AI IN ENVIRONMENT

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In recent years, environmental issues such as global warming and ocean plastic problems have become more serious. It is known that AI is also greatly involved in environmental issues for the following two major reasons. On the other hand, environmentally friendly AI is also being invented. In order to stop the escalation of environmental problems, it is necessary to rethink the way people interact with AI, considering that AI is involved in environmental problems as well as plastic problems and air pollution.

The reasons for AI's involvement in environmental issues are as follows

The first is that the process of training a single AI model, such as Large Language Models (LLMs), can consume thousands of megawatts of power and emit hundreds of tons of carbon dioxide. Researchers and policymakers say that incorporating LLMs into search engines, as Microsoft recently did with Bing, could increase the carbon dioxide emissions associated with search by up to a factor of 5.[1] Hugging Face has analyzed the emissions associated with training its own autoregressive LLM, BLOOM's An analysis of the emissions associated with training shows that 25 tons of carbon dioxide is being emitted. However, this figure would be much larger if the emissions associated with the manufacture of the computer equipment used to train the model were included. [2]

[1] Shaolei,Ren. Adam,Wierman. “The Uneven Distribution of AI’s Environmental Impacts.” Harvard Business Review, Jul. 2024, https://hbr.org/2024/07/the-uneven-distribution-of-ais-environmental-impacts.

[2] Green software Foundation, “Measuring carbon emissions is essential to scale up sustainable AI.” State of Green software, 2023, https://stateof.greensoftware.foundation/ja/insights/measuring-carbon-emissions-crucial-for-scaling-sustainable-ai/.

The second is the boom in generative AI has led to an ongoing construction boom in data centers. Cooling data centers requires large amounts of water, and the risk of depletion is increasing. We want to stay in cool, air-conditioned rooms. We need to hydrate frequently. It is not only humans who think this way. Data centers also need large amounts of water for cooling. As demand for data centers increases against the backdrop of the generation AI boom, the risk of water shortages is becoming more apparent. [3] the Middle East and North Africa, where water shortages are the most severe in the world, 60% of the population currently lives in water-scarce areas and will suffer the largest economic losses ever, an estimated 6-14% by 2050.[4] In addition, the large water consumption associated with AI could strain local freshwater resources, directly for server cooling and indirectly for off-site power generation, and exacerbate long-term droughts in water-scarce regions such as Arizona and Chile. [51]

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[3] Nikkei XTECH. “Generation AI reveals water depletion risk; GPT empties plastic bottles in 10 queries.” Nikkei Crotex, 27 Aug. 2024, https://www.worldbank.org/en/topic/water/publication/ebb-and-flow-water-migration-and-development.

[4] WORLD BANK GROUP. “Ebb and Flow: Water, Migration, and Development.” World Bank, 23 Aug. 2021, https://www.worldbank.org/en/topic/water/publication/ebb-and-flow-water-migration-and-development.

[51] Shaolei,Ren. Adam,Wierman. “The Uneven Distribution of AI’s Environmental Impacts.” Harvard Business Review, Jul. 2024, https://hbr.org/2024/07/the-uneven-distribution-of-ais-environmental-impacts.

Although AI has a negative impact on the environment for the above reasons, advances in data center power and cooling infrastructure, as evidenced by power usage efficiency (PUE) dropping from 2.0 to 1.1 or lower in state-of-the-art data center facilities, have made significant progress in reducing AI computing's once significant progress in reducing the high energy overhead. 1New approaches are being introduced that address the challenges posed by traditional air conditioning systems and allow for more efficient and advanced temperature control. One such approach is liquid cooling systems. By using a cooling liquid with high conductivity, this system achieves a cooling effect superior to air cooling and effectively cools the equipment in the data center. This significantly reduces the cooling footprint for heat dissipation and saves energy for the equipment. The evolution of air conditioning technology will also focus on precise control of cooling. This evolution will seek to improve data center performance as well as the efficient use of energy. [5]

In addition, data center operators have pursued a variety of strategies to achieve "net zero" emissions, including developing large-scale solar power plants and procuring renewable energy credits.[6] The Intergovernmental Panel on Climate Change (IPCC) has stated that in order to limit global warming to 1.5°C (2.7°F) above pre-industrial levels (beyond which the effects of climate change would be significantly more severe), virtually zero (net zero) carbon dioxide (CO2) emissions worldwide by around 2050 The proponents state that net-zero emissions will be achieved. Proponents believe that achieving net zero will slow temperature rise, create new economic opportunities, improve public health, and contribute to a better environment for future generations. [76]

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[65] PANDUIT infrastructure. "Data Center Cooling Strategies! Innovation at the forefront of air conditioning." Panduit, 12 Jan. 2024, https://www.panduit.co.jp/column/datacenter/16294/.
Shaolei,Ren. Adam,Wierman. "The Uneven Distribution of AI's Environmental Impacts." Harvard Business Review, Jul. 2024, https://hbr.org/2024/07/the-uneven-distribution-of-ais-environmental-impacts.
[76] IBM. "What is Net Zero?" IBM, 21 Mar, 2024, https://www.ibm.com/jp-ja/topics/net-zero#:~:text=.

Unfortunately, disparities between regions and communities due to the environmental impacts of AI continue to grow. In many cases, the negative environmental impacts of AI place a disproportionate burden on regions and communities that are particularly vulnerable to the resulting environmental damage.1 Google announced on April 20 that it will invest an additional €1 billion ($1.1 billion) in the expansion of its data center in Finland to facilitate the growth of its artificial intelligence (AI) business in Europe, and wind power generation in Finland has surged in recent years, growing 75% to 5,677 megawatts in 2022 alone, with wind On strong days, electricity prices have dropped to negative levels.[87] However, one scientist has found that the widening gap between developing and developed countries can occur along three different pathways: contribution to production, investment flows, and terms of trade. [98]
I think that future detailed examination of these three pathways will eliminate disparities between regions and communities due to the environmental impacts of AI.

While the uneven distribution of AI's environmental impacts can have unintended and unforeseen socioeconomic consequences without public knowledge, AI stakeholders aim to raise awareness of the environmental inequities of AI among the business community and the general public. As we strive to develop environmentally friendly AI, we must not focus solely on easily measurable sustainability metrics such as carbon emissions and water consumption, overlooking equity in the process; the environmental impact of AI must resonate with local priorities and interests. This is why I think people should look at the environment and AI alternately and consider how to engage with them.

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[87] Reuters. “Google to invest an additional €1 billion in Finnish data center.” Reuters, 21 May. 2024, https://jp.reuters.com/business/HCSEJLH2KFJDXJ2SCZE6U6DZZQ-2024-05-21/.

[98] Cristian, Alonso. Siddharth,Kothari. Sidra, Rehman. “How Artificial Intelligence Could Widen the Gap Between Rich and Poor Nations.” International Monetary Fund, 02 Dec. 2020, https://www.imf.org/ja/Blogs/Articles/2020/12/02/blog-how-artificial-intelligence-could-widen-the-gap-between-rich-and-poor-nations.