



Stefan R. Badža^[1]

Council for Artificial Intelligence
Government of the Republic of Serbia
Adviser to the President of the National Assembly
Belgrade (Serbia)

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Development of Artificial Intelligence in Serbia. Serbia as the Regional Leader

Abstract: Artificial intelligence (AI) is transforming industries and social spheres, and Serbia has come forward as the leader in Southeast Europe. By adopting the National Strategy for Artificial Intelligence in 2019 and founding the Institute for Artificial Intelligence in 2021, Serbia laid strong foundations for the development of this technology. The introduction of AI in the educational system, the development of the research infrastructure and active participation in international initiatives have contributed to important results. Ethical guidelines adopted in 2023 constitute the basis for accountable AI application. Being elected Chair of the Global Partnership on Artificial Intelligence for 2024 further confirms Serbia's position. Continued support of the Government, educational institutions and the economic sector is crucial for the future development of AI technologies.

Keywords: artificial intelligence, Serbia, National Strategy, Institute for Artificial Intelligence, Ethical Guidelines, international initiatives

Introduction

Artificial intelligence (AI) is one of the most important technologies today, which transforms industries and social spheres. AI covers a wide range of technologies, including machine learning, natural language processing, computing vision and robot systems, thus enabling machines to perform tasks which traditionally required human intelligence. This technology has the potential to improve effi-

ciency and productivity, to improve decision-making and create new economic opportunities. Many countries have recognized the importance of AI and invest in its research and development, while Serbia has come forward as one of the leaders in this sphere in Southeast Europe.

According to the definition used by the European Commission, AI refers to systems which display sensible, intelligent behaviour based on the analysis of their environment and take actions with

[1] stefan.badza@parlament.rs

some degree of autonomy to achieve specific goals. AI-based systems can be purely software-based and act in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones etc.) (European Commission, 2018).

Methodology

The analysis in this article is based on official documents, government reports, scientific papers and statements of experts in the field of artificial intelligence. The data have been collected from national and international sources, including the publications of OECD and the Global Partnership on Artificial Intelligence (GPAI). The primary sources have been used from Serbia's archives, as well as secondary sources from scientific papers and books.

Results

This strategy, covering the period 2020–2025, laid strong foundations for the development of AI through defining key goals and priorities. The goals of the Strategy include the development of research infrastructure, encouragement of innovation, AI integration in different sectors, as well as the development of human resources through education and training (Strategy

for the Development of Artificial Intelligence in the Republic of Serbia for the period 2020–2025, 2019).

In 2021, Serbia made an important step in the educational system by introducing artificial intelligence in the curriculum of primary and secondary schools. By introducing AI as part of two subjects in primary schools and an optional subject in secondary schools, Serbia made it possible for young generations to become familiar with the rudiments of this technology and its applications from the earliest age. At the end of 2021, Serbia was one of 11 countries in the world which, according to the UNESCO analysis, introduced AI in primary and secondary education at

the state level (UNESCO, 2021). Moreover, it was in the same year that the first Institute for Artificial Intelligence in Southeast Europe was founded, which plays the key role in the research and development of AI technologies. Today

this Institute has more than 50 scientists involved in the following areas – language processing, computer vision, generative artificial intelligence etc.

In 2022, Serbia continued strengthening its positions on the global scene through seven new master programs in the field of artificial intelligence, initiated at six faculties and four universities. These programs provide students with an opportunity to acquire advanced skills and knowledge which are crucial for further AI development and application. In 2022, Serbia also became part of the Global Partnership on Artificial Intelligence (GPAI), which enabled it to participate in global initiatives and exchange experiences with the leading experts and

In 2019, Serbia became the first country in Southeast Europe to adopt the National Strategy for the Development of Artificial Intelligence in the Republic of Serbia.

