

Editorial

A CALL TO ACTION: SHAPING AN INTERDISCIPLINARY FUTURE THROUGH ARTIFICIAL INTELLIGENCE

UM CHAMADO À AÇÃO: FORJANDO UM FUTURO INTERDISCIPLINAR COM INTELIGÊNCIA ARTIFICIAL

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Abstract

Artificial intelligence (AI) has evolved from a subfield of computer science into a foundational technology that is transforming a wide range of domains, from molecular biology and global finance to education and health care, signalling a profound paradigm shift. This editorial advances a new imperative for interdisciplinary collaboration among academia, industry, and policymakers to overcome fragmentation and harness the power of AI through an integrated, ethical, and human-centred approach. Despite its undeniable potential in medical diagnostics, agriculture, and climate modelling, the adoption of AI faces pressing practical and ethical challenges. Key issues include: (1) algorithmic bias, which may perpetuate social inequalities; (2) data privacy and security, exacerbated by dependence on large volumes of sensitive data and the risk of Shadow AI; (3) significant environmental costs associated with training large-scale models (LLMs); and (4) a dual economic impact, promising productivity gains while requiring extensive labour-force reskilling. Furthermore, accountability for AI-related errors remains ambiguous, necessitating clear regulatory frameworks such as the European AI Act and Brazil's Bill 2,338/2023. Addressing these challenges demands a multifaceted approach that combines technical solutions (e.g. Green AI, bias mitigation) with public policy, regulation, and education, aiming to establish a governance framework that fosters innovation and ensures the fair and equitable distribution of AI's benefits.

Keywords: Ethics, Interdisciplinarity, Innovation, Governance, Algorithmic Bias, Sustainability.

Resumo

A Inteligência Artificial (IA) evoluiu de um subcampo da Ciência da Computação para uma tecnologia fundamental que transforma diversas esferas, desde a biologia molecular e finanças globais até a educação e saúde, indicando uma profunda mudança de paradigma. Este editorial propõe um novo imperativo de colaboração interdisciplinar entre a academia, indústria e formuladores de políticas para superar a fragmentação e mobilizar o poder da IA por meio de uma abordagem integrada, ética e centrada no ser humano. Apesar de seu potencial inegável em diagnósticos médicos, agricultura e modelagem climática, a adoção da IA enfrenta desafios práticos e éticos urgentes. Problemas críticos incluem: 1) o viés algorítmico, que pode perpetuar desigualdades sociais; 2) privacidade e segurança de dados, agravadas pela dependência de grandes volumes de dados sensíveis e o risco da Shadow AI; 3) custos ambientais significativos do treinamento de grandes modelos (LLMs); e 4) impacto econômico duplo, prometendo produtividade, mas exigindo requalificação profissional maciça. Adicionalmente, a responsabilidade por erros da IA permanece ambígua, demandando marcos regulatórios claros, como o AI Act europeu e o PL 2.338/2023 brasileiro. Superar esses desafios exige uma abordagem multifacetada, combinando soluções técnicas (ex: Green AI, mitigação de vieses) com políticas públicas, regulamentação e educação, visando um arcabouço de governança que fomente a inovação e garanta a distribuição justa e equitativa dos benefícios da IA.

Palavras-chave: Ética, Interdisciplinaridade, Inovação, Governança, Viés Algorítmico, Sustentabilidade.

An Interdisciplinary Future with Artificial Intelligence

Artificial intelligence (AI) has transcended its origins as a subfield of computer science to become a transformative force reshaping every aspect of contemporary life (Pigola et al., 2023). AI's influence extends from the molecular structure of proteins in biology (Callaway, 2022) to the complex dynamics of global financial markets (Hang & Chen, 2022), from personalised learning pathways in education (Ng et al., 2023) to the strategic allocation of resources in response to pandemics (Gawande et al., 2025). This deep integration across disciplines signals a paradigm shift (Wang et al., 2023), repositioning AI from a tool confined to specialists into a foundational technology underpinning innovation and discovery (Bahoo et al., 2023).

This editorial constitutes a call to action for the academic community, industry leaders, and policymakers to adopt a new paradigm of interdisciplinary collaboration. Fragmented applications of AI must be overcome, giving way to a future in which its power is mobilised through an integrated, human-centred approach (Barmer et al., 2021) governed by ethical principles (Pflanzer et al., 2023). Building such a future requires the creation of bridges between technologists, domain experts, ethicists, and social scientists, ensuring that AI development and deployment serve humanity's highest aspirations.

AI applications are no longer confined to the digital domain (Brynjolfsson & McAfee, 2017); rather, AI has consolidated itself as a tangible agent of transformation across a wide range of knowledge domains (Bianchini et al., 2022). From the precision of medical diagnostics (e.g. Topol, 2019) to the optimisation of agricultural productivity (e.g. Sharma, 2021) and the modelling of global climate patterns (e.g. Reichstein et al., 2019), AI has become interwoven into the fabric of multiple specialised fields, unlocking unprecedented capabilities and efficiencies (Bianchini et al., 2022).

