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THE POTENTIAL OF ARTIFICIAL INTELLIGENCE IN THE FIELD OF ECONOMICS OF GREEN ENVIRONMENTAL SUSTAINABILITY

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Abstract

The modern development of science and technology is unthinkable without the use and development of almost all areas of artificial intelligence. Green environmental design includes project writing, site inspection, data collection, information arrangement and scheme selection, with the process of a constant search for answers. The continuous development of green environmental design is determined by the high-quality needs of human beings and modern society, and by highly technological, highly ecological, and systemically sustainable design concepts that are aligned with the development of time. The "Green Business" business strategy is based on profitability through environmentally friendly operational processes. A modern business with the help of artificial intelligence, its technologies, and techniques, and with "green thinking" can permeate the entire life cycle of production: products and plants, production lines and machines, products, and supply chains. The world today is struggling with the challenges of climate change and the need to reduce carbon dioxide emissions, and artificial intelligence has proven to be a powerful tool that can help optimize energy consumption, reduce harmful waste, and promote the use of renewable energy sources. The article examines the importance of the impact of artificial intelligence on green economic growth and all effective mechanisms by studying reference sources from the literature. Thanks to artificial intelligence, optimizing energy consumption in factories, buildings and cities is possible. Tools such as "predictive" maintenance and optimized consumption planning can reduce energy consumption, minimizing its harmful impact on the environment. With that, this paper aims to explore, clarify, and approximate a new development perspective, which includes artificial intelligence in its latest research, which focuses on the green industry.

Key words: Green production, agriculture, artificial intelligence, green economics, growth and environment.

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Introduction

At the beginning of the third millennium, the ancient question of the relationship between man and nature, society and the environment came to the fore again. The emergence of the digital economy and digital technologies such as artificial intelligence have provided new opportunities for green business development. Now is the time of artificial intelligence when the technology has the potential to fundamentally change the nature of production and the way it operates. Artificial intelligence can be used to solve various problems in the future such as environmental issues, including climate change and predicting natural disasters. Many dangerous jobs such as collecting radioactive waste will be taken over by artificial intelligence tools in the future. For this reason, all companies must establish a technology-driven strategy. Those that never remain untouched but are dynamic and capable of quickly adapting to changes with the emergence of new technologies. Green artificial intelligence represents a new technology that makes the development of artificial intelligence more sustainable and represents a possible solution to the problem of algorithms necessary for sufficient energy. According to Raveena Jay (2021): "Green AI will need input not just from computer scientists and mathematicians, but from cognitive science, cognitive psychology, neuroscience, cultural psychology, and many other diverse areas." (Jay, 2021)

Artificial intelligence, deep learning, neural networks, synthetic data, and machine learning, all these technologies have an exceptional potential to revolutionize everyday processes and industries, agriculture, and society, leading humanity to an era of greater self-sufficiency and productivity. Artificial green intelligence represents artificial intelligence that is also oriented towards the environment. Green artificial intelligence requires specialized expertise in both artificial intelligence and environmental science. Its goal is to achieve sustainability through ecologically stable artificial intelligence models with lower computing costs and less carbon emissions. Society around the world must quickly realize the value of green artificial intelligence in combating the growing environmental damage that current technology is producing. According to Caleb Debrah, Albert P.C. Chan, and Amos Darko, (2022): "The Architecture, Engineering and Construction (AEC) sector faces severe sustainability and efficiency challenges. The application of artificial intelligence in green building (AI-in-GB) is an effective solution to enhance the sustainability and efficiency of the sector." (Debrah et al., 2022)

The basic idea presented in the paper reflects the significant field of application of artificial intelligence and the possibilities offered for environmental protection (National Newspapers, 2008), nature conservation and the fight against climate change. (National Newspapres, 2008)

Green artificial intelligence refers to the use of artificial intelligence technology to reduce the impact of human activities on the environment. The environment is at the forefront of many companies, which leads to a high demand for "green technology". The use of artificial intelligence for environmental management also raises ethical questions. Artificial intelligence will play a stronger role in

promoting green economic growth in the long term. Green artificial intelligence is showing its advantages that can significantly help in mitigating climate change and promoting sustainability. Green AI must be actionable for all relevant stakeholders in the economy, rather than just an abstract concept for most technical experts. Ideas about green artificial intelligence are expected to grow and become more democratic. Artificial intelligence-based systems can improve crop yields, reduce water consumption, and optimize the use of fertilizers, and protection systems. This is important for reducing the environmental impact of agriculture and promoting sustainable agricultural practices. The latest developments in artificial intelligence began with the launch of generative tools and artificial intelligence technologies. The climate crisis becomes the main ingredient to define the opportunity, thanks to the selective choice of scientific inputs: reorienting the market and the economy towards green production and consumption to reduce carbon emissions.

