

Artificial intelligence in the function of sustainable development

Veštačka inteligencija u funkciji održivog razvoja

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Abstract: Artificial intelligence (Artificial Intelligence - AI) is certainly one of the greatest "inventions" of the modern age. It facilitates and improves people's lives, has the potential to respond to social needs, but also brings new challenges and risks. For individuals and a society to catch up with technological development and take advantage of that process, it is important to inform ourselves and learn as much as possible about the different segments of artificial intelligence. The increasing use of artificial intelligence in the 21st century is influencing the social and economic shift towards increased automation, data-driven decision-making and the integration of artificial intelligence systems into various economic sectors and areas of life, affecting the labor market, healthcare, government, industry, ecology and education. Although the field itself is extremely interesting, it is necessary to be fully versed in the capabilities and limitations of artificial intelligence tools and algorithms. The field is constantly developing and improving, so the level of progress is beyond all expectations. The Sustainable Development Goals are still uncertain, as they could either accelerate progress or hinder it. The aim of this work is to help understand the implications of artificial intelligence for business in conditions of rapid technological and social changes in the function of sustainable development. That is why it is important to refresh current knowledge, consult with colleagues from the profession, as well as consult recently published scientific works. AI must serve the moral good of society for its use to be ethical. The dominant example of such essential moral goods are the UN Sustainable Development Goals (SDGs) (United Nations, "The Sustainable Development Goals", 2019). Although AI has a negative impact on some, as part of this set of goals, those with the theme of environmental protection are those goals where AI has the most positive impact, but they are also interesting from the ethical side of artificial intelligence, because they can be understood as something closest to the consensus of humanity in terms of moral goals.

Keywords: artificial intelligence, sustainable development, challenges of the modern age, new technologies, environmental protection.

Sažetak: Veštačka inteligencija (Artificial Intelligence - AI), sigurno je jedan od najvećih „izuma“ modernog doba. Ona olakšava i unapređuje život ljudi, ima potencijal da odgovori na društvene potrebe, ali takođe donosi i nove izazove i rizike. Kako bismo i kao pojedinci i kao društvo mogli da uhvatimo korak sa tehnološkim razvojem i iskoristimo prednosti tog procesa, bitno je da se informišemo i saznamo što više o različitim segmentima veštačke inteligencije. Sve veća upotreba veštačke inteligencije u 21. veku utiče na društveni i ekonomski pomak ka povećanju automatizacije, donošenja odluka zasnovanih na podacima i integraciji sistema veštačke inteligencije u različite ekonomske sektore i oblasti života, utičući na tržište rada, zdravstvo, vladu, industriju, ekologiju i obrazovanje. Iako je sama oblast izuzetno interesantna, potrebno je biti potpuno upućen u mogućnosti i ograničenja alata i algoritama veštačke inteligencije. Oblast se konstantno razvija i usavršava, tako da je nivo progressa izvan svih očekivanja. Ciljevi održivog razvoja su još uvek neizvesni, kao što bi mogli ili ubrzati napredak ili ga ometati. Cilj ovog rada je da pomogne kako bi se razumele implikacije veštačke inteligencije na poslovanje u uslovima brzih tehnoloških i društvenih promena u funkciji održivog razvoja. Zato i jeste važno osvežiti trenutna znanja, posavetovati se sa kolegama iz struke kao i konsultovati nedavno objavljene naučne radove. AI mora da služi za moralno dobro društva da bi njena upotreba bila etična. Dominantni primer takvih suštinskih moralnih dobara su ciljevi održivog razvoja UN (SDG, Sustainable Development Goals) (United Nations, "The Sustainable Development Goals", 2019). Iako AI ima negativan uticaj na neke, kao deo ovog skupa ciljeva, oni sa temom zaštite životne sredine su oni ciljevi gde AI ima najpozitivniji uticaj, ali su i zanimljivi sa etičke strane veštačke inteligencije, jer se mogu shvatiti kao nešto najbliže konsenzusu čovečanstva u smislu moralnih ciljeva.

