WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Impact of Artificial Intelligence on the Environment

[1]Snigdha Sharma, [2]Dr. Shailja Thakur

University Institute of Legal Studies, Chandigarh University, Gharuan, Punjab-140413.

ABSTRACT

Artificial Intelligence (AI) is such a rapidly changing multi-branch technology that has applications in various sectors, ranging from optimizing energy use through a smart grid to enhancing climate change models. Artificial Intelligence is proving to be the best tool for sustainability. Nonetheless, its ecological consequences should not be underestimated. There is no argument that the training of such large models of AI, in particular, will require a significant energy input resulting in a carbon footprint and data centers are for one reason or another creating their issues. This article expands on the positive aspects of artificial intelligence pertaining to the environment and even goes further to explain the negative aspects because there is a necessity to create energy efficient AI systems and have the practices that Green AI focuses on, which is why it is very important to combat the issues of attaining a clean and green future. Use AI with minimal ecological damage today for environmental benefits tomorrow.

Keywords: Artificial Intelligence, environmental sustainability, energy saving, reduced carbon emissions, datacenters, e-waste, Green AI.

1. INTRODUCTION

It is indubitable that Artificial Intelligence (AI) is a game-changing technology that will provide services and address challenges that one would have thought impossible. However, there are worrying prospects regarding the concerns associated with the environmental perspective of using AI technologies has much potential to either foster environmental protection or be destructive to the environment. Optimizing energy use and reducing emissions will be some of its advantages toward environmental enhancement. For example, "the application of AI in smart grids" increased the efficiency of distributing energy, reduced waste of electricity, and decreased carbon emissions.[1] AI has also contributed considerably to climate change by forecasting changes in the environment from analyzing large data volumes to predicting future changes and improving climate models.

This, however, is associated with a lot of environmental degradation. AI is a very demanding technology in terms of the computing capacity of processors especially where complex frameworks like OpenAI's GPT-3 model are involved. All these processes consume a lot of energy thereby resulting in emissions of carbon gases in large amounts. As recently discovered, training big AI models releases carbon dioxide into the air equal to that from five cars over their lifetime. The huge demand for performance hardware for AI also increases electronic waste in the form of regular upgradings of equipment from AI industries which depletes resources and so also pollution.

While AI may bring forth some promising answers to environmental problems, it may also have adverse implications. Thus, the effects of AI on the environment should be well-regulated so that development in sustainability will be ensured. This paper aims to examine the effect of AI on environmental protection and degradation. The negative and positive implications of AI on the environment have to be looked at in a balanced approach that maximizes the benefits while ensuring a minimal ecological footprint for future developments. The gap, however, comes in the form, that how well are AI's environmental costs addressed bodes well for how well the benefits are appreciated. This paper intends to bridge the gap by looking at how AI can help as well as hinder the environment. It will analyze both the conducive and detrimental effects of AI on the environment. In this regard, focusing on future development where there will be high benefits of AI with a lower ecological footprint appears to be optimal.

2. HISTORICAL BACKGROUND

2.1 Ancient Times:

The very first machines were thought to be 'intelligent'; yet AI as an area or domain of study was non-existent. [2]There are stories from ancient Hungarians and Greeks, women and men who invented 'automata' and even 'mechanical people'. Aristotle and others wondered about logical reasoning, waiting for

[1] Farhad Khosrojerdi, Stephane Gagnon, et al., "Applications of Artificial Intelligence in Smart Grids: Present and Future Research Domains" 9 *International Conference on Smart Energy Grid Engineering* 1-3 (2021).
[2] Alex Shashkevich, Stanford researcher examines earliest concepts of artificial intelligence, robots in ancient myths, *available at:* https://news.stanford.edu/stories/2019/02/ancient-myths-reveal-early-fantasies-artificial-life (last visited on Oct. 17, 2024).

the time when it would become exact algorithms and computations[3]. But at that time, the notion of 'intelligence' in such machines was only imaginative and did not affect the real environment.

2.2 The Middle Ages

There was scarcely any direct discourse on AI in the Middle Ages. However, the progression of logical thought and engineering created the background for future developments. Mathematics and computer science were able to grow much faster due to people such as "Al-Khwarizmi" who developed some algorithms which would be widely used in the field of artificial intelligence rather than getting restricted for potential misuse.[4] Regarding the environmental impacts, there was technological advancement in the medieval age, however, the concern of computation led to environmental issues; that were still a long way in coming.

