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Environmental Sustainability: Can Artificial Intelligence be an Enabler for SDGs?

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ABSTRACT

Environmental issues have continued to spur discussions, debates, public outrages, and awareness campaigns, inciting interest in emerging technologies such as Artificial Intelligence. Its usage is spread across many environmental industries, including wildlife protection, natural resource conservation, clean energy, agriculture, energy management, pollution control, and waste management. In 2017, at the United Nations Artificial Intelligence Summit in Geneva, the UN acknowledged that AI could be an enabler in the sustainable development process towards peace, prosperity, and dignified life for humankind and proposed to refocus on the application of AI in assisting global efforts on sustainable development to eradicate poverty, hunger and to protect the environment as well as to conserve natural resources.

It is vital to address environmental sustainability concerns; however, with the advent of AI, most common environmental issues are now solvable by prioritizing human interests. Sustainability encompasses the interrelated areas of the environment, society, and economy. According to the United Nations' "Our Common Future," also known as the "Brundtland Report," it is defined as "development that satisfies current needs without compromising the ability of future generations to meet their own needs." Unfortunately, the Earth is currently facing serious consequences from global warming and climate change, and immediate action is required to encourage the use of environmentally friendly and sustainable products to address these issues. Environmental degradation and climate change are numerous environmental concerns requiring novel and intelligent artificial intelligence solutions. The literature on AI and environmental sustainability encompasses various domains. Notably, AI is being used to address the bulk of regional and global environmental concerns, including energy, water, biodiversity, and transportation, even though many of these sectors have permeated and evolved. However, there is a need to combine current literature on the application of AI, particularly in relation to environmental sustainability in areas such as energy, water, biodiversity, and transportation. There is a significant lack of research on how AI can promote environmental sustainability. This research aims to explore how AI can be applied to address environmental issues in various sectors to achieve the Sustainable Development Goals (SDGs).

INTRODUCTION

Environmental issues, debates, and programs have recently ignited awareness and public concern, sparking interest in new technologies like Artificial Intelligence (AI). As we grapple with the environmental challenges of the 21st century, AI has emerged as a crucial and distinct area of study for resolving a multitude of sustainability issues.

AI refers to the engineering and science behind the evolution of intelligent machines. It is the discipline of computer science, and its capabilities are based on the learning experience that helps increase the chances of success in solving environmental problems. According to Poole (1998), the intelligence of sophisticated machines, demonstrated by the innate intelligence of animals and humans, could be AI, scientific and technical information that allows devices to be as intelligent as humans (Wang & Srinivasan 2017). Researchers have also found that AI systems can learn from experience to create artificial services and adapt inputs to changing environmental issues (Nishant et al. 2020).

Artificial Intelligence has pushed the boundaries of human intellect in the modern era, creating a new reality in which intelligent machines with artificial brains communicate with human brains (Duan et al. 2019). As we face new environmental challenges, AI has become an

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essential tool for developing sustainable solutions that will help us preserve our planet for future generations.

Managing environmental sustainability is a complex and challenging task. However, with the integration of AI, many of these problems can be efficiently solved by utilizing human resources. The economy, the environment, and society are interconnected when it comes to sustainability. Sustainability is defined as sustainable development in the United Nations paper *Sharing Our Future*, also known as the Brundtland report, as “a program that meets the needs of the current generation without compromising the ability of future generations to meet their own needs.” To ensure that human interests do not compromise the health of ecosystems, sustainability can also be defined as a strategy for supplying future generations with the goods and services they will require. (Morelli 2011).

AI is a powerful instrument that can assist us in our quest for environmental sustainability. It grants us the ability to delve into vast amounts of data, uncover patterns and make predictions. Artificial intelligence can help us learn more about how our actions affect the natural environment and come up with long-term fixes to protect Earth for future generations. Managing environmental sustainability and ensuring we fulfill the needs of now and tomorrow require AI, which has become increasingly important in the face of new and pressing environmental concerns.

With the Earth in peril from the effects of global warming and climate change, developing eco-friendly and long-lasting products is crucial. Climate change is one of the most complex environmental issues, and recent advancements in AI are providing innovative solutions to address this problem. With the urgent need to address environmental degradation, AI is becoming crucial in finding sustainable solutions.

AI and environmental sustainability can be divided into four primary areas: sustainable agriculture, ecological resource protection, waste and pollution management, pollution control, and pollution removal. Consequently, the sustainable application of AI has been vital for advancing and implementing AI over the past fifty years.