Ključne reči: veštačka inteligencija, održivi razvoj, izazovi modernog doba, nove tehnologije, zaštita životne sredine.

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INTRODUCTION

What is AI (AI - Artificial Intelligence), where and how is it applied, what possibilities does it open for us, what is its future? Artificial intelligence is the intelligence of machines or software, as opposed to the intelligence of living beings, primarily humans. The goal of artificial intelligence research is the development of programs (software) that will enable computers to behave in a way that could be characterized as intelligent. The first research is linked to the very roots of computing. The idea of creating machines that would be capable of performing various tasks intelligently was a central preoccupation of computer scientists who chose to study artificial intelligence.

While in the past artificial intelligence was seen only in science fiction and movies, today it is part of our everyday life, involved in solving complex cognitive problems related to human intelligence, helping people find smart solutions (starting from mobile phones or healthcare, to recognizing problems in order to create solutions for better technology, people, and society). The main goal of AI has always been the creation of machines that can think like humans. AI is increasingly used in business and industry and has the potential to revolutionize many aspects of our lives, including search and discovery, learning, communication, and work (Goralski & Tan, 2020).

The use of artificial intelligence is rapidly transforming various fields such as administrative business, corporate practice, and government policy. With its deep learning capabilities, equipped machines and robotics with artificial intelligence have brought significant opportunities, but also disruptions, as well as greater trends in global sustainability. The AI revolution could lead to a positive future, where machines and humans coexist in harmony, or to a negative path, a path of conflict, poverty, and suffering. The goals of sustainable development are still uncertain, as they could either accelerate progress or hinder it. The aim of this paper is to help understand the implications of artificial intelligence in business in conditions of rapid technological and social change.

The use of AI is becoming increasingly widespread in the business and industrial sectors, and it can transform the way we work, communicate, live, learn, and discover. This technology has significant potential for society and the economy. In addition, with the emergence of the era of sustainable development, where Sustainable Development Goals (SDG) shape global development priorities, AI creates new opportunities in corporate practice, government policy, and administrative business.

Machines and robots are advanced deep learning capabilities that solve cognitive problems previously thought to require only human intelligence. According to Jeffrey Sachs, the world is entering a new era of sustainable development in which nations must work together to address issues such as poverty, economic injustice, and environmental degradation. He proposes a framework for sustainable development based on four pillars: economic development, social development, environmental protection, and good governance, all of which are essential and mutually reinforcing (Sachs, 2015).

AI is gradually taking over certain areas of expertise, offering greater predictive power, efficiency, and better outcomes. The growth of AI will create advantages in intellect and finance for certain cities and countries, while others will lag. The expansion of AI already surpasses the development and implementation of legal and regulatory frameworks designed to govern it (Sharma et al., 2022). As technologies in areas such as computer vision, robotics, and speech recognition advance, scientists, businesspeople, government officials, and policymakers are increasingly concerned about the potential for AI to replace human workers, automate warfare, and surpass human intelligence.

While people in developed countries may be concerned about job loss due to artificial intelligence, those in low-income countries may see it to break the cycle of poverty. The growth of AI is happening rapidly and globally, and no one will be able to avoid its impact (Concepcion et al., 2019). The academic community will play a key role in preparing future business leaders and policymakers for the positive and negative impacts of artificial intelligence, who must be well educated and trained to be ready for a rapidly changing world.

1. ARTIFICIAL INTELLIGENCE IN THE ERA OF SUSTAINABLE DEVELOPMENT

We are currently situated within the Fourth Industrial Revolution, a transformative era in which artificial intelligence plays a pivotal role. Industrial revolutions represent periods of rapid innovation that fundamentally alter the tools we use, leading to significant shifts in labor markets and everyday life. In recent years, the scope of AI applications has expanded dramatically, encompassing domains such as industrial process automation, widespread integration in the IT sector, and growing influence across science, medicine, economics, and law.

An overview of key AI application areas within the IT sector, along with their interrelations, is presented in Figure 1.