The "Greenhouse Out Gas" effect caused by technology was negligible as AI was in its early stages. Most of the work was, in fact, basic research and there were no as powerful and efficient computing systems as the present day. Moreover, AI in those times was employed at research centers or in the military, where environmental issues were not so much taken into account. The objective was primarily to build competent systems that could address particular issues, like shooting ranges or transportation systems.

2.3 The Modern Age:

2.3.1 The 20th century (early)

The roots of current AI can be spotted in the beginning of the twentieth century when scholars, engineers, and mathematicians enquired into the prospects of whether high-functioning miraculous machines can use the technology to think and behave like human beings. The work of 'Alan Turing' in the late 1930s and early 1940s gave rise to the ideas on how a 'machine' and 'computers' more so, could perform its jobs, what were called, 'algorithms', and gave rise to the conception of the 'Turing machine.'[5] Fair enough from the perspective of the environment half a century ago, energy concerns were scarce because computers were only beginning to be fully utilized for the environment half a century ago, energy concerns were scarce because computers were only beginning to be fully utilized.

2.3.2 Twentieth Century: The Entry of AI

The term AI was formally introduced during the 'Dartmouth Conference' way back in the year 1956.[6] This is also where the actual term ai came into use. Simple logic-driven systems were some of the first manifestations of AI and did little to affect their environment. However, these systems, as impressive as they were, were run on computers that had very little hardware power relative to current machines. The architectural computational engines were basic, hence not even a remote threat to the environment.

2.3.3 The period between the 1970s and the 1990s: The AI Phase and Ecological Stagnation

In the course of the late seventies and eighties, AI research can be said to have experienced a slump, often described as an "AI Winter."[7] It was still not advanced enough to warrant any significant consumption of energy, hence no cause for environmental concerns. The researchers faced problems of limited computing power and small amounts of data leading to overall less energy used.

2.3.4 21st Century: AI's Footprint on the Environment Introduces Itself

It brought machine and deep learning into the prominence of AI in the 21st century, inflicting heavy environmental concerns over AI[8]. Most modern applications of AI demand significant computational forces, especially with deep learning models. The gigantic models, like the one held by OpenAI's GPT-3, will consume a big chunk of energy that has been consumed lifetime.

---

[3] Edward N. Zalta and Uri Nodelman. "Artificial Intelligence." *The Stanford Encyclopedia of Philosophy* (Fall 2024 Edition), *available at:* https://plato.stanford.edu/archives/fall2024/entries/artificial-intelligence/ (last visited on Oct. 17, 2024).
[4] Katharine Miller, Designing Decision-Making Algorithms in an Uncertain World, *available at:* https://hai.stanford.edu/news/designing-decision-making-algorithms-uncertain-world (last visited on Oct. 17, 2024).

[5] Andrew Hodges, *Alan Turing The Enigma Of Intelligence* 6-7 (Princeton University Press, 2014).
[6] K. P. V. Sai Aakarsh & Adwin Manhar, "Review of Artificial Intelligence" 7 International Journal of Scientific Research in Science, Engineering and Technology 144 (2020

[7] Amirhosein Toosi, Andrea Bottino et al., "A Brief History of AI: How To Prevent Another Winter (A Critical Review") 16 *PET Clinics,* 455 (2021).
[8] Mira Bhakta, The Shocking Carbon Footprints of AI Models (2022), *available at:* https://encodejustice.org/the-shocking-carbon-footprint-of-ai-models/, (last visited on Oct. 17, 2024).
[9] Daniel Raphael Ejike Ewim Nwakamma Ninduwezuor-Ehiobu, et al., "Impact of Data Centers on Climate Change: A Review of Energy Efficient Strategies", 09 *Journal of Chemical Engineering and Catalysis* 1, (2023).

Energy demand is increasing with the count of data centers as these facilities house immeasurable computing powers that are necessary to train these models. Carbon emissions are largely sourced from data centers since they need constantly to be cooled and supplied with electricity. Also, the hardware which is essentially graphic processing units (GPU's) is highly resource-intensive to produce, contributing further to the ever-growing environmental footprint.[9]

3. AI: MEANING IN THE ENVIRONMENT CONTEXT

Artificial Intelligence refers to the development of computer systems that can do any type of work or task, just as human beings do. All these tasks and operations are decision-making and problem solving and learning. All these capabilities include large-scale data analysis, pattern recognition, and prediction based on the patterns discovered by algorithms in AI such as machine learning and deep learning algorithms.

