

The award will be given each year in recognition of the recipient's entire body of work and for their strong and fundamental contributions to the field. Details of the award are still

in development, and the inaugural award will be made at the 2024 CDC.

The TC-PG normally meets twice a year: once at the ACC and once at the CDC. If your interests align with the

scope of the committee and you would like to join, I encourage you to e-mail me directly at [jscruggs@umich.edu](mailto:jscruggs@umich.edu).

Jeff Scruggs 

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## Technical Committee on Hybrid Systems

Over the past two decades, we have witnessed the emergence of numerous complex systems resulting from the intricate interaction between digital components and physical entities. These digital components play a crucial role in monitoring and regulating various physical variables such as temperature, velocity, pressure, density, and more through the implementation of feedback control loops. Prominent examples of such systems encompass automotive and transportation systems, chemical processes, critical infrastructure, energy systems, robotics, health-care applications, and more. All of these systems fall under the category of hybrid systems, characterized by the heterogeneous nature of their models;

discrete systems capture the computational and communication aspects, while (stochastic) differential/difference equations describe the continuous physical processes.

The IEEE Control Systems Society (CSS) Technical Committee on Hybrid Systems (TC-Hybrid) is dedicated to fostering research and education in the field of hybrid systems. The committee actively provides a range of scientific forums, summer schools, invited sessions within conferences, workshops for technical discussions, special issues in prominent journals, and online resources (for example, Wikipedia and collections of software tools on hybrid systems) to support researchers and students interested in hybrid systems and their applications. Currently, TC-Hybrid boasts 138 members, with Majid Zamani [University of Colorado (CU) Boulder, USA] serving

as the TC chair and Manuel Mazo Jr. (Delft University of Technology, The Netherlands), Sadegh Soudjani (Newcastle University, United Kingdom), and Abolfazl Lavaei (Newcastle University, U.K.) as cochairs. This column aims to provide an overview of the TC's key activities throughout 2022 and early 2023.

### TC ACTIVITIES

The TC convenes annually at CSS-sponsored conferences, where recent meetings took place at the 2022 IEEE Conference on Decision and Control (CDC) and the American Control Conference (ACC) in 2022–2023. The TC actively contributes to the organization of various invited sessions, tutorials, and workshops at conferences as well as special issues in esteemed journals. Here are some notable activities that took place during 2022 and early 2023:

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The TC-Hybrid meeting during ACC 2023.

## TC-Hybrid launched the TC Outstanding Student Paper Prize in 2020 to recognize and promote young talent associated with TC-Hybrid.

- » At CDC 2022, Maurice Heemels (Eindhoven University of Technology, The Netherlands); Sandra Hirche (Technical University of Munich, Germany); Karl H. Johansson (KTH Royal Institute of Technology, Sweden); and Cameron Nowzari (George Mason University, USA) organized multiple invited sessions focused on event-triggered and self-triggered control.
- » Aneel Tanwani (CNRS, France) from the TC and other colleagues are currently organizing a special issue, titled “Nonsmooth Dynamical Systems: Analysis, Control and Optimization,” within the *Nonlinear Analysis: Hybrid Systems* journal.
- » Romain Postoyan (CNRS, France); Karl H. Johansson (KTH Royal Institute of Technology, Sweden); Manuel Mazo (Delft University of Technology, The Netherlands); and Sandra Hirche (TU Munich, Germany) from the TC and their colleagues are organizing a special issue titled “Event-Triggered and Self-Triggered Control” within the *Nonlinear Analysis: Hybrid Systems* journal.
- » Majid Zamani (CU Boulder, USA) organized a special section titled “Formal Verification and Synthesis of Cyber-Physical Systems” in *IEEE Open Journal of Control Systems*.
- » Antoine Girard (CNRS, France); Raphael Jungers (UCLouvain, Belgium); and Manuel Mazo (Delft University of Technology, The Netherlands) organized a workshop titled “Formal Methods for Data-Driven Control Systems” at ECC 2023.
- » In June 2022, Alessandro Abate (University of Oxford, U.K.); Ufuk Topcu (University of Texas at Austin, USA); and Jana Tumova (KTH Royal Institute of Technology Sweden) from the TC and their colleagues organized a workshop titled “Rigorous Automated Planning” at Lorentz Centre, The Netherlands.
- » Abolfazl Lavaei (Newcastle University, U.K.); Sadegh Soudjani (Newcastle University, U.K.); and Majid Zamani (CU Boulder, USA) organized a workshop titled “Data-Driven Verification and Control of Cyber-Physical Systems” at IFAC World Congress 2023.
- » Dragan Nesic and Mathieu Granzotto (University of Melbourne, Australia) and Romain Postoyan (CNRS, France) organized a workshop titled “Data-Driven and Optimization-Based Control” at CDC 2022.
- » Thomas Beckers (Vanderbilt University, USA) and Janine Matschek and Rolf Findeisen (TU Darmstadt, Germany), together with Sandra Hirche (TU Munich, Germany), organized a workshop titled “Gaussian Process-Based Modeling and Control” at CDC 2022.
- » Majid Zamani (CU Boulder, USA) and Ricardo Sanfelice [University of California, Santa Cruz (UCSC), USA], along with other colleagues, organized a workshop titled “Computation-Aware Algorithmic Design for Cyber-Physical Systems” at CPS-IoT Week 2023.
- » Negar Mehr [University of Illinois Urbana-Champaign (UIUC), USA]; Melkior Ornik (UIUC,

USA); and Yagiz Savas (Nuro, USA) organized a workshop titled “Learning and Control for Safety-Critical Systems” at ACC 2022.

- » Kunal Garg (MIT, USA); Ricardo Sanfelice (UCSC, USA); and Alvaro Cardenas (UCSC, USA) organized a workshop titled “Cyber-Security in Control of CPS: Recent Developments and Open Challenges” at CDC 2022.
- » Jorge I. Poveda [University of California San Diego (UCSD), USA] and Miroslav Krstic (UCSD, USA) organized a workshop titled “Recent Advances on Model-Free Equilibrium Seeking Control” at ACC 2023.
- » Ricardo G. Sanfelice (UCSC, USA) released the book *Hybrid Feedback Control* through Princeton University Press.

These activities exemplify the dedication and collaborative efforts of the TC to foster research and knowledge exchange in the field of hybrid systems and its diverse applications.

TC-Hybrid launched the TC Outstanding Student Paper Prize in 2020 to recognize and promote young talent associated with TC-Hybrid and encourage student membership and participation in the TCs. The prize is awarded to a student who is the primary author of a paper presented at the CDC and is a member of TC-Hybrid. The prize is presented at the CDC of year  $N + 1$  for a paper presented at the CDC of year  $N$ . The first two prizes were awarded during the TC-Hybrid meeting at the 2021 and 2022 CDC for papers presented at the 2020 and 2021 CDC, respectively. The complete list of winners can be found on the TC website.

### JOINING THE TC

To join the TC, e-mail the TC chair, Prof. Majid Zamani, at majid.zamani@colorado.edu. Upon receipt of your request, the TC chair will process your request and add you to the TC e-mail list.

Majid Zamani 