по разделу «Обычные вооружения» в Первом комитете 77-й сессии ГА ООН],” (speech, First Committee of the 77th session of the UN General Assembly, October 20, 2022), https://russiaun.ru/ru/news/201022_v.
3. Roman Kretsup and Aleksei Ramm, “‘Vanguards’ Are on the March: The Russian President Has Identified Five Tasks for the Ministry of Defense [Идут «Авангарды»: президент определил пять задач для Минобороны],” *Izvestiya* [Известия], December 21, 2020, <https://iz.ru/1102784/roman-kretcul-aleksei-ramm/idut-avangardy-prezident-opredelil-piat-zadach-dlia-minoborony>.
4. “Russia’s Future Largely Depends on Success in AI Sphere—Putin,” TASS, November 24, 2022, <https://tass.com/economy/1541465>.
5. “West’s Monopoly on AI ‘Dangerous’—Putin,” TASS, November 23, 2023, <https://tass.com/politics/1711479>.
6. “Putin Called for Equipping the Army with AI-Based Equipment [Путин призвал оснащать армию техникой на основе ИИ],” RIA Novosti [РИА Новости], December 19, 2023, <https://ria.ru/20231219/armiya-1916697903.html>.
7. “Alexander Vedyakhin: The Development of Artificial Intelligence Is the Key to Russia’s Technological Sovereignty [Александр Ведяхин: развитие искусственного интеллекта — залог технологического суверенитета России],” PR-IMPRESS, August 24, 2023, <https://primpress.ru/article/104212>.
8. A. V. Sergeantov, A. V. Resin, and I. A. Terentiev, “Transforming the Content of War: Contours of Future Military Conflicts [Трансформация содержания войны: контуры военных конфликтов будущего],” *Military Thought* [Военное Искусство], no. 6 (2022): 19–30, <https://cyberleninka.ru/article/n/transformatsiya-soderzhaniya-voyny-kontury-voennyh-konfliktov-buduschego/viewer>. *Voennaya Mysl* (*Military Thought*) is one of Russia’s oldest continuously published public journals and is one of the most respected military publications in Russia and abroad.
9. Sergeantov et al., “Transforming the Content of War.”
10. Sergeantov et al., “Transforming the Content of War.”
11. @Dronnitsa [@Дроннисца], “Dronification of War [Дронификация войны],” Telegram, August 25, 2023, <https://t.me/dronnitsa/257>.
12. Elena Chernenko, “‘Diplomacy Comes from Real Possibilities, Not Hypothetical Ones’ [«Дипломатия Исходит из Реальных Возможностей, а Не Гипотетических»],” *Kommersant* [Коммерсантъ], August 16, 2018, <https://www.kommersant.ru/doc/3714110>, cited in Samuel Bendett, “Military AI Developments in Russia,” in M. Raska and R. Bitzinger, eds., *The AI Wave in Defence Innovation: Assessing Military Artificial Intelligence Strategies, Capabilities, and Trajectories* (Oxford, UK: Routledge Press, 2023), <https://www.routledge.com/The-AI-Wave-in-Defence-Innovation-Assessing-Military-Artificial-Intelligence/Raska-Bitzinger/p/book/9781032110752>.
13. “‘Artificial Intelligence Technologies for the Defense and Security of the State’ Roundtable [Круглый стол «Технологии искусственного интеллекта в интересах обороны и безопасности государства],” *Ya Robot* [Я Robot], August 30, 2020, <https://ya-r.ru/2020/08/30/kruglyj-stol-tehnologii-iskusstvennogo-intellekta-v-interesah-oborony-i-bezopasnosti-gosudarstva>, cited in Bendett, “Military AI Developments in Russia.”
14. Andrei Arkadiev, “Evkurov Spoke about the Role of the Commander and the Intelligent Use of AI on the Battlefield [Евкуров рассказал о роли командира и разумном использовании ИИ на поле боя],” *Zvezda* [Звезда], August 23, 2021, <https://tvzvezda.ru/news/20218231528-wfQJx.html>, cited in Bendett, “Military AI Developments in Russia.”
15. “Russian Defense Ministry: Artificial Intelligence Will Never Make a Decision on the Use of Weapons [МО РФ: искусственный интеллект никогда не будет принимать решение о применении оружия],” TASS, August 18, 2023, <https://tass.ru/armiya-i-opk/18538359>.
16. K. V. Vorontsov, “Speech by Deputy Head of the Russian Delegation K. V. Vorontsov during the Thematic Discussion on the Section ‘Conventional Arms’ in the First Committee of the 77th Session of the UN General Assembly.”
17. Denis Smolyanov and Anton Solovyov, “Military Expert Predicted When Artificial Intelligence Will Replace Pilots [Военэксперт предсказал, когда искусственный интеллект заменит пилотов],” *News.ru*, December 6, 2023, <https://news.ru/russia/voeneksper-predskazal-kogda-iskusstvennyj-intellekt-zamenit-pilotov>.
18. “The Expert Said That Promising Combat Aircraft Will Remain Manned [Эксперт заявил, что перспективные боевые самолеты останутся пилотируемыми],” TASS, February 26, 2024, <https://tass.ru/armiya-i-opk/20081221>.
19. Dmitry Rogozin (@Rogozin [@Рогозин]), “Война на Донбассе и на Украине показала, как радикально изменились подходы к организации вооруженной борьбы с использованием традиционных вооружений, военной и . . . » Telegram, February 16, 2023, <https://t.me/rogozin-do/3705>.

20. Nikolai Alekseev, “Dmitry Rogozin: ‘We Need to Take Risks, Otherwise We Will Not Go beyond Our Usual Capabilities’ [Дмитрий Рогозин: «Нужно идти на риск, иначе мы не выйдем за пределы привычных возможностей»],” *World of Robotics* [Мир Робототехники], August 11, 2023, <https://roboticsworld.ru/gover-sup/dmitriy-rogozin-nuzhno-idti-na-risk-inache-my-ne-vyydem-za-predely-privychnykh-vozmozhnostey>. Editor note: this is the correct link, but will not render correctly if pasted in browser. To access, paste address into search engine and select the correct entry.
