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Abstract

This report, the eighth in a series of biweekly updates, is part of an effort by CNA to provide timely, accurate, and relevant information and analysis of the field of civilian and military artificial intelligence (AI) in Russia and, in particular, how Russia is applying AI to its military capabilities. It relies on Russian-language open source material.

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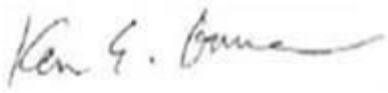

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Governance and Legal Developments

1. Putin signs experimental legal regime law

On July 31, Russian president Vladimir Putin signed the bill "On Experimental Legal Regimes in the Field of Digital Innovation in the Russian Federation" into law, and it will enter into force 180 days from that date. The main goal of the law is to create the legal conditions for accelerated development and adoption of new goods and services related to digital technologies, including artificial intelligence, blockchain, neurotechnologies, and quantum technologies. Essentially, this so-called "regulatory sandbox" allows for the removal of certain legal restrictions in order to allow those creating and implementing digital innovations to more easily introduce them and observe their utility. According to the law's authors, the law will foster the development of science, competition in the marketplace, the formation of new types of economic activity, decreases in the costs of entrepreneurial activity, and increases in the efficiency in public administration. This is part of the Russian government's effort to develop regulatory regimes that would allow for experimentation with AI-enabled technologies and services, in order to determine how Russia can best use artificial intelligence in society.

After the law passed, the Ministry of Economic Development submitted a draft resolution on the law's implementation and published the draft on its site for public comment. The draft specifically puts forth a proposed list of technologies included in the experimental legal regime (see Table 1), following on from earlier regulatory exemptions the ministry had proposed. As reported in issue 6 of *AI in Russia*, the first projects accepted under the experimental legal regime will include the creation of robot hotels, the launch of cargo transport by drones, the commercial use of self-driving cars, the remote conclusion of contracts for communications services, the use of voice antifraud services to protect consumers, the selection of optimal areas of operation for small and micro-businesses, and the introduction of AI in medicine and telemedicine technologies.

Regulatory sandboxes are already in operation in a number of other countries, including the UK, the US, Australia, and Canada. According to the chairman of the State Duma, Viacheslav Volodin, "[I]n the IT industry it is critically important not to miss the moment and to keep up with other countries. The special regime will make it possible to apply new digital technologies and test their usefulness in practice."

Table 1. Proposed technologies to include in the experimental legal regime

No	Technological Focus	Technology
1	Neurotechnology and Artificial Intelligence	• Computer vision • Natural language processing • Speech recognition and synthesis • Recommender systems and intelligent decision support systems • Advanced methods and technologies of artificial intelligence • Neuroprosthesis • Neurointerfaces • Neurostimulation • Neurosensing
2	Big Data Technologies	• Industrial internet data collection technologies • Software-defined data stores • Processing technologies, data utilization using machine learning • Data enrichment technologies • Computer methods and business analysis technologies • Descriptive, prescriptive, and predictive analytics • New technologies for collecting, storing, and processing data, including decentralized data
3	Quantum Technologies	• Quantum computing • Quantum communications • Quantum sensors and metrology
4	New Production Technologies	• Digital design, mathematical modeling, and life-cycle management of products or production • Smart and additive manufacturing technologies • Manipulators and manipulative technologies • Technologies for modeling, creating, and using new materials and constructions • Manufacturing management technologies • Platform solutions for design, engineering, manufacturing, and logistics
5	Robotics and Sensing Components	• Sensory and digital robotic components for human-computer interaction • Technologies for sensor motor coordination and spatial positioning • Sensors and the processing of sensory information • Intelligent control systems for robotic systems

