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Can artificial intelligence help us protect the climate?

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Artificial intelligence (AI) promises to transform the economy and society and thus contribute to climate protection. However, despite over ten years of rapidly advancing digitalisation, our climate problems remain unsolved. Why should this be fundamentally different with AI?

Many companies involved in the development of AI promise that it will help to reduce greenhouse gas emissions by facilitating the dematerialisation of physical processes, improving resource and energy efficiency or closing material cycles [1], [2]. Even EU Commission President Ursula von der Leyen emphasised in her speech (year, place): “The same should apply to artificial intelligence. It will improve healthcare, increase productivity and combat climate change” [3].

However, such hopes are not supported by scientific findings, as there are still too few studies on the emission effects of AI. There are, however, empirical studies on the climate impact of digital technologies, and these call into question the optimism of the AI industry and politicians. They show that digitalisation has at best led to a small reduction in greenhouse gas emissions or has even increased them [4], [5]. The reasons for this are that digital technologies are resource- and energy-intensive in production and operation and often intensify climate-damaging activities due to rebound effects [6]. And this also applies to AI.

Energy-intensive development and operation

The development, training and operation of large AI models can be very energy-intensive. The computing effort for training doubled every 24 months until 2012, every 3.4 months since 2012 and every 2 months since 2019 [7], [8]. The operation of the models, in which a model answers queries, can also require a lot of energy. Dutch digitalisation expert Alex De Vries recently estimated that the electricity consumption of Google searches would increase to around 30 TWh per year if generative AI were to be used. That is more than the annual electricity consumption of countries such as Portugal or Hungary [9]. The immense energy demand has now led to AI companies such as Microsoft and Alphabet having to rethink their climate targets [10], [11]. However, it should be emphasised that this only applies to very large AI models, and most AI applications require significantly less energy. Nevertheless, it is important to develop measures to utilise the potential of AI while keeping energy consumption and emissions low. This also includes guidelines on when AI offers added value and when it can be dispensed with [9].

AI in use: both a blessing and a curse

New AI applications will penetrate all sectors of the economy, such as transport and industry, and there is enormous potential for climate protection here. This is because AI can help accelerate the development of low-emission technologies or increase resource efficiency in agriculture [12]. A study by Microsoft and PricewaterhouseCoopers predicts that AI applications will avoid over 4% of global greenhouse gas (GHG) emissions by 2030 [13]; the Boston Consulting Group (BCG) estimates that the technology could already reduce 5 to 10 % of global GHG emissions today [14].

Although these potentials exist, they are based on very optimistic assumptions and ignore climate-damaging effects. For example, AI can also be used to expand meat production, intensify oil and gas exploration or increase online consumption through personalised advertising [2].

It is dangerous to only look at one side of the coin. Over-optimistic studies fuel the belief that the climate problem could solve itself. According to BCG, 87% of "climate and AI leaders" now expect AI to help combat the climate crisis [15].

We should not fall into the same trap again

About ten years ago, we were at a similar point in the area of digitalisation and climate protection. IT industry associations and companies touted the climate protection potential of digital technologies and raised hopes that digitalisation was a miracle weapon for climate protection. We now know that this scenario did not materialise and that the contribution to climate protection was overestimated [4], [6]. To avoid falling into the same trap with AI, we need to think in terms of the target. Climate-damaging sectors such as transport or agriculture must consider how AI can be used to achieve an absolute reduction in emissions. Ultimately, however, we also need the political and social will to implement such measures. After all, it has been known for years that we should drive less and eat less meat, and AI will not change this.

This article is based on a recently published paper in the proceedings of the ICT for Sustainability conference. ***Preprint_Bieser_ML Research Gaps [https://www.societybyte.swiss/wp-content/uploads/2024/07/Preprint_Bieser_ML-Research-Gaps.pdf]***

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