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ARTIFICIAL INTELLIGENCE AND INFORMATICS

LETTER TO THE EDITOR

From computational requirements to environmental reporting: a proportionate extension to the reporting checklist for foundation and large language models (REFINE)

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Dear Editor,

The reporting checklist for foundation and large language models (REFINE) in medical research[1] is a valuable advance toward transparent and reproducible reporting. One proportionate addition would strengthen it further.

REFINE item 1.8 asks authors to report computational requirements, including hardware, accelerator type, compute nodes, memory, runtime, and cloud specifications across training, fine-tuning, and inference. This is a strong foundation, but it stops at computational inputs; it does not explicitly request environmental estimates or the contextual information needed to derive them. Such reporting remains uncommon: A recent systematic review found only 6 of 18 radiology artificial intelligence (AI) studies quantified environmental outcomes.[2]

Computational disclosure is necessary for environmental reporting but not sufficient for it. Established methods such as Green Algorithms[3] estimate carbon dioxide equivalent (CO_2e) emissions from processing time, core type, and memory, together with contextual factors absent from item 1.8, including facility efficiency and the carbon intensity of the electricity used. Without these contextual factors or an explicit environmental estimate, readers cannot consistently compare or aggregate environmental burdens across studies, even when computational specifications are reported.

This is not a call for mandatory emissions calculations; reporting should be proportionate and feasible. For locally hosted, trained, or fine-tuned models, authors may be able to report computing location, measured energy use, facility efficiency where available, or estimated CO_2e emissions. For proprietary systems accessed through a web interface or application programming interface, reporting can reasonably be limited to available usage proxies, including the model and version, access method, token or query counts, and repeated runs, with an explicit statement when provider opacity precludes direct estimation.

There is precedent. The Framework for Large Language Models Assessment in Radiology (FLAIR), a contemporaneous international Delphi-based radiology guideline, incorporated resource efficiency, including carbon footprint, as a new reporting item to be applied where appropriate;[4] this inclusion was explicitly considered during the Delphi process.

This is not an argument against AI in medicine, whose benefits are substantial and may, as demonstrated in radiology, include efficiencies that reduce environmental burden.[5] As AI becomes more deeply embedded in medical research, those benefits are best pursued alongside transparent reporting of the resources required to achieve them. Proportionate environmental reporting would not discourage innovation; it would place it within a fuller account of its costs.

At the REFINE's planned biennial re-evaluation, a proportionate when-feasible environmental-reporting subitem linked to item 1.8 merits consideration. Such an item would harmonize the REFINE with the precedent established by FLAIR, enable more consistent comparison of environmental burdens across studies, and help readers assess, alongside reported model

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performance, whether additional computational expenditure yields meaningful gains.

Footnotes

Conflict of interest disclosure

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