No	Technological Focus	Technology
6	Distributed Ledger Systems	• Data organization and synchronization technologies • Technologies to ensure data integrity and consistency • Technologies for creating and executing decentralized applications and smart contracts
7	Wireless Technologies	• Wireless networks and their infrastructure, including WAN (global network), LPWAN (industrial internet communications technologies), WLAN (wireless local area network), PAN (wireless personal network), MAN (metropolitan area network), BAN (body-worn computer network), satellite communications technologies, and 5G network technologies
8	Virtual and Augmented Reality Technologies	• VR/AR content development tools and user experience (UX) technologies from the developer side • Platform solutions for users: editors of content creation and its distribution • VR/AR motion capture and photogrammetry technologies • Feedback interfaces and sensors for VR/AR • Graphics injection technologies • Data transfer optimization technologies
9	Manufacturing Internet (Internet of Things)	• Autonomous decision-making technologies • Machine communication components and networks • Industrial internet platforms • Computer technology and software solutions for the industrial internet
10	Sectoral Digital Technologies	• Sector-specific projects aimed at modernizing existing systems and equipment with hardware and software

Sources: Tatiana Kostyleva, "The Ministry of Economic Development proposed a list of technologies used in experimental legal regimes" [Минэкономразвития предложило перечень технологий, применяемых в экспериментальных цифровых режимах] D-Russia.ru, Aug. 4, 2020, https://d-russia.ru/minjekonomrazvitija-predlozhilo-perechen-tehnologij-primenjaemyh-v-jeksperimentalnyh-cifrovyh-rezhimah.html; "Experimental legal regimes for digital innovation in Russia" [Экспериментальные правовые режимы в сфере цифровых инноваций в России] T-Adviser, July 27, 2020, https://ww.tadviser.ru.

2. Russian government opposes Moscow AI pilot delays

On July 31, the Russian government published a statement on its site declaring that it does not support a bill to postpone part of the Moscow experimental legal regime's entry into force. The regime became law on July 1. The particular provision in question, Article 7, amends the federal law "On Personal Data," allowing for the processing of anonymized personal data, including citizen health data, in order to increase state and municipal administrative efficiency. The bill's authors proposed to postpone the entry of Article 7 into force until July 1, 2025, in order to give AI developers time to eliminate technical glitches in their products by running the "sufficient number of tests and checks." However, the government said that anonymized personal data are the basis of AI system development and that, if Article 7 were postponed, the experimental legal regime would "lose the basis for its implementation." (Please see issue 2 of *AI in Russia* for a discussion of the introduction of the bill by Russian nationalists out of concerns about the Russian government's potential mishandling of personal data.

Source: "The government did not support the bill, which postponed the Moscow AI system experiment" [Правительство не поддержало законопроект, который срывал московский эксперимент с ИИ-системами] D-Russia, Aug. 3, 2020, https://d-russia.ru/pravitelstvo-ne-podderzhalo-zakonoproekt-kotoryj-sryval-moskovskij-jeksperiment-v-s-ii-sistemami.html.

3. Ministry to clarify principles in personal data processing for greater protection

On August 5, the Russian Ministry of Telecom and Mass Communications published a draft bill to clarify the principles of personal data processing in state information systems, with the purpose of increasing information security and the security of citizens' personal data on government systems. The bill would amend Article 13 of the federal law "On Personal Data" in order to minimize the composition of processed personal data necessary for solving IT tasks, and would mandate record keeping and registration of all actions and the identification of all participants related to personal data processing. In addition, the bill introduces principles on declaring and agreeing to the procedures used in processing personal data, with the goals of processing the personal data, of storing those data in electronic form in the information systems at the site of the data's origin, and of defining an interdepartmental request as the preferred method of obtaining information about an object or data subject in the information system.

Source: "The Ministry of Communications wants to clarify the principles of personal data processing for greater protection" [Минкомсвязь хочет уточнить принципы обработки личных данных для их большей защиты], *The Future of Russia,* Aug. 5, 2020, https://futurerussia.gov.ru/nacionalnye-proekty/minkomsvaz-hocet-utocnit-principy-obrabotki-licnyh-dannyh-dla-ih-bolsej-zasity.

