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Training Specialists in the Field of Artificial Intelligence at Russia and Central Asian Countries Universities: Ranking Positions and Cooperation Opportunities

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Abstract. The introduction of artificial intelligence in the economy, increasing its share in the real sector of the economy and accelerating digital transformation require a large number of specialists in this field. States consider the possibilities and prospects of new technologies, regulate issues of their application, security, cooperation, etc. However, all this is important if there are specialists who can develop, implement, adapt, and improve artificial intelligence technologies. No less needed are specialists who will teach how to use AI, work in AI environments, apply AI in the professional sphere and everyday life. Although Russia is not a world leader in this field (according to ratings), but having a good technological research base due to the historically high level of fundamental physics and mathematics education and strong programming schools, it can become a reliable partner and platform for the creation and development of its own centers for training specialists in the field of AI in the countries of Central Asia based on universities with which Russia has established close ties.

Keywords: Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, artificial intelligence, higher education, rating, cooperation

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Introduction

With the advancement of new technologies in today's era, the field of artificial intelligence has become more relevant and compelling all over the world. Having an education in the sphere of artificial intelligence opens up a lot of career opportunities.

The Russian Federation has a number of advantages associated with the Russian education system, which allow us to talk about the high potential for training specialists in the field of artificial intelligence (AI). Such advantages include historically significant physics, mathematics and IT schools, fundamental basic education in secondary school, the existence of a unique system for searching and selecting gifted children through mathematical schools, study groups, and Olympiads [2]. In the Coursera 2020 Global Skills Index study, Russia took the 1st place in the world (out of 60 countries) in terms of technological competencies, and the first one in terms of skills in Data Science[1]. A special role in these processes belongs to Russian universities, which conduct educational activities to prepare highly qualified staff in the field of AI technologies.

Most countries in the world have developed and approved governmental and intergovernmental strategies and initiatives aimed at developing artificial intelligence.

Materials and Methods

The sphere of artificial intelligence has grown exponentially over the past few decades, making it one of the most exciting and influential fields of study today. At the same time, in Russia there are very few academic papers and, in particular, defended dissertations on the problems of professional training of staff directly in the field of AI. The examples include the works of K.V.Rozov [5], M.Kh.Badmaeva [1]. In the book of Yu.V.Frolov, T.M.Bosenko [9] statistical data on the training of specialists with the necessary competencies to work in the conditions of economy digitalization are analyzed, and indices are proposed that describe the processes of personnel provision for the digital transformation of the economy in Russia. The main challenges of the digital economy in the field of personnel training, related to the definition of key competencies of the digital economy, bridging the gap between the education system and the labor market, are considered in the study of A.A.Gibadullin and A.V.Karagodin [3]. Monitoring of personnel training for the digital economy is also carried out in the annual statistical digests of the HSE University, dedicated to the main aspects of the digital economy development in Russia [4]. In 2024, the Institute for Statistical Studies and Economics of Knowledge (ISSEK) of the HSE University presented a series of regular information and analytical materials based on specialized surveys to study the trends, directions and factors of the development and spreading of artificial intelligence (AI) technologies in Russia and the world. The results of a comprehensive survey of 1,100 universities and their branches, conducted by the ISSEK of the HSE University in 2023 as a part of the event "Monitoring the creation and results of the artificial intelligence technologies application in order to assess the level of implementation of these technologies in the sectors of the economy and the social sphere[2]" of the federal project "Artificial Intelligence" with the support of the Ministry of Economic Development of Russia, have been published.

The sources include regulations and standards of Russia, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, as well as the results of the EduRank.org and Artificial Intelligence Alliance ratings.

The methodological basis of the study is the structural-functional approach, according to which the system consists of structural and functional components, each structural element contributes to the achievement of the goal, i.e. it has a functional purpose (regulatory framework; demand from the economy; availability of educational programs and experts; statistical data and university rankings, etc.). The research methods are analysis of regulatory documents and publications, university rankings dedicated to the training of AI specialists.

