IEEE Transactions on Cybernetics
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for Special Issue on
New Generation of Artificial Intelligence for Intelligent Monitoring and Maintenance of Complex Systems

Theme: Machine learning methodologies, including reinforcement learning, deep learning, Bayesian inference, and brain-inspired learning, have achieved remarkable breakthroughs in diverse fields such as speech recognition, computer vision, natural language processing, and business analytics. Consequently, substantial strides have been made within the process industry community for monitoring and maintenance in the intelligent inspection and maintenance of complex systems due to their excellent ability to discover hidden features. However, with the rapid evolution of artificial intelligence technology and the unique characteristics of industrial processes, significant challenges have surfaced, necessitating further exploration of new generation of artificial intelligence as well as its in-depth studies. Industrial processes, which are typically complex systems, tend to generate large-scale, high-velocity, and diverse measurement datasets, posing challenges for traditional monitoring and maintenance techniques. Hence, the critical tasks of feature selection and dimension reduction become paramount to extract pertinent signals and eliminate redundant information, thereby influencing algorithmic performance. Moreover, the efficiency and computational speed of learning algorithms are crucial due to the rapid influx of data and the real-time nature of target value requirements. Ensuring statistical robustness and reliability is equally vital as traditional analytical techniques can be overwhelmed by vast amounts of data. The emergence of diverse data types further complicates matters, necessitating the development of practical tools capable of handling multi-type data problems effectively. Addressing these formidable challenges requires the development of efficient learning algorithms tailored to exploit specific characteristics of target processes.

This special issue aims to gather and present recent advancements in learning-based monitoring and maintenance methodologies. Contributions encompassing both theoretical insights and practical applications in domains such as large-scale industrial processes, industrial mechatronics, fermentation processes, network-supported industries, cyber-physical systems, and other diverse applications are particularly encouraged.

This special issue will focus on (but not limited to) the following topics:

Data-driven fault diagnosis with sustainable solutions; Computer vision-based fault diagnosis and performance recovery; Explainable sustainable fault diagnosis using neural networks; Variational Bayesian modeling and estimation methods for industrial process; Sustainable system maintenance for automation systems using AI methods; Sustainable performance evaluation using machine learning techniques; Sustainable prognostics and health management using AI methods; Transfer learning-based fault diagnosis; Zero-shot learning theory and application; Adaptive learning for fault decision; Plug-and-play aided fault-tolerant control and performance optimization; AI-based system sustainable modeling and decision making; Sustainable techniques for distributed and interconnected systems; AI-based diganois for medical applications.

Manuscript Preparation and Submission

Follow the guidelines in "Information for Authors" in the IEEE Transaction on Cybernetics https://www.ieeesmc.org/publications/transactions-on-cybernetics. Please submit your manuscript in electronic form through Manuscript Central web site: https://mc.manuscriptcentral.com/cyb-ieee. On the submitting page # 1 in popup menu of manuscript type, select: SI on New Generation of Artificial Intelligence for Intelligent Monitoring and Maintenance of Complex Systems. Submissions to this special issue must represent original materials that have been neither submitted to, nor published in, any other journal. The review process for the special issue submissions and the paper length requirement are the same as the regular issue papers.

Note: The recommended papers for the special issue are subject to the final approval by the Editor-in-Chief. Some papers may be published in a regular issue, at the EIC discretion. Depending on the number of accepted manuscripts, this special issue could be published as a special section in a regular issue.

Timetable:

Paper submission:	May 31, 2025
Completion of first round of review:	August 31, 2025
Completion of final review:	October 31, 2025
Submission of final manuscripts:	November 30, 2025
Scheduled publication:	December 31, 2025

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