4. Russians discuss AI ethics at international conference

Russian researchers from Moscow Institute of Physics and Technology (MIPT) and Moscow State Institute of International Relations (MGIMO), as well as national standards experts from TK 164 and TK 26 have developed six basic ethical principles for scientists working in the AI field. They presented these principles at the International Conference on Engineering Technologies and Computer Science (EnT):

1. AI must work for the public good while preserving spiritual and cultural values and fostering human creativity. Ethicists must delineate areas where decision-making power remains with humans rather than being transferred to machines.
2. All development must be within the bounds of the law.
3. AI may not be used to abridge citizens' rights and freedoms or to promote discrimination. AI systems must be trained in ways that avoid inherent bias. All decisions must be overseen by humans, who must always have the authority to override the decision.
4. Creators must have responsibility for the actions of the AI systems they develop.
5. Developers must be professional in developing AI systems.
6. Developers must work to educate the public about the capabilities and limitations of AI systems.

While some have accused Russia of being a spoiler in the AI ethics debate, an emerging discussion on ethical principles in using and developing AI is taking place in Russia, as discussed in past issues of AI in Russia.

Source: Ksenia Krivotulova, "How Russia is helping the world to make AI safe," [Как Россия помогает миру сделать искусственный интеллект безопасным], Lenta.ru, July 29, 2020, https://lenta.ru/articles/2020/07/29/ethics/.

Military and Security Developments

5. Pantsir air defense system to be equipped with AI

Russian Ministry of Defense (MOD) sources indicate that Pantsir-S antiaircraft missile systems will be able to operate autonomously, according to the Izvestia News Agency. Documents indicate that the Pantsir's new automated control system has aspects of artificial intelligence in that its software analyzes the tactical situation, the location of targets, the degree of danger, and other parameters in order to select the optimal tactics for defense. The Pantsir system is designed to protect against massive airborne attacks, from homemade kamikaze drones to cruise and ballistic missiles.

The Izvestia publication noted that decisions during modern antiaircraft combat could come down to seconds and that a human's ability to respond fast enough is limited. According to Lieutenant General Alexander Gorkov, the former chief of the Russian antiaircraft missile forces, in a massive air strike, the commander does not always have time to analyze the situation, especially if the attack is coming from different directions. In such a scenario, the commander should be aided by a computer system—special algorithms have been developed and programs have been created for a system such as Pantsir that can instantly determine the importance of targets and engage them.

According to the MOD statements, the use of the Pantsir system in Syria, together with Tor air defense system, was key to defending Russian bases from improvised drone attacks launched repeatedly in 2019 and 2020. The MOD hopes that by augmenting Pantsir with AI, it can more effectively protect Russian forces and their allies on the rapidly changing modern battlefield.

Source: "Pantsir with intellect: the system can counter attacks without operator input" [«Панцирь» с интеллектом: комплекс сможет отражать атаки без оператора], Izvetsia.ru, July 28, 2020, https://iz.ru/1040704/anton-lavrov-bogdan-stepovoi/pantcir-s-intellektom-kompleks-smozhet-otrazhat-ataki-bez-operatora.

6. "Avtomatika" appoints the director of digital transformation

The Avtomatika Concern—part of the Rostec defense industrial giant and the maker of AI-enabled counter-UAS systems—appointed Valery Ostrovsky its first director for digital transformation.

Prior to his new appointment, Mr. Ostrovsky held the position of deputy chief of staff at Avtomatika. He previously worked at the Ministry of Telecommunications and Mass Communications, and spent time in the Russian security services. The announcement does not describe which security services Mr. Ostrovsky worked for—the MOD, the FSB, the Interior Ministry, or the National Guard.

In his new position, Valery Ostrovsky will primarily deal with the automation research and development activities of Avtomatika consistent with initiatives of the state digital environment. This will allow the holding to participate in state digital economy programs and be involved in the development of high-tech products. Russian AI development is currently part of the "Digital Economy" national project; part of this initiative is aimed at fostering cooperation between the state/public and private/academic sectors. Ostrovsky plans to concentrate on the activities and processes that can transform this enterprise into a more high-tech, efficient, and competitive company.