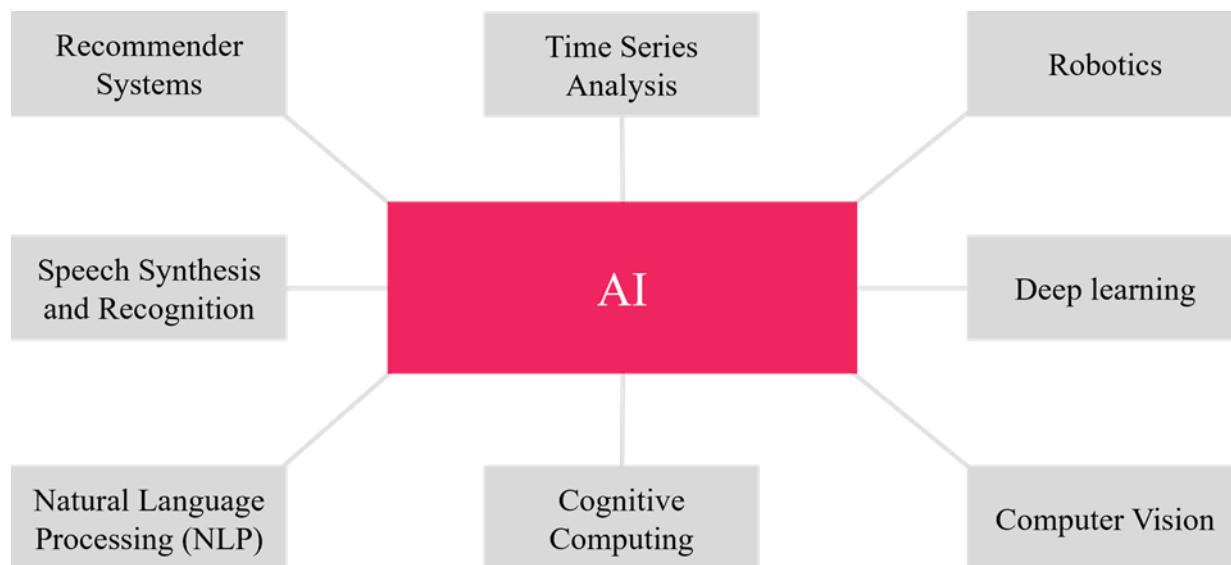


Figure 1. Examples of areas in which artificial intelligence is used - Serbian IT sector

The possibility of developing a similar creation has sparked human interest since ancient times; however, it was only in the second half of the 20th century that such a possibility received its first tools (computers), opening the path for that endeavor (Sachs, 2015). AI represents an opportunity both for startups and for already established companies. The zero prerequisite is the existence of adequately educated experts in this field, which has been partially addressed through the introduction of relevant university courses and master's programs in AI. Another limitation is the specialized infrastructure often required for processing large volumes of data used in AI. With the development of so-called cloud computing, a large initial investment in infrastructure supporting AI models is no longer necessary to compete with more developed countries.

Today, even small children interact with artificial intelligence through educational software (learning to read and perform simple math tasks before entering kindergarten). Therefore, the use of AI in the classroom is not surprising; rather, it is accepted as part of the learning process. AI already influences education by enabling students' easier access to information through search engines such as Google and Amazon. It is expected that soon, it will play an even more significant role in education and in transforming the entire structure of formal and informal learning, with educational content and exercises using artificial intelligence as a teacher on the Internet.

In addition, AI is increasingly used as a scientific assistant to students. It is possible that in the future, an artificial intelligence teacher will replace the human teacher; humans are necessary, but we must also develop an education system that supports adaptability to changes in society and the environ-

ment. Although there are potential risks and challenges associated with the use of AI in education, considering the extent to which children already interact with artificial intelligence and the ease with which they do so, it is likely that they will not find it unnatural to assimilate the idea of artificial intelligence into educational curricula.

Why is it important for the average citizen to understand the ideas and applications of AI? In addition to general literacy in an era where technology is becoming an inseparable part of the present, we will increasingly encounter AI in professional contexts, even in occupations seemingly far removed from the IT sector. Just as other technological disciplines have clearly defined legal frameworks - such as building regulations or food quality standards - it is now becoming increasingly evident that AI must also be subject to a form of review to ensure the protection of users and their data.