AI research for environmental sustainability encompasses a diverse array of disciplines. Most regional and global environmental problems need to be addressed, and artificial intelligence is used in the energy, transportation, biodiversity, and water sectors. However, these areas are constantly evolving and permeating all aspects of society. In some developed countries, the practical application of AI in biodiversity and transportation has already begun, for example, e-waste collection with a sophisticated routing strategy, protecting the ocean from pollution through AI-driven automatic garbage trucks, and increasing biodiversity through species protection. Nevertheless, the existing research on the application of AI in the transport and biodiversity sectors needs to be consolidated. It is important to note that there is a lack of studies examining how artificial intelligence might be used to improve environmental sustainability in fields including water, energy, transportation, and biodiversity.

AI APPLICATION

Many companies, including Tesla, Google, and Microsoft, driving innovation barriers, have made substantial advances in “Earth-friendly” AI systems. In Google, for example, DeepMind personal AI has helped the company reduce energy use in its data centers by 40%, making it more efficient and reducing overall GHG emissions. Data centers account for 3% of all global energy Advances in these AIs improve energy efficiency and help communities in remote areas provide access to energy by establishing microgrids and integrated green energy sources.

Unlike traditional power grids, which may be inefficient owing to a lack of power distribution planning, urban smart grids can employ AI technologies to control and regulate elements of the power grid in the neighborhood to provide exactly the amount of energy sought or necessary from its dependents.

As AI-driven autonomous vehicles wait to enter the automotive market, strategies such as eco-driving algorithms, route optimization, and ride-sharing service would reduce the carbon footprint and the number of cars on the road.

In an environment of accessible scale, intelligent buildings and innovative urban development can benefit from integrated sensors that use energy more efficiently and buildings and roads with materials that work more efficiently. Inspired by natural patterns, researchers, architects, and builders have created new materials from natural resources (Zafar 2021), including bricks made with bacteria and concrete, which capture carbon dioxide and build a solar system dependent on wind and sun. Solar energy (Zafar 2022) is increasingly used in cities and abroad to power large urban areas. These are the first steps to supporting an infrastructure that reduces costs while increasing our awareness of the environment (Miguel 2021).

Industrial emissions control and waste management is another problem that can be solved through advanced machine learning and captive grids that detect leaks, hazards, and deviations from industrial usage standards and regulations. For example, IoT technology (Giarratana 2022) has been integrated into various industrial businesses, including thermostats, refrigerators, and retailers.

Microsoft's AI for Earth is a $50 million project launched in 2017 to address climate change, agriculture, water scarcity, and biodiversity loss (Smith 2017). Due to a shortage of algorithms that can translate the data they collect into needed solutions, scientists are currently in a mad dash to foresee climate change and other environmental hurdles or bottlenecks.

Similar AI Earth-based applications infused with AI include *INaturalist* and the *eBirds*, which collect information from its large group of experts on species it encounters, which will aid in keeping an eye on their population, their favorable ecological systems, and patterns of migration. They also play an indispensable role in accurately identifying and protecting marine and freshwater ecosystems.

Many organizations, NGOs, and start-ups provide innovative agricultural solutions by applying artificial fuzzy neural networks. Apart from using bio-sensor-driven and artificial intelligence-based algorithms to monitor soil health and yield of crops and yield comprehensively, some methods can develop predictive analytic models that track and forecast different variables and elements that could impact yields in the near future.

The Berlin-based agricultural tech start-up *PEAT* has created a deep-learning application named *Plantix,* which apparently can detect prospective deficiencies and inadequacies in the soil. An analysis is performed using software algorithms that compare particular foliage patterns to problems with soil, pests, and diseases.

AWhere and *FarmShots,* both United States-based companies, use satellite machine-learning algorithms to forecast the weather, evaluate farms' sustainability, and analyze them without disease and pests. Farmers are paying close attention to the adaptive irrigation system because of its significant role in water management. This system automatically irrigates the land based on data collected from the soil by sensors powered by artificial intelligence technology.

