DSCD Newsletter

WINTER 2025

Editor: Minghui Zheng, Texas A&M University
Associate Editor: Verica Gajic, Ajman University

ASME
SETTING THE STANDARD

DSCD Executive Committee Leadership (2025)

The DSCD Executive Committee (ExComm) consists of five elected voting members plus two appointed non-voting members. Each elected voting member serves a five-year term: two years as Junior Member, one year as Vice-Chair, one year as Chair, and one year as Past Chair. In addition, there are two non-voting appointed members: the Secretary and the Treasurer.

Name	Role
Atul Gajanan Kelkar	Chair
Junmin Wang	Vice Chair
Kam Leang	Senior Member
Marcello Canova	Junior Member
Mahdi Shahbakhti	Secretary
Diane Peters	Treasurer
Marcia O'Malley	Past Chair

Newly elected member of DSCD's Executive Committee

Dr. Alex Leonessa of Clemson University has been elected the Junior Member of ASME DSCD's Executive Committee, effective July 1, 2026.

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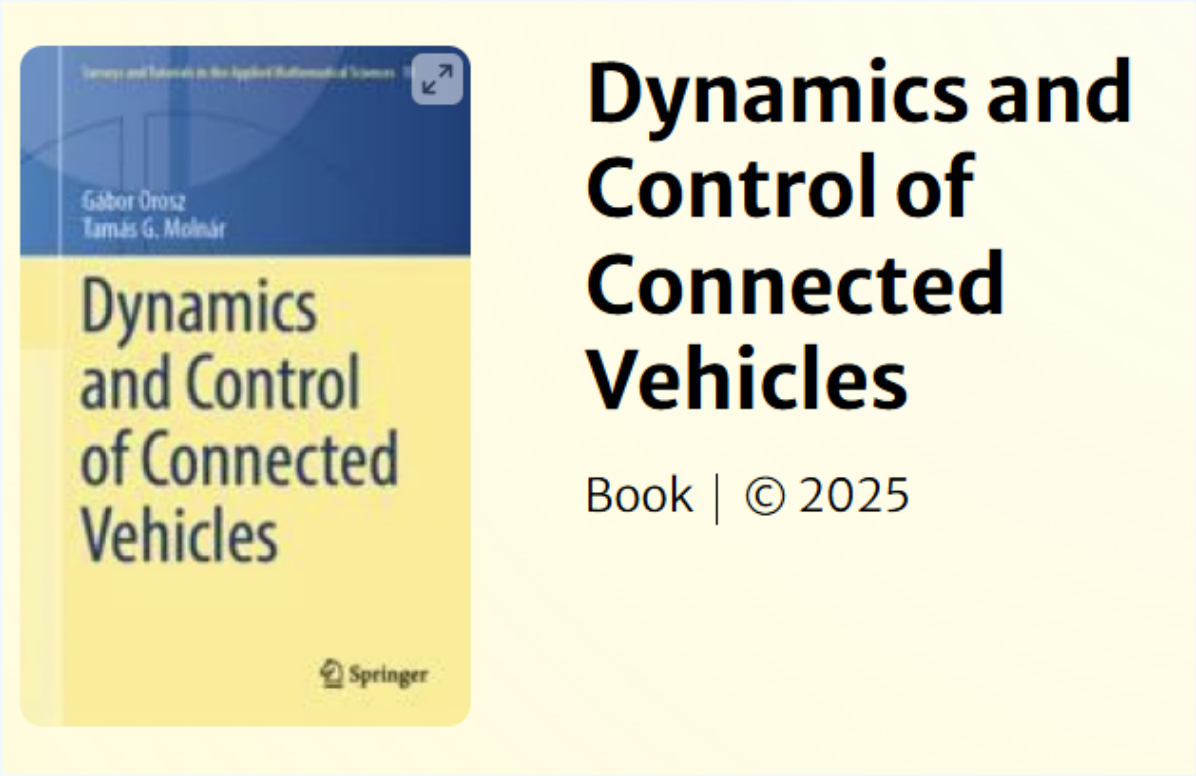
The Dynamic Systems and Control Division (DSCD) of ASME promotes advances in modeling, analysis, identification, control, and implementation of dynamical systems, including transportation systems, vibrations, robotics, energy systems, and bio-systems and health care. Our Division supports professional development, dissemination, training, and research across these fields. The Division holds public meetings on the first evening of both the American Control Conference (ACC) and the Modeling, Estimation and Controls Conference (MECC).

