2022 Modeling, Estimation, and Control Conference (MECC)

Conference Booklet

Jersey City, New Jersey October 2-5, 2022.

AACC ▷   IFAC
INTERNATIONAL FEDERATION
OF AUTOMATIC CONTROL

Welcoming Message

On behalf of the Organizing Committee, it is our great pressure to welcome you to the 2022 Modeling, Estimation, and Control Conference (MECC) in Jersey City, New Jersey, USA on October 2-5, 2022. This is the 2nd MECC but the first in-person one—due to the Covid-19 pandemic since early 2020. We sincerely thank you for joining us to disseminate your work and exchange ideas in MECC, despite all the challenges and uncertainties we are still facing.

Brought together by the diverse collective experience of the Organizing Committee (OpComm), MECC2022 features 129 original papers, 12 Journal-paper abstracts, 17 posters, and 37 special-session abstracts. These contributions are organized into 8 invited sessions, 16 contributed sessions, 12 special sessions, 2 tutorial sessions, one rapid-fire poster presentation session, and poster presentations on each day of the conference. To provide a platform to promote students' research and career growth, this year we created a series of interactive sessions (Rising Star Sessions) for close-to-graduation PhD. students and postdocs to present their work. This platform covers five frontier areas ranging from robotics, mechatronics, vibration and energy systems, automotive and transportation systems, to biomechanical systems. This excitement is resonated by the conference plenary talks presented by three distinguished scholars: Professor Masayoshi Tomizuka from University of California, Berkeley on Exploration in the Forest of Mechanical Systems Control (October 3rd, Monday), Professor Jing Sun from University of Michigan on Bridging the Gap in Prediction, Estimation, and Control of Integrated Systems (October 4th, Tuesday), and Professor Aaron Dollar from Yale University on "Mechanical Intelligence" in Robotic Manipulation: Good Design Makes Everything Easier (October 5th, Wednesday). Also, the conference offers ample opportunities and activities to students and young scholars in career building, professional development, and networking, including the Newest Advances in Systems and Control from Recent NSF DSCD CAREER Awardees, the Industrial Stories in Controls, and the Best Conference and Student Papers Competitions. A special session on funding opportunities is organized for the Directors of five different programs in U.S. National Science Foundation and Air Force Office of Scientific Research to introduce their programs and interact with the attendees. Several exciting events of the ASME Dynamic Systems and Control Division (DSCD) will also take place during the conference, including the Oldenburger Lecture along with the DSCD Award Ceremony (on Tuesday, October 4th from 11:35AM to 1:50PM), and the Nyquist Lecture (on Monday, October 3rd at 4:00PM).

Under the sponsorship and guidance of AACC along with the co-sponsorship of IFAC, this MECC is only made possible through your support and our colleagues' volunteering work. We are very thankful to the authors for contributing their quality manuscript, the Technical Committees of ASME for organizing invited sessions, the reviewers and the Conference Editorial Board members for reviewing the submissions, and our industrial colleagues for presenting their stories in practical applications. We also thank our industrial and academic sponsors for their generous support of the conference. Specifically, we would like to recognize the hard work of the Organizing Committee: Qian Wang, Conference Editorial Board Chair; Cong Wang, Local Arrangements Chair; Ellen Yi Chen Mazumdar, Students and Young Members Chair; Manish Kumar, Publicity Chair; Tuhin Das, Finance Chair; Douglas Bristow, Registration Chair; Yaoyu Li, Invited & Special Sessions Chair; Kenn Oldham, Exhibits & Industry Liaison Chair; Chinedum Okwudire, Publication Chair; and Zongxuan Sun, Workshops & Tutorials Chair. We also thank the support of our International Program Committee led by Tom Oomen. We gratefully acknowledge AACC's and IFAC's support and guidance. In particular, we are indebted to Robert Judd for leading the hotel selection and contract negotiation, and to Dawn Tilbury for pouring insights into IFAC co-sponsorship.

Located on the bank of Hudson River facing the skyline of lower Manhattan downtown, the conference venue in Jersey City offers you the convenience and endless possibilities to explore the rich history and

vibrant culture of the Big Apple and the surrounding in the most beautiful season of the year. We wish you an enjoyable and fruitful experience in MECC 2022!

Qingze Zou, Rutgers University

General Chair (NOC Chair)

Xu Chen, University of Washington

Program Chair (NOC Co-Chair)

General Information

Registration

Registration will be located at the Liberty Foyer, located on the 2nd floor of the hotel. The hours are as follows:
Sunday, October 2: 3:30PM--6:30PM
Monday, October 3: 8:00AM–5:00PM
Tuesday, October 4: 8:00AM–5:00PM
Wednesday, October 5: 8:00AM–12:00PM

THE AMERICAN AUTOMATIC CONTROL COUNCIL

The Modeling, Estimation and Control Conference (MECC) is organized under the auspices of the American Automatic Control Council (AACC), which is an association of nine professional societies:
• 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)
• Institute of Electrical and Electronics Engineers (IEEE)
• Institute for Operations Research and the Management Sciences Applied Probability Society (INFORMS APS)
• International Society of Automation (ISA)
• Society for Industrial and Applied Mathematics (SIAM)
• Society for Modeling and Simulation International (SCS)

AACC represents the United States to the global control community and supports the mission of the individual member societies in enhancing the role and contributions of automation for the benefit of humankind. AACC is also the US National Member Organization (NMO) of the International Federation of Automatic Control (IFAC), a multinational federation of NMOs, each representing the engineering and scientific societies concerned with automatic control in its country. AACC helps arrange for IFAC events in the U.S. and provides delegates for IFAC committees and leadership.

The MECC was recently created under the AACC sponsorship and guidance (co-sponsored by IFAC). AACC also supports control education from K-12 through post-graduate studies. AACC provides opportunities for personal and professional development and recognition to its large cast of volunteers, on whom it is crucially dependent for its operations and success. The activities of the AACC are governed by a Board of Directors. Each AACC member society appoints a director. Operational responsibilities for the AACC rest with five officers, who report to the Board. All directors, officers, and committee members are volunteers. To learn more about AACC please visit www.a2c2.org.

International Federation of Automatic Control (IFAC)

Founded in Paris in 1957, IFAC is the worldwide organization tasked with promoting the science and technology of automatic control in all systems, whether for example, engineering, physical, biological, social or economic, in both theory and application. IFAC is also concerned with the impact of control technology on society. Maintaining the highest technical level of scientific excellence is a major concern for IFAC. This is achieved through the technical excellence of our conferences, publications and technical committees, and excellence in terms of the efficiency and effectiveness of our secretariat and administrative systems and processes. Besides various conferences it (co-)sponsors, IFAC is well known

through the editorship of eight prestigious archival journals: Automatica, Control Engineering Practice, Annual Reviews of Control, Engineering Applications of Artificial Intelligence, Journal of Process Control, Mechatronics, Nonlinear Analysis: Hybrid Systems, and IFAC Journal of Systems and Control, which are known as IFAC Journals and published in partnership with the official IFAC publisher, Elsevier.

Jersey City, New Jersey
A melting pot of cultures and people, Jersey City used to be the first destination for many immigrants entering the U.S. through nearby Ellis Island, which operated from 1892 until 1954 and processed more than 12 million immigrant steamship passengers. Today, Jersey City reflects the flavors and influences of the international populations. An urban sophistication exists in the downtown area, from the waterfront landmark Colgate Clock through the Powerhouse Arts District, home to some of the city's many talented artists and exquisite gourmet. Thanks to the well-developed local rail transit system, Jersey City is just moments away from the Newark Liberty International Airport and Manhattan of New York City, with easy access to numerous attractions in the area. From the Statue of Liberty and iconic sites in Manhattan to Thomas Edison National Historical Park, as well as countless entertainment and shopping options, come enjoy MECC 2022 in Jersey City.

Hotel
MECC 2022 is held at the Westin hotel at Jersey City Newport, managed by Marriott. The hotel is across the street from the west shore of Hudson river with spectacular views of New York City skyline. In addition to the close proximity to numerous attractions, foods, and activities, the hotel is close to the Newport Station of PATH trains, which conveniently connect the venue to New York City and the Liberty International Airport (EWR). The conference room rate for single/double occupancy is $249 per night, available over Saturday October 1 to Wednesday October 5, 2022.

Hotel address:
479 Washington Boulevard,
Jersey City, New Jersey, USA, 07310
Toll Free: +1-800-937-8461
Fax: +1 201-626-2905

Transportation
The airport closest to the venue is the Newark Liberty International Airport (EWR). It is one of the three major airports serving the greater NYC area and has direct flights to most main cities in the US, as well as many popular international destinations. The easiest way to travel to the hotel from the EWR airport is by rail transit:

1. At Terminal C of the EWR airport, take the AirTrain of the airport to Newark Airport Railroad Station.
2. At Newark Airport Railroad Station, take any train that goes to the Newark Penn Station.
3. At the Newark Penn Station, take the PATH train that goes to Newport Station. (Depending on the arrival day, connection to a second PATH train might be needed at Journal Square Station or Grove Street Station.)
4. From Newport Station, Westin Hotel is within walking distance (about 4 minutes).

Name Badges
Please wear your name badge at all times. Admission to all conference functions will be by the badges only (unless noted otherwise). Your badge also provides a helpful introduction to other attendees.

