

BOOK REVIEW

Is AI Good for the Planet? Benedetta Brevini (2021) 160pp., \$US13 paperback, Polity Press, Cambridge, ISBN: 978-1509547951

Artificial Intelligence (AI) has been hailed as an essential solution to practically all critical challenges faced by humanity, including climate change and other natural disasters. In parallel with its proliferation over the course of the last decade, critical voices have grown stronger as well, however. These critics observe that today's AI systems power a new type of surveillance capitalism and attention economy (Zuboff, 2019), that they aggravate power disparities and cause new monopolies to emerge, and that they are based on the exploitation of cheap 'data workers' and extensive resource extraction that is damaging the environment (Crawford, 2021). Benedetta Brevini's short book adds to this growing body of critical literature, focusing on the relationship between AI and the climate crisis. Given the urgency of this crisis and the scarcity of detailed arguments in the public discourse on whether and how AI can contribute to its solution, Brevini's book is certainly timely. A quick glance at the table of contents firmly establishes the author's stance on the question posed in the title, with chapters on AI hype, data capitalism and why AI worsens the climate crisis. Does it? Could it also be a force for planetary good?

To understand its potential for environmental impact, Brevini first examines today's main drivers of AI development. These are, first and foremost, economic and competitive (Bughin *et al.*, 2018). As of early 2022, eight of the world's ten most valuable companies are technology companies, all of them heavily invested in and profiting from AI. Brevini calls (a subset of) these companies the 'digital lords' (p.26), referring to their far-reaching, near-monopolistic power over our digital lives and the lack of democratic oversight of their activities. Leaving aside discussions about the proper use of the term 'AI' – current techniques might be more appropriately labelled 'machine learning' (Pretz, 2021) and whether or how quickly the current approaches will bring us to 'true' AI (Mitchell, 2019), it is apparent that AI will have, and is already having, a tremendous impact across the economy. According to a 2021 McKinsey report, common business use cases of AI already range from service operations, AI-based product enhancement, marketing, supply-chain management and business analytics to manufacturing (Chui *et al.*, 2021). An earlier McKinsey report estimates that AI may cause an additional increase in global GDP of 1.2% per year by 2030, putting its impact above that of earlier general-purpose technologies such as the steam engine or robotics in manufacturing (Bughin *et al.*, 2018). So, comparing the development of AI with earlier breakthrough techniques such as the steam engine and electricity does not appear unreasonable, at least if one considers these projections credible. As a result, leaders of democratic countries and CEOs of companies alike feel an intense pressure to adopt and invest heavily in AI technology to stay competitive in the global economy (pp.16–23).

Does this mean, however, that AI will tackle society's pressing problems, ranging from inequity to the climate crisis? That seems unlikely. Brevini, drawing on classical critiques of technological determinism, emphasizes that 'technological "fixes" have historically been developed to remove barriers to capital accumulation, not to address inequalities' (p.26). In the same way, AI developments are primarily driven by the motive of profit maximization, not by societal needs, and there is little reason to believe that AI will 'accidentally' also solve societal and environmental problems (pp.25–9). AI research, especially in the US, is overwhelmingly dependent on and driven by the big technology companies, a fact that has led to increasing criticism in recent years (see Whittaker, 2021). On the contrary, Brevini argues that, by enabling efficiency gains, boosting productivity, increasing marketing effectiveness and powering product personalization, AI will

encourage ‘uber-consumerism’ (p.22) and so exacerbate the existing problems caused by boundless profit maximization regardless of social and environmental costs.

This, then, according to Brevini, is one of the main ways in which AI harms the planet – by acting as a catalyst for consumerism and thereby intensifying its environmental costs (p.64). While a plausible hypothesis, at least to this reader, it is not immediately evident that this is true. Brevini provides little scientific evidence, nor does there appear to be much available in the literature. Consumer demand was increasing a long time before the proliferation of AI; do we consume more now (or in the near future) *because of* AI? The McKinsey report mentions that ‘a sizable portion of innovation gains come as a result of competition that shifts market share from nonadopters to front-runners’, thus indicating that projected economic gains do not originate exclusively in increased overall consumption (Bughin *et al.*, 2018). It certainly appears plausible that AI adoption drives consumption in various ways (more effective marketing, product personalization, efficiency gains, cost reductions), but more research seems warranted to substantiate this hypothesis.