It applies those technologies aimed at solving environmental challenges, so to say, in these directions in the environment wherein AI is seen. The current areas of application go as far as climate change modelling, resource management, energy efficiency, and environmental monitoring.[10] It tries to understand and respond to those real-time processes from which vast amounts of data are derived, offering new possibilities for understanding and mitigating the effects on the environment. For instance, AI can predict natural disasters, optimize energy usage, and enhance agricultural practices in a way that reduces waste and damage to the environment.

4. LITERATURE REVIEW

As a consequence of these recent developments, efforts have been devoted to exploring poems about the field of the environment. Society has been divided on the issue of whether AI, considered by many as a valuable tool to achieve emotional achievements, needs to be regulated. Researchers conducted several studies regarding the role of artificial intelligence in saving the environment. Even though it is expressed in several studies, about the role of AI in enabling environmental sustainability, it has been expressed more cautiously the way its benefits have been expressed.

i. AI and Climate Change Mitigation

More research articles now explore how AI can fight climate change. For instance, Rolnick et al. (2022) argued that AI can play an important role in the prediction, monitoring of climate conditions, and management of resources."[11] Taking into account the great capabilities of machine learning models in data processing, this should lead to increased efficiency in climate modeling and forecasting. From improving energy efficiency and reducing losses in sectors such as farms and factories, freeing up even greater possibilities for green development. These advantages consist of, among others, the process of cutting down trees, the status of various species, predicting natural calamities, and much more resulting in a lot of efforts towards protection.

ii. Energy Consumption and Carbon Emissions of Artificial Intelligence

AI has the potential to offer answers to human-made challenges such as environmental challenges. However, many research studies indicate the high environmental price attached to this approach. More specifically, training such large and complex AI systems, machine learning, and deep learning algorithms especially, requires vast computational resources, hence a lot of energy. The environmental cost of such an input of energy is huge. For example, Schwartz et al. (2020) indicate that the large-scale models of AI, such as OpenAI's GPT-3, have a carbon footprint equivalent to that of multiple cars used throughout their lifecycle.[12]

iii. AI in Smart Energy Systems

The optimization of energy systems through AI applications has widely been regarded as a step forward in environmental sustainability. Discuss Alahakoon and Yu (2015)[13] on the role of AI in energy management systems, for instance, smart grids, whose possibilities in efficiently utilizing energy and enabling the more favorable integration of renewable forms of energy, such as solar and wind power, will be discussed. AI also saves the environmental footprints of energy production by forecasting the demand for energy and real-time management of the distribution network. Yet, the increasing need for processing data in such systems does raise various issues relating to consumption in terms of energy.

iv. Ethical and Environmental Concerns

[10] Gyandeep Chaudhary, "Environmental Sustainability: Can Artificial Intelligence be an Enabler for SDGs" 22 *Nature Environment and Pollution Technology* 1413 (2023).

[11] David Rolnick, Priya L. Donti, et al. "Tackling Climate Change with Machine Learning" 55 *Association for Computing Machinery* 2-3 (2022).
[12] Roy Schwartz, Jesse Dodge, et al. "Green AI", 63 *Communications of the ACM* 56-57 (2020).
[13] Damminda Alahakoon, & Xinghuo Yu, "Smart Electricity Meter Data Intelligence for Future Energy Systems: A Survey", 12 *Institute of Electrical and Electronics Engineers* 429 (2016).
[14] Ricardo Vineusa, Hossein Azizpour, et al., "The Role Artificial Intelligence in Achieving the Sustainable Development Goals",11 Nature Communications 233 (2020).

The ethical impacts of AI on the environment have also been substantially researched. According to Vinuesa et al. 2020,[14] there are both wins and losses, and the latter when considering SDGs, including avoiding optimal energy usage in data centers and resource-intensive hardware production, such as GPUs. These studies suggest that if the AI has not been well cared for, one may be left with devastating environmental costs, meaning the overall benefits of an AI could be overstated and thus they call for a more sustainable approach to the actual development of AI

v. Lifecycle and Sustainability Concerns

The literature also depicts emerging concerns over the lifecycle of AI hardware and systems. The work of the Life Cycle Analysis explains how from the manufacture to disposal, AI systems are emitting damaging degrees of environmental degradation. This is especially applicable to AI hardware like GPUs and the architecture of data centers that utilize enormous natural capital and generate waste in the form of electronic devices.