Although AI's transformative potential is undeniable, its future trajectory is fraught with ethical imperatives and practical challenges that demand urgent and thoughtful attention (Floridi et al., 2018). The same power that makes AI so effective also introduces profound risks (Rahwan et al., 2019), capable of undermining trust, exacerbating social inequalities, and causing tangible harm (Mehrabi et al., 2021).

One of the most pressing issues is algorithmic bias (Mehrabi et al., 2021). When AI models are trained on unrepresentative or biased datasets, they can perpetuate, and even amplify, existing inequalities (e.g. Buolamwini & Gebru, 2018). This is evident in documented failures of facial recognition systems for Black individuals (e.g. Buolamwini & Gebru, 2018) and in the lower diagnostic accuracy of ChatGPT in orthopaedic conditions (e.g. Villarreal-Espinosa et al., 2024), revealing the risks of self-diagnosis. Similarly, AI-driven credit scoring models may inadvertently discriminate against specific demographic groups if historical lending data reflect past prejudices (Hurlin et al., 2024). Addressing this challenge requires coordinated efforts across disciplines to audit datasets, implement fairness-aware algorithms, and establish robust oversight mechanisms (Whittlestone et al., 2019).

Data privacy and security constitute another critical concern (Korobenko et al., 2024). The effectiveness of many AI systems depends on access to large volumes of sensitive data, from health records to financial transactions (Kafila et al., 2024; Rahmani et al., 2021). This dependency directly conflicts with data protection principles, prompting the establishment of regulations such as HIPAA (the Health Insurance Portability and Accountability Act) in the United States, the GDPR (General Data Protection Regulation) in the European Union, and Brazil's LGPD (Lei Geral de Proteção de Dados). The risk of data breaches is further aggravated by the rise of so-called Shadow AI (Silic et al., 2025), whereby employees use generative AI tools without IT oversight, creating significant security vulnerabilities. Moreover, the use of AI in surveillance, particularly in educational environments, raises privacy concerns under legislation such as FERPA (Family Educational Rights and Privacy Act), COPPA (Children's Online Privacy Protection Act), and Brazil's *Estatuto Digital da Criança e do Adolescente* (Digital Child and Adolescent Statute). Addressing these tensions requires organisations to adopt practices such as encryption, anonymisation, and strict access controls, while promoting policies that reconcile innovation with the fundamental right to privacy.

The environmental and economic costs of AI have also become subjects of growing concern. The training of large-scale models (Large Language Models – LLMs), such as GPT-4 and GPT-5, consumes vast amounts of

computational energy, resulting in significant carbon emissions (Faiz et al., 2024) and high water usage for data centre cooling (Ren et al., 2024). Although some Green AI techniques (Schwartz et al., 2020) promise substantial energy savings, the rapid growth of AI adoption suggests that overall consumption will continue to rise markedly (Rillig et al., 2023).

From an economic perspective, AI exerts a dual impact: on one hand, it promises substantial productivity and growth gains (Damioli et al., 2021); on the other, it poses the threat of large-scale job displacement (Trabelsi, 2024). The World Economic Forum (WEF) estimates that AI could displace 85 million jobs by 2025 while creating 97 million new ones, yielding a net positive effect (WEF, 2025). However, this transition will require massive efforts in reskilling and upskilling, given that a significant share of the global labour force still lacks AI-related competencies. The shortage of skilled professionals remains one of the key obstacles to adoption, with 30% of companies reporting a lack of AI-specialised talent (WEF, 2025).

Finally, the issue of accountability stands as a central concern. When an AI system makes an error—such as issuing an incorrect medical diagnosis or flagging a legitimate transaction as fraudulent, the attribution of responsibility becomes complex. Should accountability rest with the developer, the user, or the implementing organisation? This ambiguity calls for clear regulatory frameworks and transparent, interpretable AI systems. The European Union’s AI Act (<https://artificialintelligenceact.eu/ai-act-explorer/>), which classifies AI systems according to risk levels, represents a pioneering step in this direction. In Brazil, Bill No. 2,338/2023, currently under consideration in the Chamber of Deputies, mirrors aspects of the European AI Act and could contribute to discussions surrounding liability for AI-driven actions.

Ultimately, confronting these challenges requires a multifaceted approach. This includes investment in technical solutions such as sustainable computing and bias-mitigation algorithms, but also in public policy, regulation, and societal education. The overarching goal must be to construct a governance framework that fosters innovation while safeguarding human rights and ensuring that the benefits of AI are distributed fairly and equitably.

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