New Book Announcement

Dynamics and Control of Connected Vehicles

Professors Gabor Orosz (University of Michigan) and Tamas Molnar (Wichita State University) have published "*Dynamics and Control of Connected Vehicles*" through Springer and it is available now for download.



The book blends theory and application, covering:

- Human driver behavior and traffic stability
- Longitudinal control in automated vehicles (cruise and adaptive cruise control)
- Vehicle-to-everything (V2X) communication for coordinated driving

If you are working on the future of connected and automated vehicles, this book provides a comprehensive and up-to-date perspective on one of the most transformative areas in modern transportation.

Download the book: https://link.springer.com/book/10.1007/978-3-031-94555-7

MECC 2025 Photo Gallery

2025 Modeling, Estimation and Control Conference

MECC 2025 Photo Gallery

2025 Modeling, Estimation and Control Conference

2025 Nyquist Lecturer

Rajesh Rajamani, the Benjamin Y.H. Liu-TSI Professor in Mechanical Engineering at the University of Minnesota, was named the 2025 Nyquist Lecturer by ASME DSCD. The Nyquist lecture is a distinguished annual seminar that aims to present a message of broad interest to the ASME DSCD community. The Nyquist Lecturer is selected by the Executive Committee after receiving nominations from the broad divisional membership. Rajamani delivered a lecture titled "From Theory to Practice: Nonlinear Observers Transforming Next-Generation Mechatronic Systems," on October 5, 2025.

From Theory to Practice: Nonlinear Observers Transforming Next-Generation Mechatronic Systems

This talk presents recent results on nonlinear observers and their integrated use in modern mechatronic systems ranging from autonomous vehicles to wearable sensors. First, a new observer design technique that integrates the classical high-gain observer with a novel LPV/LMI observer to provide significant advantages compared to both methods is presented. Second, a systematic extension of the high gain observer design methodology to account for sensor noise, accommodate algebraic constraints and allow for nonlinear measurement equations is presented. Following the analytical observer results, three applications in modern mechatronic systems are discussed, including a wearable device for activity classification in Parkinson's disease patients, autonomous cars designed for teleoperator remote intervention in the presence of large wireless communication latencies, and smart agricultural/construction vehicles that utilize inexpensive sensors for end-effector position estimation. The applications are accompanied by videos of prototype experimental demonstrations. One of these applications has been successfully commercialized through a start-up company which sells over 10,000 sensor boards each year.

Rajesh Rajamani obtained his M.S. and Ph.D. degrees from the University of California at Berkeley and his B.Tech degree from the Indian Institute of Technology at Madras. He joined the faculty in Mechanical Engineering at the University of Minnesota in 1998 where he is currently the Benjamin Y.H. Liu-TSI Endowed Chair Professor and Associate Director (Research) of the Minnesota Robotics Institute. His active research interests include estimation, sensing and control for smart and autonomous systems. Dr. Rajamani has co-authored over 195 journal papers and is a co-inventor on 20+ patents/ patent applications. He is a Fellow of IEEE and ASME and has been a recipient of the CAREER award from the National Science Foundation, the O. Hugo Schuck Award from the American Automatic Control Council, the Ralph Teetor Award from SAE, the Charles Stark Draper award from ASME, and a number of best paper awards from journals and conferences.

Several inventions from his laboratory have been commercialized through start-up ventures co- founded by industry executives. One of these companies, Innotronics, was recognized among the 35 Best University Start-Ups of 2016 by the US National Council of Entrepreneurial Tech Transfer.

Review Article

Toward Generalist Neural Motion Planners for Robotic Manipulators: Challenges and Opportunities