Results

The debate over the need for global regulation of artificial intelligence is gaining momentum, given that AI has become a key tool for millions of people over the past year. The question of how to integrate AI into law is becoming more pressing with more organizations using AI in such areas as medicine, politics, and judicial decisions.

State and legal regulation in the field of AI

In 2019, the Russian President Vladimir Putin approved the national strategy for the development of artificial intelligence for the period up to 2030[3]. The Federal Project "Artificial Intelligence" has become the main tool for implementing the National Strategy for the Development of AI[4]. The federal project provides for a set of measures aimed at

1 Russia took the 1st place in the Coursera 2020 Global Skills Index study. Available from: https://www.vedomosti.ru/opinion/articles/2020/07/19/834908-rossiya-global-skills.

2 Artificial intelligence. The Institute for Statistical Studies and Economics of Knowledge. Available from: https://issek.hse.ru/mirror/pubs/share/938098220.pdf.

3 The national strategy for the development of artificial intelligence for the period up to 2030, approved by the Russian President on the 10th of October in 2019 No. 490 "On Development of Artificial Intelligence in the Russian Federation". Garant.ru: Informational and legal web portal. Available from: https://www.garant.ru/products/ipo/prime/ doc/72738946/.

4 The Passport of the federal project "Artificial Intelligence" of the national program "Digital Economy of the Russian Federation" (Appendix No. 3 to the minutes of the Presidium of the Government Commission on Digital Development, Use of Information Technologies to Improve the Quality of Life and Conditions for Doing Business dated 08/27/2020 No. 17). Available from: https://ac.gov.ru/uploads/_Projects/AI_otbor/Passport.pdf.

supporting companies developing AI solutions and supporting the testing of such solutions at Russian enterprises, increasing staffing, developing the science and education system, and creating an infrastructure for the favorable development of domestic artificial intelligence. Much attention within the framework of this project is paid to education – the development of specialized bachelor's and master's degree programs, high-quality training of a large number of specialists in this field[5].

State and legal regulation in the sphere of AI in Central Asian countries at the level of national strategies has already defined development priorities. A number of legislative initiatives of the governments of Central Asian countries were devoted to the development of ICT infrastructure, innovation and digitalization of economic sectors[6].

In 2017, the Government of the Republic of Kazakhstan adopted Resolution No. 827 dated December 12, 2017 "On Approval of the State Program "Digital Kazakhstan". A number of provisions of this Resolution indicate priorities for the development of artificial intelligence until 2030. Currently, a number of strategic documents, such as the National Development Plan of the Republic of Kazakhstan until 2025 and the Concept of Digital Transformation, Development of the Information and Communication Technologies and Cybersecurity Industry for 2023-2029, define certain tasks and activities in the field of artificial intelligence[7]. According to the Ministry of Science and Higher Education of the Republic of Kazakhstan, 24 universities and research centers are engaged in some kind of research or development in the field of artificial intelligence to one degree or another. Communities of machine learning and artificial intelligence specialists are emerging in this sphere. IT schools and universities include modules on artificial intelligence in their training programs. Four universities have the appropriate equipment for processing large amounts of data and training deep learning algorithms: L.N.Gumilyov Eurasian National University, Al-Farabi Kazakh National University, Satbayev University, and Nazarbayev University. At the same time, three universities report underutilization of computing power, and one university reports a shortage of it. Two universities see the need to modernize their equipment.

The concept of digital transformation "Digital Kyrgyzstan 2019-2023" was approved by the Decision of the Security Council of the Kyrgyz Republic No. 2 of December 14, 2018[8]. The main goal of the Concept is to form an open digital society, transit to digital governance, provide digital conditions for citizens when interacting with government agencies and local governments, ensure transparency, reduce bureaucracy and corruption in government

5 The Battle for AI Talent: Difficulties in Finding Specialists in Russia. ICT. Moscow. 2021. November 26. Available from: https://ict.moscow/news/ai-talents/.

