frontiers | Frontiers in Computer Science

TYPE Editorial
PUBLISHED 15 August 2025
DOI 10.3389/fcomp.2025.1647904

OPEN ACCESS

EDITED AND REVIEWED BY
Martin Shepperd,
Brunel University London, United Kingdom

*CORRESPONDENCE
Niusha Shafiabady
✉ niusha.shafiabady@cdu.edu.au

RECEIVED 16 June 2025
ACCEPTED 31 July 2025
PUBLISHED 15 August 2025

CITATION
Shafiabady N (2025) Editorial: Computer technology and sustainable futures. *Front. Comput. Sci.* 7:1647904. doi: 10.3389/fcomp.2025.1647904

Editorial: Computer technology and sustainable futures

Niusha Shafiabady*

Discipline of Information Technology, Australian Catholic University, North Sydney, NSW, Australia

KEYWORDS

intelligent systems architecture, resilient computing, sustainable infrastructure, uncertainty modeling, human-centric technology

Editorial on the Research Topic
Computer technology and sustainable futures

This Research Topic brings together four articles that explore how computer technologies can contribute to building sustainable futures. The focus is on software and system-level innovations that improve efficiency, reliability, and adaptability in diverse domains. These articles are united by a common goal: to design intelligent systems that are not only technically sound but also scalable and resilient. The relevance to software lies in the architectural and algorithmic approaches each article takes to solve real-world problems.

Despite covering different areas—from microgrids and caching systems to DevOps and nanoelectronics—the articles share a unifying theme: they propose software-driven solutions to enhance system performance and sustainability. Each contribution demonstrates how thoughtful design and modeling can lead to smarter, more dependable technologies.

1. Sadrarhami et al.—"*Design and simulation of a new QCA-based low-power universal gate*". This article introduces a novel logic gate design using Quantum-dot Cellular Automata (QCA), which offers low power consumption and compact layout. The proposed IGDI gate supports multiple logic operations without reconfiguration, making it a promising candidate for future nanoelectronic systems. The work highlights how software-driven design principles can be applied at the hardware level to achieve sustainability.

2. Sriraman and Shriram—"A machine learning approach to predict DevOps readiness and adaptation in a heterogeneous IT environment". This study uses machine learning to evaluate organizational readiness for DevOps adoption. By combining interview data with predictive modeling, the authors identify key barriers and enablers for DevOps practices. The article emphasizes the role of software tools and cultural factors in successful technology integration.

3. Repin and Sidorov—"Distributed caching system with strong consistency model". This article proposes a caching architecture for microservices that ensures strong consistency across replicas. The authors use formal consensus models to balance performance and reliability, addressing challenges in distributed database systems. The work is directly relevant to software engineering, particularly in designing scalable and dependable backend systems.

4. Swain et al.—"Fuzzy Markov model for the reliability analysis of hybrid microgrids". This article presents a fuzzy Markov model to assess the reliability of hybrid energy systems. By modeling uncertainty and component failure states, the authors provide a robust framework for evaluating grid availability. The approach demonstrates how software-based modeling can support sustainable infrastructure planning.

Together, these articles illustrate how software and system design can contribute to sustainability across different domains. They show that intelligent architectures—whether in energy systems, development pipelines, or digital logic—can enhance performance, resilience, and adaptability. This collection encourages readers to consider how software solutions can address complex challenges and support a more sustainable future.

Author contributions

NS: Writing – original draft.

Conflict of interest

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