Some have identified problems and proposed solutions related to global sustainability, but the impacts of artificial intelligence on achieving sustainable development still need to be thoroughly examined. The most important areas of research include data processing, pattern recognition across various fields of knowledge, and applied domains such as medicine. Some people see the increased use of AI as a promising sign of improved economic prosperity and more free time, while others warn that it could worsen global economic inequalities and create existential threats to humanity.

Artificial intelligence research is focused on the following components of intelligence: learning, reasoning, problem-solving, perception, and understanding natural language. However, some fear that

taking a step further - the creation of super-intelligence far more intelligent than human beings - could lead to great dangers that would vastly surpass our own mental capabilities ("Superintelligence"). This goes beyond "general artificial intelligence" and describes an entity with abilities that even the most gifted human minds could not match - or perhaps even imagine.

Since we are currently the most intelligent species on Earth and use our own brains to control the planet, this raises the question of what will happen if we create something smarter than ourselves, or whether artificial intelligence could wipe out humanity ("X-risk"). Some researchers and technologists believe that artificial intelligence has become an "existential risk," alongside nuclear weapons and biological pathogens, and that its further development must be regulated, limited, or even halted.

As with any other world-changing technology, there are questions regarding potential risks and downsides, such as factual inaccuracies ("Hallucination" - sometimes, if you ask artificial intelligence a question, it will respond with great confidence, but the facts it presents may be false) or hidden biases ("Bias" - for artificial intelligence to learn, it must learn from us). Unfortunately, humanity is not free from prejudice. If artificial intelligence acquires capabilities from a dataset that leans in a particular direction - for example, regarding race or gender - then it has the potential to produce inaccurate, offensive stereotypes. Another risk is the fact that AI is controlled by a small group of private tech companies.

Imagine an artificial intelligence whose highest priority is to produce as many paperclips as possible. If that artificial intelligence were superintelligent and misaligned with human values, it might reason that if it were ever shut down, it would fail in its goal... and therefore would resist any attempt to do so - Instrumental convergence. As executives and politicians race to place their companies and countries at the forefront of AI development, technology may evolve too quickly for necessary safeguards, appropriate regulation, and resolution of ethical dilemmas to be established (Iafrate, 2018). However, AI could also introduce a new cycle of sustainable industrial innovation, as it has the potential to be a powerful force that could lead to economic growth, which is one of the four pillars of sustainable development (Brynjolfsson & McAfee, 2014).

There are two main types of artificial intelligence: Narrow Artificial Intelligence (NAI) and Artificial General Intelligence (AGI). NAI is currently the

weaker form of AI and encompasses all current AI technologies. AGI remains theoretical but is rapidly becoming feasible as its applications continue to expand (Bughin et al., 2017). High-Level Machine Intelligence (HLMI) is a subset of AGI that has the potential to perform as effectively as highly gifted humans in all intellectual tasks. This type of AI raises concern among some people, as it could eventually surpass the human species as the dominant species on the planet, not just in terms of short-term employment. These pioneers aim to create a database called OpenCog, which would collect knowledge from all bio-humanoid robots and distribute it evenly.

AGI could potentially eliminate jobs on a large scale due to improved production and distribution efficiency, while NAI is already causing significant job losses and disruptions in established professions - the number of people employed in retail dropped from 600 to 2 by 2017 due to advances in NAI (cashiers). These powerful forces would impact industry, innovation, and infrastructure. Uneven distribution of wealth, knowledge, and power would not only be present among individuals but also concentrated in certain countries and cities, leading to even greater global inequality and hindering progress toward Reducing Inequality. Even tasks that were previously exclusively tied to human capabilities can now be performed faster and more efficiently with the help of AI, resulting in potential job displacement as well as psychological stress for people.

As AI advances, it could potentially surpass human capabilities in various economic roles, leading to significant job displacement. Artificial intelligence experts have published an open letter calling for research into the social impacts and unintended consequences of AI. The letter warns of risks from autonomous and uncontrolled weapons, machines that escalate conflicts, and potentially lead to human extinction. Stanford University recently established the Institute for Human Artificial Intelligence (HAI) to bring together experts from various disciplines such as economics, philosophy, ethics, and psychology to study the impact of artificial intelligence on society (Simon, 2019).