6 Artificial Intelligence in Central Asia: Applications and Regulation. The Times of Central Asia. 23.02.2024. Available from: https://timesca.com/artificial-intelligence-in-central-asia-applications-and-regulation/.

7 On approval of the Concept for the development of artificial intelligence for 2024-2029. Available from: https://www.gov.kz/memleket/entities/mdai/documents/details/606493?lang=ru.

8 Decision of the Security Council of the Kyrgyz Republic No. 2 of December 14, 2018, the concept of digital transformation "Digital Kyrgyzstan 2019-2023». A centralized database of Legal Information of the Kyrgyz Republic. Retrieved 2021 May 24. Available from: http://cbd.minjust.gov.kg/act/view/ru-ru/216896.

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agencies. The Kyrgyz Republic Digital Code draft was announced at the end of 2022 and presented (published) for public discussion on the Portal for the digital bills creation and discussion on June 26, 2023[9].

The Decree of the Government of the Republic of Tajikistan approved the concept of the digital economy in the Republic of Tajikistan dated December 30, 2019, No. 642. The main objectives of the Concept are the creation of a stable and secure ICT infrastructure for high-speed transmission, processing and storage of large volumes of data, accessible to all organizations and households, as well as the use of predominantly national software by government agencies, local governments and organizations[10]. The Strategy for the Development of Artificial Intelligence in the Republic of Tajikistan until 2040[11] notes that during the implementation of the first and second stages of this strategy, legal, institutional and infrastructural frameworks will be developed, and the necessary specialists will be trained.

The Republic of Uzbekistan is also actively conducting research in the field of artificial intelligence, including the development and adoption of legislative acts, development strategies and support for scientific projects and academic educational initiatives. By the Decree of the President of the Republic of Uzbekistan dated 05.10.2020, the "Digital Uzbekistan Strategy – 2030" was adopted, which, among other points, provides for the adoption of targeted programs for scientific research and innovation projects in the areas of the country's development of the digital economy [10, 11]. The updated Constitution of 2023 lays new foundations emphasizing the importance of the development of the Internet and recognizing it as an integral part of every person's life. The state program "Digital Uzbekistan Strategy – 2030" envisages a wide range of measures to strengthen guarantees for the implementation of citizens' rights to free access to information, including compliance with the law, improving the culture of using information and protecting against destructive information[12].

In April 2024, a discussion of the draft model act "On Artificial Intelligence Technologies"[13] was held at a meeting of the Standing Commission of the CIS Interparliamentary Assembly on Science and Education. The proposed changes to the model code are aimed at developing the educational environment and traditional educational methods, introducing new effective forms of interactivity and multimedia into education. The adoption of this document should contribute to the legal regulation of the system

9 Digital Code Draft of the Kyrgyz Republic. Available from: https://code.digital. gov.kg/ru/bills/.

10 Decree of the President of the Republic of Uzbekistan No. UP-6079 dated 05.10.2020 "On approval of the Digital Uzbekistan – 2030 strategy and measures for its effective implementation". National Database of Legislation, 06.10.2020, No. 06/20/6079/1349.

11 Strategy for the development of artificial intelligence in the Republic of Tajikistan for the period up to 2040. Available from: http://portali-huquqi.tj/publicadliya/view_qonunhoview.php?showdetail=&asosi_id=26592.

12 How Artificial Intelligence is Transforming Legislation in Uzbekistan. Available from: https://anhor.uz/it-science/artificial-intelligence-legislation-uzbekistan-uzbek-expert/.

13 A law regulating the use of artificial intelligence appears in the CIS. Available from: https://snob.kg/rakurs/pro-nashe-zhitie/item/7242-zakon-reguliruyushchij-ispolzovanie-iskusstvennogo-intellekta-poyavitsya-v-sng.

of development and support of young talents for the CIS countries. Harmonization of legislation should ensure the existence of common rules in this area and create conditions for the identification, support and development of young talents, regardless of their place of residence, social status or financial capabilities of the family. The recommendations will help create a unified legal regulation of interaction with young talents in the Commonwealth countries and will contribute to the formation of a system of support for talented children at regional, state and interstate levels.

