



Reply: Environmental impact reporting in the reporting checklist for foundation and large language models (REFINE): considerations for future updates

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Dear Editor,

We thank the author for this constructive letter and for drawing the scientific community's attention to environmental impact reporting in studies involving foundation models and large language models.¹ We agree that environmental sustainability is an increasingly important dimension of responsible medical artificial intelligence (AI) research practices.^{2,3} Although the reporting checklist for foundation and large language models (REFINE) already requests reporting of computational requirements under item 1.8, environmental impact represents a related but broader consideration that warrants dedicated discussion.⁴

The current version of the REFINE reflects the scope and consensus achieved through its prespecified Delphi process. It was not intended to be a static framework. As stated in the original publication, the REFINE will undergo formal re-evaluation every two years, informed by community feedback, emerging evidence, and developments in related reporting standards.⁴ The proposal introduced in this correspondence will be explicitly included in that re-evaluation and presented to the Delphi panel for consideration. The panel can then determine whether environmental reporting should be incorporated into item 1.8, introduced as a separate or conditional item, or addressed through additional reporting guidance.

At that stage, the key issue will be how to translate this important principle into guidance that is both scientifically meaningful and feasible across diverse research settings. Environmental impacts of AI in healthcare remain understudied.⁵ In radiology AI studies, environmental outcomes are infrequently quantified and are often addressed only briefly.⁶ Moreover, available approaches for estimating computational carbon footprints depend on information such as hardware characteristics, runtime, processor utilization, memory use, data-center efficiency, geographic location, and electricity carbon intensity.⁷ When these inputs are unavailable or based largely on assumptions, the resulting estimates may be imprecise or misleading. These do not diminish the importance of environmental reporting; rather, they highlight the need for proportionate guidance that distinguishes directly measured information from assumptions and indirect estimates. Accordingly, the next REFINE update should determine how environmental impact can be reported transparently without requiring information that investigators cannot reliably measure or obtain. In the meantime, researchers may consider using tools such as EcoLogits (<https://calculator.ecologits.ai/>) to obtain approximate estimates of the energy consumption and environmental impact associated with the use of generative AI models.

We appreciate the author's proposal as a timely and constructive contribution to the REFINE's evolution. Community correspondence is precisely the type of input needed to ensure that reporting guidelines remain relevant as foundation models, large language models, and their broader societal implications continue to evolve.

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