Conference Wi-Fi
Provided at the registration desk.

Sponsors

Gold Sponsors

Siemens: Siemens Corporation is a subsidiary of Siemens AG, a technology company focused on industry, infrastructure, transport, and healthcare. From more resource-efficient factories, resilient supply chains, and smarter buildings and grids, to cleaner and more comfortable transportation as well as advanced healthcare, the company creates technology with purpose adding real value for customers. By combining the real and the digital worlds, Siemens empowers its customers to transform their industries and markets, helping them to transform the everyday for billions of people. Siemens also owns a majority stake in the publicly listed company Siemens Healthineers, a globally leading medical technology provider shaping the future of healthcare. In addition, Siemens holds a minority stake in Siemens Energy, a global leader in the transmission and generation of electrical power. Siemens has been supporting the industries and creating the infrastructure forming the backbone of America's economy for more than 160 years, with 40,000 employees, 17,000 suppliers, and customers in all 50 states and Puerto Rico. In fiscal 2020, Siemens Group USA generated revenue of nearly $20 billion.

Silver Sponsors

Rutgers University: The **Department of Mechanical and Aerospace Engineering** at Rutgers was founded in 1908 with a focus on driving the country's industrial growth. Today, with more than 30 full-time faculty members, the Mechanical and Aerospace Engineering Department educates more than 700 undergraduate and 180 graduate students. MAE is the largest of the engineering disciplines at Rutgers. Today, the department is an energetic and multidisciplined group advancing research in a variety of exciting areas, including nanostructures, autonomous robotics, electrohydrodynamics, fluid interactions, energy science, and advanced materials.

University of Washington: Seattle is a vibrant international city, known for its cultural diversity, robust economy, and natural beauty. The University of Washington (UW) is the largest university in the northwestern United States and is one of the oldest universities on the west coast. Ranked No. 7 in the world on the U.S. News & World Report's Best Global Universities rankings, the UW educates more than 54,000 students annually.The **UW College of Engineering** is ranked 20th among all engineering schools with more than half of its departments ranked in the top 20 of their respective fields. UW Engineering has 272 faculty (26.5% women, #1 among the top 50 engineering schools). **The Department of Mechanical Engineering** is one of UW's largest and most popular engineering departments. The Mechanical Engineering department's research and teaching portfolio covers all aspects of the broad field of mechanical engineering, including interdisciplinary work in engineering in medicine, robotics and controls, energy and the environment, fluid dynamics, data science and machine learning, materials, and advanced manufacturing. The department has over 40 full-time faculty, more than 400 undergraduates, and continues to grow.

Bronze Sponsors

Processes: Processes (ISSN 2227-9717) is an international, peer-reviewed, open access journal on processes in chemistry, biology, materials, energy, environment, food, pharmaceutical, manufacturing and allied engineering fields published monthly online by MDPI. The journal publishes regular research papers, communications, letters, short notes and reviews. Our aim is to encourage researchers to publish their experimental, theoretical and computational results in as much detail as necessary. There is no restriction on paper length or number of figures and tables.

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Program at a Glance

MECC Program-at-a-Glance (in US EDT)
Sunday, October 2nd: 6:00PM–8:30PM (Newport I&II and Newport Foyer) Opening Reception

Monday, October 3rd

Rooms	8:30-9:30AM	9:30-10:00AM	10:00-11:30AM	11:30AM-1:00PM	1:00-1:50PM	2-3:30PM	3:30-4:00PM	4:00-5:00PM	5:00-5:30PM
Newport III, IV, & V	Plenary: Exploration in the Forest of Mechanical Systems Control (Masayoshi Tomizuka)	Coffee Break	Rapid fire poster presentation		Rising star networking	Rising Stars in Mechatronics	Coffee break	Nyquist Lecture	
Liberty I			MoAT1			Funding agency talk I			
Liberty II			MoAT2	Conference Reserved		MoBT2			
Liberty III			MoAT3	Conference Reserved		MoBT3			
America I & II			Recent NSF CAREER awardee talks I		Conference Reserved				
Newport I			MoAT5			MoBT5			
Newport II			MoAT6	Conference Reserved		MoBT6			
Newport Foyer		Poster presentation					Poster presentation		

Tuesday, October 4th

Rooms	8:30-9:30AM	9:30-10:00AM	10:00-11:30AM	11:35AM-1:50PM	2-3:30PM	3:30-4:00PM	4:00pm-5:30PM
Newport III, IV, & V	Plenary: Bridging the Gap in Prediction, Estimation, and Control of Integrated Systems (Jing Sun)	Coffee Break		Awards & Banquet		Coffee break	Rising Stars in Vibrations and Energy
Liberty I			TuAT1		TuBT1		TuCT1
Liberty II			TuAT2		Rising Stars in Robotics		TuCT2
Liberty III			Recent NSF CAREER awardee talks II		TuBT3		TuCT3
America I & II			TuAT4		TuBT4		TuCT4
Newport Foyer		Poster presentation				Poster presentation	
Remote					Funding Agency Talk II		

Wednesday, October 5th

Rooms	8:30-9:30AM	9:30-10:00AM	10:00-11:30AM	12:00-1:00PM	1:00-1:50PM	2-3:30PM	3:30-4:00PM	4:00pm-5:30PM
Newport III, IV, & V	Plenary: "Mechanical Intelligence" in Robotic Manipulation: Good Design Makes Everything Easier (Aaron Dollar)	Coffee Break						
Liberty I			WeAT1			WeBT1		
Liberty II			WeAT2	Conference Reserved		WeBT2		
Liberty III			WeAT3	Conference Reserved		WeBT3		
America I & II			WeAT4	Careers in academia panel		WeBT4		
Newport III						Rising Stars in Biomechanical Systems		
Newport IV						WeBT6		
Newport V				MECC 2022 handover to MECC 2023		Rising Stars session for Automotive and Transportation Systems		
Newport Foyer		Poster presentation						

Plenary Sessions

Monday, October 3
Exploration in the Forest of Mechanical Systems Control
8:30AM–9:30AM (Newport III, IV, &V)

Speaker:
Masayoshi Tomizuka
University of California, Berkeley

Abstract: I have thoroughly enjoyed teaching and research in the field of mechanical systems control over the past fifty years. This field has been full of new theory, new mechanical hardware and new tools for real time control, and is nothing but the world of mechatronics. In this talk, I would like to give a brief review of how this field has developed during the past fifty years and what my personal involvements have been in this field and what my current involvements are. Overall, the talk is a chronicle of my journey of exploration with my students in the forest of mechanical systems control.
Biography: Masayoshi Tomizuka received his Ph. D. degree in Mechanical Engineering from the Massachusetts Institute of Technology in February 1974. In 1974, he joined the faculty of the Department of Mechanical Engineering at the University of California at Berkeley, where he currently holds the Cheryl and John Neerhout, Jr., Distinguished Professorship Chair and serves as Associate Dean for the Faculty in the College of Engineering. His current research interests are optimal and adaptive control, digital control, motion control, and control problems related to robotics and manufacturing, vehicles and mechatronic systems. He served as Program Director of the Dynamic Systems and Control Program of the National Science Foundation (2002-2004). He has supervised about 130 Ph. D. students to completion. He served as President of the American Automatic Control Council (AACC) (1998-99). He is Honorary Member of the ASME, Life Fellow IEEE, and Fellow of IFAC and the Society of Manufacturing Engineers (SME). He is the recipient of the J-DSMC Best Paper Award (1995, 2010), the DSCD Outstanding Investigator Award (1996), the Charles Russ Richards Memorial Award (ASME, 1997), the Rufus Oldenburger Medal (ASME, 2002), the John R. Ragazzini Award (AACC, 2006), the Richard Bellman Control Heritage Award (AACC, 2018), the Honda Medal (ASME, 2019) and the Nichols Medal (IFAC, 2020). He is a member of the National Academy of Engineering.

Tuesday, October 4
Bridging the Gap in Prediction, Estimation, and Control of Integrated Systems
8:30AM–9:30AM (Newport III, IV, &V)

Speaker:
Jing Sun
University of Michigan, Ann Arbor

Abstract: Integrated systems are ubiquitous as more heterogeneous physical entities are combined to form functional platforms. New and "invisible" feedback loops and couplings are introduced with increased connectivity, leading to emerging dynamics and making the integrated systems more control-intensive. The multi-physics, multi-time scale, and distributed-actuation natures of integrated systems present new challenges for modeling and control. Understanding their operating environments, achieving

sustained high performance, and incorporating rich but incomplete data also motivate the development of novel design tools and frameworks.

In this talk, I will use the integrated thermal and power management of connected and automated vehicles (CAVs) as an example to illustrate the challenges in the prediction, estimation, and control of integrated systems in the era of rapid advances in AI and data-driven control. While first-principle-based modeling is still essential in understanding and exploiting the underlying physics of the integrated systems, model-based control and optimization have to be used in a much richer context to deal with the emerging dynamics and inevitable uncertainties. For CAVs, we will show how model-based design, complemented by data-driven approaches, can lead to control and optimization solutions with a significant impact on energy efficiency and operational reliability, in addition to safety and accessibility.