21. Andrew Roth, “Vladimir Putin’s Massive, Triple-Decker War Room Revealed,” *The Washington Post*, November 21, 2015, <https://www.washingtonpost.com/news/worldviews/wp/2015/11/21/vladimir-putins-massive-triple-decker-war-room-revealed/>; “Russia’s Military Command Center: Sending Orders from the Heart of Moscow,” *Russia Beyond the Headlines*, January 4, 2016, https://www.rbth.com/defence/2016/01/04/russias-military-command-center-sending-orders-from-the-heart-of-moscow_555889.
22. “The National Defense Control Center of the Russian Federation Uses Artificial Intelligence [Национальный центр управления обороной РФ применяет искусственный интеллект],” *REGNUM* [РЕГNUM], January 22, 2020, <https://regnum.ru/news/2836730>.
23. “Expert Believes That Artificial Intelligence Is Becoming the Main Task in the Development of UAVs [Эксперт считает, что искусственный интеллект становится главной задачей в развитии БЛА],” *TASS*, August 22, 2021, <https://tass.ru/armiya-i-opk/12189355>; “Expert Said That the Robotization of War Has Become the Main Global Trend [Эксперт заявил, что роботизация средств ведения войны стала основным мировым трендом],” *TASS*, August 23, 2021, <https://tass.ru/armiya-i-opk/12189407>.
24. V. B. Zarudnitsky, “The Nature and Content of Military Conflicts Today and in the Foreseeable Future [Характер и содержание военных конфликтов в современных условиях и обозримой перспективе],” *Military Thought* [Военное Искусство], January 2021, 34–44, <https://cyberleninka.ru/article/n/harakter-i-soderzhanie-voennykh-konfliktov-v-sovremennykh-usloviyah-i-obozrимоy-perspektive/viewer>.
25. Roman Biryulin, “Interview with Alexey Krivoruchko, Deputy Minister of Defense of the Russian Federation [Интервью заместителя Министра обороны Российской Федерации Алексея Криворучко],” *Red Star* [Красная Звезда], December 30, 2020, <https://bmpd.livejournal.com/4224782.html>. Editor note: this links to a LiveJournal replica of the original source material, which is no longer available.
26. “‘Vityaz’ Became the First ‘Robot’ to Reach the Bottom of the Mariana Trench [Аппарат “Витязь” стал первым “роботом”, достигшим дна Марианской впадины],” *RIA Novosti* [РИА Новости], May 9, 2020, <https://ria.ru/20200509/1571206567.html>; “Armata Tank Will Get AI [Танк “Армата” получит искусственный интеллект],” *RIA Novosti* [РИА Новости], August 27, 2020, <https://ria.ru/20210827/armata-1747538483.html>.
27. Samuel Bendett, “Bureaucrat’s Gambit: Why Is Dmitry Rogozin Sending Russian Uncrewed Ground Vehicles to Ukraine—And Does It Matter?” *Modern War Institute*, February 10, 2023, <https://mwi.westpoint.edu/bureaucrats-gambit-why-is-dmitry-rogozin-sending-russian-uncrewed-ground-vehicles-to-ukraine-and-does-it-matter/>; “Russian Submarine ‘Vityaz’ Reached the Bottom of the Mariana Trench,” *Russian Geographical Society*, May 13, 2020, <https://www.rgo.ru/en/article/russian-submarine-vityaz-reached-bottom-mariana-trench>.
28. M. Chernikov and I. Ivanov, “War of the Future Is a War of Robots [Война будущего—война роботов],” *Arsenal Otechestva* [Арсенал Отечества] 65, no. 3 (2023), pp 32–25, <https://arsenal-otechestva.ru/archive/1746-3-2023>.
29. Chernikov and Ivanov, “War of the Future Is a War of Robots.”
30. “Russian Defense Ministry: Artificial Intelligence Will Never Make a Decision on the Use of Weapons.”
31. Aleksei Ramm and Bogdan Stepovoi, “Deafening Effect: When Troops Receive ‘Bylina’ Electronic Warfare Systems [Оглушительный эффект: когда войска получает системы РЭБ «Былина»],” *Izvestiya* [Известия], October 6, 2023, <https://iz.ru/1584777/aleksei-ramm-bogdan-stepovoi/oglushitelnyi-effekt-kogda-voiska-poluchat-sistemy-reb-bylina>.
32. Chernikov and Ivanov, “War of the Future Is a War of Robots.”
33. Jeffrey Edmonds et al., *AI and Autonomy in Russia* (Arlington, VA: Center for Naval Analyses, May 2021), 16–23, <https://www.cna.org/reports/2021/05/ai-and-autonomy-in-russia>.
34. “Russia Uses AI in Combat Drones,” *TASS*, November 20, 2023, <https://tass.com/defense/1708657>.
35. Smolyanov and Solovyov, “Military Expert Predicted When Artificial Intelligence Will Replace Pilots.”
36. Anya Fink, “Russian Thinking on the Role of AI in Future Warfare,” review of *Artificial Intelligence in the Military Confrontation of the Future*, by V. M. Burenok, *Russian Studies Series 5/21*, NATO Defense College, November 8, 2021, <https://www.ndc.nato.int/research/research.php?i-code=712>.
37. “Dronification of War.”
38. “Dronification of War.”
39. “Dronification of War.”

40. Fink, "Russian Thinking on the Role of AI in Future Warfare."
41. Fink, "Russian Thinking on the Role of AI in Future Warfare."
42. Edmonds et al., "AI and Autonomy in Russia."
43. "Ministry of Defense of the Russian Federation: The Development of Artificial Intelligence Is Necessary for the Successful Conduct of Cyber Wars [Минобороны РФ: развитие искусственного интеллекта нужно для успешного ведения кибервойн]," TASS, March 14, 2018, <https://tass.ru/armiya-i-opk/5028817>.
44. "Russia Launches Web Crawler for Anti-Putin Memes, Banned Content," *The Moscow Times*, February 14, 2023, <https://www.themoscowtimes.com/2023/02/13/russia-launches-web-crawler-for-anti-putin-memes-banned-content-a80210>.
45. Edmonds et al., "AI and Autonomy in Russia."
46. Edmonds et al., "AI and Autonomy in Russia."
47. Gavin Wilde, "Cyber Operations in Ukraine: Russia's Unmet Expectations" (working paper, Carnegie Endowment for International Peace, December 12, 2022), <https://carnegieendowment.org/files/202212-Wilde-RussiaHypotheses-v2.pdf>.
