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Artificial Intelligence's Environmental Costs and Promise

Artificial intelligence has been cited as a potential tool for combatting climate change. Technology companies, however, need to do more to prevent AI from becoming a source of environmental degradation.



Tesla CEO Elon Musk speaks at the ground breaking ceremony for a Tesla factory in Shanghai in 2019. Reuters

Blog Post by Elsabet Jones and Baylee Easterday, Guest Contributors

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Artificial intelligence (AI) is often presented in binary terms in both popular culture and political analysis. Either it represents the key to a futuristic utopia defined by the

integration of human intelligence and technological prowess, or it is the first step toward a dystopian rise of machines. This same binary thinking is practiced by academics, entrepreneurs, and even activists in relation to the application of AI in combating climate change. The technology industry's singular focus on AI's role in creating a new technological utopia obscures the ways that AI can exacerbate environmental degradation, often in ways that directly harm marginalized populations. In order to utilize AI in fighting climate change in a way that both embraces its technological promise and acknowledges its heavy energy use, the technology companies leading the AI charge need to explore solutions to the environmental impacts of AI.

AI can be a powerful tool to fight climate change. AI self-driving cars, for instance, may reduce emissions by 50 percent by 2050 by identifying the most efficient routes. Employing AI in agriculture produces higher yields; peanut farmers in India achieved a 30 percent larger harvest by using AI technology. In addition, AI can provide faster and more accurate analysis of satellite images that identify disaster-stricken areas in need of assistance or rainforest destruction. AI-driven data analysis can also help predict hazardous weather patterns and increase accountability by precisely monitoring whether governments and companies are sticking to their emissions targets.

Yet AI and the broader internet and communications industry have increasingly come under fire for using exorbitant amounts of energy. Take data processing, for example. The supercomputers used to run cutting-edge AI programs are powered by the public electricity grid and supported by back up diesel-powered generators. Training a single AI system can emit over 250,000 pounds of carbon dioxide. In fact, the use of AI technology across all sectors produces carbon dioxide emissions at a level comparable to the aviation industry. These additional emissions disproportionately impact historically marginalized communities who often live in heavily polluted areas and are more directly affected by the health hazards of pollution.

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Recently, AI scientists and engineers have responded to these critiques and are considering new sources for powering data farms. However, even new, ostensibly more sustainable energy sources such as rechargeable batteries can exacerbate climate change and harm communities. Most rechargeable batteries are built using lithium, a rare earth metal whose extraction can have negative effects for marginalized communities. Lithium extraction, which is fueled by an increasing demand for cleaner energy sources, demands enormous water usage, to the tune of 500,000 gallons of water for every ton of lithium extracted. In Chile, the second largest producer of lithium in the world, indigenous communities like the Copiapó people in the North often clash with mining companies over land and water rights. These mining activities are so water intensive, the Institute for Energy Research reports that in Salar de Atacama they consumed 65 percent of the region's water. This water loss damages and permanently depletes wetlands and water sources, which has caused native species of flora and fauna to become endangered and affected local populations. Portraying

lithium as “clean” energy simply because it is less environmentally disastrous than diesel or coal is a false dichotomy, which discourages stakeholders from pursuing newer, greener energy sources.

The development of artificial intelligence technology is a symbol of incredible progress; however, progress is not one size fits all, and the companies developing these technologies have a responsibility to ensure that marginalized communities do not bear the brunt of the negative side effects of the AI revolution.

Some data farms have shifted to running entirely on clean energy. Iceland's data farms, for example, largely run on clean energy powered by the island's hydroelectric and geothermal resources, and the country has become a popular location for new data centers. These data centers also don't need to be cooled by energy-intensive fans or air conditioning—Iceland's cold climate does the trick. However, Iceland is particularly well suited to hosting data processing centers, and most countries aren't able to replicate the unique environmental conditions.

Large data companies can avoid the pitfalls of lithium batteries by using physical batteries. Made of concrete, these batteries store gravitational potential energy in elevated concrete blocks which can then be harnessed at any point. This isn't some far off idea—in a Swiss valley two 35 ton concrete blocks are suspended by a 246 foot tower. These are an early prototype of what a physical battery could look like, and together, they hold enough energy to power two thousand homes (two megawatts). Physical batteries are a potential alternative to lithium batteries with a lower cost to the environment and marginalized communities, and which could be built from commonly available materials, such as concrete.

The U.S. government, through the Department of Energy and the Defense Advanced Research Projects Agency (DARPA), has invested billions of dollars in improving lithium batteries, especially by creating solid-state lithium ion batteries, which could provide better safety, energy density, and lifespan compared to traditional lithium ion

batteries. Some private companies have made commitments to expand their use of lithium ion technology in their facilities, including Google, which has created a pilot program to phase out diesel generators at some data centers and replace them with lithium ion batteries. These investments are not enough, especially at a time when electric vehicle manufacturers and the U.S. government are making multi-billion dollar investments in new kinds of batteries. Technology companies need to do more to help solve the energy use and storage issues posed by AI.

AI presents a number of advantages for solving the current climate crisis, but the potential environmental side effects are hard to ignore. Technology companies have often been lauded for their creativity and ingenuity, and they need to apply these skills to solve the problems associated with artificial intelligence.

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