Avtomatika's C-UAS system with AI-augmented capabilities is already of interest to potential domestic and international buyers. Ostrovsky's appointment is consistent with initiatives in Russia's domestic military-industrial enterprises, as they transition to a more "digital" platform that may include incorporating AI into manufacturing and R&D processes. For more on Avtomatika's R&D, please see issue #7.

Source: "Avtomatika Concern appoints Director of Digital Transformation" [Назначение директором по цифровой трансформации концерна «Автоматика»], TAdviser.ru, July 27, 2020, https://www.tadviser.ru/.

Corporate and Market Developments

7. Russian medicine on track to use AI-enabled tools

As discussed in past issues of *AI in Russia*, the exploration of AI-enabled tools is becoming increasingly common in Russian medicine, a trend accelerated by the COVID pandemic. According to reports, the K-Sky company, part of the biomedical technology cluster at Skolkovo, has developed Webiomed. Webiomed is the first Russian AI system registered by Roszrdavianadzor designed to help doctors make decisions on diagnoses and treatments. It has gone through clinical trials and been registered as a medical device with the Russian government. This predictive analysis and risk management system analyzes medical data in order to determine risk factors for various diseases and the likelihood of mortality. The project launched in 2018 using 20 million rubles from the personal funds of its founders. Investors are now funding 130 million rubles to bring the product to market.

AI can improve the accuracy and speed of medical diagnoses and identify best treatment options for complex diseases such as cancer. In a lengthy column, the director of the Digital Medicine Institute at the First Moscow State Medical University discussed the ways in which AI can help doctors make diagnoses and free them from rote work. AI can fill out medical questionnaires and charts with information such as temperature, avoiding human data entry errors and ensuring that doctors avoid prescribing medicines that have negative interaction effects. It can also analyze big data, where it can be used to identify preferred treatment options and highlight potential rare diseases that match a patient's symptoms. Another direction is using AI to analyze medical images, including turning them into three-dimensional models, to monitor the condition of unconscious patients, and to make diagnoses. AI systems can also help patients identify which clinic would be best for treating their condition. AI can also help in medical administration, identifying best practices and efficiencies in running hospitals and even the national health care system.

Source: "Skolkovo resident attracted more than 130 million rubles to develop medical AI" [Резидент «Сколково» привлек более 130 млн руб. на развитие системы искусственного интеллекта для медицины], CNews, July 22, 2020, https://www.cnews.ru/news/line/2020-07-22_rezident_skolkovo_privlek; "Searches for pathologies and reads scientific articles: why medicie needs AI" [Ищет патологии и читает научные статьи: зачем медицине искусственный интеллект], *Future Russia*/TASS, August 5, 2020, https://futurerussia.gov.ru/nacionalnye-proekty/iset-patologii-i-citaet-naucnye-stati-zacem-medicine-iskusstvennyj-intellekt.

8. Russian-British joint venture assesses personality

A Russian-British joint venture is using cascading neural nets for personality assessment, according to a study published in the journal *Scientific Russia*. The Russian partner in the BestFitMe company is a research institute, which recruited over 25,000 volunteers to provide photographs and fill out psychological profile questionnaires that were used to train the neural net software. Initial results showed that a great deal of progress still needs to be made in refining the algorithm, with correlations between neural net predictions and profiles ranging from 0.14 to 0.36, depending on the personality trait being assessed. Such an algorithm could be used by HR departments and other public and private stakeholders.

Source: "Искусственный интеллект научили определять черты характера по фото," *Scientific Russia,* July 29, 2020, https://scientificrussia.ru/articles/iskusstvennyj-intellekt-nauchili-opredelyat-cherty-haraktera-po-foto

Education and Training Developments

As discussed in past issues of *AI in Russia,* the demand for AI professionals in Russia greatly outstrips the supply, and education of the future digital workforce is part of the government's national AI strategy.