by D. Soleymanzadeh, I. Sanchez, H. Su, Y. Li, X. Liang, and M. Zheng

Project Page: https://davoodsz.github.io/planning-manip-survey.github.io/

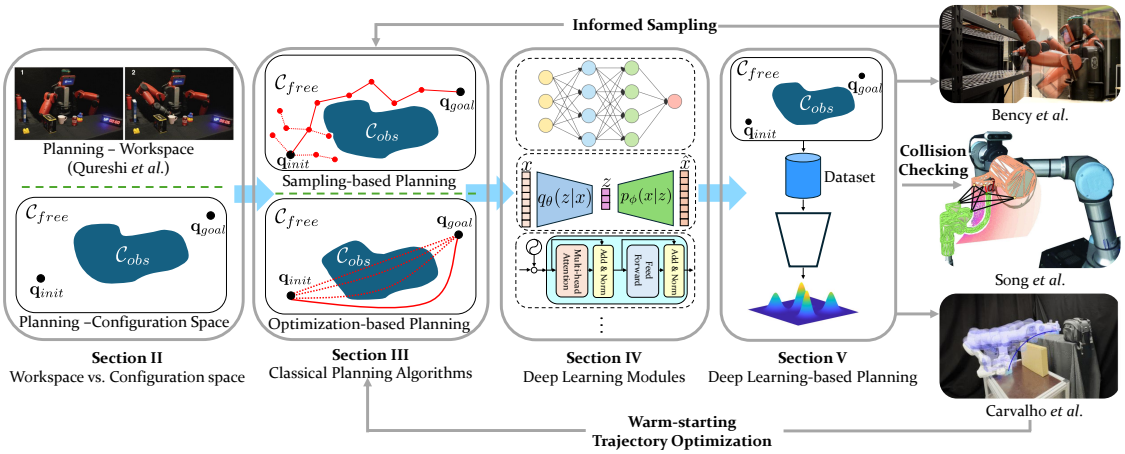


Figure 1: Overview of this survey paper

Abstract

State-of-the-art generalist manipulation policies have enabled the deployment of robotic manipulators in unstructured human environments. However, these frameworks struggle in cluttered environments primarily because they utilize auxiliary modules for low-level motion planning and control. Motion planning remains challenging due to the high dimensionality of the robot's configuration space and the presence of workspace obstacles. Neural motion planners have enhanced motion planning efficiency by offering fast inference and effectively handling the inherent multi-modality of the motion planning problem. Despite such benefits, current neural motion planners often struggle to generalize to unseen, out-of-distribution planning settings. This paper reviews and analyzes the state-of-the-art neural motion planners, highlighting both their benefits and limitations. It also outlines a path toward establishing generalist neural motion planners capable of handling domain-specific challenges.

Key Summaries

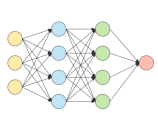
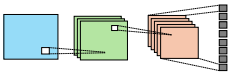
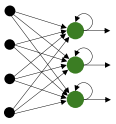
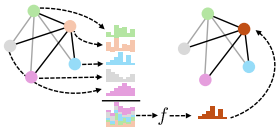
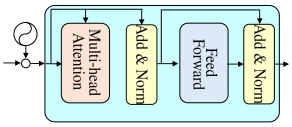
The key contributions of this survey paper are as follows:

- **Robotic manipulator motion planning:** We review the state-of-the-art literature that has utilized deep learning for robotic manipulator planning. Robotic manipulators are increasingly deployed within critical applications (e.g., healthcare, re-manufacturing, and agriculture), which necessitate safe and efficient motion planning algorithms. However, motion planning for robotic manipulators remains challenging due to their high DOF and the complexity of real-world environments.

- **Systematic mapping from deep learning frameworks to motion planning algorithmic primitives:** We provide a systematic mapping from various deep learning architectures (e.g., convolutional neural networks, deep generative models, large language models) to core algorithmic primitives of classical motion planning algorithms (e.g., sampling and steering primitives of sampling-based planning algorithms).

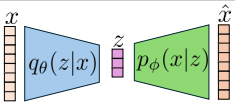
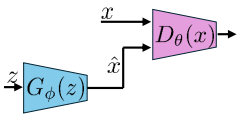
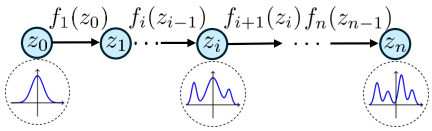
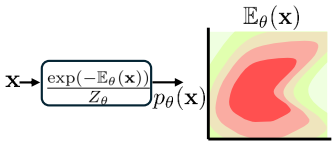
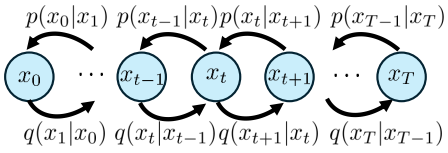
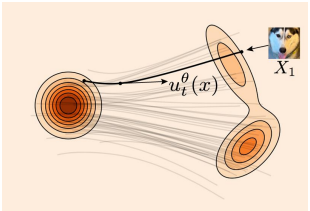
- **Road to generalist neural motion planners:** We outline a path toward generalist neural motion planners capable of end-to-end planning for robotic manipulators. We summarize the progress that has been made in this direction, identify how far the research community has advanced, and highlight key considerations necessary to achieve this goal. Particularly, we emphasize the need for standardized benchmarks, large-scale planning datasets, explicit handling of safety constraints, generalization to out-of-distribution scenarios, and robustness to planning uncertainties for reliable deployment within unstructured real-world environments. Additionally, we discuss how large-scale foundation models can be established and leveraged to facilitate traversing this path.