In the above discussion, although the body of literature shows AI's potential to offer supporting congruence with environmental sustainability, it also throws forth an imposing environmental challenge in the form of AI systems. Thus, the two paramount concerns are the energy demands needed for training large AI models and the environmental cost of developing AI hardware. Arguably, AI has to be developed to change the environment positively. The literature calls for innovation in sustainable practices by which AI development and deployment must be done, and energy efficiency, such that a more balanced approach toward harnessing its potential in environmental applications will come into play.

5. SIGNIFICANCE OF AI TOWARDS ENVIRONMENT

Significance of AI toward the environment can be determined through both its positive effects and adverse impacts.

5.1 Positive Impacts of AI toward Environment

AI promises to solve many of the main environmental issues. The analysis of large datasets by AI systems would aid in monitoring environmental changes and predict changes in energy efficiency and the optimal use of natural resources.

1.Energy Efficiency: AI is solely responsible for saving energy in different industries. For example, AI-based systems can efficiently find the optimum use of an energy grid by which a higher amount of electricity could be used more efficiently.[15] Smart grids can sense the changes in demand and can adjust the energy automatically with minimum waste. Furthermore, AI helps save a lot of energy regarding heating and cooling of buildings.

2.Climate Change Modeling: AI supports and strengthens climate change models through the ability of AI to process large amounts of data. Changes in the Environment Climate change model predictions offer changes in temperature, sea level rise, and extreme weather. With AI, one can create more intricate models for better preparation in adaptation and mitigation strategies.[16]

3.Environmental Monitoring: AI uses the environment for quality monitoring of air and water, deforestation monitoring, and biodiversity loss assessment. For instance, AI -drone-based and satellite image-based illegal logging monitoring may reduce instances of occurrences of deforestation in a specified area. In agriculture, AI technologies monitor crop health, soil quality, and water use, among others, thus nudging more responsible practices of farming.[17]

4.Resource Optimization: AI enables industries to optimize resource utilization, reduce waste, and emission. For example, a well-designed AI-enabled supply chain management system will optimize delivery route planning and schedules, reducing transportation emissions.[18] Similarly, AI would be able to improve the efficiency of waste management systems with greater recycling and less landfill waste.

5.2 Negative Impacts of AI towards Environment

The huge potential benefit comes with huge environmental drawbacks: massive amounts of computational resources required to make it work.

1.Energy Consumption: Training large AI models is a computationally heavy process, requiring all sorts of resources for power. Huge parts of data centers supporting AI technologies require a continuous flow of electricity for cooling and processing. Increased greenhouse gas emissions associated with AI, if the energy used comes from non-renewable 2. Electronic Waste (E-Waste): To cater to the highly demanding computations of AI, often upgradable hardware components such as GPUs step into play. These contribute to electronic waste that is harmful to the environment when disposed of improperly. The processes and extractions of rare minerals needed for these components have many deteriorating impacts on the environment.[19]

---

[15] James Vincent, How much electricity does AI consume, 2024, *available at:* https://www.theverge.com/24066646/ai-electricity-energy-watts-generative-consumption, (last visited on Oct.18, 2024).
[16] Joanna I. Lewis, Autumn Toney, et al., "Climate change and artificial intelligence: assessing the global research landscape" 4 *Discover Artificial Intelligence* 1-2, (2024).
[17] Thorsten Schoormann, Gero Strobel, et al., "How Artificial Intelligence is helping tackle environmental challenges", 52 *Communications of the Association for Information Systems* 560-62 (2023).
[18] Jacques Bughin, Eric Hazan, et al., Artificial Intelligence The Next Digital Frontier (2017), *available at:* https://www.mckinsey.com/ru/~/media/mckinsey/industries/advanced%20electronics/our%20insights/how%20artificial%20intelligence%20can%20deliver%20real%20value%20to%20companies/mgi-artificial-intelligence-discussion-paper.pdf, (last visited on Oct. 18 , 2024).
[19] "The Dark side of AI: Its growing environmental footprint" *The Indian Express* May 2, 2024.

3.Carbon Footprint of AI Models: Of all the pressing issues associated with training AI models, carbon footprint seems to be the most prominent. Training one single large AI model is said to emit as much carbon as five cars emit during their entire lives. The more advanced AI systems are deemed necessary by human beings, the more power intensity and energy are required to support them, thus increasing the carbon footprint.[20]

5.3 A balance within the AI environmental impact

While AI holds its apparent benefits and drawbacks on the environment, its overall import is condensed on how society likes to use and control the technology. The government, industries, and researchers study what would decrease the energy demands of AI while maximizing its benefits in environmental protection. Practices in creating more energy-efficient algorithms, investing in renewable energy for the data centers, and recycling e-waste effectively will ensure that the impacts of AI on the environment are minimized.