Green production in Agriculture

According to the United Nations (2023): "The world's population is more than three times larger than it was in the mid-twentieth century. The global human population reached 8.0 billion in mid-November 2022 from an estimated 2.5 billion people in 1950, adding 1 billion people since 2010 and 2 billion since 1998. The world's population is expected to increase by nearly 2 billion persons in the next 30 years, from the current 8 billion to 9.7 billion in 2050 and could peak at nearly 10.4 billion in the mid-2080s. (UN, 2023)".

Agriculture is the main occupation in many countries around the world and with an ever-increasing number of inhabitants, which according to UN projections (United Nations, 2023) will grow from the current 8 billion to 9.7 billion in 2050, there will be more pressure on the country because there will only be additional 4 % of land to be cultivated by 2050 AI-based systems can improve crop yields, reduce water consumption and optimize fertilizer use. (UN, 2023) This is important for reducing the environmental impact of agriculture and promoting sustainable agricultural practices. Artificial intelligence is rapidly changing the way we interact with the environment and manage agriculture. The solutions to the assessed problem are driven by artificial intelligence that will not only enable farmers to improve efficiency but also improve quantity and quality to ensure that crops get on the market faster.

Agricultural production generates thousands of data about temperature, soil, water use, weather conditions, etc. With the help of artificial intelligence and machine learning models, this data is exploited in real time to obtain useful insights such as choosing the right time to sow seeds, determining crop selection, choice of hybrid seeds to create a higher yield and the like. Regenerative agriculture is rapidly transforming agricultural production thanks to countless environmental benefits and productivity-related benefits. Agricultural production is characterised as a labour-intensive activity. However, it is an obvious fact that fewer and fewer workers participate in it. Lack of labour, increased consumer demand and high production costs are some of the key factors that accelerated robotization in that

sector, intending to reduce costs and optimize production. This was the reason for the application of robotics in agriculture. Also, according to Robotnik (2022): "Innovation in terms of robotics applications in agriculture has advanced considerably in the last 5 years. The objective of agricultural robotics is to help the sector in its efficiency and the profitability of the processes. In other words, mobile robotics works in the agricultural sector to improve productivity, specialization, and environmental sustainability." (Robotnik, 2022)

The goal of agricultural robotics is to help the sector in its process efficiency and profitability. In other words, mobile robotics work in the agricultural sector to improve productivity, specialization, and environmental sustainability. Agricultural robotics is capable, for example, of spraying pesticides only on those plants that need them. This is just one example of how very concrete benefits can be seen in sectors that have traditionally not been highly automated. Agricultural robots pick apples, gather strawberries, and harvest lettuce and weed. Dynamic work cells are also being introduced in the field of agriculture, where one human worker is assisted by several robots equipped with artificial intelligence algorithms and intelligent sensors in different stages of fruit production.

The drone is used for weeding powered by artificial intelligence that can detect and spray only the weeds, ensuring crop protection from chemicals. This offers farmers a cost-effective way to incorporate technology into their crop maintenance while increasing the effectiveness of weed killers. Also, drones collect aerial images that help farmers quickly assess the state of crop health. Likewise, by using cameras and drones powered by artificial intelligence, it is possible to monitor and monitor wild animal populations more effectively. Aerial imagery can save farmers a lot of time by giving them a bird ' s-eye view of their crops. That way, they can quickly get a feel for vegetation health, insect problems, irrigation schedules, and weed growth. Modern research has revealed the possibility of using drones and cameras to achieve the concept of green production, which consists of numerous climatic variables such as temperature, wind speed and relative humidity. Also, a new formula was developed, namely the Osama formula, which was used to estimate the thermal resistance of the soil and finally, the total heat loss, considering changes in the environment. Also, modern machines use sensor fusion, machine vision, and artificial intelligence models to identify the location of fruits for harvest and help select quality fruit. Artificial intelligence can enable farmers to reduce their use of fertilizers and pesticides, leading to healthier crops and less environmental pollution. Also, forest management using artificial intelligence can successfully ensure sustainable forest management, with minimal impact on the surrounding ecosystem.

The attitudes of artificial intelligence possess strategically important data about the environment and agriculture, it is important that it provides you and be protected from unauthorized access and theft. Governments and organizations should ensure strong security measures to protect this data and maintain public trust.