Table 1: Schematic of basic Deep learning frameworks, their characteristics, and their potential for improving various components of classical planning algorithms for robotic manipulators.

	MLPs	CNNs	RNNs	GNNs	Transformers
Schematic					
Characteristics	• Univeral approximator due to nonlinear activation function.	• Structural encoding via local, translation-invariant convolution operator.	• Spatiotemporal encoding via recurrent connections.	• spatiotemporal encoding via convolution operator and permutation-invariant operators.	• Long-horizon dependecies via multi-head attention and scaled dot-product.
E2E Planning	• planning policy representation.	• Workspace encoding.	• Temporal dependecines of planning policy.	• Spatio-temporal dependenices within planning policy.	• Long spatiotemporal relations within planning policy.
SBMP	• Sampling distribution for informed sampling.	• Planning space encoding for informed sampling.	• Encode temporal dependecies for neural sampling	• Encode spatiotemporal dependecies for neural sampling	• Encode long-horizon spatio-temporal dependecies for neural sampling
TO	• Provide initial trajectory for TO.	-	-	-	-
Collision Checking	• (Binary) collision checker.	• Point cloud collision checker.	-	-	• Distance-to-collision estimator.

Note: "E2E Planning" denotes end-to-end planning, "SBMP" denotes sampling-based motion planning algorithms, and "TO" denotes trajectory optimization algorithms.

Table 2: Schematic of various deep generative models, their characteristics, and their applications in improving various components of classical planning algorithms for robotic manipulators. The flow matching figure is adopted from [?].

	Deep Generative Models		
Schematics	 Variational Auto-encoders (VAEs)	 Generative Adversarial Networks (GANs)	 Normalizing Flows (NFs)
	 Energy-based Models (EBMs)	 Diffusion Models (DMs)	 Flow Matching (FMs)
Characteristics	• Probability density estimation.		• Sample generation during inference.
E2E Planning		• Task and planning space encoding for E2E planning.	
SBMP	• Capture the multi-modality of planning problem for neural informed sampler.		• Learning constraint manifold for constraint-aware sampling.
TO	• Learning prior for trajectory optimization algorithm.		• Solve the optimization problem via maximum -a-posterior (MAP) formulation.

Note: "E2E Planning" denotes end-to-end planning, "SBMP" denotes sampling-based motion planning algorithms, and "TO" denotes trajectory optimization algorithms.

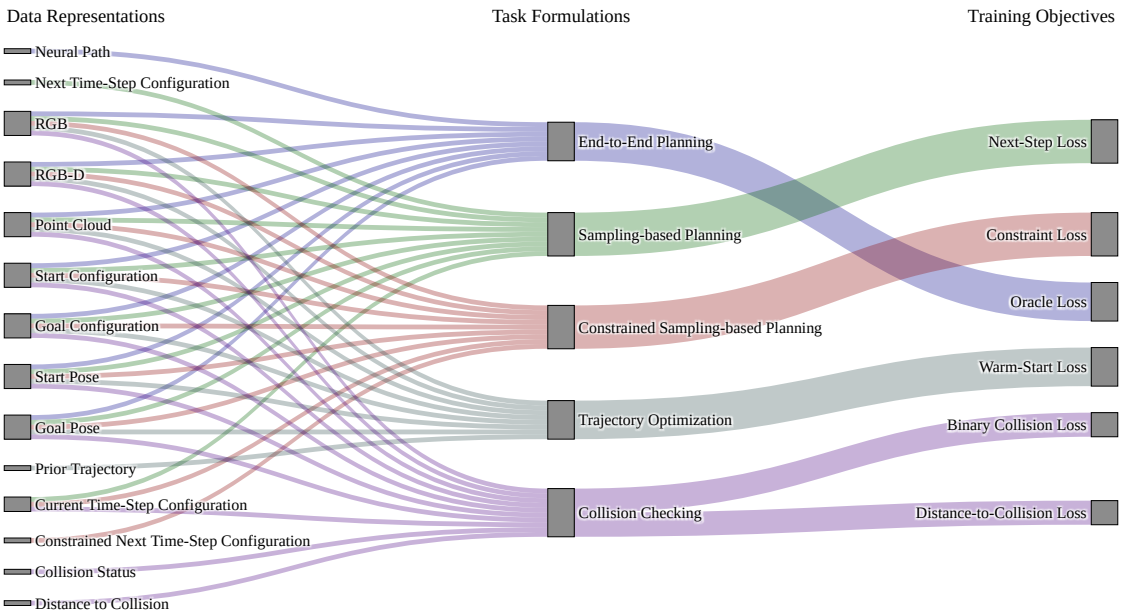


Figure 3: Data representation and training objectives of neural motion planners for robotic manipulators. The left column illustrates the input and output modalities (data representation) and the right column demonstrates the corresponding loss function (training objective) for training and deploying neural motion planners.