9. ITMO University offers new degrees with private sector partners

According to a July 29 press release, St. Petersburg's Information Technologies, Mechanics and Optics (ITMO) University will offer two new specializations in its Neurotechnology and Software Engineering master's program. As discussed in past issues of *AI in Russia,* ITMO University is one of the main AI RDT&E hubs in Russia.

The first new specialization is "Software for Telecommunications," which, in partnership with Nexign, will teach three disciplines: IT solutions architecture, DevOps software development methodology, and quality assurance in software development. Nexign, a business support system (BSS) and IoT platform provider, is also offering a boot camp for those who cannot enroll in the master's program but still want to learn about telecommunications. The second new specialization being offered is "Neurotechnology Software," which will be taught in partnership with Robotrack. Robotrack is an organization that develops robotics and technology clubs for children, and was launched by Brain Development LLC in 2015. It is one of the official projects of Russia's National Technological Initiative. According to its website, Robotrack offers training programs of varying degrees of advancement for children ages 4-6, 7-10, 11-14, and 15-17. In total, there are 104 clubs in more than 40 cities in Russia and 7 cities in Kazakhstan.

ITMO's Neurotechnology and Software Engineering masters program began in 2018 and guides research on technologies including AI, VR/AR, IoT, and technologies used to study "the brain, the nervous system, cardiovascular, respiratory and muscle functions, as well as eye movements." Instruction on data processing, neural networks, and machine learning is also provided. The master's program accepts 40 students per year.

Source: "The Master's program in Neurotechnology and Software Engineering receives corporate status and will offer two new specializations" [Магистерская программа «Нейротехнологии и программная инженерия» получила корпоративный статус и открыла две новые специализации], *ITMO News,* July 29, 2020, https://news.itmo.ru/ru/education//news/9607/; "About us" ["О нас"], Robotrack, https://robotrack-rus.ru/o-nas/.

10. RANEPA to launch graduate data science and AI degree with UK university

According to a July 27 *AI News* article, the Russian Presidential Academy of National Economy and Public Administration's (RANEPA's) Institute of Economics, Mathematics and Information Technologies (EMIT) is launching a new Data Science and Artificial Intelligence master's program. It will be a two-year, English-language dual-degree program implemented in conjunction with the University of London. According to the program website, the curriculum for the Data Science and AI program is designed by the University of London with academic direction from the Department of Computing at Goldsmiths.

The article includes an interview with two representatives of VTB Bank's data science division, which relies on EMIT graduates: the head of the Data Analysis and Modeling Department, Maxim Konovalikhin; and the head of the Advanced Machine Learning Algorithms Department, Denis Surzhko. Konovalikhin and Surzhko note the current demand for data scientists in Russia and believe that the field will only become more relevant as daily actions continue to become digitized, as seen in the banking sector. The VTB representatives note that the English-language course will be useful to Russian tech experts, as specialization in the fields of big data and AI began earlier in the West than in Russia. Additionally, Russian companies tend to use a lot of Western technology. Konovalikhin notes, "The more you know, the easier it is to apply."

Source: "Representatives of VTB's Data Science team speak about the professions of the future and explain why their banks need graduates from RANEPA" [Представители Data Science-команды ВТБ рассказали о профессиях будущего и объяснили, почему их банкам нужны выпускники РАНХиГС], *AI News*, July 27, 2020, https://ai-news.ru/2020/07/predstaviteli_data_science_komandy_vtb_rasskazali_o_professiyah_budushego_i.html; "University of London Teaching," RANEPA, https://www.ranepa.ru/eng/center-london/#data.

11. SFU and MIPT to offer joint master's program in computer mathematics

According to a July 22 press release, the Southern Federal University (SFU) and the Moscow Institute of Physics and Technology are jointly offering a master's program titled "Computer Mathematics: Theory and Applications." The program is focused on training AI specialists for the National Technological Initiative's (NTI's) "Autonet" market. According to its website, Autonet, or "the Internet of Transportation," is "an ecosystem of consumers and service providers, systems and modern vehicles based on intelligent platforms, networks and infrastructure in the logistics of people and things." Autonet market technologies include

navigation tools, traffic management systems, ride-hailing and ride-sharing apps, and route optimization tools and transport logistics.