The impact of artificial intelligence on the environment

The question is whether artificial intelligence can help protect the environment and fight climate change (?). The impact of artificial intelligence on the environment is a key factor, both positive and negative, that must be considered. The most significant advantage of artificial intelligence is its ability to optimize energy consumption and reduce waste. The field of artificial intelligence related to the field of machine learning can analyse data from smart grids to optimize energy consumption in real time, reducing the need for fossil fuel-based energy production. This can lead to a reduction in greenhouse gas emissions and lead to the mitigation of the effects of climate change. The application of artificial intelligence also creates two sets of problems when considering climate change: the possible worsening of social and ethical challenges already associated with artificial intelligence, and the contribution to climate change of greenhouse gases emitted by computationally intensive artificial intelligence systems. Green artificial intelligence is a continuous improvement approach that aims to reduce the impact of digital technologies on the environment, society, and economy. To continue with the digital transformation of societies, it is increasingly important to think about a more sober, fair, and efficient approach to digital use to reduce their impact on the environment.

In transportation, artificial intelligence can determine route optimization and fuel consumption reduction, leading to lower carbon emissions and ensuring environmental air quality. Also, in terms of environmental management, artificial intelligence can construct new materials with specific technical properties, such as increased strength and reduced weight, which can be applied in all technical systems, from construction to aviation. These materials can be made from renewable sources, which reduces reliance on fossil fuels and minimizes the impact of production and transportation on the environment. Technical improvements such as greater energy efficiency, reduction in the use of materials, and others will not be enough and there must also be facts of consumption of the use of digital technology. This means artificial intelligence developed for the benefit of the environment is not the same as establishing environmentally and socially conscious artificial intelligence systems.

Finally, there are concerns about the ethical implications of using artificial intelligence for environmental management. Artificial intelligence algorithms are only as good as the data they are based on, and biases in that data can lead to biased decision-making. For example, if an AI algorithm is trained on data that prioritizes economic growth over environmental protection (National Newspapers, 2008), then it may make decisions that prioritize short-term economic gain over long-term environmental sustainability.

According to Nadrljanski, et al., (2021), Artificial intelligence can be divided into different types. There are mainly two divisions. The first refers to the three main categorizations based on capabilities and the functional basis of artificial intelligence:

- narrow or weak artificial intelligence,

- general or strong intelligence i
- super artificial intelligence. (Nadrljanski et al., 2021)

Types of artificial intelligence reveal more about the future of this developing technology. Since artificial intelligence is crucial to understanding how it will advance in the future, the types of artificial intelligence are the basis for visualizing the future of artificial intelligence. Different types of artificial intelligence work in different ways, which means that it is necessary to understand the different types of artificial intelligence to see how they differ from each other. To distinguish the degree to which AI applications can perform tasks, they are generally divided into three types. The first classification is based on their capabilities, the basis of which is the ability of human thinking. These species differ from each other and show a natural progression towards today's artificial intelligence systems.

The rapidly evolving nature of artificial intelligence has resulted in numerous terms for the various forms of artificial intelligence that have been realized so far and are in the process of being realized. Additionally, not everyone agrees on what these terms refer to, which adds to the difficulty in understanding what AI can and cannot do. It is crucial to have the ability to think ahead because the future of artificial intelligence is mapped out, primarily in its types that have been scientifically described to date.

Dongare, et al., (2012) stated: "An Artificial Neural Network (ANN) is an information-processing paradigm that is inspired by the way biological nervous systems such as the brain, process information." (Dongare et al., 2012)The idea of ANN is based on the belief that the work of the human brain by creating the right connections can be imitated using silicon and conductors (wires) as neurons and dendrites.

The human brain consists of nerve cells which are called neurons. Average number of neurons in the brain is 86 billion (Frederico Azevedo et al., 2009). They are connected to other thousands of cells by axons. Stimuli from the external environment or inputs from sensory organs are accepted by dendrites. These inputs create electrical impulses that travel rapidly through the neural network. The neuron can then send the message to another neuron to solve the problem or not send it forward. Artificial narrow intelligence (ANI), also called weak artificial intelligence or narrow artificial intelligence, is the only type of artificial intelligence that has been successfully implemented to date. The name comes from the fact that such artificial intelligence systems are explicitly created for a single task. Narrow artificial intelligence is goal-oriented and designed to perform individual tasks. Rawat, Goyal, and Sharma (2023) stated: "As the financial institutes are adopting ANI as its core technology, a large digital wave can be seen in the financial sector. Almost all financial access such as normal account access, loan processing, insurance, purchasing, information related to finance etc. are now digitized leading towards a digital society. It allows the creation of large amounts of data. Now the major challenge is to process and analyse that created data so that new ways and techniques can be created to improve the services provided by financial institutions for digital society. The three distinct innovation areas of ANI

can be seen as machine learning, non-traditional data, and automation. The usage of AI in financial services for digital society has various impacts on consumers and the market including protection of consumers, consumer empowerment, financial crime, competition, and stability of markets." (Rawat et al., 2023)

Conclusion

Artificial intelligence can offer solutions that can be used to identify and monitor sources of CO2 emissions, such as transport, industrial production, and agricultural activities.