48. "The Ministry of Defense Demands to Limit ChatGPT: This Is a Weapon That Drives Russians into a Cognitive Trap [Минобороны требует ограничить ChatGPT: Это оружие, загоняющее россиян в когнитивную ловушку]," CNews, December 25, 2023, https://www.cnews.ru/news/top/2023-12-25_minoborony_trebuat_zapreta.
49. "The Ministry of Defense Demands to Limit ChatGPT."
50. Jason Nelson, "Federal Elections Commission Takes on AI Deepfakes Ahead of the 2024 Elections," Decrypt, August 16, 2023, <https://decrypt.co/152725/federal-elections-commission-ai-deepfakes-2024-elections>.
51. Filip Noubel, "The Role of AI in Russia's Invasion of Ukraine: Interview with Expert Anton Tarasyuk," The Good Men Project, October 19, 2023, <https://goodmen-project.com/featured-content/the-role-of-ai-in-russias-invasion-of-ukraine-interview-with-expert-anton-tarasyuk>.
52. Vasilina Kopitko, "How Artificial Intelligence Works against Ukraine in War [Как искусственный интеллект работает против Украины в войне]," RBC-Ukraine [РБК-Україна], December 5, 2023, <https://www.rbc.ua/ukr/styler/k-shtuchniy-intelekt-pratsyue-proti-ukrayini-1701779868.html>.
53. Doug Cunningham, "Microsoft, OpenAI Fighting Foreign Hackers Utilizing AI in Attacks," United Press International, February 14, 2024, https://www.upi.com/Top_News/World-News/2024/02/14/Microsoft-OpenAI-distrupt-AI-foreign-hacking/1391707926760.
54. Cunningham, "Microsoft, OpenAI Fighting Foreign Hackers Utilizing AI in Attacks."
55. Mary Chesnut et al., "Artificial Intelligence in Nuclear Operations" (Arlington, VA: Center for Naval Analyses, April 2023), <https://www.cna.org/reports/2023/04/ai-in-nuclear-operations>.
56. "Russian Research Agency to Design AI-Based Technology for Decoding Satellite Images," TASS, January 18, 2019, <https://tass.com/science/1040656>.
57. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
58. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
59. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
60. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
61. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
62. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
63. Chesnut et al., "Artificial Intelligence in Nuclear Operations."
64. Edmonds et al., "AI and Autonomy in Russia."
65. Edmonds et al., "AI and Autonomy in Russia."
66. "A Retired Colonel Spoke about the Peculiarities of the Russian 'Dead Hand' [Полковник в отставке рассказал об особенностях российской «мертвой руки»]," News.ru, September 29, 2023, <https://news.ru/russia/polkovnik-v-otstavke-rasskazal-ob-osobennostyah-rossijskoj-mertvoj-ruki>.
67. Edmonds et al., "AI and Autonomy in Russia."
68. Edmonds et al., "AI and Autonomy in Russia"; "The Russian Ministry of Defense Created a Department for Working with Artificial Intelligence [В Минобороны РФ создали управление по работе с искусственным интеллектом]," TASS, August 17, 2022, <https://tass.ru/armiya-i-opk/15492531>.
69. "The MOD Announced It Is Using the Special Military Operation Experience in Improving Weapons [В Минобороны сообщили об использовании опыта СВО для улучшения системы вооружения]," TASS, August 21, 2022, <https://tass.ru/armiya-i-opk/15527585>.

70. “Russian Defense Ministry Introducing AI Technologies in Army,” TASS, August 24, 2022, <https://tass.com/defense/1497995>.
71. “The Expert Believes That a Single AI Service in the Army Can Unite Those Who Want to Help the Front [Эксперт считает, что единая служба ИИ в армии может объединить желающих помочь фронту],” TASS, August 26, 2023, <https://tass.ru/ekonomika/18590131>.
72. Edmonds et al., “AI and Autonomy in Russia.”
73. “Alexander Vedyakhin: The Development of Artificial Intelligence Is the Key to Russia’s Technological Sovereignty [Александр Ведяхин: развитие искусственного интеллекта — залог технологического суверенитета России].”
74. “Chernyshenko: National Center for the Development of Artificial Intelligence Launched in Russia [Чернышенко: В России начал работу Национальный центр развития искусственного интеллекта],” RG.ru, September 9, 2022, <https://rg.ru/2022/09/09/chernyshenko-v-rossii-nachal-rabotu-nacionalnyj-centr-razvitiia-iskusstvenno-go-intellekta.html>.
75. Samuel Bendett, “Here’s How the Russian Military Is Organizing to Develop AI,” Defense One, July 20, 2018, <https://www.defenseone.com/ideas/2018/07/russian-militarys-ai-development-roadmap/149900>.
76. Vladimir Sosnitsky, “Innovation Is Evaluated by Practice—Technopolis ERA Has Become an Effective Platform for Constructive Research Dialogue [Инновации Оценивает Практика Технополис ЭРА стал эффективной площадкой конструктивного исследовательского диалога],” *Red Star* [Красная Звезда], July 25, 2022, <https://dlib.eastview.com/browse/doc/78978635>, cited in Bendett, “Military AI Developments in Russia.”
77. Sosnitsky, “Innovation Is Evaluated by Practice.”
78. “Using UAVs and Artificial Intelligence Was Discussed in the ‘Era’ Technopolis [В технополисе “Эра” обсудили вопросы применения БПЛА и искусственного интеллекта],” TASS, August 25, 2023, <https://tass.ru/armiya-i-opk/18591197>.
79. *Artificial Intelligence and Autonomy in Russia*, Center for Naval Analyses, 37 (May 2, 2022), <https://www.cna.org/our-media/newsletters/ai-and-autonomy-in-russia/issue-37>.
80. *Artificial Intelligence and Autonomy in Russia*.
81. “Russia Has Created a Neural Network for Drones That Recognizes NATO Equipment [В России создали нейросеть для дронов, распознающую технику НАТО],” RIA Novosti [РИА Новости], February 12, 2024, <https://ria.ru/20240212/neyroset-1926762249.html>.