One of the concepts that stands out most relates to Green AI, minimizing the energy that systems of AI consume does not sacrifice their performance.[21] Researchers are working on models that necessitate reduced amounts of data and computational power to operate, thereby reducing their environmental effects. In addition, people can generate clean energy solutions through AI, such as optimizing wind and solar power generation.

Therefore, machine learning and deep learning are at the forefront of transforming environmental sustainability in the present age. In particular, its capability to enhance power consumption, facilitate environmental surveillance, and help address the effects of global warming is invaluable in combating environmental destruction.[22] Nevertheless, the high energy consumption and electronic waste associated with the use of AI systems need addressing. The dilemma is how to appreciate the ecological advantages of AI systems without ignoring the ecological challenges posed by them. In much simpler terms, the AI technologies used must be developed to be energy consumption efficient, and prudent measures undertaken to ensure that AI is utilized in preserving the environment.[23]

6. METHODOLOGY

A holistic research design incorporating both qualitative and quantitative research methods may be used to establish the extent to which AI will transform the ecosystem. It would include the following: it will be important to conduct a comprehensive review of all the literature available in the field of knowledge about the adoption of AI within the environmental marketplace including scholarly journals, trade magazines, and case studies.

1. Literature Review:

There is already a comprehensive literature review that covers the state-of-the-art of AI and its environmental implications. The reviews in this paper are scholarly articles, research papers, and case studies from diverse fields such as environment, computer science, and AI. Some of the key sources studied to understand how AI evolved through history include:

- Current Applications of AI in Environmental Monitoring and Climate Change
- Gain and Loss: AI Environmental Impact
- Technological advancement in the field of AI or more precisely those advancements that will go hand-in-hand with energy efficiency improvements**.**

2. Data Collection:

- Primary Data: To grasp how AI is affecting the ecosystem, it has been necessary to gather opinions and opinions from AI and environmental experts, and from those involved in the energy and technology sectors. These interviews aim to understand the use of energy resources and the management of the environment. The interviews also focus on developing strategies to minimize the negative effects.
- Secondary Data: Agencies that deal with the environment tech companies and government had 21 sources. This consisted of gathering data on the power consumption of data centers, manufacturing of AI equipment, and carbon emissions attributable to such processes.

3. Case Studies

- Positive Example: AI in Smart Cities: To mention a few examples, Singapore's AI enables monitoring of air quality, optimization of flows to minimize traffic in cities, and control of energy consumption in smart buildings.[24] The systems therefore reduce emissions by reducing the

[20] Ren'ee Cho, AI'S Growing Carbon Footprint, (2023), *available at:* https://news.climate.columbia.edu/2023/06/09/ais-growing-carbon-footprint, (last visited on Oct. 18, 2024).
[21] David Patterson, Joseph Gonzalez, et al., *The Carbon Footprint of Machine Learning Training Will Plateau, Then Shrink*, https://esdst.eu/green-ai-reducing-the-carbon-footprint-of-machine-learning/.
[22] World Economic Forum, BloombergNEF, et al., Harnessing Artificial Intelligence to Accelerate the Energy Transition, (2021), *available at:* https://www3.weforum.org/docs/WEF_Harnessing_AI_to_accelerate_the_Energy_Transition_2021.pdf, (last visited on Oct. 18, 2024).
[23] *supra* note 14 at 238.
[24] Amit Roy Choudhury, *Singapore's Smart Nation 2.O Policy focuses on AI and building resilience*, GOVINSIDER (2024), *available at:* https://govinsider.asia/intl-en/article/singapores-smart-nation-20-policy-focuses-on-ai-and-building-resilience, (last visited on Oct. 18, 2024).

traffic congestion that leads to emissions as well as lowering the energy demand of city infrastructure. Cities like Singapore can therefore cut their environmental impact while a high quality of life is maintained for its people.

- Negative Example: Data Centers and Carbon Emissions: Data centers are very critical for AI applications, although they are one of the areas contributing highly to AI's footprint in the environment.[25] Most of the world's data centers are still running on fossil fuels, which makes for highly intensified carbon emissions. Data centers sometimes consume as much energy as cities -which therefore works to offset the positive effect AI would have on the environment.

4. Comparative Analysis

The approach also entailed a comparative analysis of the environmental impact of various AI designs and algorithms. An assessment of energy usage between conventional systems and AI systems was made. This particular assessment enabled determining the magnitude of the environmental concern surrounding the utilization of artificial intelligence.