Universities and the training of highly qualified staff in the field of AI

Universities around the world offer programs that focus on this cutting-edge field. Universities implement the training of highly qualified staff in the field of AI within two tracks:

Educational programs that have been developed or updated in accordance with the AI competency model. Students studying in this track acquire skills in developing methods and tools for AI technologies and learn how to use them professionally at an advanced level.

Programs of other profiles containing the module "Artificial Intelligence Systems". Students of such programs learn to apply AI in their area of competence, taking into account the direction of training (specialty) and future field of activity. According to the National Strategy for the Development of AI, the corresponding modules are supposed to be included in all educational programs of higher education in Russia.

However, not all universities are effective in delivering AI programs. To identify the best universities in this field, various ranking systems are being developed to assess the quality of such programs. AI rankings evaluate universities based on a number of factors, including academic staff, the quality of their research output (publications), and the number of successful AI projects. These rankings serve as a valuable resource for prospective students, researchers, and industry professionals interested in getting education or collaborating in this sphere. By reviewing these rankings, people can make informed decisions about which universities offer the strongest AI programs and are at the forefront of AI research.

There are many universities in the field of artificial intelligence that offer exceptional programs for students to develop their skills and knowledge. These universities are known for their expertise and contributions in the field, and their programs are highly regarded by industry professionals and researchers. According to EduRank.org, an independent, metrics-based ranking, 14,131 universities from 183 countries use the world's largest database of research papers containing 98,302,198 scientific publications and 214,9512,106 citations to rank universities across 246 research topics. The ranking lists the top universities in the world based on their research output in artificial intelligence (252 million citations processed, 13.4 million research papers received, compiled from 5,743 universities)[14]. One

14 Best Universities for Computer Science in the World. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/.

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university that consistently ranks at the top for its AI program is Stanford University. Stanford offers a comprehensive curriculum, including courses covering topics such as machine learning, natural language processing, and computer vision. The university's academic staff are renowned experts in the field and have made significant contributions to the development of artificial intelligence technologies.

Another university that ranks highly in this pioneering field of research is the Massachusetts Institute of Technology, which offers a wide range of AI programs at both Bachelor's and Master's levels. The university's research is highly regarded, with its faculty publishing influential papers and leading groundbreaking projects. The University of California, Berkeley, is also known for its excellence in research into emerging computer technologies. Berkeley's program focuses on an interdisciplinary approach that combines computer science, statistics, and cognitive science. The university's labs provide students with hands-on research opportunities and the chance to work with leading experts in the field of AI. Other notable universities in the AI rankings include Carnegie Mellon University, Oxford University, and the University of Toronto. These universities offer excellent programs and have a track record of producing successful professionals in the field. In the 9th place is Tsinghua University of China, which ranks first in Asia in artificial intelligence research. In the 21st place is Nanyang Technological University of Singapore, which ranks second in Asia according to this ranking.

Russian universities are assigned to the European region:

1. Lomonosov Moscow State University, according to this study, is the leader in Russia, ranked 115th in Europe and 322nd in the world.

2. Saint Petersburg State University (242nd in Europe and 618th in the world).

3. National Research University Higher School of Economics (275th in Europe and 719th in the world).

4. ITMO University (374th in Europe and 1008th in the world).

5. Tomsk State University (400th in Europe and 1086th in the world).

In total, 100 Russian universities are represented in this ranking (Murmansk State Technical University ranks 100th, while it ranks 1094th in Europe and 4459th in the world)[15].

A separate section of the ranking is the best universities in the field of "Artificial Intelligence" in Asia[16], where educational institutions from 41 countries are represented (Figure 1). The list of the best universities in Asia is ranked based on their research performance in Computer Science (55.8 million citations, 5.14 million academic papers, 2466 universities in Asia).

In the ranking of the Best Universities for Computer Science in Asia, the top twenty includes 13 universities from China – Tsinghua University, Harbin Institute of Technology, Shanghai Jiao Tong University, University of Hong Kong, Zhejiang University, Beihang University, Huazhong University of Science and Technology, Peking University, Xi'an

15 100 Best universities for Computer Science in Russia. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/ru/.