82. “The Russian Army Will Receive Drones Controlled Using Artificial Intelligence Technologies [Армию России вооружают беспилотниками с искусственным интеллектом],” Obyektiv [Объектив], February 25, 2024, <https://obyektiv.press/node/135154>.
83. Evgeny Dyumin, “The Russian Defense Ministry Has Identified Three Main Tasks for the Army during the Special Military Operation [Главные задачи на время СВО: Минобороны РФ],” URA.RU, August 27, 2023, <https://ura.news/news/1052679738>.
84. @UAV Observer [@Обозреватель БПЛА], “Neural Nets Control ‘Lancet’ Navigation [Нейронные сети управляют наведением ‘Ланцетов’],” Telegram, June 14, 2023, <https://t.me/dronesrussia/22978>; Sumit Saha, “A Comprehensive Guide to Convolutional Neural Networks—The ELI5 Way,” SaturnCloud, December 15, 2018, <https://saturncloud.io/blog/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way>, cited in Samuel Bendett, “Roles and Implications of AI in the Russian-Ukrainian Conflict,” *Russia Matters*, July 20, 2023, <https://www.russiamatters.org/analysis/roles-and-implications-ai-russian-ukrainian-conflict>. A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm that can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image, and be able to differentiate one from the other.
85. Will Knight, “Russia’s Killer Drone in Ukraine Raises Fears About AI in Warfare,” *Wired*, March 17, 2022, <https://www.wired.com/story/ai-drones-russia-ukraine>.
86. Gregory Allen, “Russia Probably Has Not Used AI-Enabled Weapons in Ukraine, But That Could Change,” Center for Strategic & International Studies, May 26, 2022, <https://www.csis.org/analysis/russia-probably-has-not-used-ai-enabled-weapons-ukraine-could-change>.
87. David Hambling, “Russian Kamikaze Drone Now Seems to Identify Its Own Targets,” *Forbes*, March 1, 2024, <https://www.forbes.com/sites/davidhambling/2024/03/01/russian-kamikaze-drone-now-seems-to-identify-its-own-targets/?sh=5bf226e24b89>.
88. “Russian Tech Firm Shows Aqua-22 AI-Based Combat Drone at Army Forum,” TASS, August 18, 2023, <https://tass.com/defense/1662161>; Oleg Burunov, “Russia Unveils Cutting-Edge UAV Fitted with Neural Network–Based Object Identification System,” *Sputnik International*, August 18, 2023, <https://sputnikglobe.com/20230815/russia-unveils-cutting-edge-uav-fitted-with-neural-network-based-object-identification-system-1112616500.html>; Marina Krizhanovskaya, “At the Army-2023 International Military Forum, the Veter and X-89 Drones, Capable of Overcoming Electronic Warfare, Were Presented [На МВТФ «Армия-2023» представили дроны «Ветер» и X-89, способные преодолевать действие РЭБ],” *Zvezda* [Звезда], August 16, 2023, <https://tvzvezda.ru/news/202381643-zJVJi.html>.

89. “The ‘Admiral’ drone carrier was shown at the international exhibition in Moscow [На международной выставке в Москве показали ‘Беспилотник-дрозносец’ ‘Адмирал’],” TASS, May 18, 2023, https://tass.ru/ob-schestvo/17779609?utm_source=ixbtcom.
90. @Project ‘Archangel’ [@Проект ‘Архангел’], “Компания Вереск запустила в производство и начала поставки инновационного решения на базе искусственного интеллекта для FPV дронов. Дроны дооснащаются головкой . . .” Telegram, October 28, 2023, <https://t.me/projectArchangel/2434>.
91. @Bespilotniki (Drones, BPLA, UAV) [@Беспилотники (дроны, БПЛА, UAV)], “Homing System for Kamikaze Drones of the ‘Gadfly’ Family [Система самонаведения для дронов-камикадзе семейства ‘Овод’],” Telegram, August 14, 2023, https://t.me/uav_tech/19131.
92. Kristina Kiryanova, “Artificial Intelligence Hits the Target: The Engineers from the ‘Tsar’s Wolves’ Spoke about the ‘Sturm 1.2’ Drone [Искусственный интеллект бьёт точно в цель: инженеры ‘Царских волков’ рассказали о дроне ‘Штурм 1.2’],” Bloknot [Блокнот], August 27, 2023, <https://bloknot.ru/v-mire/iskusstvenny-j-intellekt-b-yot-tochno-v-tsel-inzhenery-tsarskih-volkov-rasskazali-o-drone-shturm-1-2-1156567.html>; @Bespilotniki (Drones, BPLA, UAV) [@Беспилотники (дроны, БПЛА, UAV)], “Homing System for Kamikaze Drones of the ‘Gadfly’ Family [Система самонаведения для дронов-камикадзе семейства ‘Овод’].”
93. “A Russian Military Man Spoke about the Use of Drones That ‘Deceive’ Electronic Warfare Equipment [Российский военный рассказал о применении ‘обманывающих’ средства РЭБ дронов],” TASS, February 21, 2024, <https://tass.ru/armiya-i-opk/20046201>.
94. “A Russian Military Man Spoke about the Use of Drones That ‘Deceive’ Electronic Warfare Equipment [Российский военный рассказал о применении ‘обманывающих’ средства РЭБ дронов].”
95. @Hronika Operatora BPLA [@Хроника оператора БПЛА], “репортаж про ZALA AERO, рекомендую к просмотру / В новом репортаже про ZALA AERO был момент, где показали, как вместо магазинов в торговом центре теперь нахо . . .” Telegram, July 16, 2023, <https://t.me/xronikabpla/5078>.
96. @Voennyj Ovsedomitel [@Военный Осведомитель], “Izdelie-53,” Telegram, July 16, 2023, <https://t.me/milinfo/103637>.
97. Dmitry Lutovych, “The Russian Armed Forces Began Using the New Izdeliye-53 Drone: What Is Known about the Improved Lancet [ВС РФ начали использовать новый дрон ‘Изделие-53’: что известно об улучшенном ‘Ланцете],” October 29, 2023, <https://focus.ua/voennye-novosti/602314-vs-rf-nachali-ispolzovat-novyy-dron-izdeliye-53-chto-izvestno-ob-uluchshennom-lancete-foto>.
