Special Issue on Redefining Perception: Applications of Artificial-intelligence-driven Sensor Systems: Part 1

Preface

It is my great pleasure to introduce Part 1 of the Special Issue of Sensors and Materials, "Redefining Perception: Applications of Artificial-Intelligence-Driven Sensor Systems." Artificial intelligence is redefining how sensors function, transforming them from passive data collectors into intelligent systems capable of analyzing, interpreting, and acting on information in real time. This Special Issue brings together innovative studies that demonstrate how AI-driven sensing technologies are making an impact across diverse fields—from industrial manufacturing to healthcare, disaster management, and predictive maintenance.

The six contributions in part 1 of this special issue in September 2025 showcase both the technical advances and the practical relevance of this fast-growing field. One paper demonstrates how combining particle swarm optimization with deep learning can significantly improve wafer classification in industrial manufacturing. Another presents a machine learning approach to flood susceptibility mapping, offering novel sampling strategies to support disaster preparedness and community resilience. The EnSta-Fi framework highlights how Wi-Fi sensing, enhanced through ensemble learning, can provide unobtrusive solutions for human activity recognition.

The health domain, broadly understood as both human well-being and the "health" of devices, is strongly represented. One study introduces an AI-driven augmentative and alternative communication system for individuals with cerebral palsy, advancing accessibility through American Sign Language recognition. Another applies clustering-based models to predict anomalies in hard disk drives, ensuring the reliability and longevity of critical devices. A further contribution combines 2D and 3D LiDAR with convolutional neural networks to detect sediment accumulation in underground spaces after disasters, supporting both safety and environmental protection.

Together, these papers reflect the richness of AI-enabled sensing—advancing efficiency, safety, inclusivity, and resilience. Part 2 of this Special Issue, to appear in December 2025, will continue to expand this scope with additional contributions.

I would like to thank all the authors for their excellent work and the reviewers for their insightful evaluations. My heartfelt appreciation goes to Ms. Tomoko Tanabe for her dedicated assistance in coordinating the review and publication process, and to Professor Makoto Ishida, Editor-in-Chief, and the associate editors for inviting me to serve as guest editor. Their trust and support have made this Special Issue possible.

Pitikhate Sooraksa
School of Engineering, King Mongkut's Institute of Technology Ladkrabang
Thailand