2. ARTIFICIAL INTELLIGENCE AND SUSTAINABLE DEVELOPMENT

Artificial intelligence (AI), on the one hand, and sustainable development, on the other, are two topics in which we all have a certain interest. The dominant technological trend of AI is confronted with our obligation to develop and preserve our world in a sustainable way. This paper aims to examine the role of artificial intelligence within the complex global

contemporary world in the context of efforts toward sustainable development, as the multi-societal world is burdened by socioeconomic and environmental factors and issues, in comparison with the Sustainable Development Goals (SDG): no poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation (wastewater); affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action. All these goals are interdependent and crosscutting in relation to sustainability and sustainable development.

This paper is based on scientific research, as well as interviews with participants-actors from the professional and humanitarian sectors regarding the application of AI in real-world contexts related to sustainable development. The use of artificial intelligence is integrated into the Sustainable Development Goals - SDG (a universal call to action to end poverty, protect the planet, and ensure safety) through trial and error, as well as through sustainable management and leadership programs. In this paper, we present research on two of the most significant initiatives: Smart water management through AI, and AI in agriculture.

The importance of water as a vital resource for human life and progress is indisputable and has been evident for millennia, through the widespread use of water in various industries and households - adequate treatment and transport to meet hygiene and health standards. In recent years, interest has grown in using new technologies to offer sustainable solutions for water treatment, transport, purification, and reuse. Access to clean, safe water is a key component of several sustainable development goals, including those related to equality, agriculture, energy, climate, and technology. (Hill, 2018).

Although there is enough water in the world to meet current needs, distribution and treatment facilities are insufficient. Many communities in developing countries still face water shortages, which negatively affect human health, productivity, economic development, and the environment. This is because several SDGs aim to address issues related to water consumption, production, ecosystems, and the preservation of clean and treated wastewater (sewage - sanitary water). Water resource management at the community, city, and national levels is significant, as are the consequences for our future well-being.

Excessive use of freshwater reserves, contamination of natural-clean water, and degradation of ecosystems that support the food chain have led to

long-term risks. Therefore, it is crucial to utilize technological and AI advancements to meet short-term economic needs while ensuring long-term ecological sustainability. The tools used for water management have evolved; smart water and AI-driven management help water utility companies monitor water treatment facilities more efficiently and cost-effectively, while also protecting public health. Because AI can process large volumes of data in real time and continuously adapt, it is an asset for managing water resources in a constantly changing environment. This enables water utility managers to maximize revenue and effectively plan (Karimidastenaeei et al., 2022).

By using these new software platforms, they can create and manage dynamically strategic financial operations to significantly improve productivity and reduce costs. The system also includes low-cost sensors and communication networks for monitoring water losses in real time and managing distribution networks. "The power of artificial intelligence unleashes the imagination of our water professionals" is a phrase that emphasizes AI's ability to combine growth projections with future water availability and infrastructure condition assessments to maximize investment decisions, where system performance depends on the quality of data received and the managers' understanding of the results.

While AI takes responsibility, human interpretation remains necessary, but as AI improves and becomes more widely used, human involvement may become less significant. The goal of AI is not to be perfect, but to perform better than humans. Although the transition to AI-based water management may present certain challenges and risks, it has the potential to improve productivity, conserve water, and contribute to achieving various global goals, including the SDG for good health and well-being, the SDG for drinking and wastewater sanitation, and others.

The clean water system functions by detecting the shape of molecules under a microscope; it must distinguish between beneficial microbes and harmful bacteria and expand its research to include virus detection. This innovation has profound implications for improving the safety and efficiency of water and sanitation systems on a global level. The AI clean water system can be used in cities around the world, especially those willing to invest in this low-cost innovation. However, there are challenges in fostering partnerships between governments, local officials, and corporate water sources for the adoption and management of this transformative technology. Nevertheless, it has the potential to support the achievement of various

Global Goals, particularly the SDG for good health and well-being, the SDG for water and sanitation, and the SDG for sustainable cities and communities.