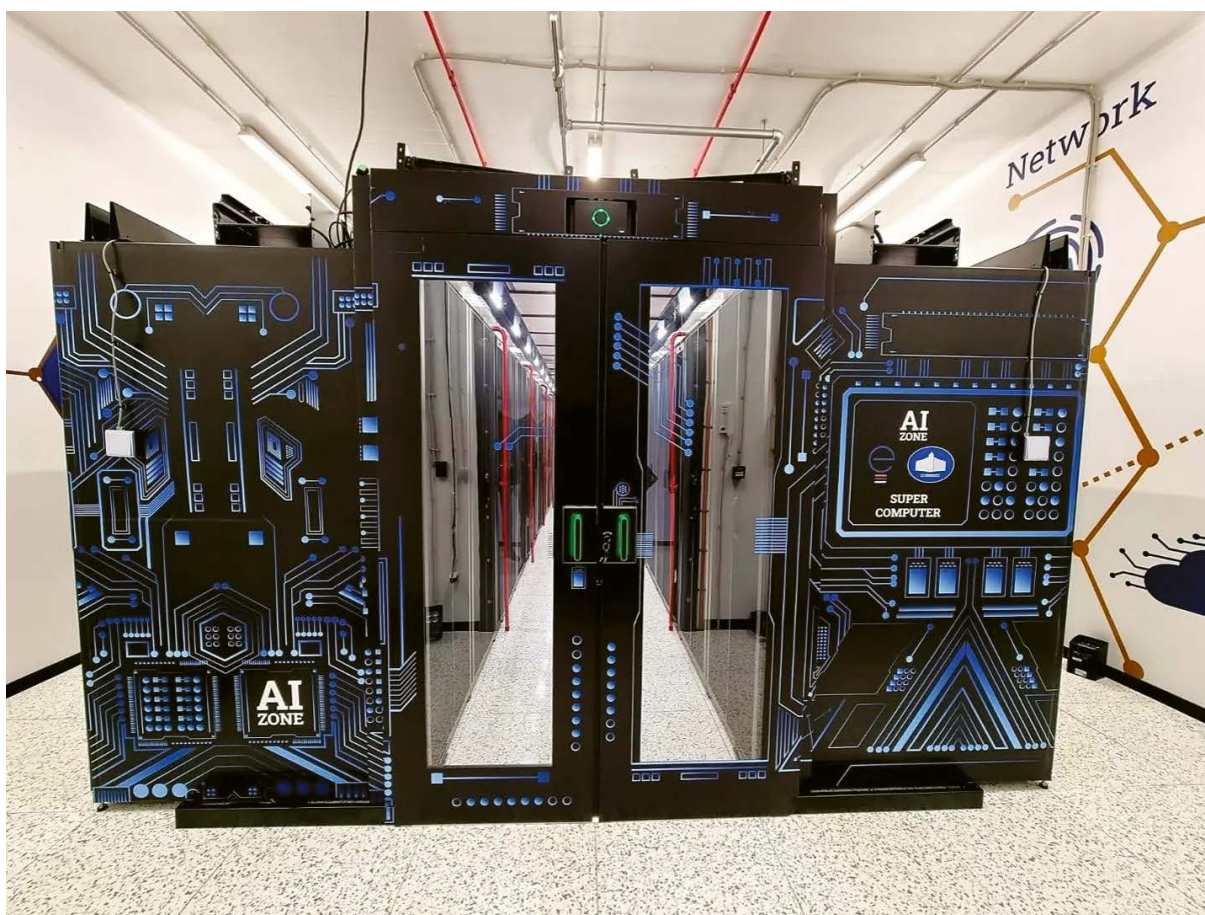
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institutions. Serbia thus became part of the elite number of only 29 countries within the GPAI, which was founded at the initiative of the French President Macron and the Canadian Prime Minister Trudeau.

Serbia's national AI platform, the supercomputer which was made available free of charge to universities, faculties, institutes and domestic start-up companies, was rated by OECD as one of the

most innovative projects in the public sector in 2023 (OECD, 2023). This platform was ranked among best 10 innovative projects, out of as many as 1,048 projects from 94 countries. At the Global Summit in Dubai, the Government of Serbia was recognized as one of the most innovative governments in the world, while the initiative to enable the work of startups on the National AI platform was rated as



The National Artificial Intelligence Platform (supercomputer) in the State Data Centre in Kragujevac.

Photo: Office for Information Technologies and Electronic Administration

one of the most innovative ones (Global Partnership on Artificial Intelligence (GPAI), 2024).

In the course of 2023 Serbia adopted the Ethical Guidelines for Development and Implementation of Artificial Intelligence, ensuring that AI technologies are used in an accountable and ethically acceptable manner. These Guidelines laid the foundation for further regulation of this field and promoting principles of transparency, accountability and protection of privacy (Ethical Guidelines for Development, Implementation and Use of Robust and Accountable AI, 2023).

The year of 2024 has brought another great recognition for Serbia because it will chair the Global Partnership on Artificial Intelligence (GPAI). This organization, which has been integrated in OECD and increased its membership to include 45 countries, will hold a large conference in Serbia, with the participation of several thousand experts from the AI field. According to the plan, the conference will be attended by the representatives of more than 50 countries at the ministerial level, which will position Serbia as the central venue for discussion about the future of AI.

Discussion

Serbia has succeeded in positioning itself as the leader in the field of artificial intelligence in South-east Europe through strategic initiatives and investments. Continued investments in education, research and development, as well as the integration in international initiatives, have enabled Serbia to achieve important results in a relatively short period. The key factor of success lies in the synergy between government initiatives, educational institutions and the private sector.