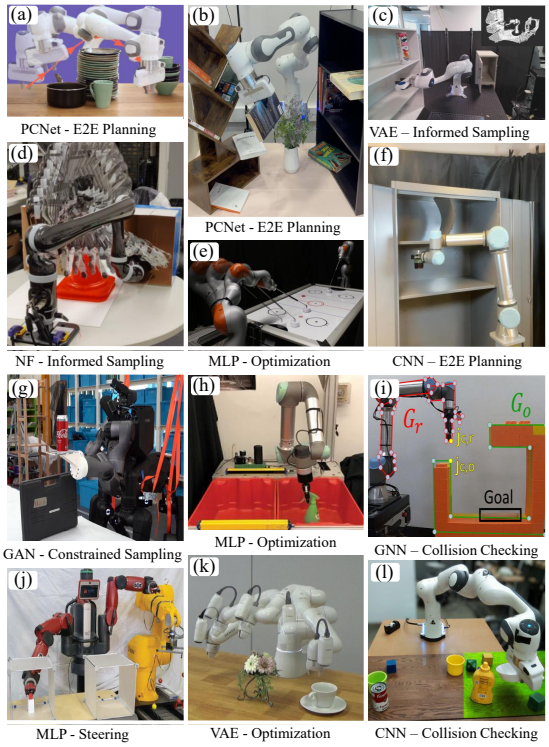


Figure 2: Deep learning for robotic manipulator motion planning.

Conclusions

Through a comprehensive examination of state of the art, we analyzed how various deep learning architectures have improved classical motion planning algorithms for robotic manipulators. In this examination:

- We delved into classical planning algorithms to identify their core components, and we discussed how various deep learning characteristics, such as fast inference, inductive biases, parallelization, and multi-modal feature encoding capabilities, have improved these components, and provided a systematic map from various deep learning frameworks to specific algorithmic primitives of classical motion planning algorithms.
- We also outlined the essential considerations towards developing generalist neural motion planners capable of end-to-end planning and robust deployment within unstructured real-world environments.

In addition to highlighting the improvements that deep learning methods lend to motion planning algorithms, we also identified challenges and considerations that need to be addressed before these frameworks can be safely deployed within a broad range of unstructured real-world environments. Particularly, we emphasized the need for standardized benchmarks, large-scale planning datasets, explicit handling of safety constraints, generalization to out-of-distribution scenarios, and robustness to planning uncertainties for reliable deployment within unstructured real-world environments. Additionally, we discussed and emphasized how recent large-scale foundation models can be established and leveraged to facilitate reaching this goal. This review aims to serve as a foundational resource for researchers interested in exploring deep learning applications in motion planning for robotic manipulators.

D. Soleymanzadeh, I. Lopez-Sanchez, H. Su, Y. Li, X. Liang and M. Zheng, "Toward Generalist Neural Motion Planners for Robotic Manipulators: Challenges and Opportunities," in IEEE Transactions on Automation Science and Engineering, vol. 23, pp. 4488-4531, 2026, doi: 10.1109/TASE.2026.3660830.

Honors and Awards

Miroslav Krstic elected Fellow of American Institute of Aeronautics and Astronautics (AIAA).

Citation: For enabling contributions to arresting gear on new aircraft carriers and pioneering contributions to suppressing aeroengine instabilities, flow control, UAV endurance, and GPS-denied navigation

Changliu Receives IFAC Robotics Outstanding Young Researcher Award.

Changliu receives IFAC Robotics Outstanding Young Researcher Award "For significant and sustained contributions in intelligent robot control with provable safety and efficient human-robot collaboration in manufacturing, logistics, and autonomous driving."

Marcia O'Malley received the Grand Nagamori Award.