5. Quantitative Assessment

- Energy Usage: This study analyzed the energy usage of artificial intelligence systems, most notably machine learning and deep learning algorithms. It mentioned the power needed for the data storage facilities and the artificial intelligence infrastructures such as graphical processing units.
- Emissions of Carbon Dioxide: The calculations of the volumes of carbon footprints were performed similarly to the analysis of the energy consumption. Such estimates were done assuming existing models applied in environmental science to calculate emissions from data centers and their hardware production.
- E-Waste: Data collected on the volume produced and then discarded of AI-related hardware, including items using GPUs, in an attempt to estimate a rough volume that is generated as e-waste.

7. Legal Frameworks and Case Laws: AI and Environmental Protection

India

The Indian judiciary has struggled with the environmental implications of new technologies, including AI. "In M.C. Mehta v. Union of India (AIR 1987 SC 1086), the Supreme Court emphasized the fact that a balance has to be achieved between development and the protection of the environment."[26] This judgment has become the guiding principle in the discussions on the environment interface of AI. It talks about an extreme need for regulation because AI must not impact ecological systems.

United States

The landmark ruling was in "Massachusetts v. Environmental Protection Agency (549 U.S. 497, 2007), where the U.S. Supreme Court held that the Environmental Protection Agency must regulate carbon emissions, an area with far-reaching consequences for AI."[27] In the pursuit of emerging AI-driven industries, the imperative for regulations surrounding carbon emissions becomes a critical issue. This case has helped mold policies around how technology, including AI, should be regulated within environmental protection contexts.

8. RESULTS AND DISCUSSION

Improvements in AI can positively impact the environment in terms of efficiency, climate models, and optimal resource use. However, the increase in energy consumption has led to higher carbon emissions, together with electronic waste, as AI has grown rapidly.[28] The enormous computing needs of AI, mainly in data centers, have brought a significant environmental burden. To tackle this concern, one of the fundamental endeavors is "Green AI", which aims to cut down the carbon emissions of AI technology without compromising its performance.[29] In reinforcing their desire for a sustainable future, it is imperative that the benefits of the AI system are weighed against its effects on the environment practices that are less harmful to the environment are adopted and inventions in energy efficient practices advanced**.**

9. FINAL THOUGHTS

Artificial intelligence is transforming the face of our exposure to technology, offering humongous possibilities for greater environmental sustainability and solving severe ecological problems. It could be crucial for the future because it enhances energy consumption, advances climate modeling, and tracks

[25] Melissa Heikkila, *We're getting a better idea of AI's true Carbon Footprint* (2022), *available at:* https://www.technologyreview.com/2022/11/14/1063192/were-getting-a-better-idea-of-ais-true-carbon-footprint/, (last visited on Oct. 18, 2024).
[26] *M.C. Mehta v. Union of India*, AIR1987 SC 1086.
[27] *Massachusetts v. Environmental Protection Agency*, 549 U.S. 497, (2007).
[28] supra note 11 at 5.
[29] Arbab Khan, *Green AI: Reducing the Carbon Footprint of Machine Learning*, (2023), *available at:* https://esdst.eu/green-ai-reducing-the-carbon-footprint-of-machine-learning/, (last visited on Oct. 18, 2024).

further degradation in the environment. AI technologies are now starting to be implemented to reduce waste, promote renewable energy, and enhance agricultural practices. This offers apparent evidence of how massive AI serves as an important solution to mitigate environmental degradation.

With all that AI gives, there is a major negative impact on the environment. In addition to the environmental costs of the gigantic data centers needed, there is a large energy consumption for training large AI models. The production of the hardware for AI brings along powerful processors for such machines, added e-waste, and resource depletion. Without being judiciously addressed, this carbon footprint offsets the benefits the AI environment wants to present.

The going forward will thus be balancing the pros and cons of the environmental impact of AI. The concept of Green AI, that is prioritizing aspects of AI models on being energy efficiency and sustainability, seems quite promising. This can be achieved by designing energy-saving algorithms, recycling electronic waste, and utilizing only renewable energy resources, and in this way preventing any pollution from occurring as much as possible.

It would all depend on the strategies that various stakeholders - governments, industries as well as researchers - would adopt to exploit the potentiality of AI, for example, whether such activities would contribute to degrading the environment or would help to improve it. Therefore, for the use of AI suitable technologies to bear fruits for the health of the planet, it has to adopt ways of life that are sustainable and learn how to do things more efficiently.