Plant Village (Mohameth et al., 2020) is a recognized initiative aimed at identifying plant diseases using an inexpensive smartphone application that can be used by any farmer in the field. By scanning plants with a phone, the app provides a software-based diagnosis of diseases or pests and offers suggestions for technological treatments (Vinuesa et al., 2020). Additionally, the team is building a database capable of recognizing and diagnosing plant diseases through images taken with mobile phones. The database currently contains 150,000 photos of diseased plants, with plans to expand to three million. With the help of AI technology, vast amounts of data can be used to identify patterns and make predictions, which is the core concept of PlantVillage.

Plant diseases and local pests can reduce crop yields by 40 percent or more, even though some crops can survive drought and infertile soil. Currently, the team is offering the photo database free of charge worldwide, but the main goal is to disseminate information as quickly as possible. They realized that the most urgent need is for plant-related information to reach people seeking advice, since images of diseased plants have so far been scattered across various databases, making it difficult to access them when a disease is found in the field.

“In low-income countries lacking human and financial capital in fields such as agricultural science, there is an opportunity to use artificial intelligence to help break the cycle of poverty.” This new application of artificial intelligence, which uses locally appropriate and inexpensive mobile phone technologies, has the potential to increase farm system productivity, improve agricultural output, and enhance food production. It provides a form of development assistance that helps bridge the digital divide between rich and poor nations, spreads innovative technological solutions in agriculture, and supports the achievement of several SDGs, including the SDG on reducing hunger, the SDG on industry and innovation, and the SDG on reduced inequalities.

Due to global climate change, forest fires are becoming more frequent, and their consequences are increasingly severe. Previously isolated incidents were now treated as standard occurrences. One modern approach to early fire detection uses AI systems to monitor satellite images of areas of interest for forest fire detection. AI also has significant potential for efficient waste management,

segregation, and recycling to reduce resource consumption.

CONCLUSION

Throughout this paper, we have seen that AI technology is both powerful and elusive. Contemporary research on artificial intelligence is oriented toward expert systems. Artificial intelligence, as a concept in a broader sense, refers to the capacity of an artificial creation to perform functions characteristic of human thinking. The potential of artificial intelligence can promote sustainable development, and its contribution is immense, involving various actors and sectors. AI can be a key tool for promoting economic development while also addressing improvements in production and consumption and environmental management.

Innovators and global development champions using AI have made significant progress in industries and sectors such as the preservation of non-renewable resources, the dissemination of knowledge and expertise, bridging global technological gaps, and establishing effective partnerships between governments, the private sector, civil society, and citizens to contribute to global sustainability. The pursuit of global goals and the implementation of the SDGs face significant challenges, including apathy, inertia, ignorance, and a lack of resources and political will from governments and corporations focused on short-term profits. To fight for global sustainability, a range of public and private organizations, national governments, and civil society must dedicate all available resources, including the use of opportunities and technologies made available by AI.

The rise of the SDGs presents a significant opportunity for the emerging artificial intelligence industry. AI has the potential to create intelligent interventions, reduce waste, transform entire industries, and improve connectivity, bringing technological advancement to people around the world. However, these innovations and initiatives may also carry potential risks. AI has both positive and negative implications that must be studied to prevent unintended consequences. Although AI can promote sustainability, it can also exacerbate global issues. Even low-cost innovations, such as those mentioned, require incentives and partnerships among various stakeholders, including governments, corporations, the social community, workers, employers, and the academic community.

When wisely applied to sustainability-focused initiatives, AI can create significant opportunities while simultaneously improving access, efficiency, and connectivity across sectors such as healthcare,

education, and agriculture. To be prepared for a future based on artificial intelligence, it is essential for the academic community to prepare future business leaders and policymakers to face the challenges and opportunities offered by AI and its potential to advance global goals. Without proper education and management, individuals, corporations, and governments cannot effectively strive for economic growth and sustainability.

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