Eugene Mukhanova, vice-rector for design and innovation and international cooperation of SFU, is quoted as saying that the partnership will allow the program to offer training in software development for use in unmanned vehicles. He notes that, in the future, this will allow the university "to create a system of training programmers for unmanned ground and aircraft apparatuses, for unmanned surface and submarine ships, [and] for robots."

The digital engineering and design company Scientific and Design Bureau of Computer Systems is partnering in the master's program by offering practical training for students. The company has been researching the development of self-driving vehicles for many years.

As discussed in past issues of *AI in Russia,* MIPT and SFU are emerging as the key AI RDT&E nodes in Russia. In particular, SFU is also working with the MOD on autonomous vehicle developments (please see issue #1).

Source: "SFedU and MIPT are implementing a joint master's program for the National Technical Initiative markets" ["ЮФУ и МФТИ реализуют совместную программу магистратуры для рынков НТИ"], Southern Federal University, July 22, 2020, https://www.sfedu.ru/www2/web/press-center/news/63261; "NTI Autonet," Autonet, "About Us," Scientific Design Bureau of Computing Systems, https://autonet-nti.ru/en/autonet/; https://www.nkbvs.ru/en/o-firme/.

12. MIPT, MTS, and Skolkovo Business School to offer joint master's program in digital technologies

According to a July 22 article, the Moscow Institute of Physics and Technology, in partnership with Mobile TeleSystems (MTS) and the Skolkovo Business School, is launching a two-year master's program titled "Digital Technologies in Business." Students will acquire technical skills taught from MIPT's curriculum, as well as business and managerial training taught by the Skolkovo Business School. Students will then complete an internship at MTS, Russia's leading telecommunications provider, which will provide hands-on experience in subjects including Big Data, artificial intelligence, IoT, e-commerce, and cloud solutions. Tuition fees are fully covered by a grant from MTS.

"Today it is obvious that technical knowledge alone is not enough to achieve success," Andrei Sharonov, president of Skolkovo's Moscow School of Management is quoted as saying.

Therefore, the Skolkovo Business School "will help participants in the master's program develop managerial skills, leadership competencies, soft skills and critical thinking."

As discussed in past issues of *AI in Russia,* collaboration between MTS and Skoltech also includes a joint natural language processing (NLP) laboratory.

Source: "MTS, MIPT and SKOLKOVO open the master's program "Digital Technologies in Business" [МТС, МФТИ и СКОЛКОВО открывают магистратуру 'Цифровые технологии в бизнесе], COMNEWS, July 22, 2020, https://www.comnews.ru/content/208225/2020-07-22/2020-w30/mts-mfti-i-skolkovo-otkryvayut-magistraturu-cifrovye-tekhnologii-biznese; "Recruitment for a new master's degree from MIPT, SKOLKOVO and MTS is open: 'Digital technologies in business'" [Открыт набор на новую магистратуру от МФТИ, СКОЛКОВО и МТС: «Цифровые технологии в бизнесе»], MIPT, https://mipt.ru/news/otkryt_nabor_na_novuyu_magistraturu_ot_mfti_skolkovo_i_mts_tsifrovye_tekhnologii_v_biznese.

Article: MOD officials describe "intellectualization" of Russian armed forces in key General Staff journal

The Russian military establishment has been debating the use of advanced and breakthrough technologies for a number of years, and discussions of the development of unmanned and autonomous systems, as well as artificial intelligence (AI), are becoming more frequent. It is clear in defense writing that Russian defense experts are trying to understand the proper role of AI in the Russian military.