The second main way in which, according to Brevini, AI contributes to the climate crisis is more direct: gathering the necessary data and training AI models consumes a large and rapidly growing amount of energy and natural resources. This occurs in various stages throughout the life cycle of an AI system. The training of large models itself is now (somewhat) well-known to have a very significant carbon footprint (Strubell *et al.*, 2020) which will likely further explode considering the ever-increasing size of current ‘foundation models’. Some cause for hope in this regard is given by the fact that this carbon footprint is comparatively simple to track (Henderson *et al.*, 2020; Anthony *et al.*, 2020) and, thus, manage. For example, based on such carbon footprint tracking tools, some AI conferences are beginning to ask authors for information regarding their work’s carbon footprint. Moreover, with such carbon impact estimates now available, a multitude of potential techniques for reducing the carbon impact of model training can be explored, promising very significant impact reductions with relatively minor changes (Gupta *et al.*, 2021; Patterson *et al.*, forthcoming). These are certainly promising steps in the right direction. Nevertheless, the carbon impact of model training represents a crucial challenge that should be more widely discussed, both publicly and in the academic community.

However, model training is responsible for only a part of the resource usage associated with AI. While it does not seem justified to associate the environmental footprint of the entire global IT industry with AI, as Brevini sometimes appears to do (pp.82–7), it is undoubtedly true that a significant part of it is at least partially attributable to the use of AI (IEA, 2021). Most prominently, this includes the infrastructure for gathering and processing vast amounts of data (required for training AI models) and the immense amounts of toxic and non-biodegradable e-waste associated with end-user devices exploiting AI capabilities. According to the IEA, data centres and data transmission networks each accounted for around 1% of global electricity usage in 2020 (IEA, 2021), together roughly equalling the total electricity consumption of Germany. Cooling today’s huge data centres is another significant driver of environmental impact. Motivated by energy-related expenses already making up a significant fraction of the cost of operating these systems, large gains in energy efficiency have been achieved in recent years, partly compensating for the steep increase in consumer demand and internet traffic (IEA, 2021). Partly because of these efficiency gains, it has been estimated that by far the larger share of the carbon impact of today’s ICT technology stems from hardware manufacturing and infrastructure, resulting in a carbon footprint of the ICT industry that is still growing despite all efficiency gains and net-zero pledges (Gupta *et al.*, 2021). As in many other areas of our globalized economy, the harms caused by the extraction of the required resources and the disposal of toxic waste are largely out-sourced to poorer regions of the world, as has recently been explored in depth by Kate Crawford (2021). However, it is crucial to realize that these harms are not symptoms of AI specifically; instead, they are symptoms of an economic environment that incentivizes profit maximization, consumerism and planned obsolescence at the cost of resource and energy consumption and waste production. The same can be said of Brevini’s criticism of the

use of AI techniques in fossil resource extraction: the problem is not AI; the problem is that we still use and extract fossil resources.

Comparatively little space in the book is devoted to ways in which AI *can* be good for the planet – and these are, indeed, manifold (Rolnick *et al.*, forthcoming). AI can help increase energy efficiency in various domains, optimize supply chains and develop new, sustainable materials or better batteries. It can be used to monitor greenhouse gas emissions, deforestation and wildlife conservation efforts (Tuia *et al.* 2022). AI can enable predictive maintenance (thus extending product lifetime), as for wind turbines and trains, and improve the precision and efficiency of recycling plants. It can be used for precision agriculture, enabling optimal crop selection, reduced pesticide and water use, and optimal livestock health management.

