

The *ITU Journal on Future and Evolving Technologies (ITU J-FET)* is an international journal providing complete coverage of all communications and networking paradigms, free of charge for both readers and authors.

The ITU Journal considers yet-to-be-published papers addressing fundamental and applied research. It shares new techniques and concepts, analyses and tutorials, as well as learning from experiments and physical and simulated testbeds. It also discusses the implications of the latest research results for policy and regulation, legal frameworks, the economy and society. This publication builds bridges between disciplines, connects theory with application, and stimulates international dialogue. Its interdisciplinary approach reflects ITU's comprehensive field of interest and explores the convergence of ICT with other disciplines. The ITU Journal welcomes submissions at any time, and on any topic within its scope.

Special issue on

## **Energy-efficient and environmentally sustainable edge computing and communications for artificial intelligence**

**Call for papers**

The Information and Communication Technology (ICT) sector, including areas such as artificial intelligence (AI), wireless communications, and the Internet of Things (IoT), is both a significant consumer of energy and a notable source of carbon emissions. Despite its impressive and rapid growth over the past seven decades, projections suggest that ICT could account for between 7% and 20% of global energy demand by 2030. To align with the emission reduction targets set for other sectors of the economy, the ICT sector must also take steps to reduce its carbon emissions. This would entail decreasing emissions by 42% by 2030, 72% by 2040, 91% by 2050, and ultimately achieving net-zero emissions by 2050. Therefore, it is imperative for our research endeavors to echo these objectives, paving the way for pioneering solutions that empower the ICT sector to meet its emission reduction aspirations without impeding its growth.

Today, as the ever-increasing prevalence of learning that occurs in proximity to over billions of mobile and IoT devices aims to enhance data privacy and minimize end-to-end latency, we expect to see more computation being shifted away from data centres to the edge, where access to renewable energy might be limited. Coupled with the super-linear growth in AI model complexity and ubiquity of AI-empowered edge devices and systems, there is a potential risk of escalating energy consumption and carbon emissions from these devices and systems.



This special issue invites recent contributions that address the twin challenges of energy efficiency and environmental sustainability in the integration of AI into edge computing systems, networks, and applications from two distinct perspectives: (1) AI for sustainability: we welcome ground-breaking research that employs AI to improve resource efficiency in edge computing and communication systems. (2) Sustainability of AI: we aim to investigate the design of AI algorithms and systems that are themselves energy-efficient and environmentally sustainable.

The topics of interest for this special issue include, but are not limited to:

### Suggested topics

#### AI for sustainability

- AI for resource management in edge computing systems and networks
- AI for context-aware computing and communications
- AI for carbon emission monitoring and prediction
- AI for quantifying the carbon footprint of computing and communications
- AI for green edge AI applications

#### Sustainability of AI

- Energy-efficient and sustainable hardware and software co-design
- Energy/carbon-aware task offloading strategies for edge AI systems
- Energy-efficient and sustainable edge AI applications, e.g., federated learning
- Energy-efficient and sustainable AI training at the edge
- Modelling resource requirements of AI algorithms and edge AI systems
- Predictive models of energy consumption in edge AI systems and networks
- Energy consumption and carbon footprint measurement and benchmarking



### Keywords

Artificial intelligence, sustainable AI, energy-efficient computing and communications, edge computing, carbon neutrality

### Deadlines extended

Paper submission: **17 November 2024**

Paper acceptance notification: 17 February 2025

Camera-ready paper submission: 17 March 2025

### Paper submission

This special issue calls for original scientific papers. Submitted papers should not be under consideration for publication elsewhere. Submissions must be made electronically using [ScholarOne Manuscripts](#), where templates and guidelines are also available.

### Publication

Papers will be published in the ITU digital library.

### Additional information

Please visit the ITU Journal website at

<https://www.itu.int/en/journal/j-fet/Pages/default.aspx>.

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