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IEEE Internet of Things Journal Special Issue on
Collaborative Intelligence via Meta-Computing in the Industrial Internet of Things

Amidst the rapidly evolving landscape of the Industrial Internet of Things (IIoT), the role of devices has transcended that of isolated data collectors and analyzers; they are now integral components of a sophisticated, interconnected network of intelligent agents. The essence of the IIoT paradigm envisions a seamless and dynamic environment wherein devices possess not only the capability to gather and process data but also the capacity to communicate, collaborate, and mutually enhance their operational efficiency. However, within this realm of immense potential and collective intelligence, lies the intricate challenge of coordination, particularly in scenarios where devices must operate autonomously without a centralized authority. Addressing this challenge, the concept of harnessing collaborative intelligence through meta-computing emerges as a promising solution.

At its core, meta-computing embodies techniques that facilitate the creation, management, and optimization of computational resources across diverse and heterogeneous environments. In the context of IIoT, meta-computing signifies a methodology wherein devices not only fulfill their designated functions but also actively engage in higher-level decision-making processes by exchanging knowledge and resources amongst themselves. This decentralized approach advocates for the autonomy of IIoT devices while simultaneously bolstering their collective capabilities.

This special issue endeavors to delve profoundly into the academic and industrial progress in integrating meta-computing into the IIoT landscape to foster collaborative intelligence. The aim is to explore the multifaceted aspects of this integration, ranging from the theoretical underpinnings that underscore such systems to the practical challenges that manifest when implemented within real-world scenarios. By bridging the gap between individual device intelligence and a cohesive, decentralized decision-making network, the insights presented in this issue aspire to usher in a new era of IIoT. In this era, devices, unguided by a singular central authority, can seamlessly collaborate, amplify each other's performance, and elevate efficiency and productivity to unparalleled heights.

Through this comprehensive exploration, the issue strives to provide an in-depth comprehension, thereby establishing the groundwork for future research and innovative applications in the realm of decentralized IIoT systems. The scope encompasses a diverse array of topics, including but not limited to:

- Development of decentralized algorithms for knowledge exchange among IIoT devices.
- Implementation of cross-device learning and adaptation strategies in IIoT environments.
- Formulation of dynamic resource allocation tactics in decentralized IIoT systems.
- Design of meta-computing architectures tailored specifically for IIoT applications.
- Consideration of data integrity and privacy within collaborative IIoT environments.
- Establishment of performance evaluation metrics for decentralized IIoT networks.
- Optimization of communication protocols to enhance collaborative intelligence in IIoT.
- Exploration of challenges in integrating traditional industrial devices with intelligent meta-computing models.

- Ensuring security and trustworthiness in decentralized and collaborative IIoT setups.
- Development of lightweight, energy-efficient meta-computing algorithms for resource constrained IIoT devices.
- Application of edge and fog computing paradigms to support meta-computing within IIoT.
- Design of network topologies conducive to fostering collaborative intelligence within IIoT.
- Integration of AI and machine learning with meta-computing to enable advanced IIoT functionalities.
- Formulation of methods to ensure reliability and fault tolerance in decentralized IIoT systems.
- Implementation of collaborative sensing and actuation strategies within IIoT.
- Examination of standardization challenges and opportunities in deploying meta-computing for IIoT.
- Exploration of user-centric designs and human-machine collaboration within intelligent IIoT networks.
- Investigation of economic and business implications stemming from the deployment of collaborative intelligence in industrial setups.

Important Dates:

Submission Deadline: November 15, 2024

First Reviews Due: December 30, 2024

Revision Due: January 30, 2025

Second Reviews/Notification: February 28, 2025

Final Manuscript Due: March 31, 2025

Publication Date: May 2025

Submission Guidelines:

All original manuscripts or revisions for the IEEE IoT Journal are to be made electronically via IEEE Manuscript Central (<http://mc.manuscriptcentral.com/iot>), where, at the "Article Type" step, authors are to choose "SI: Collaborative Intelligence via Meta-Computing in the Industrial Internet of Things." Note that submissions should be exclusive and not under review elsewhere. For detailed submission instructions and author guidelines, please visit <http://ieee-iotj.org/guidelines-for-authors>.

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