



AIM AND SCOPE: The 2021 Nobel Prize for physics was awarded to Prof. Giorgio Parisi, whose exceptional research contributions include deciphering the collective behavior of birds. This phenomenon reflects the development and cognition of biological and intelligent individuals, which sheds light on the development of cognitive, autonomous and evolutionary robotics. Each individual effectively transmits information and learn from several neighbors, and thus making cooperative decision-making among them. Such interactions among individuals show the development and cognition of natural groups in the evolutionary process, which can be modeled as multi-agent systems. Multi-agent systems are capable of solving complex tasks, which also improve the robustness and efficiency through collaborative learning. Multi-agent learning is playing an increasingly important role in various fields, such as aerospace systems, intelligent transportation, smart grids, etc. As the environment is becoming more complicated (e.g., highly dynamic environment and incomplete/imperfect observational information, etc.), tasks are becoming more difficult (e.g., how to share information, how to set learning objectives, and how to deal with the curse of dimensionality, etc.), most of the existing methods cannot effectively solve these complex problems in cognitive intelligence. In addition, cognitive learning of multi-agent systems shows the efficiency of learning how to learn in a distributed way. From this aspect, multi-agent learning, though of great research value, faces the challenges of solving learning problems ranging from single to multiple, simplicity to complexity, low dimension to high dimension, and one domain to other domains.

In addition, there exist competitive or even adversarial activities in multi-agent systems. This situation can be regarded as the agents making more complex decisions through cognitive learning. In recent years, scientists and engineers on antagonistic multi-agent systems have made great breakthroughs, and the most representative ones are AlphaGo/AlphaZero, Pluribus and AlphaStar, etc. However, there are still limitations and challenges, including incomplete/imperfect information environments and data/strategy generalization. How can agents autonomously and quickly make swarm intelligent decision-making via cognitive learning in complex environments under these circumstances? It is of great significance to the development of various practical fields.

This special issue aims to investigate the cognitive learning in multi-agent systems from the perspective of applications, including practical applications including cognitive, autonomous and evolutionary robotics, etc. All the related original researches that contribute to the development and cognition of multi-agent systems along with their applications are particularly welcome and encouraged.

TOPICS: This special section will focus on (but not limited to) the following topics: Development and cognition of multi-agent systems; Brain-inspired optimization/learning in multi-agent systems; Federated learning/distributed learning; Causal inference in distributed learning; Zero-shot/Few shot/No-regret learning; Critical behavior in multi-agent systems; Meta multi-agent reinforcement learning; Multi-agent reinforcement learning in games; Best-response and learning dynamics; Multi-agent multi-armed bandits; Cooperative-competitive multi-agent framework; Application to cognitive, autonomous and evolutionary robotics.

SUBMISSION: Manuscripts should be prepared according to the guidelines in “Submission Guidelines” of the IEEE Transactions on Cognitive and Developmental Systems in <https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=7274989>. Submissions should be done through the journal submission website: <https://mc.manuscriptcentral.com/tcds-ieee>, by selecting the Manuscript Type of “Cognitive Learning of Multi-Agent Systems” and clearly marking “Cognitive Learning of Multi-Agent Systems” in the comments to the Editor-in-Chief. Submitted papers will be reviewed by domain experts. Submission of a manuscript implies that it is the authors’ original unpublished work and is not being submitted for possible publication elsewhere.

IMPORTANT DATES:

Deadline for manuscript submissions: September 30, 2022

Final decision: April 30, 2023

Expected publication date: August 30, 2023

GUEST EDITORS:

Prof. Yang Tang, East China University of Science and Technology, China, tangtany@gmail.com

Prof. Wei Lin, Fudan University, China, wlin@fudan.edu.cn

Prof. Chenguang Yang, University of the West of England, UK, cyang@ieee.org

Prof. Nicola Gatti, Politecnico di Milano (PoliMi), Italy, nicola.gatti@polimi.it

Prof. Gary G. Yen, Oklahoma State University, USA, gyen@okstate.edu