Biography: Jing Sun received her Ph. D degree from the University of Southern California in 1989 and her master's and bachelor's degrees from the University of Science and Technology of China in 1984 and 1982, respectively. From 1989 to 1993, she was an assistant professor in the Electrical and Computer Engineering Department at Wayne State University. She joined Ford Research Laboratory in 1993, where she worked on advanced powertrain system controls. After spending almost ten years in the industry, she returned to academia in 2003. She joined the University of Michigan, where she is the Michael G. Parsons Collegiate Professor in the Naval Architecture and Marine Engineering Department, with joint appointments in the Electrical Engineering and Computer Science Department and Mechanical Engineering Department at the same university. She holds 44 U.S. patents and has published over 300 archived journal and conference papers. She is a Fellow of NAI (the National Academy of Inventors), IEEE (Institute of Electrical and Electronics Engineers), IFAC (International Federation of Automatic Control), and SNAME (the Society of Naval Architecture and Marine Engineering). She is a recipient of the 2003 IEEE Control System Technology Award.

Wednesday, October 5
"Mechanical Intelligence" in Robotic Manipulation: Good Design Makes Everything Easier
8:30AM–9:30AM (Newport III, IV, &V)

Speaker:
Aaron Dollar
Yale University

Abstract: The human hand is the pinnacle of dexterity – it has the ability to powerfully grasp a wide range of object sizes and shapes as well as delicately manipulate objects held within the fingertips. Current robotic and prosthetic systems, however, have only a fraction of that manual dexterity. My group attempts to address this gap in three main ways: examining the mechanics and design of effective hands, studying biological hand function as inspiration and performance benchmarking, and developing novel control approaches that accommodate task uncertainty. In terms of hand design, we strongly prioritize passive mechanics, including incorporating adaptive underactuated transmissions and carefully tuned compliance, and seek to maximize open-loop performance while minimizing complexity. In this talk, I will discuss how constraints imparted by external contacts in robotic manipulation and legged locomotion affect the mobility and control of the mechanism, introduce ways that these can be redressed through novel design approaches, and demonstrate how our group has been able to apply these concepts to produce simple and robust grasping and dexterous manipulation for tasks that are difficult or impossible to perform using traditional approaches.

Biography: Aaron Dollar is a Professor of Mechanical Engineering & Materials Science and Computer Science at Yale University. He earned a B.S. in Mechanical Engineering at the University of Massachusetts at Amherst, a Ph.D. in Engineering Science at Harvard University, and was a postdoctoral

associate at MIT in Health Sciences and Technology and the Media Lab. Prof. Dollar is the recipient of a number of awards, including young investigator awards from AFOSR, DARPA, NASA, and NSF, and is the founder of the IEEE Robotics and Automation Society Technical Committee on Mechanisms and Design. Aside from more than 200 peer-reviewed papers and mentoring over 40 PhD Students and Postdocs, his work has made an impact through the Yale OpenHand Project, the YCB manipulation benchmarking initiatives, and lab spin-off company RightHand Robotics, among others.

Social and Networking Activities

Opening Reception
Sunday, October 2
6:00PM–8:30PM
Newport I&II and the Newport Foyer
Start this year's conference off right! Enjoy reconnecting with your friends and colleagues over cocktails and hors d'oeuvres.
Tickets and/or Badges are required.

Extended Coffee Breaks
Daily (Monday through Wednesday, with no afternoon break on Wednesday)
9:30AM–10:00AM and 3:30PM–4:00PM
Newport Foyer
Morning and afternoon coffee breaks are scheduled daily in the Registration Area. Coffee, tea, lemonade, iced tea and light snacks will be served.

Poster Presentations
Daily (Monday through Wednesday, with no afternoon session on Wednesday)
9:30AM–10:00AM and 3:30PM–4:00PM
Newport Foyer
This year's conference program includes daily poster presentations. Researchers will present their latest results in a poster format, and attendees and presenters will have an opportunity to interact, discuss, and share ideas.

DSCD Careers in Academia Panel
Wednesday, October 5
12:00PM–1:00PM
America I & II
In this event, professors will be invited to talk about their career paths, discuss challenges, provide advice on how to succeed, and answer questions from the audience. Food will be provided for panelists and students who RSVPed on the conference website and are members of the ASME Dynamic Systems and Controls Division (DSCD).

Awards Banquet
Tuesday, October 4
11:35AM–1:50PM
Newport III, IV, & V
The Awards Banquet will recognize conference awards and the exceptional achievements and dedication of the numerous leaders within the Dynamic Systems and Control Community. The awards ceremony will be concluded by the presentation and acceptance of the ASME Rufus Oldenberger Medal.

Student Events

Rising Stars Networking (Monday, October 3rd from 1PM-1:50PM in Newport III, IV, & V): The ASME Dynamic Systems and Controls Division (DSCD) Rising Stars program aims to recognize senior Ph.D. students and postdocs for their recent research accomplishments. Please join the 2022 Rising Stars winners for this lunchtime networking session to learn more about their work. Food will be provided for those who RSVPed at the conference website and are members of DSCD (you can sign up for DSCD during the RSVP process). Please come to enjoy lunch and meet the other Rising Stars!

Rising Stars Talks: The ASME Dynamic Systems and Controls Division (DSCD) Rising Stars invited talks are designed to help kick-start the careers of postdocs and senior Ph.D. students nearing graduation. The selected individuals will give 15-minute-long presentations (with 5-minute Q&A) during special DSCD Rising Stars invited sessions to discuss their recent and most high impact research. The following DSCD Rising Stars sessions are arranged:

Rising Stars in Automotive & Transportation Systems (Wednesday, October 5th from 2PM-3:30PM in Newport V)
Rising Stars in Biomedical Systems (Wednesday, October 5th from 2PM-3:30PM in Newport III)
Rising Stars in Mechatronics (Monday, October 3rd from 2PM-3:30PM in Newport III,IV,&V)
Rising Stars in Robotics (Tuesday, October 4th from 2PM-3:30PM in Liberty II)
Rising Stars in Vibrations and Energy (Tuesday, October 4th from 4PM-5:30PM in Newport III)

Careers in Academia Panel (Wednesday, October 5th, 12PM-1PM, America I & II): Are you considering a career in academia or do you want to learn more about the process? In this event, professors will be invited to talk about their career paths, discuss challenges, provide advice on how to succeed, and answer questions from the audience. Food will be provided for panelists and students who RSVPed at https://forms.gle/J3dR5sxEMEsoqUSv7 and are members of DSCD (you can sign up for DSCD during the RSVP process). Panelists include:

Dr. Juan Ren, Iowa State University
Dr. Kaiyan Yu – Binghamton University
Dr. Ramanarayan Vasudevan – University of Michigan
Dr. Yuncheng Du – Clarkson University
Moderators: Ellen Yi Chen Mazumdar (Georgia Tech) and Minghui Zheng (The State University of New York at Buffalo)

Student Best Paper Award Finalists:

"Application of Pseudo-Symbolic Dynamic Modeling (PSDM) in the Modeling & Calibration of a 6-DOF Articulated Robot," Steffan Lloyd, Rishad Irani, and Mojtaba Ahmadi, Carlton University

"A Novel Decentralized Consensus-Based Tracking Control for Exploration of Saturn's Rings," Shane Le Compte, and Annalisa Scacchioli, Rutgers University

"A Framework for Analysis of Lithium-Ion Battery Pack Balancing Including Cell Parameter Heterogeneity," Preston Abadie and Donald Docimo, Texas Tech University

"Linear Motor Command Tracking: A Novel Immersion and Invariance Adaptive Control Method With Arctangent-Function-Based Parameter Projection," Xingyu Zhou, Heran Shen, Zejiang Wang, Hyunjin Ahn, and Junmin Wang, The University of Texas at Austin

"Characterization of a 3D Printed Electric Solenoid with Multi-layer Silver Nanoparticle Traces," Sebastian Mettes, Noah Kohls, Noah, Kenneth Allen, and Yi Mazumdar, Georgia Institute of Technology

"Data-Driven Robust Feedback Control Design for Multi-Actuator Hard Disk Drives," Nikhil Potu Surya Prakash and Roberto Horowitz, University of California at Berkeley

Special sessions

DSCD Presentation: Nyquist Lecture

Monday, October 3rd
4PM-5PM
Newport III, IV, &V

Control of Scanning Tunneling Microscope for Silicon Quantum Device Fabrication: Mechatronics at the Atomic Scale
Speaker: Reza Moheimani, University of Texas at Dallas

Abstract: Improvement in manufacturing precision has been the driving force behind technological advancements throughout history. In recent years, the scanning tunneling microscope's atomic-precision placement accuracy has enabled several research groups to engineer atomic-scale silicon quantum devices like qubits for emerging quantum computers. Future commercial success of this technology hinges on reliable, repeatable, and high-throughput operation of the scanning tunneling microscope. However, the STM is a characterization tool and its use for nanofabrication leads to challenges. In this talk, we demonstrate that many of these challenges can be traced back to the poor performance of the STM's feedback control system and propose solutions to improve its robustness and reliability. Furthermore, we describe new modes of imaging, spectroscopy and lithography made possible by alterations made to the STM's feedback control loop.

