IEEE Transactions on Cognitive and Developmental Systems

CALL FOR PAPERS

for Special Issue on

Neuro-Inspired Learning for Robotics

IEEE TRANSACTIONS ON COGNITIVE AND DEVELOPMENTAL SYSTEMS

A PUBLICATION OF THE IEEE COMPUTATIONAL INTELLIGENCE SOCIETY THE IEEE ROBOTICS AND AUTOMATION SOCIETY

AIM AND SCOPE: Robots are increasingly needed and used in various applications such as manufacturing, agriculture, healthcare, construction, search and rescue, etc. In such cases, robots are expected to perform the tasks (e.g., manipulation, grasping) in different environments such as occluded environments, dynamic environments and unstructured environments, human–robot collaboration and so on as well as to match human performance. To accomplish these tasks accurately, successfully, and efficiently by the robotic systems, closing the robot perception-action loop with sensory feedback is a good solution. However, the system/environment nonlinearities and uncertainties bring great challenges to the robot system performance.

It is significant to note that humans demonstrate exceptional performance in carrying out delicate tasks in a wide range of environments. To achieve comparable performance using robots, one approach is to draw inspiration from the biological nervous system to overcome the challenges in robotics. Consequently, integrating neuroscience, artificial intelligent (AI) with robotics is one effective way to develop better performing and intelligent robots. For example, through the study of the biological system, the sensory-motor control and learning in humans mainly involves three key components: cerebral cortex (concise representation of the sensory state, context, and action via unsupervised learning), basal ganglia (action selection by evaluation of candidate actions via reinforcement learning), and cerebellum (biological muscles' control via error-based supervised learning). Given these observations, a bioinspired learning-based approach that combines various learning mechanisms can be adopted for developing intelligent robotic systems. This approach has the potential to enable robots to perform various tasks accurately and efficiently, even in diverse environments. By integrating brain-inspired algorithms into robotic systems, their adaptivity, efficiency, and accuracy can be enhanced, leading to the development of more advanced robotic applications.

In addition, the ideas of imitation learning, learning from experience, multi-sensory integration, and perception-action coupling can be effective ways to guarantee and improve the performance, adaptability, and robustness of robotic systems.

This special issue aims to investigate the applications of fusing neuroscience and robotics. All the original researches that contribute to this area, especially neurorobotics and cognitive robotics, are particularly welcome.

TOPICS: This special issue will provide a platform to support the exchange of new ideas and experiences in the research field on intelligent robot development with neuro-inspired learning. Topics of interest include, but are not limited to: Neurorobotics and cognitive robotics; Brain-inspired/Brain-like learning in robotics; Deep learning, imitation learning (IM), reinforcement learning (RL), and meta-learning in robotics; Locomotion and motor control with neuroengineering technology; Embodied artificial intelligence with robotics; Bio-inspired Human-robot interaction technology; Perception-Action coupling; Applications of cognitive technology in robotic systems.

SUBMISSION GUIDELINES: 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 "SI: **Neuro-inspired learning for robotics**". 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:

Paper submission deadline: 1st May 2024
First round of decision: 1st June 2024
Final decision: 1st October 2024
Expected publication date: 1st December 2024

GUEST EDITORS:

Qinyuan Ren, Zhejiang University, China, renqinyuan@zju.edu.cn

Nelson Sepulveda Alancastro, Michigan State University, U.S.A, Sepulve6@msu.edu

Wenyu Liang, Institute for Infocomm Research, A*STAR, Singapore, Liang_Wenyu@i2r.a-star.edu.sg

Hareesh Godaba, University of Sussex, U.K., H.Godaba@sussex.au.uk

Fei Cao，Aberystwyth University，U.K., fec10@aber.ac.uk