How Sustainable Is AI Research? Insights from Brazil's Largest AI Conference

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Abstract

Promoting sustainability is a worldwide challenge that encourages all sectors of society to cultivate a sense of responsibility for the ecological, social, and economic network that supports us. This ongoing research aims to analyze how Brazil's artificial intelligence community has considered environmental sustainability. This paper presents the results of an assessment of how frequently and in what ways environmental sustainability is addressed in Brazil's largest artificial intelligence conference, BRACIS. The study analyzed 146 articles from the 2025 edition and categorized them into three levels of relation to environmental sustainability: direct, indirect, and none. The methodology included examination of titles, abstracts, full-text keyword analysis, and contextual verification to ensure accurate classification. The results reveal a substantial research gap: most articles showed no connection to environmental sustainability, and only about 3% presented explicit and meaningful sustainability indicators. These findings highlight the limited integration of environmental considerations in Brazilian AI research and reinforce the need for greater alignment with global sustainability goals.

CCS Concepts

• **Computing methodologies** → *Artificial intelligence.*

Keywords

Artificial Intelligence, Sustainability, Assessment

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1 Introduction

Sustainability is often understood as using fewer resources and producing less waste, but in reality, it means way more than that. Promoting sustainability is a worldwide challenge that encourages all sectors of society to cultivate a sense of responsibility for the ecological, social, and economic network that supports us [10]. This perspective aligns strongly with Sustainable Development Goal 12, one of the 17 Sustainable Development Goals created by the United Nations in 2015, which stresses the need for responsible consumption and production patterns that preserve natural resources [11]. Achieving SDG 12 requires not only individual behavioral changes but also systemic transformation in governmental, industrial, and technological practices. As a result, this concept has driven significant lifestyle and policy changes in multiple areas, especially in the technological field, which increasingly seeks innovations that reduce environmental impact while maintaining economic growth.[12]

One of the most rapidly evolving areas in recent years is artificial intelligence (AI). AI holds great potential for promoting a more sustainable world through advanced data analysis, resource optimization, and efficient automation [13]. Although its applications offer numerous benefits in environmentally focused contexts, the technology still demands substantial resources, such as water and energy, for model training and operation [9]. Considering how widely AI has spread across the globe, it becomes essential to evaluate not only its environmental impacts but also how responsibly and sustainably societies and industries are using it [4].

In this context, considering the increasing volume of research exploring different applications of AI across various fields, it becomes possible to assess the level of importance given to sustainability by examining academic publications that reference artificial intelligence [3].

This study aims to analyze how sustainability is addressed within the context of Brazil's largest AI event, the Brazilian Conference on Intelligent Systems (BRACIS), and to identify the extent to which research papers presented at the conference incorporate sustainability indicators or considerations in 2025 [1]. The goal is to evaluate not only how frequently sustainability is mentioned, but also how meaningfully it is integrated into the research, providing insights into whether discussions of AI in Brazil align with sustainable development priorities.

2 Methodology

In order to evaluate how sustainability aspects has been addressed by researchers in Brazil, the BRACIS event was selected due to its relevance and impact in the field. A total of 146 articles written in English and presented at the 2025 edition of the event were analyzed. The classification was conducted manually by a single reviewer, and the results were later discussed to ensure consistency and validity. All articles were accessed through the official conference proceedings, and a spreadsheet was used to record classifications, notes, and observations.

The main objective of this study was to determine whether the authors provided any indicators or direct mentions of sustainability

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in their work, focusing exclusively on environmental sustainability. The articles were categorized into three groups: direct relation, indirect relation, and no relation. Articles classified as having a *direct relation* contained explicit references or indicators related to environmental sustainability. Articles categorized as *indirect relation* included references that could potentially be interpreted as environmentally relevant sustainability indicators, such as mentions of energy consumption that were not specifically framed within a sustainable context. Articles classified as *no relation* did not present any explicit or implicit references to environmental sustainability.

The analysis procedure was conducted in three stages, as depicted in Figure 1. First, the title and abstract of each article were reviewed to understand its general context. Even if a direct indicator was identified at this stage, the remaining steps were still applied. Next, the full text was scanned for specific keywords related to sustainability, including *sustainability*, *energy*, *consumption*, *execution time*, and *kW*. When a keyword was identified, the complete paragraph in which it appeared was read to verify that the term was used in relation to environmental sustainability rather than in a different context. Finally, the conclusion section was examined to ensure that potential indicators not captured through keywords were considered. Based on these combined observations, each article was classified according to the established criteria.