The applications of good practice include the organization of the Simulation Centre at the Faculty of Medicine, the University of Belgrade, which uses virtual and expanded reality for training medical staff. GovTech Program gathers the representatives of the public sector and economy for the purpose of identifying problems which can be resolved by the application of AI. The examples of AI application include “read to me” function on the website of the Government of Serbia, the digital avatar at the Prokop railway station for helping persons with impaired hearing, and the “Hawk Eye” system for parking surveillance in Belgrade.

Serbia has also taken first steps regarding the possibilities of applying artificial intelligence in the field of autonomous vehicles. The Law on Bases of Traffic Safety on Roads was amended by introducing the concept of an autonomous vehicle (Law on Bases of Traffic Safety on Roads, 2009), the Rulebook on the Conditions for Conducting Autonomous Driving was enacted (Rulebook on the Conditions for Conducting Autonomous Driving, 2023) and the Rulebook of Technical Inspection of Vehicles was amended (Rulebook of Technical Inspection of Vehicles, 2012), which enabled the examination and issuance of licenses for testing these vehicles up to Level four in real traffic.

In the previous period, Serbia achieved significant progress in the field of education regarding AI. Two optional subjects were introduced in primary schools, while there are three optional subjects available in secondary schools. At a number of faculties there are study programs which fully or partly deal with AI. In addition, the Centre for Robotics and Artificial intelligence in Education was founded at the University of Belgrade. The National Academy for Public Administration organizes training for all public servants dedicated to AI-related topics.

Serbia has also recognized the importance of developing infrastructure necessary for AI. A supercomputer platform for artificial intelligence has been established in the State Data Centre, which is used for the development and application of AI technologies. In 2023, this platform was rated by the OECD as one of best 10 innovative projects in the public sector (OECD, 2023).

Furthermore, the improvement of infrastructure, as well as data availability, are crucial for the development of AI. Currently in Serbia there are more than 2,500 data sets available at the Open Data Portal. The adoption of the Electronic Administration Act in 2018 made the public entitled to use data once again for commercial or non-commercial purposes (Electronic Administration Act, 2018).

The legal framework for AI development in Serbia includes the adoption of ethical guidelines prepared in line with the recommendations of the UNESCO and the European Union. Serbia actively participates in the work of international bodies, such as the Global Partnership on Artificial Intelligence (GPAI). The preparation of the legal and institutional frameworks is an important condition for further development and application of artificial intelligence. It is a mechanism which will organize the activities related to artificial intelligence and at the same time define the framework enabling Serbia to use its specific features while also being in compliance with international rules and principles.

Some of the key challenges are the proper development and application of this technology, which includes safe, secure and reliable AI in all life cycle stages. Furthermore, it is necessary to inform and educate all members of society about the possibilities and risks brought about by artificial intelligence. In line with the above-mentioned need

and the fact that the nature, conditions, manner of development, possibilities and manner of application of artificial intelligence should be properly presented to all members of society, there is an idea that it is necessary to further improve promotion and education. Apart from advantages, for the purpose of proper use and protection of all subjects, promotional campaigns should also point out and inform about potential challenges and risks, as well as manners of overcoming those risks.

In this stage of the development of artificial intelligence, it is necessary to include to a larger extent business enterprises, as well as professionals from the non-engineering fields. Artificial intelligence requires a comprehensive approach and it is not necessary to develop only engineering capacities, but also the regulatory and usable ones so as to enable the proper use of what has been developed.

It is particularly relevant that we develop language technologies in order to protect our language and culture. In that respect, attention is dedicated to finding solutions for collecting, systematizing, making available for use and further development of resources for the use of the Serbian language, both written and spoken, and potentially of video content. It seems quite important to include in the process all creative industries and cultural and national institutions so that we can together preserve the Serbian language, Serbian culture and Serbian worldview.

Concluding considerations

Serbia has achieved significant progress in the development of artificial intelligence through strategic initiatives, investments in education and research,

as well as active participation in international initiatives. Continued support of the government, educational institutions and the economic sector is crucial for further development and application of AI technologies in Serbia. The challenges include the need for further regulation, education and development of infrastructure to ensure safe and ethically acceptable application of artificial intelligence. With further investments and cooperation, Serbia has the

potential to become the leader in the field artificial intelligence in the region and on a larger scale.

In the future, the focus should be on further integration of AI in the educational system, larger investments in research infrastructure and strengthening international cooperation. Moreover, it is necessary to develop ethical and legal frameworks which will ensure accountable application of AI, taking into account potential differences and challenges.

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