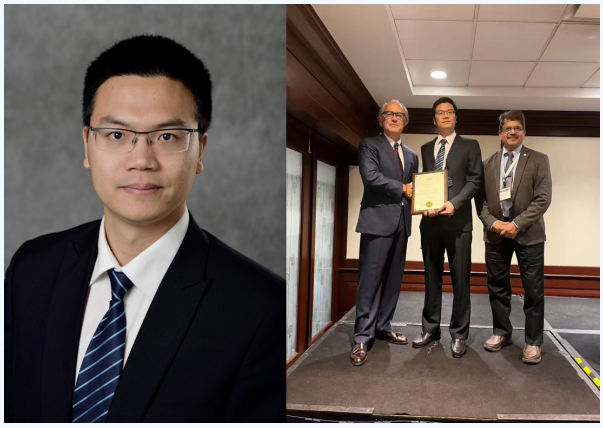
For contributions to the design of exoskeleton robots and implementation of shared control algorithms to assist upper limb movements

Anna Stefanopoulou awarded a Distinguished University Professorship

Anna Stefanopoulou, the William Clay Ford Professor of Technology and professor of mechanical engineering, has been awarded a Distinguished University Professorship, one of the University of Michigan's highest honors for faculty. Anna chose to name her professorship after Dr. Huei Peng, the Roger L. McCarthy Professor of Mechanical Engineering and an influential figure of the DSC Division who passed away unexpectedly in 2022. Anna worked closely with Huei to develop a laboratory and wrote a book on Control Systems for Fuel Cells. Anna is very proud to honor Huei's contributions and to now be called the Huei Peng Distinguished University Professor of Mechanical Engineering. More information: https://me.engin.umich.edu/news-events/news/anna-stefanopoulou-honored-as-distinguished-university-professor/.

2025 Outstanding Young Investigator Award

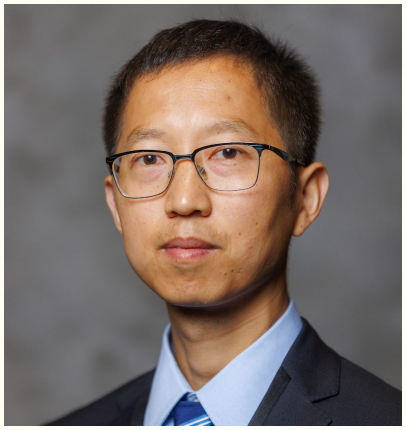
Michigan State University researcher Zhaojian Li has received the 2025 Outstanding Young Investigator Award(opens in new window) from the American Society of Mechanical Engineers(opens in new window) (ASME) Dynamic Systems Controls Division (DSCD)(opens in new window) "for pioneering contributions to learning-enabled and safety-critical control, and for transformative advances in autonomous agricultural robotics, including field-deployed multi-arm fruit harvesting systems."



Dr. Zhaojian Li is a Red Cedar Distinguished Associate Professor in the Department of Mechanical Engineering at Michigan State University. He obtained M.S. (2013) and Ph.D. (2015) in Aerospace Engineering (flight dynamics and control) at the University of Michigan, Ann Arbor. Dr. Li worked as an algorithm engineer at General Motors from January 2016 to July 2017. His research interests include Optimal Control and Machine Learning, with applications to Robotics and Connected Automated Vehicles. He is the author of more than 80 top journal articles and several patents. He is currently the Associate Editor for IEEE Transactions on Control System Technology, IEEE Transactions on Intelligent Vehicles, and ASME Journal of Dynamic Systems, Measurement. His research has been funded by National Science Foundation, National Institute of Health, US Department of Agriculture, Army, Office of Naval Research, Ford, DENSOR, T-Mobile, among others. He is a senior member of IEEE and the recipient of 2025 ASME DCSD Outstanding Young Investigator Award, the 2021 NSF CAREER award, 2023 ASABE Engineering Concept of the Year Award, and several Best Paper awards.

2025 NSF CAREER AWARD

CAREER: Scalable Adaptive Control with Performance Guarantees for Safe and Efficient Autonomous Systems



Dr. Pan Zhao of the Department of Aerospace Engineering and Mechanics at the University of Alabama received NSF CAREER award recently. "The goal of this project is to develop advanced control methodologies that enable the reliable deployment of autonomous systems in dynamic and uncertain environments, addressing key challenges such as safety, performance, adaptability, and the ability to manage complex, high-dimensional systems. To achieve this, the research focuses on three main thrusts: (i) designing a control architecture that integrates robust adaptive uncertainty compensation and constrained control to ensure safe and efficient operation of nonlinear systems under complex uncertainties, (ii) establishing an adaptive nonlinear parameter-varying control framework to handle large uncertainties, including those arising from control authority constraints and unmatched uncertainties, and (iii) leveraging machine learning techniques to enhance the scalability and performance of the projected robust adaptive control algorithms, enabling their application to high-dimensional systems with stringent performance demands. Together, these efforts aim to advance the state of the art in managing uncertainty, constraints, and nonlinear dynamics, setting a foundation for deploying safety-critical autonomous systems across a wide range of applications. The educational and outreach components will complement the research by equipping students across all levels with the skills and motivation to pursue careers in control and autonomy, thereby contributing to a stronger workforce and regional ecosystem in intelligent systems."

