CALL FOR PAPERS
SPECIAL SESSION ON

Intelligent AI Systems for Autonomous Control, Predictive Diagnosis, and Medical Applications: Bridging Deep Learning, Reinforcement Learning, and Natural Language Processing

for ICCAD 2026
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Session Co-Chairs:
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Session description:

This special session addresses the emerging challenges and opportunities at the intersection of artificial intelligence, autonomous control systems, intelligent diagnosis, and medical applications. As industrial and healthcare systems become increasingly complex and interconnected, there is a critical need for intelligent solutions that can autonomously control processes, predict failures, diagnose diseases, and interact naturally with operators and clinicians through multimodal interfaces.

The convergence of Deep Learning (DL), Deep Reinforcement Learning (DRL), and Natural Language Processing (NLP) offers unprecedented capabilities for creating intelligent systems that can learn from data, adapt to dynamic environments, and communicate insights in human-understandable formats. This session focuses on innovative AI-driven approaches that enhance automation, improve diagnostic accuracy in both industrial and medical contexts, and enable seamless human-machine collaboration in control and healthcare systems.

The session particularly encourages contributions leveraging medical imaging analysis, genomic data processing, and early disease detection (including Alzheimer's, cancer, and cardiovascular diseases).

The goals of this session are to:

• Explore cutting-edge deep learning and reinforcement learning techniques for autonomous control, optimization, and diagnosis in complex industrial and medical systems

• Investigate the integration of NLP and language models for intelligent human-machine interfaces in control, industrial diagnosis, and clinical applications

• Present novel multimodal AI approaches that combine vision, language, sensor data, and medical imaging for enhanced situation awareness and decision-making

• Showcase real-world applications in critical domains including manufacturing, energy systems, robotics, IoT, and healthcare (early detection of Alzheimer's, cancer diagnosis, etc.)

• Foster interdisciplinary collaboration between AI researchers, control engineers, healthcare professionals, and domain experts to advance the state-of-the-art in intelligent automation

The topics of interest include, but are not limited to:

Axis 1: Industrial Control and Automation

- Deep Reinforcement Learning for adaptive control and optimization in dynamic environments
- Transformer models and large language models (LLMs) for control system understanding and generation
- NLP-based interfaces for human-robot interaction and explainable AI in automation
- Vision-language models for visual inspection, anomaly detection, and predictive maintenance
- Federated learning and distributed AI for networked control systems
- Neural architecture search and AutoML for automated controller design
- Graph neural networks for modeling and control of complex networked systems
- Safe reinforcement learning and constraint satisfaction in critical control applications
- Neuromorphic computing and edge AI for real-time control and diagnosis
- Hybrid AI systems combining model-based control with data-driven learning

Axis 2: Medical Diagnosis and Healthcare Applications

- Deep learning for early detection of Alzheimer's disease using MRI, PET scans, and cognitive assessment data
- AI-driven cancer diagnosis and classification from medical imaging (CT, MRI, mammography, histopathology)
- Convolutional and vision transformers for tumor detection, segmentation, and treatment planning
- Multi-omics data integration (genomics, proteomics, transcriptomics) for personalized medicine
- Recurrent neural networks and transformers for disease progression prediction and prognosis

- Explainable AI for clinical decision support and transparent diagnostic reasoning
- NLP and large language models for electronic health records analysis
- Deep learning for cardiovascular disease detection from ECG and cardiac imaging
- Reinforcement learning for optimal treatment planning and dosage optimization
- Computer-aided diagnosis systems for rare diseases and differential diagnosis

Axis 3: Cross-Domain AI Technologies and Emerging Methods

- AI-driven fault diagnosis and prognosis using multimodal sensor data
- Generative AI for synthetic data generation and digital twin creation
- Transfer learning and few-shot learning for rapid adaptation across industrial and medical domains
- Conversational AI and chatbots for system monitoring, patient interaction, and operator assistance
- Ethical AI, fairness, and trustworthy automation in safety-critical and clinical applications
- Federated learning for privacy preservation in distributed systems and medical data
- AI for drug discovery and industrial process optimization

SUBMISSION

Papers must be submitted electronically for peer review by**: January 31, 2026**
https://www.iccad-conf.com/submission/

All papers must be written in English and should describe original work. The length of the paper is limited to a maximum of 6 pages (in the standard IEEE conference double column format).