16 Best Universities for Computer Science in Asia. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/as/.

Jiaotong University, Hong Kong Polytechnic University, Southeast University, University of Electronic Science and Technology of China, Chinese University of Hong Kong; two universities from Singapore – Nanyang Technological University, National University of Singapore, Japan – University of Tokyo, two educational institutions from Israel – Tel Aviv University, Technion – Israel Institute of Technology, two educational institutions from South Korea – Seoul National University, Korea Advanced Institute of Science and Technology.

We also consider which universities from Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan have been included in the EduRank.org the ranking of the Best Universities in Artificial Intelligence and what place they take among universities in Asia and around the world.

The Best Universities in Artificial Intelligence in Asia ranking features 10 best universities in Kazakhstan[17]:

1. Nazarbayev University (568 in Asia, 1529 in the world).
2. L.N.Gumilyov Eurasian National University (1034 in Asia, 2415 in the world).
3. Al-Farabi Kazakh National University (1163 in Asia, 2660 in the world).
4. Satbayev University (1775 in Asia, 4063 in the world).
5. KIMEP University (1858 in Asia, 4246 in the world).
6. Kazakh-British Technical University (1916 in Asia, 4368 in the world).
7. Almaty University of Power Engineering and Telecommunications (2062 in Asia, 4751 in the world).
8. International Kazakh–Turkish University (2209 in Asia, 5181 in the world).
9. North Kazakhstan State University (2377 in Asia, 5574 in the world).
10. Karaganda State University (2442 in Asia, 5698 in the world).

In Tajikistan, the ranking highlights two best universities based on their research performance in Computer Science[18]:

1. Tajik National University (2670 in Asia, 6417 in the world).
2. Tajik State Medical University (2768 in Asia, 6668 in the world).

In Kyrgyzstan, the ranking highlights 7 best universities based on their research performance in Computer Science[19]:

1. University of Central Asia (2413 in Asia, 5765 in the world).
2. Osh State University (2507 in Asia, 6005 in the world).
3. Kyrgyz State Medical Academy (2530 in Asia, 6061 in the world).
4. Kyrgyz National University (2542 in Asia, 6103 in the world).
5. Kyrgyz State Technical University (2638 in Asia, 6341 in the world).
6. American University of Central Asia (2688 in Asia, 6484 in the world).
7. Ala-Too International University (2759 in Asia, 6657 in the world).

17 10 Best universities for Artificial Intelligence (AI) in Kazakhstan. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/ai/kz/.

18 2 Best universities for Computer Science in Tajikistan. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/tj/.

19 7 Best universities for Computer Science in Kyrgyzstan. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/kg/.

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Below is a list of 11 best universities in Uzbekistan ranked by analysts based on their research performance in Artificial Intelligence (AI)[20]:

1. Tashkent University of Information Technologies (1162 in Asia, 2659 in the world).
2. National University of Uzbekistan (1384 in Asia, 3115 in the world).
3. Tashkent State Technical University (1497 in Asia, 3386 in the world).
4. Samarkand State University (1815 in Asia, 4156 in the world).
5. Urgench State University (2115 in Asia, 4890 in the world).
6. Tashkent State University of Economics (2131 in Asia, 4950 in the world).
7. Tashkent Institute of Railway Transport Engineers (2147 in Asia, 4986 in the world).
8. Westminster International University in Tashkent (2320 in Asia, 5427 in the world).
9. Namangan State University (2370 in Asia, 5552 in the world).
10. Andijan State University (2387 in Asia, 5592 in the world).
11. Tashkent State Agrarian University (2450 in Asia, 5711 in the world).