98. Bendett, “Bureaucrat’s Gambit.”
99. Bendett, “Bureaucrat’s Gambit.”
100. “The Marker Combat Robot Was Taught to Navigate in Fog and Smoke Conditions [Боевой робот ‘Маркер’ научили ориентироваться в условиях тумана и дыма],” TASS, August 16, 2023, <https://tass.ru/armiya-i-opk/18522863>; “The Russian Robot ‘Marker’ Was Taught to Shoot Faster and More Accurately Than a Human [Российский робот ‘Маркер’ научили стрелять быстрее и точнее человека],” RIA Novosti [РИА Новости], August 17, 2023, <https://ria.ru/20230817/robot-1890622435.html>.
101. “Source: Russia Will Develop ‘Marker’ Robot That Is ‘Tailored’ for a Special Operation in Ukraine” (Источник: в России создадут робот “Маркер”, “заточенный” под спецоперацию), RIA Novosti [РИА Новости], September 28, 2022, <https://ria.ru/20220928/marker-1819962564.html>.
102. Stacie Pettyjohn, *Evolution Not Revolution: Drone Warfare in Russia’s 2022 Invasion of Ukraine*, (Washington, DC: Center for a New American Security, February 2024), <https://www.cnas.org/publications/reports/evolution-not-revolution>.
103. “Russian Uran-6 Robotic Demining UGV Undergoing Modernization Following Ukraine War Experience,” Army Recognition, June 13, 2023, https://www.armyrecognition.com/defense_news_june_2023_global_security_army_industry/russian-uran-6-robotic-demining-ugv-undergoing-modernization-following-ukraine-war-experience.html.
104. “Russian Combat Robots to Employ Artificial Intelligence in Special Military Operation Area,” TASS, October 4, 2023, <https://tass.com/defense/1684137>.
105. Rachel Metz, “How a Deepfake Tom Cruise on TikTok Turned into a Very Real AI Company,” CNN, August 6, 2021, <https://www.cnn.com/2021/08/06/tech/tom-cruise-deepfake-tiktok-company/index.html>.
106. Edmonds et al., “AI and Autonomy in Russia”; Joshua Rhett Miller, “Deepfake Video of Zelensky Telling Ukrainians to Surrender Removed from Social Platforms,” *New York Post*, March 17, 2022, <https://nypost.com/2022/03/17/deepfake-video-shows-volodymyr-zelensky-telling-ukrainians-to-surrender>.
107. “Channel 1 AI: Personalized Global News Network,” Channel 1, accessed March 13, 2024, <https://www.channel1.ai>.
108. Ameya Paleja, “Deepfakes Blur the Lines in Russia-Ukraine War, Reveals New Study,” *Interesting Engineering*, October 25, 2023, <https://interestingengineering.com/culture/deepfakes-misinformation-russia-ukraine-war>.

109. “NRNU MEPHI Will Engage in Joint Development with Russian Manufacturers of Microprocessors and Electronics [НИЯУ МИФИ займется совместными разработками с российскими производителями микропроцессоров и электроники],” EnergyLand.info, April 11, 2022, <https://energyland.info/news-show--atom-226912>.
110. R. Konaev and J. Dunham, *Russian AI Research 2010 to 2018: Topics, Trends, and Institutions* (Washington, DC: Center for Security and Emerging Technology, October 2020), <https://cset.georgetown.edu/wp-content/uploads/CSET-Russian-AI-Research-2010-to-2018.pdf>; “In Russia, with the Help of AI, Substances with Strong Antibacterial Activity Were Obtained [В России с помощью ИИ получили вещества с сильной антибактериальной активностью],” TASS, March 29, 2022, <https://nauka.tass.ru/nauka/14212133>; “Artificial Intelligence in the Russian Healthcare System,” SberMedAI, April 22, 2022, <https://sbermed.ai/en/iskusstvennyy-intellekt-v-meditsine-rossii>.
111. Nikita Korolev, “Artificial Intelligence Is on the Wane [Искусственный интеллект пошел на убыль],” *Kommersant* [Коммерсантъ], January 18, 2023, <https://www.kommersant.ru/doc/5773647>.
112. “Obstacles to AI Development in Russia Were Named [Названы препятствия для развития ИИ в России],” News.ru, December 24, 2021, <https://news.ru/technology/nazvany-prepyatstviya-dlya-razvitiya-ii-v-rossii>.
113. “National Technology Initiative: Principles,” National Technology Initiative, accessed March 13, 2024, <https://nti2035.ru/nti>.
114. Caleb Davis, “Russian IT Workers Head Overseas despite Call-Up Assurances,” Reuters, September 28, 2022, <https://www.reuters.com/world/europe/russian-it-workers-head-overseas-despite-call-up-assurances-2022-09-28>.
115. “Chernyshenko announced a reduction in the personnel shortage in the field of AI [Чернышенко заявил о сокращении дефицита кадров в области ИИ],” TASS, August 18, 2023, <https://tass.ru/ekonomika/18538375>.
116. “The Deputy Prime Minister Announced the Need to Prepare about 10 Thousand Specialists per Year”; “Gref: Russia Lacks 1 Million IT Specialists [Греф: России не хватает 1 млн IT-специалистов],” *Vestnik Kavkaza* [Вестник Кавказа], September 21, 2023, <https://vestnikavkaza.ru/news/gref-rossii-ne-hvataet-1-mln-it-specialistov.html>.
117. James Byrne et al., *Silicon Lifeline: Western Electronics at the Heart of Russia’s War Machine* (London, UK: Royal United Services Institute, August 2022), <https://static.rusi.org/RUSI-Silicon-Lifeline-final-web.pdf>.
118. Korolev, “Artificial Intelligence Is on the Wane”; “Expert States the Impossibility of Import Substitution in Case of Technological Sanctions [Эксперт заявил о невозможности импортозамещения в случае технологических санкций],” *Izvestiya* [Известия], February 1, 2022, <https://iz.ru/1285062/2022-02-01/ekspert-zaiavil-o-nevozmozhnosti-importzameshcheniia-v-sluchae-tekhnologicheskikh-sanktcii>; Tatiana Isakova, “State Plans Got Confused in Neural Networks [Госпланы запутались в нейросетях],” *Kommersant* [Коммерсантъ], April 6, 2022, <https://www.kommersant.ru/doc/5294266>.