AI APPLICATIONS IN BIODIVERSITY

To model the ecosystem's services, rules-based models like ARIES are one of the most popular and well-known systems (Death 2015). The program incorporates other machine learning models that specifically assist researchers in understanding the different relationships through analysis software (Death 2015). In addition, numerous AI (artificial intelligence) examples show how AI is utilized to enhance the observation of biodiversity and conservation (Kwok,2019). Important to emphasize the significance of preventing excessive use of resources, which may cause environmental issues, and the understanding of the access to artificial intelligence-related information depends on the ecosystem and its diverse biodiversity has developed effective methods (Nishant et al. 2020) that offer estimates or estimates of the services provided by land. Similar to the use of machine training (ML) (also known as natural processing of language (NLP), most of the research on biodiversity that utilizes Artificial Intelligence can predict ecosystem services (Toivonen et al. 2019). Artificial Intelligence is a novel method to tackle biodiversity issues across space and time. Research into Artificial Intelligence to sustain sustainability through Genetic Algorithms focuses on particular Artificial Intelligence applications that use Genetic Algorithms, the well-liked machine-learning model for biodiversity and artificial neural networks, and one of the well-known modeling networks in ecosystems, known as Bayesian networks (Nishant et al. 2020).

AI APPLICATIONS IN ENERGY

Artificial Intelligence is thought (Wang & Srinivasan 2017) to have helped reduce the use of natural resource consumption and the energy requirements from human-related actions. The main research areas are pattern recognition, expert systems, neural networks, and fuzzy logic (Nishant et al. 2020), which are relevant to energy research (Tyralis et al. 2019). This includes the distribution and production of energy and maintenance and operations, which are the major research areas in energy (González Ordiano et al. 2017). Computer-aided learning is employed to forecast (Olowu et al. 2018), and NC algorithms can also be used in solving complex problems (Li et al. 2018). Most of the algorithms used by scientists are implemented in fuzzy logic systems that aid in making decisions based on forecasts (Wang & Srinivasan 2017). Furthermore, using multiple models, such as the area neural network, produces better results and broad combinations.

AI APPLICATIONS IN TRANSPORTATION

Research into artificial intelligence (AI) applications is available for sustainable transportation. Most articles published can be about the machine learning process (Abduljabbar et al. 2019). Applications of artificial intelligence research are also important for sustainable transportation. Learning through the machine has been the main focus of most published papers (Liyanage et al. 2019). Additionally, the use of computer vision to assist in making decisions was observed in safety and traffic management, urban mobility, and public transportation (Liyanage et al. 2019). The AI applications in transportation include machine learning and other time series and statistical models used to manage and manage traffic (Nishant et al. 2020). Computer vision methods were primarily employed for road marking.

AI APPLICATIONS IN WATER MANAGEMENT

Since 2015, significant research emphasis has been focused on artificial intelligence (AI) applications to improve water management in water protection. Artificial neural networks, especially neuro-fuzzy adaptive sequence systems, support vector machines (SVMs) for machine learning (ML). In this area, models such as decision trees (mainly random forest) and multiple regression, autoregressive displacement models (ARMS), regression splines, and adaptive neuro-fuzzy inference are used (Salcedo-Sanz et al. 2016), with the genetic algorithm being the best by far a known method. Additionally, popular machine learning models include the most popular regional networks (ANNs) (including ANFIS) and genetic algorithms (Rodríguez-Soto et al. 2017). For example, we could use machine training (ML) algorithms to determine river flow and evaluate water quality parameters (Demirci et al. 2019).

HOW CAN AI HELP COMBAT CLIMATE CHANGE?

The technology is used in Japan's top natural disasters to monitor deforestation in the Amazon and design more sustainable and intelligent urban areas in China. Artificial intelligence applications can also create more efficient buildings, improve electricity storage, and improve and renovate wind and solar energy in the grid when needed. In a small way, this can help households reduce energy consumption when they turn on lights automatically, when not in use, or even control the network requirements of electric vehicles to meet expectations.

A recent research study conducted by the well-known accounting firm PricewaterhouseCoopers in partnership with Microsoft, a company that specializes in developing machine learning solutions for the climate change sector, has uncovered some intriguing findings. The study found that by 2030, implementing AI technology could potentially significantly reduce global greenhouse gas emissions, specifically by 4%. This is a noteworthy finding as it highlights the potential of AI in addressing one of the most pressing concerns of our time, climate change.

The proficiencies of AI, specifically its ability to process enormous amounts of unstructured data such as images, graphs, and maps, are pushing the boundaries of climate modeling and providing unparalleled opportunities to better understand the dynamics of sea-level rise and ice caps. This exemplifies the enormous potential of AI in facilitating a better comprehension of the effects of human activity on the Earth and informing the creation of sustainable solutions.