Biography: Reza Moheimani is a Professor and James Von Ehr Distinguished Chair in Science and Technology in the Department of Systems Engineering at the University of Texas at Dallas with appointments in Electrical and Computer Engineering and Mechanical Engineering Departments. He is the past Editor-in-Chief of Mechatronics, and a past associate editor of IEEE Transactions on Control Systems Technology, IEEE Transactions on Mechatronics and Control Engineering Practice. He received the Charles Stark Draper Innovative Practice Award (ASME DSCD, 2020), Nathaniel B. Nichols Medal (IFAC, 2014), IEEE Control Systems Technology Award (IEEE CSS, 2009) and IEEE Transactions on Control Systems Technology Outstanding Paper Award (IEEE CSS, 2007 and 2018). He is a Fellow of IEEE, IFAC, ASME and Institute of Physics (UK). Moheimani received the Ph.D. degree in Electrical Engineering from University of New South Wales, Australia in 1996. His current research interests include applications of control and estimation in high-precision mechatronic systems, high-speed scanning probe microscopy and atomically precise manufacturing. He is leading a multidisciplinary effort to develop new tools and methods for fabrication of atomic-scale silicon quantum devices with scanning tunneling microscope.

DSCD Presentation: Oldenburger Medalist

To be presented during the Award & Banquet
Tuesday, October 4th
11:35AM-1:50PM
Newport III, IV, &V

Wayne J. Book, HUSCO/Ramirez Professor (emeritus) taught systems and control in Mechanical Engineering at Georgia Tech from 1974 until 2012. A farm boy from Miles, TX, (B.S.M.E @ U. TX) Wayne was enamored with the

mechanisms of automation. At M.I.T. luck linked Wayne with NASA's research led by Prof. Daniel Whitney. A primary concern was the flexibility that would result from a long mechanical arm light enough to be launched into space.

In 1974, Dr. Book joined Georgia Tech. For verification of theory RALF (Robot Arm Large and Flexible) a 40 ft arm, hydraulically actuated was built. Initially RALF moved only in a plane, but it soon carried SAM, (Small Articulated Manipulator), which could inertially damp (or excite) vibrations of RALF. Wayne spent a summer at NASA, Houston working on RMS flexible control.

In 1981 Wayne joined Marc Raibert for a Sabbatical at Carnegie Mellon University's Robotics Institute. He extended recursive approaches to flexible arms, publishing "Recursive Lagrangian Models of Flexible Manipulators."

In 1982 Wayne at Georgia Tech and advised Oak Ridge National Laboratories where Nuclear waste handling was becoming a major concern, and Wayne served on an advisory Committee addressing the problem. Here again robotic arms needed to be long but light. Research at ORNL, Sandia, and Richland were all attacking this problem and involved Prof. Book and his students.

The need for lightweight, robotic arms applied by industry for material handling in factories and ships. CAMotion, Inc. a GT "spinoff", started by Wayne and Prof. Steve Dickerson incorporated Book's technology to provide motion control which was then acquired by PaR Systems, Inc. in 2013 for use in industry. Quoting PaR's president Mark Wrightsman "CAMotion … delivered motion solutions previously … impossible."

Wayne guided student Arto Kivila (coadvised by William Singhose) to the time domain dynamic model needed for full control of complex distributed motion and supported the theoretical base with laboratory experiments and practical microprocessor control. "Modeling Spatial Multi-link Flexible Manipulator Arms Based on System Modes" appeared in the International Journal of Intelligent Robotics and Applications based on Kivila's dissertation.

Special Session: Rapid Fire Presentation
Monday, October 3
10:00AM-11:30AM
Newport III, IV, and V

MECC 2022 provides a rapid-fire presentation of late-breaking research results in modeling, estimation, and controls. Each rapid-fire talk provides a 5-min presentation followed by poster demonstrations during coffee breaks.

Special Session: Funding Agency Talks
Session 1: Monday October 3, 14:00-15:30, Liberty I
Session 2: Tuesday October 4, 14:00-15:30, Remote at https://www.tinyurl.com/237e7y43

Abstract: MECC 2022 will organize two panel sessions for federal funding agencies. An in-person session will be held during 2:00 p.m. ~ 3:30 p.m. on Monday October 3rd, where Dr. Yueyue Fan, Dr. Harry Dankowicz and Dr. Jordan Berg will be the panelists, presenting the relevant funding programs at NSF, followed by Q&A and discussions with the attendees. During 2:00 p.m. ~ 3:30 p.m. on Tuesday October 4th, Dr. Frederick Leve from Air Force Office of Scientific Research (AFOSR) and Dr. Juan P. Wachs from NSF/CISE will participate with remote attendance. Presentations on the relevant funding programs will be made, followed by the online Q&A and discussion with the attendees.

Dr. Yueyue Fan, as a program director in the Division of Civil, Mechanical and Manufacturing Innovation at NSF, will introduce the following funding opportunities at NSF: Civil Infrastructure Systems (CIS), Cyber Physical Systems (CPS), Smart and Connected Communities (S&CC) and Civic Innovation Challenges (CIVIC). Some of these solicitations feature multi-agency efforts.

Dr. Harry Dankowicz is a Program Director at NSF/CMMI, responsible for the Program of Dynamics, Control and Systems Diagnostics (DSCD). *Dr. Jordan Berg* is a Program Direct at NSF/CMMI, who involves in the management of a number of programs at NSF. Dr. Dankowicz and Dr. Berg will jointly introduce the recent funding opportunities with DSCD and other relevant programs at NSF.

Dr. Frederick Leve is the Program Officer for the Dynamical Systems and Control Theory program at Air Force Office of Scientific Research (AFOSR). The Dynamical Systems and Control Theory program at AFOSR funds innovative basic research in mathematical theory for complex dynamical systems that could one day be relevant to the future US Air Force and Space Forces.

Dr. Juan P. Wachs is a Program Director at NSF/CISE responsible for the robotics programs. In this session, Dr. Wachs will discuss the possibilities related to robotics programs at NSF, with an emphasis on the CISE directorate, and IIS division. The foundational research in robotics (FRR) will be showcased as the flagship program in robotics at NSF.

Special Session: Newest Advances in Systems and Control from Recent DCSD CAREER Awardees
Session 1: Monday October 3, 10:00-11:30, America I & II
Session 2: Tuesday October 4, 10:00-11:30, Liberty III

Session Organizers
Robert G. Landers, University of Notre Dame
Atul Kelkar, Clemson University

Abstract: This special session brings together recent CAREER awardees from the Dynamics, Control and Systems Diagnostics program at the National Science Foundation to discuss their research. You will hear about the latest advances in a wide variety of topics covering both fundamental understanding and cutting-edge applications. The format of this session will provide the audience ample time for questions and for the entire group to explore future directions in the field of systems and controls.

Session Talks
Toward Lifelong Safety of Autonomous Systems in Uncertain and Interactive Environments

Changliu Liu, Carnegie Mellon University

Functional Monolithic Holograms for Ultrasonics

Shima Shahab, Virginia Tech

Bridging the Gap between Safety and Real-Time Performance in Receding-Horizon Trajectory Design for Mobile Robots

Ramanarayan Vasudevan, University of Michigan

Augmenting the Aw-Rascle-Zhang Traffic Flow Model with a Distributed Energy Equation

Stephanie Stockar, The Ohio State University

Modeling and Control of Cardiovascular System

Yuncheng Du, Clarkson University

Dynamic & Control-Based Approach to Cellular Mechanotransduction Investigation

Juan Ren, Iowa State University

Bio-Inspired Variable Recruitment Fluidic Artificial Muscle Actuators: Innovations in Modeling, Configuration, and Control

Nicholas Mazzoleni, North Carolina State University
Jeong Yong Kim, North Carolina State University
Emily Duan, North Carolina State University
Matthew Bryant, North Carolina State University

What Can We Make Out of Control and Learning for Batteries and Electrification?

Huazhen Fang, University of Kansas

Simultaneous and Independent Control of Nanostructured Objects through the Use of Coupled External Electric Fields

Kaiyan Yu, State University of New York at Binghamton

Special Session: Industry Stories in Controls
Monday October 3, 14:00-15:30, Newport I

Session Organizers
Dr. Selina Pan, Waymo
Dr. Pingen Chen, Tennessee Tech University
Dr. Carrie Hall, Illinois Institute of Technology
Dr. Yan Chen, Arizona State University
Dr. Mahdi Shahbakhti, University of Alberta
Joe Drallmeier, PhD Candidate, University of Michigan
Mehmet Ozkan, PhD Candidate, Texas Tech University

Abstract: Academic research and industry development have a symbiotic relationship. The insights gleaned from academic research can be propagated into usable products and technologies by companies. The practical problems identified in industry can also inspire and develop new academic research topics and areas. This cycle and relationship is key for researchers to understand and to participate in. To facilitate these connections, every year, the ASME Dynamic Systems and Control Division organizes an industry special session at a major controls conference.

The speakers featured in this session have a variety of technical backgrounds and life experiences. The purpose of this session is to showcase some of the current industry jobs available to controls students.