119. Anna Zhadan, “Russia’s Version of GitHub Is on Its Way, Ministry of Digital Development Announced,” Cybernews, October 14, 2022, <https://cybernews.com/news/russias-version-of-github>.
120. Serhii Flash (@Про звязок від Сергія Флеш), “Россияне жалуются в группах, что GitHub закрыл для общего доступа многие разработки в области машинного зрения итд / Не прошло и два года, как догадались, что . . .” Telegram, December 11, 2023, https://t.me/serhii_flash/1744.
121. Zhadan, “Russia’s Version of GitHub Is on Its Way.”
122. “Skolkovo, MIPT and Gaps in the Innovation Cycle [«Сколково», МФТИ и разрывы в цикле инноваций],” *Expert* [Эксперт], June 4, 2023, <https://sk.ru/news/skolko-vo-mfti-i-razryvy-v-cikle-innovacij>.
123. “Chernyshenko Did Not Rule Out the Emergence of a New National Project in the Field of Radio Electronics [Чернышенко не исключил появления нового нацпроекта в области радиоэлектроники],” TASS, February 12, 2023, <https://tass.ru/ekonomika/13688715>; Center for Analysis of Strategies and Technologies (@BMPD), “Sanctions Prospects for Microelectronics in Russia [Санкционные перспективы микроэлектроники в России],” *LiveJournal*, March 27, 2022, <https://bmpd.livejournal.com/4503539.html>; “Russian Electronics Will Be Revived in a New Way. Resurrection Strategy Is Almost Ready [Российскую электронику оживят по-новому. Стратегия воскрешения почти готова],” *CNews*, September 13, 2022, https://www.cnews.ru/news/top/2022-09-13_rossijskuyu_elektroniku_ozhivyat.
124. “Technological Sovereignty as the Key to Sustainable Development of Russia in the 21st Century [Технологический суверенитет как ключ к устойчивому развитию России в XXI веке],” *RosCongress* [Росконгресс], December 29, 2022, <https://roscongress.org/materials/tekhnologicheskij-suverenitet-kak-klyuch-k-ustoychivomu-razvitiyu-rossii-v-xxi-veke>.
125. “A Marketplace for Microelectronics Creators Will Be Launched in Russia. The Industry Is in Doubt [В России запустят маркетплейс для создателей микроэлектроники. Отрасль в сомнениях],” *CNews*, May 27, 2022, https://www.cnews.ru/news/top/2022-05-27_v_rossii_s_tselyu_razvitiya.
126. “Putin Sets Russia’s Priorities in Science and Technologies for 10 years—Decree,” TASS, February 28, 2024, <https://tass.com/science/1753037>.

127. “The Government Approved the Roadmap of the Ministry of Economic Development for the Development of AI until 2030 [Правительство утвердило дорожную карту Минэкономразвития по развитию ИИ до 2030 года],” TASS, December 20, 2022, <https://tass.ru/ekonomika/16641611>.
128. Edmonds et al., “AI and Autonomy in Russia.”
129. Korolev, “Artificial Intelligence Is on the Wane.”
130. Leonid Uvarchev, “The Government Has Set a Goal for Seven Years to Increase the Production of Chips, Machine Tools and Drones [Правительство поставило цель за семь лет нарастить производство чипов, станков и беспилотников],” *Kommersant* [Коммерсантъ], May 30, 2023, <https://www.kommersant.ru/doc/6002130>.
131. “Baikal Developers Began Creating a Line of AI Processors to Compete with Nvidia [Разработчики «Байкалов» начали создавать линейку ИИ-процессоров, чтобы потягаться с Nvidia],” CNews, August 25, 2023, https://www.cnews.ru/news/top/2023-07-25_bajkal_elektroniks_budet.
132. “‘Baikals’ Are Up for Auction. Developments Related to Russian Chips Will Go under the Hammer Due to the Bankruptcy of T-platforms [«Байкалы» выставлены на аукцион. Связанные с российскими чипами наработки уйдут с молотка из-за банкротства «Т-платформ»],” CNews, August 24, 2023, https://www.cnews-ru.translate.google.com/news/top/2023-08-24_bajkaly_ujdut_s_molotka?x_tr_sl=auto&x_tr_tl=en&x_tr_hl=en&x_tr_pto=wapp.
133. “The Russian Government Decided to Allocate an Additional 1.2 Billion Rubles for the Development of AI [Правительство РФ решило выделить дополнительно 1,2 млрд рублей на развитие ИИ],” DRussia, October 9, 2023, <https://d-russia.ru/pravitelstvo-rf-reshilo-vydelit-dopolnitelno-1-2-mlrd-rublej-na-razvitiie-ii.html>.
134. AFP, “Putin Orders State Support for AI as Race Heats Up,” *The Moscow Times*, September 7, 2023, <https://www.themoscowtimes.com/2023/09/07/putin-orders-state-support-for-ai-as-race-heats-up-a82393>.
135. “The Russian Government Will Update Its AI Development Strategy [Правительство России обновит стратегию развития ИИ],” *Vedomosti* [Ведомости], November 22, 2023, <https://www.vedomosti.ru/technology/news/2023/11/22/1007069-pravitelstvo-rossii-obnovit-strategiyu>.
136. “Six Organizations Will Receive Support to Develop AI Research Centers [Шесть организаций получат поддержку для развития центров исследования ИИ],” Interfax [Интерфакс], December 29, 2023, <https://www.interfax.ru/russia/938499>.
137. “Dmitry Chernyshenko: It Is Necessary to Combine Industry Experience for the Development of AI in the Civilian Sphere and in the Defense Industry [Дмитрий Чернышенко: необходимо объединить отраслевой опыт для развития ИИ в гражданской сфере и в ОПК],” Obnasnyayem [объясняем], August 18, 2023, <https://xn--90aivcdt6dxbc.xn--p1ai/articles/news/dmitriy-chernyshenko-neobkhodimo-obedinit-otraslevoy-opyt-dlya-razvitiya-ii-v-grazhdanskoy-sfere-i-v>.
138. “Tsalikov Proposed Creating Joint Laboratories of AI Centers Based on the Era Technopolis [Цаликов предложил создать совместные лаборатории центров ИИ на базе технополиса ‘Эра’],” TASS, August 18, 2023, <https://tass.ru/ekonomika/18537837>.