Artificial intelligence allows us to better grasp the consequences of our actions on the world and create long-term alternatives to the current climate crisis. AI has the ability to significantly contribute to combating climate change and lowering GHG emissions. The partnership between Microsoft and PwC illustrates the significance of the private sector and researchers working together to find solutions. We must continue to invest in research and development of AI technology to address the pressing issue of environmental sustainability and ensure a sustainable future for our planet.

USERS OF TECHNOLOGY AND AI

The costly nature of AI computing power has led to a significant portion of research in this field being undertaken by the private sector. One shining example is Climavision, a state-of-the-art super-resolution radar network that harnesses the power of satellite data and high-altitude weather balloons to fill in the "hundreds of holes" in existing weather forecast networks (Nelsen 2021). This technology allows transportation and energy companies, businesses, and military personnel to real-time weather elements, updating every second. As the world moves towards low-carbon energy, the market for AI-powered applications that predict market behavior, balance transactions in real-time, and maximize energy efficiency from networks to intelligent devices is set to flourish. Investing in research to fully realize the potential of AI in addressing environmental issues and supporting the achievement of Sustainable Development Goals is of paramount importance. It is an investment in our planet's future and the future of generations to come.

CHALLENGES OF USING AI TO ACHIEVE ENVIRONMENTAL SUSTAINABILITY

Artificial Intelligence has been shown to address environmental issues effectively, yet, in contrast, they face challenges because they rely on the historical data used for machine learning. This is because machine-learning models find it challenging to account for AI's unpredictable nature and constantly changing characteristics of human behavior. Thus, before any significant human activity, data from the past can be used to reflect people's ages and climate cycles, so it is challenging to predict the likelihood of climate change. Also, it isn't easy to deal with variance when including historical data in models because most computer scientists pay close attention to it. The data added to the models can be generalized, which can be the basis for erroneous predictions of future scenarios, and this is called *variance bias shift* (Nishant et al. 2020).

Additionally, increasing cybersecurity risk is a challenge when implementing AI for resilience. The management of cybersecurity risks is essential for incorporating data into AI applications. However, the growing number of cybersecurity threats due to hackers poses a significant challenge when addressing environmental sustainability issues. Third parties have access to vital data, and disparate methods are less effective in mitigating security risks. Another obstacle to using AI for environmental sustainability is the lack of adequate performance indicators and the unreliable human behavioral responses (Nishant et al. 2020) to various AI-based interventions. To increase environmental sustainability, tracking and evaluating the results of actions is essential. The measurement method is complicated and often unsuccessful, so combining analytical and technical aspects into one standard metric is crucial for AI to achieve environmental sustainability. AI software is as sophisticated as human decision-making; However, their approach differs from human reactions to decisions. However, being aware of behavioral responses is crucial to avoid the common problem associated with technological advances due to feedback traps (Nishant et al. 2020). The rebound effect is a common problem that arises from technology.

THE DOWNSIDE OF THE TECHNOLOGY: AI CAN HAVE A SUBSTANTIAL CARBON FOOTPRINT

The computational demands of AI-based systems are incredibly high and require large amounts of data to be processed and analyzed. This leads to an increase in the number of servers and energy needed to cool data centers and causes a significant spike in energy consumption. According to a study, the energy required to process and store data to develop a complex algorithm alone can produce as much carbon dioxide as driving a car for five times its lifetime or taking 300 round trips between New York and San Francisco (Hao 2020). Data centers that process and store information from online activities such as streaming videos and sending emails are accountable for a substantial portion of the world's energy use estimated to be around 1% (IEA 2022). Predictions suggest that by 2030, computing could make up as much as 8% of the world's overall energy demand (Bacchi 2020), raising concerns about the increased use of fossil fuels.

This case of CO_2 emissions generated by artificial intelligence is shocking and disturbing. This is a wake-up call for all of us. Nevertheless, we must see the bigger picture before focusing too much on these findings. This is the only study for a specific type of AI that is not common. The most representative training tasks generate relatively small amounts of carbon. Just because the most commonly used AI techniques today are not massive carbon emissions do not mean they will not significantly contribute in the foreseeable future. Only a few studies are currently available that can help companies assess the carbon footprint of AI.