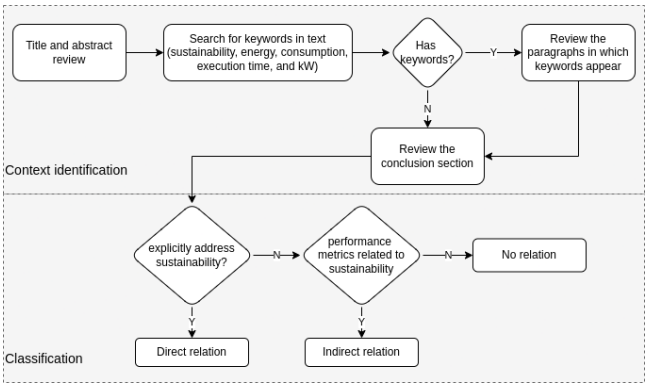

Figure 1: Methodology workflow

3 Results

Figure 2 summarizes the analysis results. The majority evaluated articles (87.7%) did not contain any direct or indirect relation to sustainability. In the second category, 8.9% were classified as having an indirect relation, and only 3.4% had an explicit relation to sustainability in an environmental context.

Among the articles classified as having an indirect relation, the most recurrent term identified was *"execution time."* A total of 13 articles fell into this category. Of these, six were classified as indirect because they reported execution time as a performance metric, which can potentially be used as an indicator for assessing the environmental sustainability of a computational system. Three articles addressed topics that were inherently related to sustainability — for example, optimizing the placement of offshore wind turbines for renewable energy production — but did not include any sustainability-related metrics in their methodological

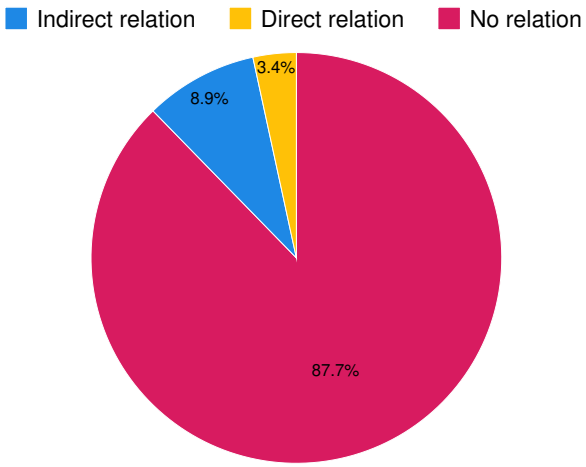

Figure 2: Distribution of articles by sustainability relation

or experimental results. The remaining four articles did not focus on sustainability as their main theme, but mentioned metrics or approaches that could be associated with sustainability, such as the use of models that prioritize efficiency and reduced energy consumption.

Within the articles classified as having a direct relation to environmental sustainability, different motivations were identified for their categorization. In total, 5 out of 146 articles fell into this group.

Silva et al. [8] emphasized sustainability by highlighting that although large language models achieve state-of-the-art results, they require substantial computational resources and pose concerns regarding accessibility, transparency, and privacy; the authors argued that small language models represent a more cost-efficient and environmentally friendly alternative due to lower energy consumption, aligning with green computing principles. Almeida et al. [2] explicitly stated that the proposed model could contribute to achieving sustainability goals, which was used as a justification within the study. Freitas et al. [5] reported that its research was aligned with the United Nations 2030 Agenda for Sustainable Development Goals, thus explicitly addressing sustainability. Junior et al. [6] focused on hydroelectric generation and discussed how the generation process could be optimized through more sustainable methods. Finally, Porfírio et al. [7] investigated water distribution and highlighted that optimizing its use and management is essential for sustainable resource utilization.

4 Conclusion

The results of this analysis indicate that environmental sustainability remains a low priority for most researchers publishing in BRACIS. Although integrating sustainability into research requires additional effort—particularly the evaluation of environmental impacts and the inclusion of meaningful sustainability metrics—this absence suggests that such assessments are not yet part of the standard research workflow. Each study would need to adopt its own sustainability evaluation framework, which may limit its adoption.

Despite the small number of articles directly addressing sustainability, the identified mentions were substantial. In these cases, sustainability was not merely referenced; it played a central and meaningful role in the research design or motivation. Such a concern is more valuable than a larger number of papers containing weak or symbolic references. These contributions introduced important perspectives, reinforcing the idea that technological development should be aligned with societal and environmental responsibilities.

The number of articles classified as having an indirect relation to sustainability demonstrates significant potential for future integration. These papers typically presented metrics—such as energy consumption or efficiency—that, with further elaboration, could serve as sustainability indicators. This suggests that many research topics already have an inherent connection to environmental sustainability, even if it is not yet explicitly addressed.

Finally, although most papers showed no relation to environmental sustainability, this evaluation remains highly relevant. Environmental sustainability is still underrepresented in the field of artificial intelligence, partly because its impacts are not always immediately visible. However, AI research and development can have meaningful environmental consequences, particularly in terms of computational resource usage. The findings highlight a notable gap within the Brazilian AI research landscape—one that should be addressed, especially considering the global commitments outlined in the United Nations 2030 Agenda for Sustainable Development. Encouraging researchers to incorporate sustainability considerations could foster more responsible innovation and advance long-term environmental goals.

As a continuation of this research, future work aims to evaluate previous editions of BRACIS and other national and international conferences. Furthermore, it proposes a method to guide authors in highlighting the impacts of their research on environmental sustainability.

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