In Russia, in 2023, the Alliance in the Sphere of Artificial Intelligence, together with the Ministry of Education and Science of Russia, developed a rating of Russian universities by the quality of training of AI specialists. The Alliance in Artificial Intelligence Association unites technology companies to develop artificial intelligence in Russia and ensure the country's leadership in the global market. The association's members include Sberbank, Gazprom Neft, Yandex, VK, RDIF, SIBUR, URALCHEM Holding Company, Rusagro Group, Severstal, Samolet Group and others. The ranking of universities by the quality of training specialists in the field of artificial intelligence is a new tool in the ecosystem of education support which the Alliance is creating. The goal of the project is to improve the quality of training new personnel, involve industry businesses in the AI personnel agenda, and provide objective information about universities to applicants and employers. The first version of the rating only considers universities that have bachelor's programs in the field of AI.

According to D.Chernyshenko, Deputy Prime Minister of the Russian Federation, curator of the national program "Digital Economy": "Among 180 universities from 64 regions of the country that have been included in the rating, 10 of them have grades of A+, A (good quality) B+, B (acceptable quality). The absolute leaders are HSE, MIPT and ITMO. Thus, the TOP-10 Russian universities can already compete for the title of the best ones, which means they train highly qualified specialists and successfully develop science in the field of artificial intelligence"[21].

Judging by the Alliance rating, the top 10 Russian universities in terms of the quality of training specialists in the field of AI are[22]:

Level A+

20 11 Best universities for Artificial Intelligence (AI) in Uzbekistan. 29.02.2024. EduRank.org. Available from: https://edurank.org/cs/ai/uz/.

21 Universities rating based on the quality of training specialists in the field of artificial intelligence appeared in Russia. The Alliance in the field of artificial intelligence. Available from: https://a-ai.ru/?page_id=2254.

22 Universities rating. The Alliance in the field of artificial intelligence. Available from: https://rating.a-ai.ru/#rating.

- National Research University ITMO (Saint Petersburg);
- National Research University Higher School of Economics (Moscow);
- Moscow Institute of Physics and Technology (National Research University) (Moscow);

Level A

- Lomonosov Moscow State University (Moscow);
- Saint Petersburg State University (Saint Petersburg);

Level B+

- Ural Federal University named after the first President of Russia B.N.Yeltsin (Sverdlovsk Region);
- Bauman Moscow State Technical University (National Research University) (Moscow);

Level B

- National Research Nuclear University MEPhI (Moscow);
- Peter the Great St. Petersburg Polytechnic University (St. Petersburg);
- Innopolis University (the Republic of Tatarstan).

The rating methodology is based on a mathematical model that actual data-driven and approved by a wide range of experts from the Alliance member companies and academic community. The experts have identified only 4 groups of criteria: demand for graduates in hiring; relevance of the learning process in the field of AI; educational environment; activity in the development of school education[23]. To build the model, both open and specially collected data on the quality of education in higher education institutions, survey results, and graduates' salaries information received from the Ministry of Science and Higher Education of the Russian Federation have been used.

The rating includes 71 universities in the Central Federal District, 39 of which are in Moscow. The ranking includes 29 universities from the Volga Federal District, 24 universities from the Northwestern Federal District, and 22 from the Siberian Federal District.

In the framework of the international industrial exhibition "Innoprom. Central Asia", the first deputy chairman of the board of Sberbank A.Vedyakhin invited Uzbekistan to take part in the ranking of universities in AI. "This is not just a competition. This is an opportunity to look at yourself from the outside and become even better in order to produce excellent specialists who will be in demand both in Uzbekistan and beyond,"[24] he said.

According to Sberbank estimates, by 2030, at least 100 universities will be able to annually graduate thousands of high-quality AI specialists who will be able to meet the growing demand for personnel in this field.

In Russia, a lot of work is being done to create an education system in the field of artificial intelligence, e.g., advanced training courses for teachers in the field of AI,

23 Rating methodology. The Alliance in the field of artificial intelligence. Available from: https://rating.a-ai.ru/methodology.

24 Uzbekistan may launch a universities rating based on the quality of training in the field of AI. Gazets.ru. Available from: https://www.gazeta.ru/social/news/2024/04/22/22846316.shtml.