139. Maria Shagina and Emily Kilcrease, “Can Russia Rebuild Its Tech Sector with China’s Help?” *War on the Rocks*, June 2, 2022, <https://warontherocks.com/2022/06/can-russia-rebuild-its-tech-sector-with-chinas-help>; Brian (Chun Hey) Kot, “Hong Kong’s Technology Lifeline to Russia” (Washington, DC: Carnegie Endowment for International Peace, May 17, 2023), <https://carnegieendowment.org/2023/05/17/hong-kong-s-technology-lifeline-to-russia-pub-89775>.
140. Kot, “Hong Kong’s Technology Lifeline to Russia.”
141. “Russia, China Discussed Approaches to Military Application of AI—Foreign Ministry,” TASS, February 2, 2024, <https://tass.com/politics/1740853>.
142. “Huawei Advances AI Strategy in Russia, Propelling AI Ecosystem to New Levels,” Huawei, November 13, 2019, <https://www.huawei.com/en/news/2019/11/huawei-ai-strategy-russia>.
143. “China Plans to Continue Cooperation with Russia in the IT Field [Китай планирует продолжить сотрудничество с Россией в IT-сфере],” TASS, March 3, 2022, <https://tass.ru/ekonomika/13945187>.
144. “We Need to Learn to Translate Knowledge into Technology from China, Said the President of the Russian Academy of Sciences [Учиться переводить знания в технологии надо у Китая, заявил президент РАН],” RIA Novosti [РИА Новости], November 8, 2019, <https://ria.ru/20191108/1560713849.html>.
145. “The Chinese Language to Be Included in the Programs across Russian Universities [Китайский язык хотят включить в программы российских вузов],” Business Online [Бизнес Online], August 27, 2023, <https://mkam.business-gazeta.ru/news/604888>.
146. Valentina Petrova, “For the First Time in the Russian Federation, a Russian-Chinese Center Was Opened at a Technical University [В РФ впервые в техническом вузе открыли российско-китайский центр],” Ura.ru, October 2, 2023, <https://ura.news/news/1052690463>.
147. Rodion Rudnev, “Post-Pandemic Russia Artificial Intelligence [Постпандемичная Россия: искусственный интеллект],” RAPSI [РАПСИ], May 21, 2020, http://rapsinews.ru/incident_publication/20200519/305816690.html.

148. Ian Carlos Campbell, “Moscow Adds Facial Recognition Payment System to More Than 240 Metro Stations,” *The Verge*, October 15, 2021, <https://www.theverge.com/2021/10/15/22728667/russia-face-pay-system-moscow-metro-privacy>.
149. “Russian and Chinese Scientists Discussed the Use of Artificial Intelligence Technologies in Medicine [Ученые России и Китая обсудили применение технологий искусственного интеллекта в медицине],” St. Petersburg State University, October 27, 2022, <https://spbu.ru/news-events/novosti/uchenye-rossii-i-kitaya-obsudili-primeneniye-tekhnologiy-iskusstvennogo>.
150. Samuel Bendett and Elsa Kania, *A New Sino-Russian High-Tech Partnership*, report no. 22 (Canberra, AU: Australian Strategic Policy Institute, 2019), <https://www.aspi.org.au/report/new-sino-russian-high-tech-partnership>.
151. Ivan Nechepurenko, “How Western Goods Reach Russia: A Long Line of Trucks through Georgia,” *The New York Times*, January 13, 2023, <https://www.nytimes.com/2023/01/13/world/europe/georgia-russia-cargo-border.html>.
152. Jim Crowley, “Russia Has 400,000 Software Developers—What Does That Mean for the West?” *Industrial Defender*, March 4, 2022, <https://www.industrialdefender.com/blog/russia-software-developers-ransomware-gangs>.
153. Seth J. Frantzman and Aaron Mehta, “In Wake of Hamas Attack, Israel May Have to Change Intel, Tech Strategy,” *Breaking Defense*, October 9, 2023, <https://breakingdefense.com/2023/10/in-wake-of-hamas-attack-israel-may-have-to-change-intel-tech-strategy>.
154. “Evgeny Dudorov: Russian Robotics Needs a Revolution, There Is No Time for Evolution [Евгений Дудоров: робототехнике РФ нужна революция, на эволюцию времени нет],” *RIA Novosti* [РИА Новости], December 12, 2022, <https://ria.ru/20221212/dudorov-1837506676.html>.
155. “Expert Believes That the Russian Federation Has Technologically Approached the Creation of Combat Robotic Terminators [Эксперт считает, что РФ технологически подошла к созданию боевых роботов-терминаторов],” *TASS*, August 18, 2023, <https://tass.ru/armiya-i-opk/18540667>.
156. Dan Robitzski, “Russia: Our Killer Robots Don’t Need any Pesky International Laws,” *The Byte, Futurism*, August 4, 2021, <https://futurism.com/the-byte/russia-killer-robots-international-laws>.
157. Council of Councils, “The BRICS Summit 2023: Seeking an Alternate World Order?” *Global Memo*, Council on Foreign Relations, August 31, 2023, <https://www.cfr.org/councilofcouncils/global-memos/brics-summit-2023-seeking-alternate-world-order>.
158. Tamila Askerova, “For Russia, the G7 Format Is Outdated, Kosachev Said [Для России формат G7 является устаревшим, заявил Косачев],” *Parliamentary Newspaper* [Парламентская газета], Federal Assembly of the Russian Federation, July 21, 2020, <https://www.pnp.ru/politics/dlya-rossii-format-g7-yavlyaetsya-ustarevshim-zayavil-kosachev.html>.
159. “Putin Named the Advantages of a New Multipolar World Order [Путин назвал плюсы нового многополярного миропорядка],” *Lenta.ru*, July 24, 2023, <https://lenta.ru/news/2023/07/24/mnogopolyyar>.
160. “Russia Should Be at the Forefront of AI Researchers and Not Be Afraid of Robotization—Putin [Россия должна быть в авангарде исследователей ИИ и не бояться роботизации—Путин],” *RAPSI* [РАПСИ], December 14, 2023, https://rapsinews.ru/digital_law_news/20231214/309481681.html.
161. “Russia Should Be at the Forefront of AI Researchers.”
