River Publishers

Pervasive Intelligence - From Architectures to Sustainable Edge AI Systems-of-Systems

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Artificial intelligence is rapidly moving beyond centralized cloud computing into distributed edge environments, creating a new generation of intelligent systems that are autonomous, adaptive, efficient, and sustainable. *Pervasive Intelligence: From Architectures to Sustainable Edge AI Systems-of-Systems* explores the technologies, architectures, and engineering methodologies driving this transformation.

Written by leading researchers and industry experts, the book provides a comprehensive examination of edge AI, covering topics such as embedded AI acceleration, active inference agents, hardware-software co-design, distributed orchestration, privacy-preserving intelligence, and sustainable computing. It bridges theory and practice by addressing key deployment challenges, including real-time speech enhancement, neural network optimization for embedded devices, AI benchmarking on ARM processors, FPGA-based acceleration, and trustworthy AI systems operating at the edge.

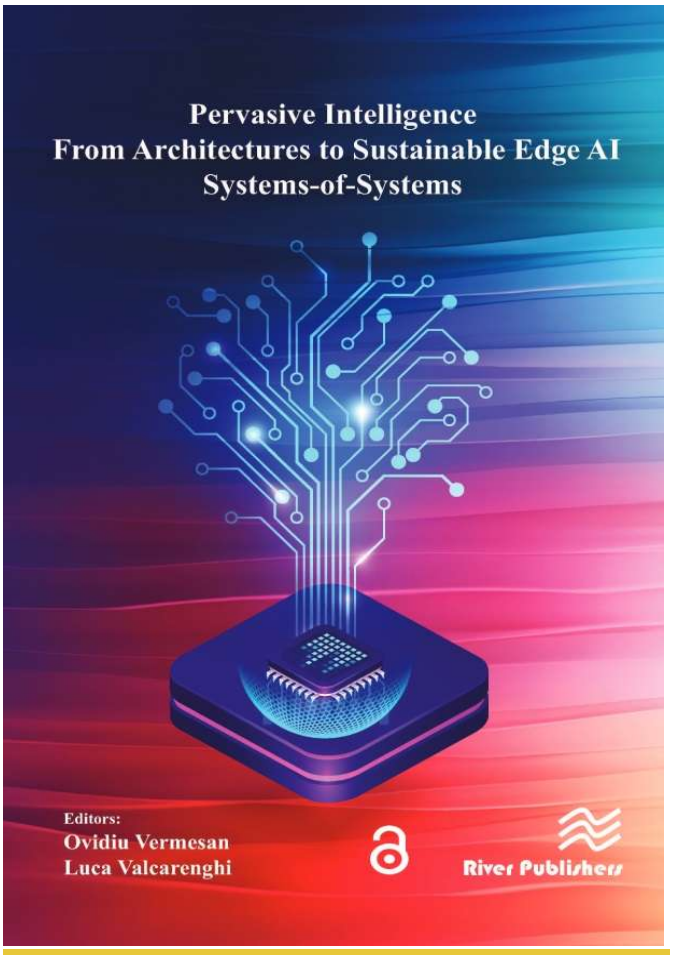
A recurring theme is the emergence of edge AI systems-of-systems, in which intelligent agents, sensors, devices, and computing resources collaborate seamlessly across the edge-to-cloud continuum. The book highlights the importance of interoperability, resilience, trustworthiness, adaptive autonomy, and energy efficiency in building next-generation intelligent infrastructures.

Drawing on practical applications in robotics, autonomous systems, surveillance, smart agriculture, environmental forecasting, and cyber-physical systems, the contributors demonstrate how pervasive intelligence is transforming industries and enabling more responsive, data-driven decision-making. By combining advances in artificial intelligence with systems engineering, control theory, and physics-informed modeling, this volume offers both a strategic vision and a technical framework for the future of sustainable edge intelligence.

An essential resource for researchers, engineers, system architects, and advanced students, this book provides the knowledge and tools needed to design, deploy, and manage intelligent systems operating at the edge.

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River Publishers Series in open

ISBN: 9788743815198
e-ISBN: 9788743815204
Available From: June 2026
Price: $ 136.00

KEYWORDS:
Pervasive intelligence, edge AI technologies, edge AI systems, systems of systems, edge AI systems reference architecture, edge AI technology stack, micro-edge, deep-edge, and meta-edge, artificial intelligence (AI), edge AI accelerators, deep learning (DL), machine learning (ML), federated learning (FL), edge AI trustworthiness, AI explainability (XAI), AI interpretability (IAI), interconnection networks.

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