In the fight against climate change, AI can be both an enabler and a disabler. The need for rare earth materials to build the hardware could have a negative impact, and the AI is not magical and can make mistakes while computing or generating output. The possibility of logging individuals' energy usage raises privacy concerns regarding the capability to track back data that belongs to people (Nelsen 2021). Climate change must "primarily affect the people who contribute most to emissions and significantly change our lives." It is not enough to rely on technology in the near future to solve the problem and thus save one's conscience in the short and medium term (Nelsen 2021).

AI FOR SUSTAINABILITY

Given the interconnectedness inherent in all SDGs and the spectrum of sustainable development and its actors, it makes no sense to separate the third section, which will then provide a more detailed overview of the current use of AI in the context of actors of sustainable development, by evaluating the views of AI experts in the field of application conducted for research purposes give perspectives on particular situations.

On that note, we are attempting to determine how AI is being used by various businesses to engage, identify, and ultimately lead to sustainable development. The potential unpredictability of potential causes as well as other characteristics, such as actors, industries, non-governmental organizations, the scientific and technological community, and local actors, producers are to be made clear to the proposed hypothesis, i.e., best classified political actors, will not only have a higher impact on progress toward the SDGs. However, they will also be the channels through which AI will have an ideal positive impact on sustainable development, and the SDGs will be able to reach that point. Of course, this should be the main effect of the pyramid, which is then created, in which actors can influence or endow other ranks in better positions and more appropriate acting modes than other actors descending into the dynamic. AI can promote social cooperation among actors, in this case sustaining an extensive level of sustainable development.

Each of the SDGs has the potential to benefit from the use of AI. This is demonstrated by a McKinsey Global Institute study, which found up to 135 AI use cases supporting the

SDGs by November 2018. These examples demonstrate definite, partial, or hypothetical opportunities for AI applications.

Various use cases will have different domains, capabilities, restrictions, and risk profiles- AI is applied in various ways. We'll look at a few scenarios that could serve as examples of how AI might be used for overall good and sustainable development. These are just a few examples, but they show a variety of potential applications, skills, and effects. Many textbook cases dealing with various examples of deep learning applications in medical imaging have flourished. An overview that would illustrate the aforementioned trend. In fact, since 2015, an intense and rich economic activity has arisen around this medical imaging and diagnosis field. Reportedly, as many as a third of healthcare AI start-ups that raised funds after January 2015 were working on imaging and diagnostics (Varadharajan & Lee 2020). Additionally, researchers at International Business Machines Corporation, one of the first multinational corporations in the computing industry, predict that by 2026, medical images will account for at least 90% of all medical data. Its enormous amount would make it the most significant source of healthcare data.

When we comprehend the relationship between AI and data, especially in large amounts, as we saw earlier with the rise of big data, deep learning has already been applied in this field for tumor development tracking, quantification, and visualization of blood flow, medical interpretation, and treating diabetic retinopathies. In each of the examples, the use of AI is discussed in relation to a business, including a start-up, but more specifically, three global leaders in technology: IBM, Google, and the Samsung group. An additional well-known name in the technology industry contacted was brought to mind by looking at these scenarios: Argus, a global SAP Labs China project. A team there developed the "Argus" solution, which uses machine learning to detect signs of lung cancer on CT scans. Argus then enables testing more patients in less time while enhancing detection precision. Again, we see the same components as before: artificial intelligence, the contribution to the Sustainable Development Goals for "Nutrition, Health, and Well-Being," but most notably by actors in the "Trade and Industry" sector, as defined by the United Nations. The SAP company is a real-world illustration of how a business can employ AI sensibly for potential effects on sustainable development.

DOCUMENTED CONNECTIONS BETWEEN AI AND THE SDGS

Evidence shows that AI can help achieve 134 (79%) of all SDGs, often through technological improvements to overcome known limitations. However, 59 goals (35% of all SDGs included) can be negatively (UN 2019) impacted by AI development (Stockholm Resilience Centre 2017).

AI AND ENVIRONMENTAL OUTCOMES

The final category of sustainability goals is concerned with the environment; when examined, three of the sustainability goals in this group are concerned with climate measurements, life underwater, and life on land (SDG 13, 14, and 15). For environmental organizations, 25 goals (93%) could be identified where AI can act as an enabler (PwC & Stanford Woods Institute for the Environment 2018). The benefits of artificial intelligence may lie in the ability to analyze massively interconnected databases for collaborative curatorial work. When we look at SDG 13 on climate change, we can see that advances in artificial intelligence are helping to understand climate change and model its potential effects. AI also has the potential to aid in developing low-carbon energy systems, which are essential in the fight against climate change as they use renewable resources and improve energy efficiency. Ecosystem health can also be improved with artificial intelligence. Using AI-based automated oil spill detection algorithms, we can achieve our goal 14.1 of preventing and significantly reducing marine pollution (Keramitsoglou et al. 2006).