162. Guy Faulconbridge, “What Did Putin Say on War and Peace, WW3 and AI?” *Reuters*, February 9, 2024, <https://www.reuters.com/world/europe/what-did-putin-say-war-peace-ww3-ai-2024-02-09>.
163. Jake Epstein, “The U.S. Military Let Artificial Intelligence Fly a Fighter Jet and Even Battle Simulated Enemies in Air-to-Air Combat,” *Business Insider*, February 15, 2023, <https://www.businessinsider.com/us-military-let-ai-fly-fighter-battle-simulated-enemies-combat-2023-2#:~:text=The%20US%20military%20successfully%20let,in%20developing%20advanced%20AI%20capabilities>.
164. Edmonds et al., “AI and Autonomy in Russia.”
165. Masha Borak, “From Central Asia to the World: Digitalization Drive Pushes New Biometric Startups,” *Biometric Update*, May 10, 2023, <https://www.biometricupdate.com/202305/from-central-asia-to-the-world-digitalization-drive-pushes-new-biometric-startups>.
166. “Lukashenko: Belarus Has Now Set a Course for Structuring Its Opportunities in Russia [Лукашенко: Беларусь сейчас взяла курс на структурирование своих возможностей в России],” *TVR.by*, October 10, 2023, <https://www.tvr.by/news/politika/lukashenko-belarus-seychas-vzyala-kurs-na-strukturirovanie-svoikh-vozmozhnostey-v-rossii>; “Russia and Belarus Can Create a Joint AI Development Strategy [Россия и Белоруссия могут создать совместную стратегию развития искусственного интеллект],” *TASS*, June 28, 2023, <https://tass.ru/ekonomika/18144985>.
167. Carey Goldberg and Denise Pellegrini, “MIT Cuts Ties with Russia Tech Center in Protest of Invasion,” *Bloomberg*, February 26, 2022, <https://www.bloomberg.com/news/articles/2022-02-26/mit-cuts-ties-with-russian-tech-institute-in-protest-of-invasion>.
168. “Lavrov Says That Russia Won’t Allow Games into One Goalpost with the EU [Россия не допустит ‘игры в одни

- ворота' с Евросоюзом, заявил Лавров,” RIA Novosti [РИА Новости], November 3, 2020, <https://ria.ru/20201103/evrosoyuz-1582872350.html>.
169. Ivan V. Danilin, *Digital Transformation: (Re)constructing EU-Russia Dialogue (The Case of AI)*, EUREN Brief No. 2 (Brussels, BE: European Union External Action, May 2019), https://www.eeas.europa.eu/sites/default/files/euren_brief_no._2.pdf.
170. “Inaugural Joint Skoltech-UoS Workshop Focuses on AI Applications and New Technologies,” Skoltech, October 10, 2020, <https://www.skoltech.ru/en/2020/10/inaugural-joint-skoltech-uos-workshop-focuses-on-ai-applications-and-new-technologies>.
171. “Russia Is Ready to Share AI Technologies with Arab Countries [Россия готова делиться AI-технологиями с арабскими странами],” Go31, February 26, 2024, <https://www.go31.ru/news/obshchestvo/rossiya-gotova-delitsya-ai-tehnologiyami-s-arabskimi-stranami>.
172. “Saudi Aramco Reviews Possibility of Participating in Projects in Russia [Saudi Aramco рассматривает возможность участия в проектах в России],” Vesti [Вести], December 21, 2020, <https://www.vesti.ru/finance/article/2501550>.
173. “Russia and Israel Launch New Projects for Industrial R&D [Россия и Израиль начали новый отбор проектов по промышленным НИОКР],” Rusnano [Роснано], July 16, 2020, <https://www.rusnano.com/news/20200716-rosnano-rossiya-i-izrail-nachali-noviy-otbor-proektov-po-promyshlennym-niokr>.
174. Siddhant Sibbal, “BRICS Umbrella to Increase India, Russia Collaboration on Artificial Intelligence,” Zee News, November 18, 2020, <https://zeenews.india.com/india/brics-umbrella-to-increase-india-russia-collaboration-on-artificial-intelligence-2325292.html>.
175. Dipanjan Roy Chaudhury, “Gazprom & Zyfra JV on Digital Industrialisation Eyes India's Oil & Gas Market,” *The Economic Times*, November 25, 2020, <https://m.economictimes.com/industry/energy/oil-gas/gazprom-zyfra-jv-on-digital-industrialisation-eyes-indias-oil-gas-market/articleshow/79392935.cms>; Timofey Kornev et al., “Programming over Three Seas [Программирование за три моря],” *Kommersant* [Коммерсантъ], January 24, 2023, <https://www.kommersant.ru/doc/5783884>.
176. “Buddy App Is Being Sold in Spanish-Speaking Countries [Старт продаж приложения Buddy в испаноязычных странах Латинской Америки],” TAdviser, August 12, 2020, <https://www.tadviser.ru/index.php/%D0%9F%D1%80%D0%BE%D0%B4%D1%83%D0%BA%D1%82:MyBuddy.ai>.
177. “BRICS Joint Statement on ‘Strengthen BRICS Solidarity and Cooperation, Respond to New Features and Challenges in International Situation,’” BRICS, May 20, 2022, http://brics2022.mfa.gov.cn/eng/hywj/ODMM/202205/t20220529_10694180.html.
178. “BRICS Agree to Create Artificial Intelligence Study Group,” teleSur, April 23, 2023, <https://www.telesuren-english.net/news/BRICS-Agree-to-Create-Artificial-Intelligence-Study-Group-20230823-0011.html>.
179. Yuri Kukin, Irina Mandrykina, and Vadim Belozertsev, “For Knowledge and Snow: What Attracts African Students to Study in Russia [За знаниями и снегом: что притягивает африканских студентов в учебе в России],” TASS, December 29, 2020, <https://tass.ru/obshchestvo/10353061>.
180. “VEB Ventures Invests 990 Million Rubles in Tsi-fra Group Developer of Solutions for the Digitalization of Industry [VEB Ventures инвестирует 990 млн рублей в разработчика решений для цифровизации промышленности Группу «Цифра»],” Ru-Bezh [РУБЕЖ], December 23, 2020, <https://ru-bezh.ru/press-releases/38953-veb-ventures-investiruet-990-mln-rublej-v-razrabotchika-reshenij>.

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