Artificial Intelligence and its Interaction with Environmental Sustainability: Reconstructing the Ecosystem

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Abstract

The use of Artificial Intelligence in environmental sustainability would include both problem-solving and decision-making. Every intelligent being, be it natural or artificial must develop some logico-linguistic ontology, in its cognitive structuring. The intelligence is inclusive of perceptions and reactions. How the technology can help in conservation, management and sustainability is a deeper space to explore. The impact of efficient machines and sensitivity of human necessities bring forth the much-awaited policies for economic, social and environmental sustainability. In the world of consumerism and technological maximalism, where is the space to breathe? Ensuring resources and owning responsibility for climate change falls on our shoulder. Human consciousness is as remote as that of an intelligent machine. Where our way of life is automated and unconsciously participative in environmental degradations. Can we stop behaving like Robots, and realize that our sustenance depends on air and water. The paper tries to discuss the conceptual relevance of how machines can be useful and whether we should depend on them for a secure future under the ambit of a regulatory framework.

Introduction

With the giant corporations leaving ecological footprints, it is much easier to attain sustainability goals or impact climate change. It is intriguing to conceptualize those tools and techniques which can be used to quantify carbon credits and most sustainable forms of machine learning or artificial intelligence infrastructure could be resorted to. Artificial Intelligence is a parasite that feeds itself by exploiting the humans. The impact it leaves behind doesn't only lead to environmental vulnerabilities but also sometimes result in intrusions into domains of human rights. For instance, extraction of metals from the earth, debris in outer space, Oil spilling in ocean and data protection issues, everything interferes with the domains of technology, environment and human beings.

Artificial Intelligence, Carbon Emissions and Environmental Sustainability

We are already late in assessing the role of Artificial intelligence in managing environmental catastrophe. Artificial intelligence has a dual role to play, it propels environmental sustainability on one hand but also leads the race as carbon emitter. As per a study undertaken by University of Massachusetts, the authors estimated that carbon footprint of training a single big language model is equal to around 300,000 kg of carbon dioxide emissions. When such is the situation how would we realize the efforts of Artificial Intelligence in managing sustainability. In a move to cut down emissions, the major BigTechs have pledged to cut down on emissions, refuse contracts with fossil fuel companies, non-funding to climate change deniers. For instance, Google's DeepMind has developed an AI that

teaches itself to minimize the use of energy, Microsoft has committed to be Carbon negative by 2030, Amazon has plans of poering its giant infrastructures by using only renewable energy. But unless we quantify the emissions by Machine learning equipment and Artificial Intelligence infrastructure, we will not be in a position to know- how much do we cut down to balance our sustainability agendas.

Alexandra Luccioni, a pioneer in this research area has also developed an emission calculator to assess the amount to emissions made during the use of a machine learning model. This perspective furthers the approach of Copenhagen Centre on Energy Efficiency, which emphasis that environment sustainability should be considered as the foremost principle towards development of Artificial Intelligence practices which will mitigate environmental impacts. To keep checks and balances in this regard Green AI Certifications may be adopted, which will encourage the industries to resort to promoting green AI research and development. Every industry must adhere to an industry framework and guidelines that regulates deployment of green Artificial Intelligence techniques and devices. Above all, it is suggested that, government must consider the impacts and formulate a regulatory framework, or a legislative backbone to legally address the issues pertaining to transparency and sustainability when it comes to Machine Learning or Artificial Intelligence Models. Limits for carbon emissions can be pre-determined for various industrial sectors.

Moreover, the Artificial Intelligence is also moving forward to contribute to environment protection in several other ways. Evolving technologies like Footprint Identification technology can help identify, track and monitor animals protecting them against threats, Machine learning is used for protecting coral bleach, oil spiling, marine protection and ocean mining, also Artificial intelligence in agriculture sector helps in generating data regarding detection of crop diseases thereby enhancing efficiency. Also, can monitor and manage environmental conditions for better crop yield. When we talk about artificial intelligence and environment protection market, we intend to bring the attention and focus towards the area of energy management, water management, waste management, carbon emissions etc. In China, IBMs Green Horizon project uses Artificial Intelligence techniques to forecast air pollution, track the pollutants and also suggest viable solutions. Artificially developed tools and equipment's works towards energy conservation. In energy sector, Artificial intelligence with the help of predictive capabilities and smart grid systems may manage the demand and supply of the renewable energy.

Artificial Intelligence: Repairing the Eco-system and Considering the Systematic Risks
It is also believed that the era of Artificial Intelligence, automation or robotics will adjust the human societies to climatic changes or will themselves take a charge for repainting the ecosystem. These technologies can help in effective monitoring and use of natural resources, effective uses of land and sea spaces, autonomous underwater marine conservation, Ai supported tracking of illegal wildlife trade or may even assess the environmental capabilities or revolutionize the supply chains. It is pertinent to ponder on the risks involved, when the Artificial Intelligence intrudes into the social, economic or political sphere. When such intrusions happen, systematic risk cannot be ignored for instance allocative harms, unexpected social and ecological impacts etc. It is nothing unusual as the human-machine interactions are all not certain, which increases the possibilities of disruptions in key sectors like food, energy, essential commodities etc. The use of Artificial intelligence in urban livability with emerging smart cities keep a tab on combustion and fuel usage. As we have been referring to above there can be certain risks involved, if not taken care of may finally lead to environmental damage or slow down the goals of achieving sustainability. Some of these are:
Algorithmic Bias and allocative harms- these kinds of risks refer to inconsistencies in data, data manipulation and capture because of breaches and unidentified intrusions, tampered decision-making systems, and flawed Artificial Intelligence models.