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conducted by MIPT, Moscow State Pedagogical University, Innopolis University, Digital University 2035 and other Russian educational organizations; educational materials on AI being developed, presented by leading technology companies such as Yandex, Sberbank, VK and others; an international educational project in the field of information technology called "Digital Lesson".

The educational campaign "Digital Lesson" on the topic "Artificial Intelligence in Education" in 2021 united Russian-speaking schoolchildren from 127 countries. Belarus, Germany, Kazakhstan, Kyrgyzstan, the Netherlands, Romania, the USA, Turkey, Uzbekistan, Ukraine and Sweden became the leading countries in terms of the number of people who accessed the lesson materials; compared to 2020, the international geography of the lesson has significantly expanded (previously, 86 countries took part in it)[25]. This has become possible thanks to the active support of Rossotrudnichestvo and the involvement of Russian schools abroad.

You can organize a lesson or take a class on the topic of "Artificial Intelligence in Education" even after the end of the campaign – all materials will remain publicly available. Through the network of our Russian Houses, schoolchildren around the world meet specialists from the largest Russian IT companies, gain knowledge about cybersecurity, artificial intelligence, and thereby improve their digital literacy. Schoolchildren from Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Tajikistan and other countries of the post-Soviet territory took an active part in the educational campaign too.

Artificial intelligence technologies are being applied across a variety of industries, including healthcare, finance, transportation, manufacturing, entertainment, and more, to automate processes, improve efficiency, enhance decision-making, and create new products and services.

However, the development and deployment of AI also raises ethical, social, and economic issues, with concerns including job displacement, algorithmic bias, privacy concerns, and the potential for misuse or unintended consequences. As AI continues to evolve, it is important to consider these implications and develop appropriate policies and frameworks to ensure that AI benefits society as a whole.

Learning objectives for AI typically depend on the specific context, level of expertise, and anticipated results. There are some common learning objectives for studying AI such as understanding AI concepts and principles; learning AI algorithms and models; mastering programming languages and tools; data collection and pre-processing; model evaluation and validation; ethical and responsible AI development; problem solving and application development; collaboration and communication skills; continuous learning and adaptation; critical thinking and problem-solving skills. These learning objectives provide a fundamental foundation for acquiring AI knowledge, skills, and competencies that enable individuals to contribute to the development and application of AI technologies across a variety of spheres and industries [6].

25 Artificial Intelligence Digital Lesson unites Russian-speaking children in 127 countries. Available from: https://ug.ru/urok-czifry-po-iskusstvennomu-intellektu-obedinil-russkoyazychnyh-detej-v-127-stranah/.

In Russia, there are programs to attract foreign applicants both within the framework of Rossotrudnichestvo and at the level of individual universities. Leading universities (HSE, MIPT, Skoltech) have created world-class educational programs that train specialists in data science and artificial intelligence[26]. It is also possible to attract specialists from Russia to implement specific projects in the field of information technology.

The Interuniversity Center for Artificial Intelligence was established in the Interuniversity Campus of the Eurasian World-Class Scientific and Educational Center in Ufa. The center's work started in real time from the platform of the International Industrial Exhibition "Innoprom-2024", which takes place in Yekaterinburg, according to the website of the Government of Bashkortostan[27].

The Eurasian Center for Digital Technologies (EDCT) of the Ufa University of Science and Technology (UUST) has been launched in Ufa, specializing in the development, testing and promotion of IT products, as well as training specialists. One of the main areas of work is the training, internship and employment of specialists in the humanities and technical fields[28].

At the same time, Central Asian countries are also focused on other partners in the development of higher education in the field of artificial intelligence. StrategEast, in partnership with Google, launched a large-scale intercountry project Build with AI for Sustainable Growth, designed for several months and uniting developers from all over the Central Asian and Caucasus region to find solutions to sustainable development problems using AI technologies. The best teams of developers from Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Azerbaijan, Armenia and Georgia will present their projects at the final hackathon in Astana in the fall of 2024. For Google, supporting the program is a part of a targeted effort to teach IT industry specialists how to use AI tools[29].