Session Speakers
Xiaoling Han, TuSimple, Senior Director of Sensors and VES
Bryan Maldonado, Oak Ridge National Laboratory, R&D Associate Staff
Scott Hotz, Southwest Research Institute, Assistant Director, Automotive Propulsion Systems
Avra Brahma, Locomation, Inc, Director of Vehicle Integration
Selina Pan, Waymo, Senior Systems Engineer

Special Session: Toward Dynamic Learning and Decision Making Using Artificial Intelligence in Manufacturing Systems
October 4, 14:00-15:30, America I & II

Session Organizers
Ilya Kovalenko, Pennsylvania State University
James Moyne, University of Michigan, Ann Arbor
Dawn Tilbury, University of Michigan, Ann Arbor
Kira Barton, University of Michigan, Ann Arbor

Abstract: Over the past several years, manufacturers have faced a number of challenges, including shutdowns due to COVID-19, long lead times for raw materials, and labor shortages. Due to these challenges, manufacturers have constantly looked to improve their ability to address disruptions and disturbances, while reducing cost and maximizing quantity and quality. companies have looked to integrate tools, methods, and algorithms from the recent explosion of Artificial Intelligence (AI) capabilities into their manufacturing systems. However, several gaps exist that prevent the integration of AI for dynamic learning and decision making in a dynamic manufacturing environment, including:

1. Developing tools, architectures, and methods for dynamic learning and decision making at the various levels of manufacturing control systems
2. Developing validation and verification techniques for learned information in manufacturing control systems
3. Design and standardization of the human-AI interface to support an interactive learning process and enhance the interoperability and interchangeability of human (e.g., operator) and AI elements
4. Enhancing the trustworthiness of the cyber components of the manufacturing system, considering the human users of the system (operators and manufacturers)
5. Managing the evolution of human and AI collaboration allowing AI to have larger decision making roles
6. Developing methods for ensuring cybersecurity of the system before and after the deployment of the AI tools

These challenges require researchers from a number of disciplines to work together to solve highly multidisciplinary problems. This session will provide an overview of the challenges in creating dynamic decision making and learning in the manufacturing system environment and identify research opportunities for control engineers in academia and industry to contribute to this area of research.

Tutorials

Tutorial: Modeling, Estimation, and Control for Single Molecule Investigation
Tuesday October 4, 16:00-17:30, America I & II

Organizer: Murti V. Salapaka, University of Minnesota, Twin Cities

Abstract: Studying bio-molecules one at a time provides a unique view of their behavior and function, a perspective unavailable to bulk studies hindered by averaging effects. Single molecule experiments have led to the discovery of the mechanisms of several fatal and currently incurable diseases such as Alzheimer's, Amyotrophic Lateral Sclerosis, Duchenne Muscular Dystrophy and more. This advancement was enabled by the engineering of several Nobel prize winning molecular probes, such as the Atomic Force Microscope, Optical Tweezers, and Super Resolution Microscopy. However, performing single molecule experiments with high fidelity still has several challenges due to extremely small sizes and stochastic nature of molecules needed to be studied and the noise inherent in the systems leading to unreliable data interpretation. There remain many more avenues for engineering to push the boundaries of single molecule science.

The main objective of this tutorial is to provide a brief overview of existing single molecule techniques. The tutorial will familiarize the audience with instrumentation and associated software tools needed to perform experiments and efficiently analyze experimental data, while showcasing examples where advanced controls and estimation strategies have provided answers to some challenging problems. This tutorial will also demonstrate novel biochemistry required for advanced controls and estimation techniques. The interplay between instrumentation, advanced controls and estimation techniques, and biochemistry will be illustrated via a case study combining all the above-mentioned techniques. This will enable researchers from the modeling, estimation, and controls community to identify new avenues for contributing towards discoveries at a single molecule limit.

Tutorial: Control and Testing of Connected and Automated Vehicles

Tuesday October 4, 16:00-17:30, Liberty I

Organizer: Yunli Shao, Oak Ridge National Laboratory

Abstract: Connectivity enables vehicles to communicate with other surrounding vehicles and infrastructure, extending the line-of-sight of drivers or automated driving systems (ADS) to road and traffic conditions. With vehicle automation, connected and automated vehicles (CAVs) can anticipate future driving situations and be controlled in an intelligent and proactive way to further benefit current vehicular and transportation systems. A CAV is a complex system that involves fusion of multiple technologies such as sensing, perception, localization, communication, traffic prediction, motion planning, optimization, and vehicle controls. CAV technologies require collaborative research efforts from various domains. This tutorial session features researchers from national laboratories, universities, and industries presenting state-of-the-art methodologies on traffic prediction, optimization and control, testing and evaluation for connected and automated vehicles.

Session talks

Control and Testing Connected and Automated Vehicles in Multi-resolution X-in-the-loop Simulation

Yunli Shao, R&D Staff, Oak Ridge National Laboratory

Real-time Traffic Prediction for Connected and Autonomous Vehicles

Zongxuan Sun, Professor, University of Minnesota

Development and Validation of Eco-Autonomous Driving System

Junfeng Zhao, Arizona State University

AV/ADAS scenario-based modeling and simulation

Yuming Niu, Connected Modeling & Simulation Research, Research and Advanced Engineering, Ford Motor Company

Digital Twin-Enabled Personalized Adaptive Cruise Control

Ziran Wang, Assistant Professor, Purdue University

Technical Sessions

Content List of 2022 Modeling, Estimation and Control Conference

CHEN, Yue Ming	Hyundai-Kia America Technical Center
Fan, Shihong	Hyundai-Kia America Technical Center, Inc
Holmer, Justin	Hyundai America Technical Center Inc
Lee, Jason	Hyundai America Technical Center Inc

MoAT3　　　　　　　　　　　　　　　　　　Liberty III

Modeling: Recent Advance and Emerging Applications (Regular Session)

| Chair: Das, Tuhin | University of Central Florida |
| Co-Chair: Jain, Neera | Purdue University |

10:00-10:15　　　　　　　　　　　　　　　　　MoAT3.1

Reduced Order Modeling of an Autorotating Samara for Steady-State and Dynamic Analysis, pp. 68-73.

| McConnell, Jonathan | University of Central Florida |
| Das, Tuhin | University of Central Florida |

10:15-10:30　　　　　　　　　　　　　　　　　MoAT3.2

Application of Pseudo-Symbolic Dynamic Modeling (PSDM) in the Modeling & Calibration of a 6-DOF Articulated Robot, pp. 74-80.

Lloyd, Steffan	Carleton University
Irani, Rishad	Carleton University
Ahmadi, Mojtaba	Carleton University

10:30-10:45　　　　　　　　　　　　　　　　　MoAT3.3

Dynamic Modeling of a Low-Cost Mechanical Ventilator, pp. 81-85.

Pivik, Will	Villanova University
Clayton, Garrett	Villanova University
Jones, Gerard	Villanova University
Nataraj, Nat	Villanova Univ

10:45-11:00　　　　　　　　　　　　　　　　　MoAT3.4

Causality-Free Modeling of a Wind Turbine with Open-Loop and Closed-Loop Validation Results, pp. 86-91.

Mohsin, Kazi	University of Central Florida
Odeh, Mohammad	University of Central Florida
Ngo, Tri	University of Central Florida
Das, Tuhin	University of Central Florida

11:00-11:15　　　　　　　　　　　　　　　　　MoAT3.5

A Training-Free Data-Driven Method for Input-Output Modeling of Complex Processes, pp. 92-98.

Ruan, Jianqi	Purdue University
Nooning, Bob	Castrip LLC
Parkes, Ivan	Castrip LLC
Blejde, Wal	Castrip LLC
Chiu, George T.-C.	Purdue Univ
Jain, Neera	Purdue University

11:15-11:30　　　　　　　　　　　　　　　　　MoAT3.6

Modeling Nonlinear Heat Exchanger Dynamics with Convolutional Recurrent Networks, pp. 99-106.

Bhattacharya, Chandrachur	Pennsylvania State University
Chakrabarty, Ankush	Mitsubishi Electric Research Laboratories
Laughman, Christopher	Mitsubishi Electric Research Laboratories
Qiao, Hongtao	Mitsubishi Electric Research Labs (MERL)

MoAT5　　　　　　　　　　　　　　　　　　Newport I

Precision Systems (Regular Session)

| Chair: Oldham, Kenn | University of Michigan |
| Co-Chair: Mazumdar, Yi | Georgia Institute of Technology |

10:00-10:15　　　　　　　　　　　　　　　　　MoAT5.1

Design for Interaction: Factorized Nyquist Based Control Design Applied to a Gravitational Wave Detector, pp. 107-112.

van Dael, Mathyn Rene	Eindhoven University of Technology
Witvoet, Gert	TNO
Swinkels, Bas	Nikhef
Pinto, Manuel	European Gravitational Observatory (EGO)
Casanueva Diaz, Julia	European Gravitational Observatory
Bersanetti, Diego	INFN, Sezione Di Genova
Mantovani, Maddalena	European Gravitational Observatory
Vardaro, Marco	Nikhef
Oomen, Tom	Eindhoven University of Technology

10:15-10:30　　　　　　　　　　　　　　　　　MoAT5.2

Noise Rejection Mode Imaging of Atomic Force Microscope, pp. 113-118.

| Chen, Jiarong | Rutgers, the State University of New Jersey |
| Zou, Qingze | Rutgers, the State University of New Jersey |

10:30-10:45　　　　　　　　　　　　　　　　　MoAT5.3

Linear Modeling and Open-Loop Control of a Multi-Axis Piezoelectric Micro-Mirror for Random-Access Laser Scanning, pp. 119-124.