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Unequal access and benefits: with the diffusion and absorption of the artificial intelligence into various industrial units, there are chances resource availability or unequal access of information. Though, this is not a certain situation, despite getting equal access of information and resources, results of the outcome may vary.

Cyber Attacks: Complex systems face what is termed as 'normal accidents', which indicate internal failures that spread across the networks, making such circuits vulnerable to external malicious attacks. Even the most safeguarded neural network cannot escape the acts of sabotage. There can be intentional detriment caused to sensor access to wireless or remote transmission system.

Artificial Intelligence and Ethics: Though, Artificial Intelligence and automation ensures sustainability but it also entails risk to humans and its interaction with the machine. To ensure lesser risks, one resorts to Artificial Intelligence Ethics or 'Ethical AI', to address issues involving non-discrimination and fairness, privacy, security etc. In reality not much heed has been paid to the "non humans" i.e., non-human animals and environment.

As also suggested in case of carbon emission problems, here also, to tackle with such issues, one must follow sector-specific guidelines. Some of the countries like in EU, have also developed Artificial Intelligence Act, a legislative framework which calls for "environment sustainability' as voluntary requirement by those developing the Artificial Intelligence. With the increase in the complexities of the circuits and the neural networks, the voice for regulations is getting louder. To these proposals have been made to either make amendments to existing legislative framework in data protection, cybersecurity or consumer related provisions or supervision by national authorities calling for Artificial Intelligence systems audit. When the legislations emphasize on having the 'safety' clause in the legislative picture, the serious issue regarding governance is raised, as the safety mentioned herein refers to the individuals exclusive of environmental sustastainability context.

Product Designing, Big Data and Social Sustainability

Big Data and Artificial Intelligence contributes to not only smarter product designs but also sustainable product designs falling within the objectives of social sustainability. Artificial intelligence focusses much on product design processes, sustainability is a component for smart manufacturing for instance, in smart vehicles the sustainable design provides autonomous, sustainable, shared, individualized transport facility which improvises economic, social and environmental sustainability. Big data impacts the manufacturing process by way of providing flexibility and mobility in experimenting with newer components, products or materials of varied composition. Bio printed products yielded out of bioprinting using AI process promote the biomanufacturing and triggers the sustainability goals. By using the Artificial intelligence techniques and big data once understands the supply chain or rather place of origin of the product, which helps in tracing down its originality and authenticity. Such life-cycle information about the products helps in identification of the functional performance, environment impact etc. Also, when talking about manufacturing, Artificial Intelligence can help reduce wastage and energy consumption while production. In facilities management Artificial Intelligence can help recycle heat within the buildings and maximize the efficiency of heating and cooling and also tracking number of people in that area. The biggest area that relates to identifying and managing business impacts is that of social sustainability, a term less often used as compared to economic or environmental sustainability. Social sustainability is mostly maintained by designers to meet demand preferences while they design products. Any product configuration equipment based on Artificial intelligence, enable designers to effectively make configuration that meets the demands of the consumers and also reduce the cost. For instance, in material science, Artificial Intelligence can facilitate in finding newer material for solar panels for the purpose of extracting electricity by using efficient absorbents. The lesser use oof this

concept of social sustainability is because of its unclear term. Thus, there is a need to pay more attention to this concept, because it determines various operations in the supply chain of the product. If we pat more attention to aspects of social sustainability, artificial intelligence techniques will be able to upgrade the product and its designs economically, socially and environmentally.

There are three domains where the Artificial Intelligence does have an edge on environment sustainability:

Reduction in Error- Artificial Intelligence is much efficient when it comes to performance. Humans are prone to making errors and machines eliminate the risk of doing errors which would consume no extra energy to redo its mistake. The Turing test proves the point here.

Raw Materials: Because of the Artificial Intelligence methods the techniques deploy precision and focus which eliminates wastage and also the raw materials are used to design products in a manner that they are low-carbon and more sustainable environmentally.

Greater Efficiency: Artificial Intelligence contributes to following lesser steps while reengineering the processes. The swiftness and efficiency get the work done as desired.

Conclusion

Though, the Artificial intelligence deployment assures and safeguards the environmental protection, facilitates industry engagements by efficient procedures and less wastage of products and resources but it has its own battles to fight. The developed nations may have carved out ways to set up big servers or infrastructural units to support Artificial Intelligence triggered processes. This has become a major issue in developing and underdeveloped nations where the huge infrastructure requires immense energy and survival resources. By exhausting once's resources for promoting Artificial Intelligence technologies, we cannot balance our sustainability goals and for putting renewable energy to support this technology, we do not have enough sources and plans. The second important concern is in regard to its regulatory framework, framework that calls for protection of environment in the sense of safeguarding its components like environment, wildlife, air, water or waste management. Whether the legislations are enough or sectoral guidelines or policies are enough? Whether we add 'to collateral and incidental technology' to existing laws would suffice or a self-regulatory technology may take over the space? Is a question yet to be finalized? Whatsoever may be the approach, all the nations must adhere to international norms and sustainable goals, to survive. Life subsists on earth for now, mars expeditions won't help in the times of environmental apocalypse.

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