In June 2024, the Forum for the High-Level Regional Policy Dialogue in Central Asia, dedicated to the theme "Facilitating the Transformation of Higher Education Based on Generative Artificial Intelligence", was held in Tashkent, Uzbekistan. During the discussions, the participants considered a variety of strategies and initiatives related to the application of generative artificial intelligence in higher education, providing an opportunity for an open dialogue between representatives of various stakeholders in this field.

The forum was organized by Tashkent University of Information Technologies (TUIT), UNESCO Institute for Information Technologies in Education (UNESCO IITE), UNESCO Regional Office in Almaty and the International Centre for Higher Education

26 On the risks and opportunities of implementing artificial intelligence in Central Asia. Available from: https://e-cis.info/news/566/105167/.

27 Interuniversity Artificial Intelligence Center of the Eurasian Scientific and Educational Center opens at Innoprom. CIS Internet Portalэ Available from: https://e-cis.info/news/569/119571/.

28 The Eurasian Center for Digital Technologies UUST has begun operating in Ufa. News in Russia and the world – TASS. Available from: https://tass.ru/obschestvo/21328923.

29 A large-scale program Build with AI for Sustainable Growth is being launched for the countries of Central Asia and the Caucasus. Available from: https://the-tech.kz/zapuskaetsya-masshtabnaya-programma-build-with-ai-for-sustainable-growth-dlya-stran-czentralnoj-azii-i-kavkaza/.

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Innovation under the auspices of UNESCO (UNESCO ICHEI)[30]. The forum became a platform for constructive exchange of views, summarizing promising experiences and formulating recommendations for stakeholders in the field of higher education in the region and beyond. The speeches and discussions made at the event are intended to contribute to the development of policies and action plans for the management of higher education based on generative artificial intelligence and the professional development of teaching staff at various levels – from the region to individual educational institutions and specialists.

Nevertheless, the prospects for cooperation between Central Asian and Russian universities seem more relevant due to a number of reasons, including historically established neighborly relations, supported by numerous bilateral treaties and intergovernmental agreements, including interregional ones, and joint counteraction to external security threats, extremist groups, drug trafficking, and cooperation in the economic sphere in order to combat unemployment, reduce production levels and trade turnover. It is also worth noting the remarkable differences in approaches to training specialists coming to study from other regions and countries in European-American and Russian universities: the former are often focused on the fact that people who received an education in their countries are recruited to work here, while Russian educational institutions prepare specialists who, after receiving an education, return to their native places and take part in the development of their own regions, contributing to an increase in the level of development of the relevant industries.

Conclusions

Clearly, addressing AI in higher education requires a multi-faceted approach and collaborative efforts among stakeholders, increasing investment in digital infrastructure, capacity building, policy development, and fostering a culture of innovation and adoption across Central Asia. This collaborative effort will allow for parallel advancement of the overall level of improvement in the sector, rather than creating separate highly developed centers and underdeveloped outskirts.

The challenges facing contemporary higher education include the lack of personalized education for students, lack of resources for teachers, and inadequate development of AI courses. In this regard, there is an urgent need to change a comprehensive knowledge-based model aimed at improving the competence of higher education teachers in the field of artificial intelligence, both to train specialists in the field of AI technology transformation and its professional use at an advanced level, and to train users in the methods of applying AI in their area of competence, taking into account the direction of training.

30 UNESCO IITE Co-Organizes Strategic Session on AI in Higher Education in Central Asia. Available from: https://iite.unesco.org/ru/news/iito-yunesko-stal-soorganizatorom-strategicheskoj-sessii-po-ispolzovaniyu-ii-v-vysshem-obrazovanii-v-tsentralnoj-azii/.

Political dialogue provides fertile ground for generating new ideas, strengthening cooperation and exploring future directions of higher education. Cooperation between universities in Russia and Central Asian countries is aimed at increasing digital competence and AI literacy among higher education staff, creating a uniform educational space, and improving the quality of specialists training in the field of artificial intelligence.

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