In a June 2020 article in *Military Thought*, several military officials in the Russian Ministry of Defense's Department of Information Systems discussed the concept of the "intellectualization" of the Russian armed forces. Today, the word "intellectualization" is often used by the Russian military establishment as a synonym for artificial intelligence technology and concepts. *Military Thought* (*Voennaya Mysl*), published by the Russian General Staff, is one of the oldest Russian-language military periodicals, dating back to the 1930s. For decades, Soviet, and later Russian, military officers, scientists, and contributors have used the journal to explore the conduct of war and its relationship to technology RDT&E. Details of the article are as follows:

Title: "Intellectualization is an important component of digitalization of the Russian Armed Forces" [Интеллектуализация — важная составляющая цифровизации Вооруженных Сил Российской Федерации], *Military Thought* [*Voennaya Mysl*] magazine, June 2020, pp 67-77.

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Colonel O.M. Tlyashev, candidate of technical sciences, head of the Department of Information Systems of the Russian Ministry of Defense

The authors note that the "digitalization" of the armed forces leads over time to the lessening of the role of humans. They believe that the human role in digital armed forces will consist primarily of monitoring the (combat) environment, conducting a comprehensive analysis of decisions made by robotic systems, and of monitoring the issuance of commands to attack, especially in the event of a threat of civilian death. These human-in-the-loop and human-on-the loop scenarios are nonetheless not the final evolution of AI-enabled "intellectual" military forces. The authors note that the formation and adoption of decisions becomes the prerogative of machines—more precisely, of artificial intelligence systems, including weapons control processes.

The authors do not explain the way out of this dilemma, noting that a human is included (in decision-making) only in exceptional critical cases; the human's main functions are supervision and control. They suggest that the Russian military intends to fully progress down this evolutionary path from human to machine decision-making, by noting that decision-making in combat operations would be mainly carried out by robotic systems. As proof, they quote Chief of the General Staff Gerasimov's 2013 statement that "…in the near future, it (would be) possible to create fully robotic formations capable of conducting independent combat operations."

The authors' main arguments do not deviate much from the accepted thinking on the impending military automation and the role of AI that is found in Western (including American), and other sources. They note that mixed reality, quantum, and AI technologies are the highest priority for military forces around the world. They explain that the further development and deepening of digitalization processes in the armed forces is associated with "intellectualization" processes—the creation, widespread implementation, and use of artificial intelligence systems capable of performing creative functions that are traditionally considered the prerogative of a person.

The authors note the following AI technologies that are increasingly in focus: expert systems and decision support systems; heuristic search engines; natural language processing; data mining; pattern recognition; and technologies for creating "intelligent" robots and multi-agent systems (swarms).

The authors argue that it is a foregone conclusion that the Russian Armed Forces will undergo the "intellectualization" processes—in using AI to increase Russian defense capability. They describe Vladimir Putin's November 2019 speech, in which the Russian leader noted that AI is assigned the role of solving problems in almost all spheres of life, including in increasing defense capability. Further, they refer to another quote in the same speech that "AI should be used in military affairs, but not to the extent that it replaces a person everywhere." They conclude that "man plus the machine" is a preferable scenario, which may be a Russian way of

explaining the evolution from the "human-in-the-loop" to the "human-on-the-loop" use of AI military systems.

One focus area in today's Russian debates on the use of AI in weapons systems is "intellectual" technologies, or those technologies augmented with better decision-making capacity through AI. As an example, the authors cite the SU-24M and TU-22M3 bombers' SVP-24 computing system that utilizes AI technologies to analyze GLONASS data in order to carry out bombing in an automated mode as witnessed in the Syrian campaign. They assert that this could be a solution to the "intellectualization" of onboard aviation control systems for complex aerial campaigns. The authors note that the "man-plus machine" type of AI use is "currently highly effective," highlighting the following main AI RDT&E efforts in the Russian military: decision support systems at tactical, operational, and strategic levels; automated and autonomous vehicles and swarming concepts; video analytics and mixed reality technology; and unmanned support systems such as mine-clearing and logistics/towing robots.

