Call for Papers
Special Issue on Energy-Efficient Bio-Integrated Sensing and Interfaces for Edge AI Applications

The fusion of ultra-low power sensing, bioelectronics, and embedded artificial intelligence is transforming biomedical and wearable systems. This Special Issue invites contributions that address the growing demand for energy-efficient, intelligent, and autonomous bio-integrated sensors and systems. From novel sensor architectures to real-time machine learning on edge devices, the goal is to highlight cutting-edge innovations that enable sustainable and scalable solutions for health monitoring, diagnostics, and human-machine interaction. The next-generation platform, comprising wearable, implantable, or environmentally embedded biosensors and mobile robots with sensing capabilities, are expected to perform in-situ data processing, interact intelligently with users and surroundings, and operate reliably over extended periods without requiring constant maintenance or power supply. The integration of low-power embedded processors (e.g., microcontrollers, ASICs, and FPGAs), ultra-efficient machine learning algorithms, and multi-modal sensor fusion is enabling unprecedented advances in both performance and form factor and improve the latency of decision making exploring efficient machine learning. Key to this transformation is the development of Edge AI technologies that can run efficiently on constrained devices, while extracting actionable insights from bio-signals such as electrophysiology, biochemical markers, motion patterns, and environmental parameters. This opens new opportunities in healthcare, rehabilitation, human augmentation, and IoT, where self-powered, secure, and adaptive sensor systems are needed for effective deployment. The aim of this Special Issue is to gather state-of-the-art research that addresses the core challenges and innovations across the stack—from sensor hardware to signal processing, machine learning, and systems integration—with a strong focus on energy efficiency, bio-compatibility, and autonomous edge intelligence. Contributions are also encouraged that explore robotic platforms (e.g., wearable robotics, mobile assistants) as carriers and integrators of advanced biomedical sensing technologies. We welcome interdisciplinary work that spans materials, electronics, signal processing, and systems integration, with an emphasis on real-world deployments and robust, low-power performance. Submissions may cover theoretical advances, experimental validations, hardware-software co-design, and application case studies in healthcare, robotics, and IoT.

Topics

This Special Issue of the IEEE Sensors Journal will showcase state-of-the-art in Energy-Efficient Bio-Integrated Sensing and Interfaces for Edge AI Applications. Original research contributions and review papers are sought related areas including (but not limited to):

- **Energy-Efficient Bio-Sensing Interfaces**: Novel architectures that merge bioelectronics with ultra-low-power processors.
- **Self-Powered Smart Biosensors**: Energy harvesting and low-power designs enabling long-term, maintenance-free sensing.
- **Edge AI for Biomedical Sensing**: On-device learning, signal processing, and adaptive algorithms for in-sensor bio-data analysis.
- **Hybrid Multi-Sensing Systems**: Integration of UWB, RF and mmWaves, electrophysiological, biochemical, and environmental sensors for context-aware wearable systems.

- **Neuromorphic and Bio-Inspired Sensing Interfaces**: Event-driven processing and AI models for real-time health monitoring.
- **Cyber-Physical and Wearable Bio-Systems**: Secure, autonomous, and networked sensor platforms for remote diagnostics and smart healthcare.
- **Robotics for Biomedical Sensing**: Emerging systems and applications using mobile or wearable robotics platforms for physiological and biochemical monitoring.
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Important dates (tentative)

January 15, 2026:	Deadline for Manuscript Submission
March 31, 2026:	Completion of Final Review
July 31, 2026:	Publication

Upon acceptance papers appear as Early Access (preprints) in IEEExplore and are fully citable.

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Submission and Peer Review of Papers

Manuscripts submitted to the special issue should maintain an explicit focus on sensors or sensor systems, to be considered within the scope of the IEEE Sensors Journal (please check full journal scope). All manuscripts must be submitted on-line, via the *IEEE Author Portal*, see https://ieee.atyponrex.com/journal/sensors. Choose the special issue listed in the dropdown menu during submission. For manuscript preparation and submission, please follow the guidelines in the *Information for Authors* at the IEEE Sensors Journal web page, https://ieee-sensors.org/ieee-sensors-journal/for-authors