Artificial intelligence offers great opportunities for protecting the environment, mitigating climate change, and conserving resources and biodiversity. There are many opportunities for artificial intelligence to help many areas of science and business. Some of them focus on the abilities of artificial intelligence algorithms to recognize and identify objects using cameras and other sensors. While there is huge potential for AI to be an "engine" for positive change, it also raises questions about building fairness, interpretability, privacy, and security into all systems. Climate change is very real. If no action is taken now, it may be too late to correct its effects. Innovations based on artificial intelligence can promote sustainable consumption, accelerate the spread of renewable energy sources, detect marine plastic waste, or facilitate the transition to sustainable transport. Green technology, as ecological technology, includes technologies intended to reduce human impact on the environment and promote sustainability. It encompasses a wide range of industries and products, including renewable energy sources such as solar, wind and hydropower, green building materials and practices, and waste reduction technologies such as recycling and composting systems.

While the potential of artificial intelligence is undeniable, it must be managed and adapted to global climate efforts. By applying artificial intelligence in renewable energy sources, food sustainability, forest management, agriculture, and biodiversity conservation, it is a key factor in the common search for a sustainable future. The significance of the increase in global temperatures, forest fires are becoming more frequent, and large areas of forests are decreasing, which has a degradative effect on wild animals and causes an increase in the amount of CO2 in the atmosphere.

In conclusion, the potential impact of artificial intelligence on the environment is significant, both positive and negative. Artificial intelligence can enable companies to identify and reduce inefficiencies, optimize supply chains, and achieve sustainability goals.

The perspective of artificial intelligence and green technology is a development perspective because it offers a way to solve pressing environmental challenges while improving productivity, efficiency, and sustainability.

Artificial intelligence has the potential to promote energy efficiency, reduce waste and improve sustainable practices. However, it has the potential to contribute to environmental degradation and depletion of natural resources. It is crucial to take steps to mitigate the potential negative environmental impacts of AI and promote

responsible and sustainable use. In doing so, AI can be argued to contribute to a more sustainable and environmentally friendly future.

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POTENCIJAL VEŠTAČKE INTELIGENCIJE U OBLASTI EKONOMIJE ZELENE ODRŽIVOSTI ŽIVOTNE SREDINE

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Apstrakt

Savremeni razvoj nauke i tehnologije nezamisliv je bez upotrebe i razvoja gotovo svih oblasti veštačke inteligencije. Zeleni ekološki dizajn uključuje pisanje projekta, inspekciju lokacije, prikupljanje podataka, sređivanje informacija i odabir šeme, uz proces stalne potrage za odgovorima. Kontinuirani razvoj zelenog ekološkog dizajna određen je visokokvalitetnim potrebama ljudi i modernog društva, te visokotehnološkim, visoko ekološkim i sistemski održivim konceptima dizajna koji su usklađeni s vremenom. Poslovna strategija „Zeleno poslovanje" zasniva se na profitabilnosti kroz ekološki prihvatljive operativne procese. Moderno poslovanje uz pomoć umjetne inteligencije, njenih tehnologija i tehnika, te „zelenog razmišljanja" može prožimati cijeli životni ciklus proizvodnje: proizvoda i postrojenja, proizvodnih linija i strojeva, proizvoda i lanaca opskrbe. Svijet se danas bori s izazovima klimatskih promjena i potrebom za smanjenjem emisije ugljičnog dioksida, a umjetna inteligencija se pokazala kao moćno sredstvo koje može pomoći u optimizaciji potrošnje energije, smanjenju štetnog otpada i promoviranju korištenja obnovljivih izvora energije. U članku se proučava značaj uticaja veštačke inteligencije na zeleni ekonomski rast i sve delotvorne mehanizme proučavanjem referentnih izvora iz literature. Zahvaljujući umjetnoj inteligenciji, moguće je optimizirati potrošnju energije u tvornicama, zgradama i gradovima. Alati kao što su "predvidljivo" održavanje i optimizirano planiranje potrošnje mogu smanjiti potrošnju energije, minimizirajući njen štetan utjecaj na okoliš. S tim u vezi, ovaj rad ima za cilj istražiti, razjasniti i približiti novu razvojnu perspektivu, koja uključuje umjetnu inteligenciju u svoje najnovije istraživanje, koje se fokusira na zelenu industriju.

Ključne reči: Zelena proizvodnja, poljoprivreda, veštačka inteligencija, zelena ekonomija, rast i životna sredina.

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