IEEE Control Systems Letters (L-CSS)

Call for submissions to L-CSS Special Issue: "Safety, Robustness, and Effectiveness in Human-Machine Teaming"

IEEE CSS TC on Manufacturing Automation and Robotic Control

The L-CSS invites submissions for **a special issue** on **Safety, Robustness, and Effectiveness in Human-Machine Teaming** (to be included, tentatively, in the 2025 volume of L-CSS). Authors are invited to submit their manuscripts typewritten in English; the maximum number of allotted pages is 6, in 2-column, single-spaced format (including figures). Submission instructions can be found on the L-CSS website at http://ieee-cssletters.dei.unipd.it/Page_authors.php?p=1. Submission for the special issue will be possible starting on **March 1, 2025**, and before or on **April 30, 2025**.

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As intelligent systems are applied to real-world tasks, a paramount challenge emerges: ensuring that these systems operate within rigorously defined safety parameters to prevent violations of fundamental safety constraints. For instance, surgical robots need precise operation to prevent harm during procedures; smart grids must manage electricity distribution without causing disruptions; semi-autonomous aerial vehicles must navigate within predetermined safety envelopes; and robots must avoid collisions with obstacles, other agents, and pedestrians. The absence of general, formal, and verifiable assurances of safe behavior precipitates the development of ad-hoc solutions that are overly tailored to specific applications,

domains, and platforms, thereby limiting their scalability and versatility. Moreover, failure to consider edge cases can have devastating consequences, including erosion of public trust and, ultimately, loss of human life.

This challenge is particularly pressing in human-in-the-loop systems, where humans and intelligent systems collaborate to accomplish diverse tasks, e.g., air traffic control, medical diagnosis and treatment, smart homes, industrial control systems, etc. As humans and machines collaborate, the boundaries between human and machine decision-making become increasingly blurred, creating a heightened risk of human error or machine malfunction with potentially disastrous consequences. In addition, the ability of robotic systems to work with diverse human users is critical towards robustness and adaptivity. Finally, the increasing labor cost requires the effective yet efficient human-robot collaboration. Hence, ensuring the safety, robust and effectiveness of human-in-the-loop systems requires a deep understanding of the interactions between humans and machines, as well as the development of novel safety-critical and robust control methodologies that can accommodate the inherent uncertainties and variabilities of human behavior to address both performance and efficiency needs. To address these challenges, novel safety-critical control methodologies must be developed to accommodate the unpredictability of human behavior and ensure the reliability and efficiency of human-machine collaborations.

The increasing use of robotic systems and the growing integration of these systems into everyday life necessitates advanced control strategies that ensure **safety, robustness, and effectiveness in human-machine teaming**. This special issue intends to focus on the latest research, methodologies, and applications in the control of robotic systems, addressing critical aspects such as **safety and optimization, human-robot interaction, and the effectiveness of human-centered control design**.

The primary aspect of any contribution should be novelty and originality. Also, the results should be presented in a mathematical language, according to the L-CSS standard. Specific topics of interest for this special issue include, but are not limited to:

- **Hybrid model-based and data-driven control for safety guarantees**
- **Robustness, efficiency, and safety in human-centered control design**
- **Robustness and trustworthiness in safety-critical control**

A manuscript submitted to the special issue should be **six pages** long in the journal format (style files are available on PaperPlaza), which is a strict limit. The contribution may also be accompanied by **supplementary material** (up to 6 additional pages are possible). However, according to the journal policy, **the value of the submission shall be decided based only on the main paper**, which must be self-contained, namely, it needs to be possible to understand the results and check their correctness without reading the supplement. The supplement is intended to present complementary information, such as simulations, videos, figures, or examples, but not, for instance, theorem proofs or definitions. Some mathematical background can be added to the supplement for the reader's convenience if it is already existing in the literature. However, crucial new derivations must be in the main paper.

The manuscripts will be peer-reviewed by international experts. According to the L-CSS policy, the final decision will be made within two rounds of review with no exceptions.

Submission deadline: **April 30, 2025**.

(Accepted) Papers online publication: within one week from the submission of the final manuscript and, in any case, no later than 6 months after the initial submission.