SOCIETY FOR CONSERVATION BIOLOGY

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IMPACTS OF AI ON THE ENVIRONMENT

Artificial intelligence (AI) holds lots of potential in addressing critical environmental challenges. By using its ability to analyze large datasets and predict outcomes, AI is already aiding efforts to fight climate change, protect ecosystems, and manage resources more efficiently. That being said, the rapid expansion of AI infrastructure comes with significant environmental costs, including resource-intensive manufacturing, high energy demands, and water consumption, raising concerns about its sustainability.

NEGATIVE IMPACTS

The production of AI servers and microchips relies on elements and critical minerals, often sourced through unsustainable mining practices. Data centers generate substantial electronic waste and consume vast quantities of water for cooling, exacerbating resource scarcity. Additionally, their immense energy requirements, frequently met by fossil fuels, contribute to greenhouse gas emissions. As AI adoption accelerates, its ecological footprint poses challenges that require urgent attention.

POSITIVE IMPACTS

AI's ability to detect patterns and anomalies makes it a powerful tool for environmental monitoring and protection. Governments and organizations can utilize AI to track greenhouse gas emissions, optimize renewable energy grids, and improve resource management.

INTERVIEW:

DR. HALL
PH.D. CIVIL ENGINEERING
SCHOOL OF ENVIRONMENTAL STUDIES

How does the environmental footprint of AI compare to other major technological innovations?

I'm not sure if I have ever compared AI to other major technological innovations. The environmental footprint of running the AI systems is something that I don't think is well talked about, as the problem is. Everyone gets concerned with one aspect or the other, but it comes down to water, it's the environment, and its communities where these centers are located that are feeling this footprint.

I think that it's a pretty big footprint and it's a footprint that probably is going to get a lot larger. We will get better at doing what we do, and maybe there can be places in which the AI centers can be located where cooling can be offset, such as using climatic conditions. We are accelerating in AI and that requires massive computing. The use of open models such as ChatGPT is free, the fact that it's free means the user base is massive which drives the whole footprint. Even if you are using renewable energy, you are still increasing carbon footprint just to run these things.

-Dr. Hall

In what ways can AI aid in achieving sustainability, and combating environmental concerns?

One of the big things with AI is data. Analyzing data and looking for trends that aren't as clear-cut. But It's even the old tools that people don't think of as AI that are helping. It's things such as image detection, looking at environmental change over time with satellite imagery, that's old school but it's still AI, it's just not what people think about when they think about AI. If you think about the "old school" use of AI its vast, everything from health data in developing economies, its understanding movements of the desert, monitoring and understanding fish populations, it's still AI that is doing all of this.

Where we go in the future, a lot of it we haven't figured out yet. It's very widespread, almost every area is being impacted because it's something that we haven't traditionally thought of as AI until ChatGPT (free AI services) exploded that it does not get the lens put on it that it's happening and expanding

-Dr. Hall

Are there any industries or sectors where AI-driven innovations have led to significant reductions in carbon footprints?

Transportation and even routing (better ways to deliver packages), has become more efficient with AI allowing fewer engines to run while delivering, which then improves carbon footprint. However, we are now a society that really utilized amazon and how they deliver is a different story. But certainly, in just delivering packages, we are getting better at that, it's a very simple piece

I mean anywhere that you are making human activity more efficient that have a link to fossil fuels you are likely going to be reducing footprint

-Dr. Hall

What are the environmental costs associated with the operation of AI and their data centers? (energy consumption & e-waste)

From my side of things at the level that I look at it, the big things are around energy and cooling. Energy from the cooling but also energy to just run the system. Those are the big impacts. There has been discussion about moving them to areas that are cooler.

-Dr. Hall

Moving data centers to cooler regions can significantly reduce their environmental impact by lowering the energy required for cooling systems. Cooler climates allow facilities to rely more on natural cooling, decreasing dependence on energy-intensive air conditioning.

Are there examples where AI has been used in ways that exacerbate environmental issues, such as promoting unsustainable consumption patterns

If we are making things more accessible and efficient then there is likely a negative trade off to that. The fact that ChatGPT is available to everybody means they are computing power needed to explode compared to if it was just select individuals or a paid service and so forth you are going to have small user group but now everyone is going to use it. In many areas if things become more accessible and drive consumer behavior because of it then you have the potential to exacerbate environmental issues.

-Dr. Hall

How do you see the role of AI evolving in the fight against climate change and achieving the SDGs over the next decade?

My option on that is around understanding our data better and the ability for Ai to crunch complex data sets and see trends more efficiently. The **SDGs** are driven on data and there are massive amounts of data. The better we can understand what that data really means will help to achieve this

-Dr. Hall

The **Sustainable Development Goals (SDGs)** are a set of 17 global goals established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. They aim to address major global challenges such as poverty, inequality, climate change, environmental degradation, peace, and justice.

How might AI perpetuate existing environmental inequalities or create new ones?

A lot of that comes down to accessibility, equity in its use. In the global north there is the infrastructure, the money to drive a lot of that whereas in other places there might not be. The Plant Village was specifically developed to try and eliminate that barrier. A system that could stay on your cellphones and can be used without satellite"

-Dr. Hall

The plant village or Nuro was an app created with AI that farmers can use to detect over 150, 000 plant diseases with the use of any cellphone and no cell link needed. This is one way in which AI was used and combined with low-tech solutions to address productivity concerns of farmers' crops.

How can policymakers ensure that the environmental benefits of AI outweigh its costs?

In my opinion, from a policy side of things, it comes down to having a proper understanding of it. Maybe that is where the comment around **the precautionary principle** comes in, not just how might AI negatively have an impact but in having an understanding of what the sustainability implications are if we move forward with it.

-Dr. Hall

The precautionary principle is an approach to risk management that advocates for taking preventative action in the face of uncertainty. In terms of the use of AI this principle encourages a cautious and responsible approach to its development, deployment, and regulation, especially given AI's potential for significant societal, ethical, and environmental impacts

We would like to thank Dr. Hall for taking the time to answer our questions!