Yang, Hanzhi	University of Michigan
Yu, Joonyoung	University of Michigan
Birla, Mayur	University of Michigan
Oldham, Kenn	University of Michigan

10:45-11:00　　　　　　　　　　　　　　　　　MoAT5.4

Automated MIMO Motion Feedforward Control: Efficient Learning through Data-Driven Gradients Via Adjoint Experiments and Stochastic Approximation, pp. 125-130.

| Aarnoudse, Leontine | Eindhoven University of Technology |
| Oomen, Tom | Eindhoven University of Technology |

11:00-11:15　　　　　　　　　　　　　　　　　MoAT5.5

Data-Driven Robust Feedback Control Design for Multi-Actuator Hard Disk Drives, pp. 131-138.

| Potu Surya Prakash, Nikhil | UC BERKELEY |
| Horowitz, Roberto | Univ. of California at Berkeley |

11:15-11:30　　　　　　　　　　　　　　　　　MoAT5.6

Characterization of a 3D Printed Electric Solenoid with Multi-Layer Silver Nanoparticle Traces, pp. 139-144.

Mettes, Sebastian	Georgia Institute of Technology
Kohls, Noah	Georgia Institute of Technology
Allen, Kenneth	Georgia Tech Research Institute
Mazumdar, Yi	Georgia Institute of Technology

MoAT6　　　　　　　　　　　　　　　　　　Newport II

Estimation, Control, and Optimization of Energy Storage and Conversion Systems (Invited Session)

| Chair: Zuo, Lei | Virginia Tech |

Co-Chair: Fang, Huazhen	University of Kansas
Organizer: Dey, Satadru	The Pennsylvania State University
Organizer: Lin, Xinfan	University of California, Davis
Organizer: Fang, Huazhen	University of Kansas
Organizer: Docimo, Donald	Texas Tech University
Organizer: Song, Ziyou	The University of Michigan
Organizer: Vermillion, Christopher	NC State
Organizer: Stockar, Stephanie	The Ohio State University
Organizer: Moura, Scott	UC Berkeley
Organizer: Pangborn, Herschel	Pennsylvania State University

10:00-10:15	MoAT6.1

Multi-Objective Optimization of the Buoy Shape of an Ocean Wave Energy Converter Using Neural Network and Genetic Algorithm (I), pp. 145-150.

Lin, Weihan	Virginia Tech
Shanab, Belal	Virginia Tech
Lenderink, Corbin	Virginia Tech
Zuo, Lei	Virginia Tech

10:15-10:30	MoAT6.2

Drag-Mitigating Dynamic Flight Path Design for an Ultra-Long Tether Underwater Kite (I), pp. 151-157.

Abney, Andrew	North Carolina State University
Vermillion, Christopher	NC State

10:30-10:45	MoAT6.3

Electric Vehicle Energy Consumption Estimation with Consideration of Longitudinal Slip Ratio and Machine-Learning-Based Powertrain Efficiency (I), pp. 158-163.

Shen, Heran	The University of Texas at Austin
Zhou, Xingyu	University of Texas at Austin
Wang, Zejiang	Oak Ridge National Laboratory
Ahn, Hyunjin	The University of Texas at Austin
Maxavier, Lamantia	Tennessee Technological University
Chen, Pingen	Tennessee Technological University
Wang, Junmin	University of Texas at Austin

10:45-11:00	MoAT6.4

Design and Implementation of Hybrid Photovoltaic-Thermoelectric System with Intelligent Power Supply Management, pp. 164-168.

Wang, Ning	University of Shanghai for Science and Technology
Ni, Lulu	University of Shanghai for Science and Technology
Wang, Ao	University of Shanghai for Science and Technology
Jia, Hongzhi	University of Shanghai for Science and Technology
Zuo, Lei	Virginia Tech

11:00-11:15	MoAT6.5

Laboratory Simulation of Electricity Harvesting from an Underwater Kite, pp. 169-174.

Alvarez Tiburcio, Miguel	University of Maryland
Bhattacharjee, Debapriya	University of Maryland, College Park
Kadkhodaeielyaderani, Behzad	University of Maryland, College Park
Fathy, Hosam K.	University of Maryland

MoAT4	America I & II
Newest Advances in Systems and Control from Recent DCSD CAREER Awardees (I) (Special Session)	
Chair: Landers, Robert G.	University of Notre Dame
Co-Chair: Kelkar, Atul	Clemson University
Organizer: Landers, Robert G.	University of Notre Dame
Organizer: Kelkar, Atul	Clemson University

10:00-10:15	MoAT4.1

*Toward Lifelong Safety of Autonomous Systems in Uncertain and Interactive Environments (I)**.

Liu, Changliu	Carnegie Mellon University

10:15-10:30	MoAT4.2

*Functional Monolithic Holograms for Ultrasonics (I)**.

Shahab, Shima	Virginia Tech

10:30-10:45	MoAT4.3

*Bridging the Gap between Safety and Real-Time Performance in Receding-Horizon Trajectory Design for Mobile Robots (I)**.

Vasudevan, Ramanarayan	University of Michigan

10:45-11:00	MoAT4.4

*Augmenting the Aw-Rascle-Zhang Traffic Flow Model with a Distributed Energy Equation (I)**.

Stockar, Stephanie	The Ohio State University

11:00-11:15	MoAT4.5

*Modeling and Control of Cardiovascular System (I)**.

Du, Yuncheng	Clarkson University

MoAAT7	Newport III,IV,&V
Rapid Fire Poster Presentations (Special Session)	
Chair: Bristow, Douglas A.	Missouri University of Science and Technology

10:00-10:05	MoAAT7.1

Estimation and Control for the HyCUBE Small Satellite and Reentry Vehicle, pp. 175-175.

Hayes, Alex Donald	University of Minnesota
Caverly, Ryan James	University of Minnesota

10:05-10:10	MoAAT7.2

Model-Based Optimal Control System for the Reduction of Carbon Emission, pp. 176-176.

yang, yong	Kyung Hee University
Won, Wangyun	Kyung Hee University

10:10-10:15	MoAAT7.3

Model Predictive Control System Via Hydrogen Fueling Station Modeling, pp. 177-177.

Jeong, Suji	Kyung Hee University
Won, Wangyun	Kyung Hee University

10:15-10:20	MoAAT7.4

Process Development for Hydrogen Refueling Station and Integrative Analyses, pp. 178-178.

Choe, Bomin	Kyung Hee University
Won, Wangyun	Kyung Hee University

10:20-10:25	MoAAT7.5

Z-Axis Control of an Active AFM Microcantilever Using Electrothermal Actuator, pp. 179-179.

Mahmoodi Nasrabadi, Hazhir	University of Texas at Dallas
Nikooienejad, Nastaran	The University of Texas at Dallas
Moheimani, S.O. Reza	University of Texas at Dallas

10:25-10:30	MoAAT7.6

Forward Kinematics of a Cable-Driven Parallel Robot with Pose Estimation Error Covariance Bounds, pp. 180-180.

Patel, Samir	University of Minnesota
Nguyen, Vinh	University of Minnesota
Caverly, Ryan James	University of Minnesota

10:30-10:35	MoAAT7.7

Optimization of Architecture and Operation of Intelligent Wells under Geological and Economic Uncertainties, pp. 181-181.

Khan, Zurwa	TAMU
Tafreshi, Reza	Professor
Wahid, Md	Texas A&M University at Qatar
Retnanto, Albertus	Texas A&M University at Qatar

10:35-10:40	MoAAT7.8

Predicting Ankle Torque to Enhance Human Performance While Utilizing ExoBoots*.

Epstein, Stephanie	University of Massachusetts: Lowell
Iqbal, Amir	University of Massachusetts, Lowell, MA
Gu, Yan	University of Massachusetts Lowell
Inalpolat, Murat	University of Massachusetts Lowell

10:40-10:45	MoAAT7.9

A Feed-Forward Neural Network for One Step Ahead Lithium-Sulfur Battery Voltage Prediction, pp. 182-182.

Nozarijouybari, Zahra	University of Maryland College Park
Fathy, Hosam K.	University of Maryland

10:45-10:50	MoAAT7.10

Fast Computation and Optimal Control of Part-Scale Interlayer Temperature for Laser Powder Bed Fusion Based on the Finite-Difference Method, pp. 183-183.

Ren, Yong	The Pennsylvania State University
Wang, Qian	Penn State Univ

10:50-10:55	MoAAT7.11

Robust Controller Design Based on Convex Optimization and RBode Plots for Hard Disk Drive Systems, pp. 184-184.

Wang, Xiaoke	The University of Tokyo
Ohnishi, Wataru	The University of Tokyo
Atsumi, Takenori	Chiba Institute of Technology

10:55-11:00	MoAAT7.12

Ergodic Exploration for Mobile Sensors: Application in Environmental Monitoring, pp. 185-185.

Lapins, Chantel	University of Utah
Clayton, Garrett	Villanova University
Leang, Kam K.	University of Utah

11:00-11:05	MoAAT7.13

Process Development and Analysis for the Production of Turquoise Hydrogen Via Thermal Decomposition of Methane, pp. 186-186.

Jo, SuA	Kyung Hee University
Won, Wangyun	Kyung Hee University

11:05-11:10	MoAAT7.14

Hydrogen Transport Using Liquid Organic Hydrogen Carrier: Process Synthesis and Analyses, pp. 187-187.