News

Mentoring Session MECC 2025

Mentoring Session for Students and Young Members Held at MECC 2025

Minghui Zheng, Texas A&M University

This mentoring session aimed to promote community building and support the professional growth of near-graduate students and early-career members through an informal and interactive panel discussion featuring four distinguished professionals from diverse backgrounds in MECC-related fields: Ellen Mazumdar (Georgia Institute of Technology), Changliu Liu (Carnegie Mellon University), Jonathon Slightam (Sandia National Laboratories), and Chaozhe He (University at Buffalo). During the session, the panelists shared personal reflections on their career journeys, highlighted common challenges encountered in both academia and industry, and offered practical advice to help attendees navigate and succeed in their professional paths.

2026 Modeling, Estimation and Control Conference

October 25 - 28, 2026 (Sunday – Wednesday)

Phoenix, Arizona, USA

MECC 2026 *Tentative* Key Dates

Joint paper submission deadline:	**March 14, 2026**
Conference-only paper submission deadline:	**April 06, 2026**
Notification of acceptance/rejection:	**June 26, 2026**
Final manuscript submission deadline:	**July 20, 2026**

Logo credit: Isaac Weintraub

The 2026 Modeling, Estimation and Control Conference (MECC 2026), sponsored by the American Automatic Control Council (AACC) and co-sponsored by the International Federation of Automatic Control (IFAC), will be held from Sunday through Wednesday, October 25 – 28, 2026 in Phoenix, AZ, United States at the Tempe Mission Palms Hotel. Phoenix is a sprawling desert city renowned for its year-round sunshine, rugged mountain backdrops, and vibrant Southwestern culture. As the fifth-largest city in the U.S., it boasts a dynamic mix of outdoor recreation, thriving arts scenes, and world-class dining. From hiking Camelback Mountain to exploring downtown's lively districts, Phoenix blends urban energy with stunning natural beauty.

MECC is an annual conference of the American Automatic Control Council (AACC), the U.S. national member organization of the International Federation for Automatic Control (IFAC). National and international society co-sponsors of MECC include member societies of the AACC: the American Institute of Aeronautics and Astronautics (AIAA), the American Institute of Chemical Engineers (AIChE), the American Society of Civil Engineers (ASCE), the American Society of Mechanical Engineers (ASME), the IEEE Control Systems Society (IEEE-CSS), the Institute for Operations Research and the Management Sciences (INFORMS), the International Society of Automation (ISA), the Society for Modeling & Simulation International (SCS), and the Society for Industrial & Applied Mathematics (SIAM). MECC 2026 is pleased to partner with Motion, Vibration, and Control (MoViC) community and offer special tracks in MoViC comprising of technical presentations, keynote lectures, and invited sessions.

MECC 2026 aims to serve the scientific and engineering communities in the cross-disciplinary areas of modeling, estimation, and control of dynamic systems; to provide a platform for the dissemination and discussion of the state-of-the-art in relevant research areas; and to create opportunities for networking with colleagues. The conference features contributed sessions, invited sessions, workshops, special sessions, plenary talks, keynote speeches, student and young professional programs, industry programs, and conference awards ceremonies. The conference will also host the ASME Dynamic Systems and Control Division's committee/general meetings and many social functions including opening and closing receptions.

MECC 2026 invites: (1) manuscripts that report original research on all aspects of modeling, estimation, and control; (2) proposals for invited, special, and tutorial sessions, and workshops on emerging topics; and (3) exhibits and sponsors from industry and research laboratories. MECC 2026 is excited to continue the popular joint submission process, with three ASME journals including the ASME Letters in Dynamic Systems and Control (ALDSC), the Journal of Dynamic Systems, Measurement and Control (JDSMC), and the Journal of Autonomous Vehicles and Systems (JAVS). Manuscripts submitted through this joint process will be considered for peer-reviewed publication in the journal selected by the authors. Manuscripts not recommended for journal publication will receive consideration for inclusion in the peer-reviewed MECC proceedings, in the same way as the conference-only submissions. MECC 2026 proceedings will be published via the open-access IFAC-PapersOnLine, indexed in EI, Scopus, Web of Science, and INSPEC.