15.3 is another example that asks for combatting desertification and rehabilitating degraded lands and soils. Artificial neural networks and particular methodologies can improve the classification of land cover types from satellite photos, potentially processing a considerable number of images quickly (Mohamadi et al. 2015). These artificial intelligence (AI) tools can help spot large-scale patterns of desertification and provide helpful information for decision-making, planning, and environmental supervision, preventing more desertification or reversing trends by identifying root causes. However, as previously indicated, attempts to accomplish SDG 13 on climate change may be impeded by AI applications' high energy requirements, mainly when using carbon-free energy sources.

Moreover, it is anticipated that with more access to information about Artificial Intelligence (AI) related to the environment, there will be an increased likelihood of resource overexploitation, despite the growing number of examples showing how AI is being utilized to aid in biodiversity conservation and monitoring (Kwok 2019). Although these abuses of AI have not yet been extensively documented, they will be examined in more detail later, where the current deficiencies in AI research will be considered.

RESEARCH GAPS IN ARTIFICIAL INTELLIGENCE'S ROLE IN SUSTAINABLE DEVELOPMENT

As Artificial Intelligence (AI) applications are increasingly being utilized to advance Sustainable Development Goals, such as self-driving vehicles, AI-based smart grids (IEA 2017), and healthcare (De Fauw et al. 2018), these systems must become more resilient and valuable to minimize any disruptions. With the increasing use of AI in various industries, investments in AI security research will become even more critical to prevent mishandling or damage.

An important area of research in AI security integration is understanding the potential disasters and system failures that can occur in AI technologies. For instance, a recent World Economic Forum (WEF 2018) study has raised similar concerns about using AI in the banking industry. In a world that is increasingly dependent on this technology, it is vital to raise awareness about the hazards of AI system failures and invest in research addressing these concerns. By doing so, we can ensure that AI is developed and implemented in a way that promotes safety, efficiency, and sustainability. As society continues to evolve and adapt to the impact of AI and non-AI technological advancements, the demands on AI also change, creating a dynamic interplay between society and technology. This ongoing interaction forms a chain of communication where society shapes the development and use of AI, and in turn, AI shapes society.

Furthermore, while we have been able to find some studies that show that AI has the potential to contribute to many SDG goals and calculations, most of this research has limited data. It cannot be performed in a controlled or laboratory setting by using prototypes (Gandhi et al. 2017). Therefore, it is often difficult to extrapolate this information to assess the impact in the real world. This is predominantly true when examining the effects of AI on larger temporal and geographical dimensions. We understand that by performing controlled experiments to assess the impact of AI in the real world, it is possible to describe how well AI tools adapt to a specific environment.

As society evolves and adapts to the impact of non-AI technological advancements, the demands on AI also change, creating a dynamic interplay between society and technology. This ongoing interaction forms a chain of communication where society shapes the development and use of AI, and in turn, AI shapes society.

However, an alarming aspect of current research is society's resistance to change brought about by AI. To ensure that the effect of new technologies is evaluated in terms of efficiency, ethics, and sustainability, there is a need for new methodologies to be implemented before the widespread adoption of A.I., Given the significant risks associated with errors in AI systems. It is essential that research is conducted to understand the causes of these errors and to develop integrated human-machine analysis tools. This will pave the way for the responsible development and use of AI technology (Nushi et al. 2018).

Although we discovered more published evidence suggesting AI would aid rather than impede the fulfillment of the SDGs, there are at least two important considerations to remember. First, vested interests motivate the AI research community and industry to report favorable findings. Second, long-term research may be necessary to discover AI inadequacies, and as stated before, there are a limited number of accessible assessment methodologies. The tendency to report positive results was particularly strong for sustainable development goals corresponding to the environmental group. Coastal and marine protection objective 14.5 is an excellent example of this bias (Beyer et al. 2016). Machine learning algorithms provide the best solution because many parameters are involved in the optimal selection of safety nets. More research is needed to evaluate the long-term ramifications of such algorithms on fairness and justice, even if the output is theoretically optimum (within the provided parameter range).