Ahn, Byeongchan	Kyunghee University
Won, Wangyun	Kyung Hee University

11:10-11:15	MoAAT7.15

Input-Output Sampling and Bounding of Uncertainties with Input-State Coupling for Robust Control of a Hypersonic Vehicle, pp. 188-188.

Cheah, Sze Kwan	University of Minnesota
Bhattacharjee, Diganta	University of Minnesota
Hemati, Maziar	University of Minnesota
Caverly, Ryan James	University of Minnesota

11:15-11:20	MoAAT7.16

Nonlinear Control Laws for Positional Control of an Omnidirectional All-Terrain Screw-Driven Robot, pp. 189-189.

Oladunjoye, Opeyemi	Villanova University
Kozinov, Andrey	Villanova University
Leang, Kam K.	University of Utah
Clayton, Garrett	Villanova University

MoBT2	Liberty II
Machine Learning, Modeling, and Controls (Regular Session)	
Chair: Li, Fangjian	Clemson University
Co-Chair: Yan, Leon (Liangwu)	University of Washington

14:00-14:15	MoBT2.1

Safety-Aware Adversarial Inverse Reinforcement Learning (S-AIRL) for Highway Autonomous Driving, pp. 190-190.

Li, Fangjian	Clemson University
Wagner, John R.	Clemson Univ
Wang, Yue	Clemson Univeristy

14:15-14:30	MoBT2.2

Data Driven Modeling of Turbocharger Turbine Using Koopman Operator, pp. 191-196.

Zinage, Shrenik	Purdue University
Jadhav, Suyash	Canoo Technologies Inc
Zhou, Yifei	Purdue University
Bilionis, Ilias	Purdue University
Meckl, Peter H.	Purdue Univ

14:30-14:45	MoBT2.3

Precision Data-Enabled Koopman-Type Inverse Operators for Linear Systems, pp. 197-202.

Yan, Leon (Liangwu)	University of Washington
Devasia, Santosh	Univ of Washington

14:45-15:00	MoBT2.4

Control-Oriented Modeling Using Koopman Operator: An Application to the Cahn-Hilliard Coarsening Problem, pp. 203-208.

Tellez-Castro, Duvan	Universidad Nacional De Colombia
Abdeljawad, Fadi	Clemson University
Vaidya, Umesh	Clemson University

15:00-15:15	MoBT2.5

Deep Reinforcement Learning for Robotic Control with Multi-Fidelity Models, pp. 209-214.

Leguizamo, David	Iowa State University
Yang, Hsin-Jung	Iowa State University
Lee, Xian	Iowa State University
Sarkar, Soumik	Iowa State University

15:15-15:30	MoBT2.6

Carbon Black Sensor and Neural Network Model for Sensing Angle in Soft Pneumatic Actuators, pp. 215-220.

Kohls, Noah	Georgia Institute of Technology
Gibson, Keith	Georgia Institute of Technology

Singla, Aaryan	Georgia Institute of Technology
Balak, Roman	Georgia Institute of Technology
Jargalsaikhan, Amarsaikhan	Georgia Institute of Technology
Bartolek, Bruno	Georgia Institute of Technology
Gattani, Vishesh	Georgia Institute of Technology
Mazumdar, Yi	Georgia Institute of Technology

MoBT3	Liberty III

Modeling and Controls in Automotive Systems (Regular Session)

Chair: Pozzato, Gabriele	Stanford University
Co-Chair: Ma, Yao	Texas Tech University

14:00-14:15	MoBT3.1

Cooperative Eco-Driving Controller for Battery Electric Vehicle Platooning, pp. 221-226.

Su, Zifei	Tennessee Technological University
Chen, Pingen	Tennessee Technological University

14:15-14:30	MoBT3.2

Mean-Value Exergy Modeling of Internal Combustion Engines: Characterization of Feasible Operating Regions, pp. 227-227.

Pozzato, Gabriele	Stanford University
Rizzo, Denise	Ground Vehicle Systems Center, U.S. Army CCDC, 6501 E. 11 Mile R
Onori, Simona	Stanford University

14:30-14:45	MoBT3.3

Inverse Resource Rational Based Stochastic Driver Behavior Model, pp. 228-233.

Ozkan, Mehmet	Texas Tech University
Ma, Yao	Texas Tech University

14:45-15:00	MoBT3.4

Machine-Learning Based Tire-Road Friction Prediction for Ground Vehicles, pp. 234-239.

Scott, Perry	University of Texas at Austin
Wang, Junmin	University of Texas at Austin

15:00-15:15	MoBT3.5

Steering Modeling and Off-Tracking Suppression Control of Train-Like Automobiles, pp. 240-245.

Sun, Zhaocong	Tsinghua University
Dai, Pengcheng	CRRC Nanjing Puzhen Co., Ltd
Tian, Zhiye	Tsinghua University
Meng, Huadong	Univ. of California, Berkeley
Wang, Wenjun	Tsinghua University

15:15-15:30	MoBT3.6

Modeling and Simulation of Energy Harvesting Hydraulically Interconnected Shock Absorber, pp. 246-251.

Deshmukh, Nishant	Virginia Tech
Ren, Siyuan	Virginia Tech
Mi, Jia	2768804508
Zuo, Lei	Virginia Tech

MoBT7	Newport III,IV,&V

Rising Stars in Mechatronics (Special Session)

Chair: Bristow, Douglas A.	Missouri University of Science and Technology

14:00-14:15	MoBT7.1

Fast Model Predictive Control for Robotic Systems: Efficient

Operations and Applications (I)*.

Astudillo, Alejandro	KU Leuven
Gillis, Joris	KU Leuven
Decré, Wilm	Katholieke Universiteit Leuven
Pipeleers, Goele	Katholieke Universiteit Leuven
Swevers, Jan	K. U. Leuven

14:15-14:30	MoBT7.2

Soft Electromagnetic Actuators with Liquid Metal Conductors and Compliant Permanent Magnets (I)*.

Kohls, Noah	Georgia Institute of Technology
Balak, Roman	Georgia Institute of Technology
Mazumdar, Yi	Georgia Institute of Technology
Ruddy, Bryan	University of Auckland

14:30-14:45	MoBT7.3

Physics-Guided Machine Learning (PGML) for Feedback Control in Additive Manufacturing (AM) (I)*.

Inyang-Udoh, Uduak	Purdue University

14:45-15:00	MoBT7.4

Towards Micro-Scale and Meso-Scale Robots with Integrated Shape Sensing for Minimally Invasive Surgery (I)*.

Deaton, Nancy Joanna	Georgia Institute of Technology
Chitalia, Yash	Boston Children's Hospital & Harvard Medical School
Sheng, Jun	University of California Riverside
Jeong, Seokhwan	Sogang University
Rahman, Nahian	Research Associate
Patel, Pretesh	Winship Cancer Institute, Emory University
Desai, Jaydev	UMD

15:00-15:15	MoBT7.5

Passive Flexible Multirotors with Physical Interaction Capabilities (I)*.

Patnaik, Karishma	Arizona State University
Zhang, Wenlong	Arizona State University

MoBT6	Newport II

Feedforward and Motion Control (Regular Session)

Chair: Oomen, Tom	Eindhoven University of Technology
Co-Chair: Nersesov, Sergey G.	Villanova Univ

14:00-14:15	MoBT6.1

Feedforward Control in the Presence of Input Nonlinearities: A Learning-Based Approach, pp. 252-257.

van Hulst, Jilles	Eindhoven University of Technology
Poot, Maurice	Eindhoven University of Technology
Kostic, Dragan	Eindhoven University of Technology
Yan, Kai Wa	ASM Pacific Technology
Portegies, Jim	Eindhoven University of Technology
Oomen, Tom	Eindhoven University of Technology

14:15-14:30	MoBT6.2

Gaussian Process Based Feedforward Control for Nonlinear Systems with Flexible Tasks: With Application to a Printer with Friction, pp. 258-263.

van Meer, Max	Eindhoven University of Technology
Poot, Maurice	Eindhoven University of

	Technology
Portegies, Jim	Eindhoven University of Technology
Oomen, Tom	Eindhoven University of Technology

| 14:30-14:45 | MoBT6.3 |

Iterative Control Framework with Application to Guidance Control of Rockets with Impulsive Thrusters, pp. 264-269.

Liu, Xun	Villanova University
Ashrafiuon, Hashem	Villanova Univesity
Nersesov, Sergey G.	Villanova Univ

| 14:45-15:00 | MoBT6.4 |

Feedforward with Acceleration and Snap Using Sampled-Data Differentiator for a Multi-Modal Motion System, pp. 270-275.

Mae, Masahiro	The University of Tokyo
van Haren, Max	Eindhoven University of Technology
Ohnishi, Wataru	The University of Tokyo
Oomen, Tom	Eindhoven University of Technology
Fujimoto, Hiroshi	The University of Tokyo

| 15:00-15:15 | MoBT6.5 |

Vibration-Generation Mechanism and Reduction Method in Linear Iron-Cored Permanent-Magnet Synchronous Motors at Stationary State, pp. 276-276.