All publication materials submitted to MECC 2026 must be original and cannot be published or under review elsewhere, and they will be peer reviewed through PaperCept ((https://ifac.papercept.net). Accepted papers must be presented onsite at the conference by an author of the paper. For additional information, please check the conference website: https://mecc2026.a2c2.org.

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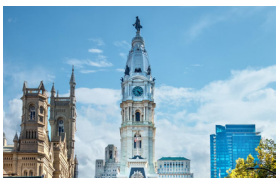
AMERICAN CONTROL CONFERENCE
PHILADELPHIA•JULY 7-9, 2027

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CALL FOR PAPERS

The 2027 American Control Conference (ACC) will be held Wednesday through Friday, July 7-9, 2027 in Philadelphia. The pre-conference workshops will be held Monday through Tuesday, July 5-6, 2027. Philadelphia, the birthplace of American democracy, offers an inspiring backdrop for our conference. This historic yet vibrant city invites you to explore the life and legacy of Benjamin Franklin, visit landmarks like the Liberty Bell and Independence Hall, and enjoy access to world-class museums, theaters, and a thriving arts and culture scene. One of America's most iconic cities with its walkable downtown and rich intellectual heritage, Philadelphia combines centuries of tradition with a dynamic, modern spirit, ideal for academic exchange and professional networking.

ACC is the annual conference of the American Automatic Control Council (AACC), the U.S. national member organization of the International Federation for Automatic Control (IFAC). National and international society co-sponsors of ACC include the American Institute of Aeronautics and Astronautics (AIAA), American Institute of Chemical Engineers (AIChE), American Society of Civil Engineers (ASCE), American Society of Mechanical Engineers (ASME), IEEE Control Systems Society (IEEE-CSS), Institute for Operations Research and the Management Sciences (INFORMS), International Society of Automation (ISA), Society for Modeling & Simulation International (SCS), and Society for Industrial & Applied Mathematics (SIAM).

The 2027 ACC technical program will comprise several types of presentations in regular and invited sessions, tutorial sessions, and special sessions along with workshops and exhibits. For contributed and invited papers, authors may be invited to present to a larger audience in a rapid-interactive (RI) format. Submissions are encouraged in all areas of the theory and practice of automatic control.

Contributed Papers: ACC Papers are invited in the form of regular manuscripts (allotted 6 proceedings pages and up to 8 pages with additional page charges). Submissions to L-CSS have the option for presentation at ACC (note: L-CSS papers have a strict 6 page limit). Papers must conform to the submission policies, detailed on the conference and journal web pages. All manuscripts should be written in English, be in 2-column format, and meet strict page limits.

Invited Sessions: Invited sessions consist of 6 papers presenting a unifying theme from diverse perspectives. Proposals should include a list of potential papers and clearly describe the motivation and relevance of the session. A full version of each paper in the invited session must be submitted by the manuscript deadline and will be reviewed independently. Specific details on the submission process are on the conference website.

Tutorial Sessions: Tutorial sessions are a special category of invited sessions organized to provide an introduction to a topic of interest. The format is structured around a main tutorial paper and talk to bring the participants up to speed, followed by several presentations (with or without papers of up to 6 pages each) to give a picture of the state of the art. Tutorial sessions involving strong industry and academic collaboration are highly encouraged.

Special Sessions: Special sessions offer a venue for creating awareness of, and providing exposure to emerging research areas, research and funding opportunities, and other topics of broad interest to attendees. History and industry-sponsored sessions also fall into this category.

Workshops: Workshops to be held prior to the conference are solicited on all related topics. Proposals addressing novel control methodologies, emerging applications, and workshops with strong tutorial value are encouraged.

Exhibits: Exhibitors are invited to showcase, demonstrate and market control-related publications, software tools, educational products, services, and jobs. Exhibits are open throughout the conference to all attendees of ACC.

All papers and session and workshop proposals must be submitted through the conference submission website. Submissions must conform to the policy found at the conference website: https://acc2027.a2c2.org/

AACC ASCE ASME IFAC IEEE AIAA ISA informs SCS AIChE siam

IMPORTANT DATES

L-CSS SUBMISSION
SEPTEMBER 11, 2026

ACC MANUSCRIPT SUBMISSION
SEPTEMBER 25, 2026

ACCEPTANCE-REJECTION NOTIFICATION
JANUARY 22, 2027

FINAL MANUSCRIPTS DUE
MARCH 12, 2027

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