IEEE Transactions on Control Systems Technology

Special Journal Issue on
Data-driven and Learning-based Control of Autonomous Systems

Abstract

Learning-based and data-driven control have emerged as powerful paradigms for designing controllers in settings where first-principles models are incomplete, uncertain, or prohibitively complex. By leveraging data, these approaches present new opportunities to improve performance and reliability in modern engineered systems. These systems, however, still require adequate solutions to many open research problems, such as providing (rigorous) safety, stability or performance guarantees, or implementing such controllers in a computationally tractable way. This Special Issue of IEEE Transactions on Control Systems Technology addresses open research questions, recent advancements, and novel methods at the intersection of machine learning, control, and numerical optimization. While the underlying methodology is contemplated as the common denominator, contributions must demonstrate their real-world implementation in and impact on complex engineering systems where accurate models are difficult to obtain. Such application areas are energy systems, robotics, automotive, aerospace, and other large-scale engineered infrastructures. Submissions should emphasize control-relevant insights, algorithmic advances, and demonstrate technological impact, consistent with the scope of the journal. Purely simulation based or black box learning papers without clear practical significance are discouraged.

Topics relevant to the special issue include (but are not limited to):

- Learning-based or data-driven MPC
- Decision making and control using non-parametric, data-driven predictors
- Statistical learning for simultaneous system identification and control
- Bridging reinforcement learning and optimal control
- Risk-aware/distributionally robust control & optimization
- Safety, stability, and robustness guarantees in learning-based/data-driven control and reinforcement learning
- Certification, interpretability, and structure in learning-based controllers

Paper Submission Guidelines

All submitted papers must be relevant to the control community (papers without relation to control theory are not eligible) and convey **technological advances**, which are either validated in **realistic/high fidelity simulations** or in **experiments,** while simulations for benchmark models or experiments on trivial lab equipment are discouraged. **Only regular papers** may be submitted to and will be considered for the special issue. Contributions should be original and not be under consideration elsewhere for publication. The authors should follow the journal guidelines, regarding the manuscript content, scope, and its format. Manuscripts submitted for inclusion in this special issue will be handled by a panel of Guest Editors (see below) and will go through a

peer review process to assess their suitability in terms of technical novelty, scientific rigor, scope, and relevance. Manuscripts that are deemed unsuitable for the special issue will be returned to the authors and may not be resubmitted or considered for publication outside the special issue without approval from the Editor-in-Chief.
Authors are kindly invited to submit their manuscripts via the Transactions submission portal: https://css.paperplaza.net/journals/tcst/scripts/login.pl

Important Dates:

- Submission Site Opens: 1 May 2026
- First Submission Deadline: 1 December 2026
- Notification of First Round Decision: 1 March 2027
- Revised Paper Submission Deadline: 15 April 2027
- Notification of Final Decision: 1 June 2027
- Final Manuscript Submission: 15 July 2027
- Tentative Publication Date (Online): November 2027

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