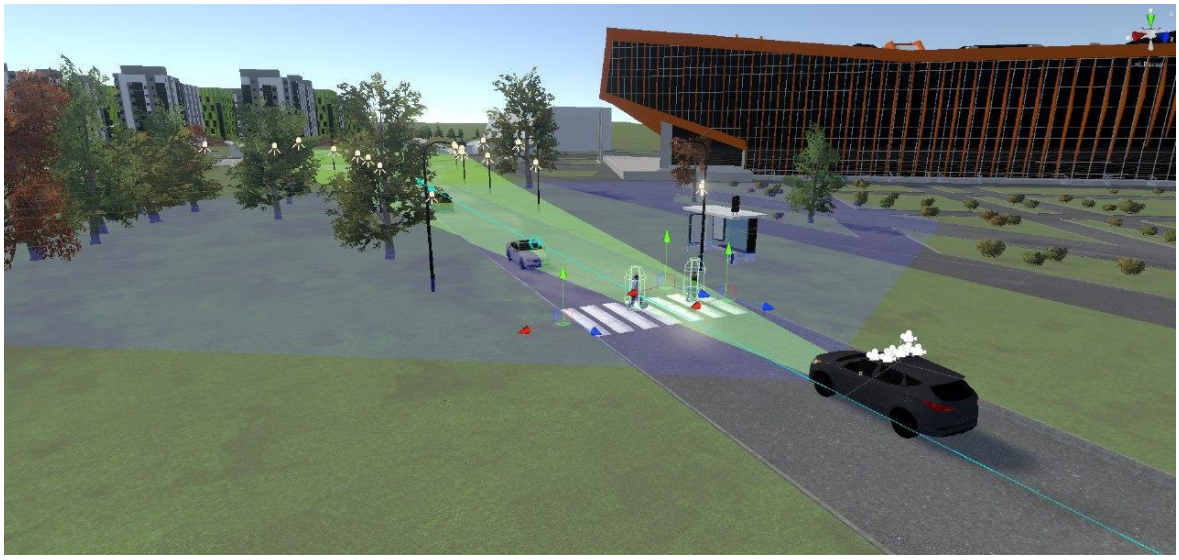
This article offers a glimpse into public discussions among Russia's active military personnel on the importance of AI. These discussions also highlight discrepancies in official statements—for example, some discuss the ever-increasing autonomy in weapons and the need for a human control mechanism over them. Other questions linger, such as the extent of human control over the increasingly sophisticated "intellectual" decision-making mechanisms. The authors do not discuss the dilemma of the ever-decreasing time left for a human operator to make a decision based on AI-enabled systems during combat, and the resulting battlefield unpredictability. Some of the arguments presented here, such as the inevitable need for AI in military applications, follow the generally established pathway; nonetheless, they allow for a window into a more opaque world of Russian military debate on the future of artificial intelligence.

Spotlight: An Autonomous Kamaz

The Laboratory of Autonomous Transport Systems, part of Innopolis University's Center for Technological Components for Robotics and Mechanics (www.robotics.innopolis.university) is developing an autonomous Kamaz truck that utilizes an onboard aerial reconnaissance module. The scientists claim to have created their own algorithms for object recognition, classification, and routing. According to the center director, Salimzhan Gafurov, the system purportedly creates 2,048 different trajectories for the vehicle's anticipated movement over the next 6.5 seconds and updates these every .05 seconds. Additionally, the system continually monitors 360 degrees around the vehicle out to a range of 220 meters.

With the assistance of the onboard UAV (stored and charged on a platform of the truck), the truck can navigate through terrain without the use of maps. The truck does retain a driver, although developers claim there is no identified need for one. The truck has logged over 3,000 kilometers on the Innopolis compound. The center uses its own simulator to test a vehicle's ability to respond to various situations.

The online sourcing does not mention any military aspects of this technology, although those are obvious. Russian military planners assess that the electronic environment of the modern battlefield—including the availability of space-based information—is likely to be highly compromised. A system such as the one in development at the center would be consistent with Russian efforts to maintain military capabilities in a compromised environment.



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