In all these domains, it is essential to consider the risk of techno-solutionism, also discussed by Brevini (pp.25–35). Is an AI fix really what is needed, or is the fix really only a band-aid, often motivated by potential economic gain and distracting from a deeper problem? The use of harvesting drones in agriculture does not alleviate the need to switch away from intensively farmed monocultures to a more sustainable, regenerative and humane agriculture. Is our vision for a sustainable future to have large, drone-farmed fields and livestock equipped with physiological sensors and augmented reality goggles? Indeed, is this sustainable, considering the environmental costs associated with the mass use of AI and drones or robots? All AI solutions come with an associated environmental cost that must be outweighed by the reaped benefits. Moreover, proposed AI-based solutions must not distract us from less sexy (and less profitable) low-technology solutions, many of which have been known for a long time. Finally, owing to the fundamental nature of this technology, AI solutions are typically associated with a risk of increased centralization and societal dependence on international profit-driven technology companies and technologies.

Containing the risks and aligning AI development efforts for maximum positive environmental impact will depend largely on society putting in place the right incentives. Brevini appears very pessimistic in this regard, writing about ‘the total abdication of strategic decisions and choices on the direction of AI research and development, from government to corporate boardrooms’ (pp.61–2). This has certainly been true in the past, but appears to be changing now. The European Union has recently put forth a whole series of far-reaching policy proposals, including the Digital Markets Act, Digital Services Act, and Artificial Intelligence Act, all of which entail significant limitations to the power of the ‘digital lords’ and are meant to ensure compatibility with existing EU law. One should keep in mind the EU’s ongoing struggles to enforce the GDPR (see Massé, 2021). At the same time, tightening environmental regulations and rising carbon prices will also affect the AI industry, encouraging both less energy-intensive ways of operating AI systems and the development of AI-based technologies for reducing carbon emissions in other domains. As is known from the progressively worsening IPCC projections, much more stringent policy action is needed (IPCC, 2022). Holding multinational companies effectively accountable for environmental harms committed along their supply chain in other parts of the world remains a crucial challenge, with direct consequences for the environmental impact of AI.

To conclude, it seems increasingly clear that AI indeed represents a new general-purpose technology that will permeate all aspects of society. Being general-purpose implies that it has the potential to both aggravate and help solve our pressing environmental problems, as has been widely emphasized. Whether the impact of AI on the climate and our natural environment more broadly will be net positive or negative will depend almost exclusively on the predominant social and economic incentives influencing AI developers and companies. As Brevini puts it in her introduction, ‘without challenging the current myths of limitless economic growth and boundless consumerism, without reconsidering the way in which the structures, the violence and the inequality of capitalism work, we won’t be able to achieve the radical change we need if we are to tackle the climate crisis’ (p.14). Juxtaposed with this insight, Brevini’s concluding call for action appears almost tame. She emphasizes the need for public discourse and increased technology literacy, transparency about the environmental costs of AI, green activism and more open and unbiased (by corporate influence)

research about the environmental impact of AI. While these are all crucially important, the fundamental challenge remains that societal and economic incentives are not aligned with societal and environmental needs. Arguably, the question posed in the title of the book could be reformulated as: is the economy good for the planet?

How to transform our economy to one that *is* good for the planet has, of course, troubled ecological thinkers for many decades. Proposed solutions abound from degrowth (Kallis *et al.*, 2012) and green growth (Hickel and Kallis, 2020) to doughnut economics (Raworth, 2017), cradle-to-cradle or regenerative design (McDonough and Braungart, 2002), and stakeholder capitalism (Schwab and Vanham, 2021). So far, these proposals have seen little uptake, but one can hope that the urgency of the looming climate disaster may change this. If we do succeed in transitioning to an economic environment that incentivizes finding balance instead of growth at all costs, and if we do not let AI distract us from simple, low-technology, economically unattractive solutions, AI may indeed come to play an important role in solving the climate crisis. There are, after all, many ways in which it can help.

Brevini's book provides neither a fully comprehensive analysis of the subject matter nor final answers or conclusions, but this does not seem to be the book's aim. Instead, the book may serve as a spark for public discourse and an urgent call to action for more research, policy action and public advocacy on this subject. Given its brevity and its non-technical, opinionated and engaging writing style, it is well-positioned to achieve this aim.

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