The second point highlighted above brings to attention a crucial issue in AI – the tendency for funding to be directed toward projects with the highest potential for profit maximization. This can lead to a disproportionate focus on AI applications driven by economic and commercial interests, resulting in greater inequality. As pointed out by researchers in 2018 (Whittaker et al. 2018).

It is imperative to remember that the potential for economic gain should not be the sole determinant in prioritizing AI-based solutions for achieving Sustainable Development Goals (SDGs). Rather, we should also consider emerging AI technology's social, ethical, legal, and environmental effects. It is crucial that funding is allocated to projects that evaluate and address these important factors, in addition to those that hold commercial promise. Doing so will help guarantee that AI advances are made in a way that benefits everyone and helps all communities thrive.

One way to utilize the capabilities of AI technologies in accomplishing the SDGs is through extensive research and application of machine learning algorithms and data mining techniques on the growing amount of data that has been collected over time, from analyzing past weather events to making predictions about future occurrences (Vinuesa et al. 2020). The requirement for this research study is to permit the prep work and feedback for an extensive range of events ahead if anything comes up unexpectedly without knowing when it will occur. The gap in real-world applications of AI systems is a significant concern for governments seeking ways to effectively incorporate these technologies into their decision-making processes (Chen et al. 2020). Institutions have several barriers that must first be overcome before they can successfully implement such an approach, including setting up cybersecurity measures and protecting citizen's privacy across all aspects related to surveillance issues, as well as tracking what data might potentially leak or become compromised within the institution's operation; this also includes automating specific processes without rigorous ethical standards put forth by law which would target any possible bias present- however small it may seem at times –with using artificial intelligent machines (Courtland 2018).

There is a narrow application for AI technologies at the moment, with many projects addressing problems that only developed countries face. For instance, automated harvesting or optimizing its timing can be done more effectively by systems that operate within these countries because they have access to tools like robust electricity networks and high-end computing power needed for such operations where less developed areas may not always contain everything needed at once – making their AI technology less useful there than if it was designed from scratch using components available locally without any need whatsoever for international trade agreements which often burden low-income economies most heavily as well.

While promising, recent developments in Artificial Intelligence (AI) technology also raise concerns about exacerbating inequality within and between nations. This inequality could potentially hinder progress toward the achievement of Global Goals. Therefore, researchers and funders must focus on designing solutions tailored to the specific needs of less developed nations or regions where adopting AI may be more challenging (Bird et al. 2020).

These solutions must consider the unique cultural and societal dynamics of these regions rather than simply importing solutions from more technologically advanced economies. Every project must be custom fit to the traditions and needs of the region in which it is implemented. By taking a localized approach, we can ensure that AI technology is used to promote equality and contribute to the betterment of all communities.

CONCLUSION

The realm of artificial intelligence is a vast and ever-expanding frontier with the potential to revolutionize industries and sectors across the board. The potential for this technology to be used to protect the world's natural resources is particularly exciting. The environment, though not an industry, is the foundation upon which human life thrives. As such, it has become a top priority for governments worldwide to safeguard it for future generations. The notion that technology could be harnessed for the betterment of our planet was once considered a fanciful dream, yet with the advent of AI. It has become a tangible reality.

As we march towards a more sustainable future, the role of AI in environmental conservation is becoming increasingly apparent. AI technologies and algorithms are constantly evolving to monitor pollution levels, reduce energy use, and increase comprehension of climate change's complex consequences.

Governments at all levels, from local to national governments, recognize AI's potential to protect our planet and incorporate it into their program and policy roadmaps for environmental protection. With its ability to quickly collect and analyze large amounts of data, as well as its ability to learn and adapt to new situations, artificial intelligence can be a powerful tool in the battle against pollution and climate change.

Moreover, integrating AI with IoT (Internet of Things), technology can improve environmental sustainability in new and innovative ways. By connecting various devices, sensors, and machines to the internet, we can gather a wealth of data that can be analyzed and acted upon in real time. By combining AI's power with IoT's connectivity, we can significantly reduce carbon emissions, improve air and water quality, and preserve natural habitats.

This article delves into the many ways in which AI is helping to increase environmental sustainability. From understanding the AI carbon footprint and its impact on the environment to exploring the various applications of AI in environmental conservation, we will gain a deeper understanding of AI's role in preserving our planet for future generations. As the world becomes increasingly dependent on technology, it is vital that we harness its power for the benefit of our planet and all its inhabitants.

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