CALL FOR PAPERS

IEEE Transactions on Computational Social Systems

Cyber-Physical-Social Intelligence: State-of-the-art, Perspectives, and Challenges

Overview:

Cyber-Physical-Social Systems (CPSS) combine cyber, physical, and social spaces, enabling systems that simultaneously perceive, interpret, and interact with the physical environment and human behaviors. Through this deep cross-domain integration, CPSS are increasingly capable of context-aware monitoring, adaptive control, personalized assistance, and collaborative decision support. The shift from perception to cognition and from basic interconnection to intelligent coordination motivates the development of Cyber-Physical-Social Intelligence (CPSI), which aims to provide users with the ability to comprehend complex scenarios, anticipate future dynamics, and make autonomous decisions.

Recent advances in CPSI have rapidly transitioned from conventional rule-based or domain-specific methods to more integrated forms of cognition and autonomy. Despite rapid progress in multimodal fusion, holistic awareness, and distributed intelligence, CPSI still faces several fundamental challenges in model construction, intelligent knowledge discovery, decision-making, high-performance computing, and system security. These challenges include accurately capturing coupled cyber-physical-social dynamics, ensuring robust multimodal representation and cross-domain alignment, modeling cognitive behaviors under uncertainty, and maintaining real-time digital-twin synchronization. Knowledge discovery remains difficult due to heterogeneous and incomplete data, ambiguous human intentions, and the need for reliable semantic reasoning, causal inference, and emergent behavior detection. Intelligent decision-making is hindered by the difficulty of learning generalizable policies, coordinating multi-agent planning, predicting long-term behavioral tendencies, and translating high-level reasoning into dependable actions. Scalable real-time CPSI is constrained by the computational demands of perception and foundation models, high-frequency synchronization, and distributed learning under strict resource limitations. Moreover, achieving secure and trustworthy CPSI is complicated by expanded cross-domain attack surfaces, privacy risks, vulnerabilities in generative models, and the need for transparent, resilient intelligence across cyber-physical-social ecosystems.

This Special Issue invites high-quality original contributions from researchers and practitioners to advance theoretical and practical approaches in CPSI, enhancing cognitive reasoning, behavioral prediction, cross-domain perception, autonomous adaptation, human-AI collaboration, and system resilience, to push the boundaries toward truly intelligent, trustworthy, and self-evolving CPSS.

Topics include but are not limited to:

- AI/ML-driven sensing and perception for cyber, physical, and social environments
- Cognitive behavior modeling and human-machine interaction in CPSI
- Digital twin modeling and real-time synchronization in CPSS
- Deep multimodal fusion architectures for heterogeneous CPSS data
- Embodied intelligence and CPSI-driven agents for adaptive interaction and decision-making
- LLM-based semantic reasoning, cross-domain alignment, and causal inference
- Reinforcement learning and optimal control for adaptive CPSS behavior
- Generative AI-based modeling, simulation, and prediction of CPSS dynamics
- Agent-based simulation of social interaction and collective intelligence
- Cognitive situation awareness and intent prediction in dynamic CPSI environments
- LLM-driven multi-agent systems for planning and collective decision-making
- CPSI for metaverse governance, safety, and trustworthy digital ecosystems
- Intelligent defense and resilience against cyber-physical-social attacks
- Federated learning and privacy-preserving techniques for large-scale CPSS
- Explainable, transparent, and trustworthy AI models for CPSI decision-making
- Data-driven intelligent services in CPSS

Important Dates:

- Paper Submission Deadline: November 10, 2026
- First Decision Deadline: January 15, 2027
- Revision Deadline: February 15, 2027
- Final Decision Deadline: March 15, 2027

Submission Guidelines:

Authors should prepare their manuscripts according to the submission guidelines of the IEEE Transactions on Computational Social Systems. Manuscripts should be submitted through the online submission system at: https://ieee.atyponrex.com/journal/tcss, and select “Special Issue” of “Cyber-Physical-Social Intelligence: State-of-Art, Perspectives, and Challenges” under the Manuscript Category. All submissions will undergo a rigorous, single-blind peer-review process.

Guest Editors:

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