Kim, Eun Kyu	Yonsei University
Song, Wontaek	Yonsei University
Kwon, Yoon Sik	Yonsei University
Kim, Jae Hyun	Yonsei University
Yoon, Hyeong Min	Yonsei University
Lee, Hyo Geon	Yonsei University
Yoon, Jun Young	Yonsei University

| 15:15-15:30 | MoBT6.6 |

Optimal Data-Driven Difference-Inversion-Based Iterative Control: High-Speed Nanopositioning Tracking Example*.

| zhang, zezhou | Rutgers University |
| Zou, Qingze | Rutgers, the State University of New Jersey |

MoCP	Newport III,IV,&V
Nyquist Lecture (Special Session)	
Chair: Tan, Xiaobo	Michigan State Univ
Co-Chair: Yi, Jingang	Rutgers University

| 16:00-17:00 | MoCP.1 |

Control of Scanning Tunneling Microscope for Silicon Quantum Device Fabrication: Mechatronics at the Atomic Scale*.

| Moheimani, S.O. Reza | University of Texas at Dallas |

TuPP	Newport III, IV & V
Plenary: Bridging the Gap in Prediction, Estimation, and Control of Integrated Systems (Plenary Session)	
Chair: Wang, Qian	Penn State Univ
Co-Chair: Kumar, Manish	University of Cincinnati

08:30-09:30	TuPP.1

Bridging the Gap in Prediction, Estimation, and Control of Integrated Systems*.

Sun, Jing	Univ of Michigan

TuAT1	Liberty I
Adaptive and Learning Systems (Regular Session)	
Chair: Zhang, Wenlong	Arizona State University
Co-Chair: Chen, Xu	University of Washington

10:00-10:15	TuAT1.1

Shape-Adaptive Lighting for Uneven and Non-Uniform Topographies in Automated Visual Inspection, pp. 277-281.

Gerges, Mark	University of Washington
Chen, Xu	University of Washington

10:15-10:30	TuAT1.2

Linear Motor Command Tracking: A Novel Immersion and Invariance Adaptive Control Method with Arctangent-Function-Based Parameter Projection, pp. 282-287.

Zhou, Xingyu	University of Texas at Austin
Shen, Heran	The University of Texas at Austin
Wang, Zejiang	Oak Ridge National Laboratory
Ahn, Hyunjin	The University of Texas at Austin
Wang, Junmin	University of Texas at Austin

10:30-10:45	TuAT1.3

Adaptive Control of a UAV with Continuously Time Varying Center of Gravity, pp. 288-293.

Barawkar, Shraddha	University of Cincinnati
Kumar, Manish	University of Cincinnati
Bolender, Michael	Air Force Research Laboratory, Dayton, OH

10:45-11:00	TuAT1.4

Hierarchical Robust Adaptive Control for Wind Turbines with Actuator Fault, pp. 294-294.

Ameli, Sina	Florida State University
Anubi, Olugbenga	Florida State University

11:00-11:15	TuAT1.5

Stabilization of Vertical Motion of a Vehicle on Bumpy Terrain Using Deep Reinforcement Learning, pp. 295-300.

Salvi, Ameya	Clemson University
Coleman, John	Clemson University
Buzhardt, Jake	Clemson University
Krovi, Venkat	Clemson University
Tallapragada, Phanindra	Clemson University

11:15-11:30	TuAT1.6

Learning-Based Control for Passive Flexible Multirotors (PFMs) with Physical Interaction Abilities, pp. 301-306.

Patnaik, Karishma	Arizona State University
Zhang, Wenlong	Arizona State University

TuAT2	Liberty II
Mechatronic Design and Analysis (Regular Session)	
Chair: Oomen, Tom	Eindhoven University of Technology

Co-Chair: Yao, Bin	Purdue University

10:00-10:15	TuAT2.1

Design of Asymmetric Parallel Manipulator for Axial-Bending Dynamic Stiffness Analysis, pp. 307-313.

Torres, Gabriel Andres	Purdue University
Soliman, Ahmed	Purdue University
Ribeiro, Guilherme Aramizo	Purdue University
Rastgaar, Mo	Purdue University
Mahmoudian, Nina	Michigan Technological University

10:15-10:30	TuAT2.2

Designing a Virtual Reality Testbed for Direct Human-Swarm Interaction in Aquatic Species Monitoring, pp. 314-320.

Bhattacharya, Arunim	Northern Illinois University
Butail, Sachit	Northern Illinois University

10:30-10:45	TuAT2.3

Optimal Commutation for Switched Reluctance Motors Using Gaussian Process Regression, pp. 321-326.

van Meer, Max	Eindhoven University of Technology
Witvoet, Gert	TNO
Oomen, Tom	Eindhoven University of Technology

10:45-11:00	TuAT2.4

A One-Step Approach for Centralized Overactuated Motion Control of a Prototype Reticle Stage, pp. 327-332.

Tacx, Paul	Eindhoven University of Technology
Oomen, Tom	Eindhoven University of Technology

11:00-11:15	TuAT2.5

Adaptive Active Fault Tolerant Control for a Wheeled Mobile Robot under Actuator Fault and Dead Zone, pp. 333-338.

H. Pham, Yen	International School, Vietnam National University
Nguyen, Trang Linh	International School Vietnam National University
Bui, Tung	International School - Vietnam National University
Nguyen, Tinh Van	International School, Vietnam National University, Hanoi

11:15-11:30	TuAT2.6

Modeling and Analysis of a Cable-Pulley Actuated Lifting System, pp. 339-344.

Chen, Zeshen	Purdue University
Yao, Bin	Purdue University

TuAT3	Liberty III
Newest Advances in Systems and Control from Recent DCSD CAREER Awardees (II) (Special Session)	
Chair: Kelkar, Atul	Clemson University
Co-Chair: Landers, Robert G.	University of Notre Dame
Organizer: Landers, Robert G.	University of Notre Dame
Organizer: Kelkar, Atul	Clemson University

10:00-10:15	TuAT3.1

Dynamic & Control-Based Approach to Cellular Mechanotransduction Investigation (I)*.

Ren, Juan	Iowa State University

10:15-10:30	TuAT3.2

Bio-Inspired Variable Recruitment Fluidic Artificial Muscle Actuators: Innovations in Modeling, Configuration, and Control (I)*.

Mazzoleni, Nicholas	North Carolina State University
Kim, Jeong Yong	North Carolina State University
Duan, Emily	North Carolina State University
Bryant, Matthew	North Carolina State University

10:30-10:45	TuAT3.3

What Can We Make Out of Control and Learning for Batteries and Electrification? (I)*.

Fang, Huazhen	University of Kansas

10:45-11:00	TuAT3.4

Simultaneous and Independent Control of Nanostructured Objects through the Use of Coupled External Electric Fields (I)*.

Yu, Kaiyan	State University of New York at Binghamton

TuAT4	America I & II
Tracking and Following Controls (Regular Session)	
Chair: Oldham, Kenn	University of Michigan
Co-Chair: Astudillo, Alejandro	KU Leuven

10:00-10:15	TuAT4.1

Multi-Sensor Aided Deep Pose Tracking, pp. 345-351.

Lee, Hojun	University of Michigan
Toner, Tyler	University of Michigan
Tilbury, Dawn M.	Univ of Michigan
Barton, Kira	University of Michigan

10:15-10:30	TuAT4.2

A Tracking System for Dynamic Subset Targets Using Probability Hypothesis Filtering, pp. 352-357.

perera, R.A. Thivanka	University of Rhode Island
phillips, Andrew	University of Rhode Island
Yuan, Chengzhi	University of Rhode Island
Stegagno, Paolo	University of Rhode Island

10:30-10:45	TuAT4.3

Curriculum-Based Reinforcement Learning for Path Tracking in an Underactuated Nonholonomic System, pp. 358-363.

Chivkula, Prashanth	Clemson University
Rodwell, Colin	Clemson University
Tallapragada, Phanindra	Clemson University

10:45-11:00	TuAT4.4

Varying-Radius Tunnel-Following NMPC for Robot Manipulators Using Sequential Convex Quadratic Programming, pp. 364-371.

Astudillo, Alejandro	KU Leuven
Pipeleers, Goele	Katholieke Universiteit Leuven
Gillis, Joris	KU Leuven
Decré, Wilm	Katholieke Universiteit Leuven
Swevers, Jan	K. U. Leuven

11:00-11:15	TuAT4.5

Constrained Visual Servoing of Quadrotors Based on Model Predictive Control, pp. 372-379.

Recalde, Luis F	Universidad De Las Fuerzas Armadas Espe
Varela-Aldás, José	Universidad Tecnológica Indoamérica
Guevara, Bryan S.	Universidad De Las Fuerzas Armadas ESPE
ANDALUZ ORTIZ, VICTOR HUGO	Universidad De Las Fuerzas Armadas ESPE

Gimenez, Javier	CONICET - Universidad Nacional De San Juan
Gandolfo, Daniel Ceferino	UNSJ

11:15-11:30	TuAT4.6

Cerebral Blood Flow Tracking with Thin-Film Piezoelectric Sensing on an Intracranial Catheter and a Low-Order Hemodynamic Model, pp. 380-387.

Wang, Lu	University of Michigan
Yang, Jimin	University of Michigan
Kennan, James	University of Michigan
Brzezinski, Alexa	University of Michigan
Williamson, Craig	University of Michigan
McCracken, Brendan	University of Michigan
Tiba, Mohamad Hakam	University of Michigan
Ward, Kevin	University of Michigan
Oldham, Kenn	University of Michigan

TuBT1	Liberty I
Bioinspired Techniques for the Control and Assessment of Robotic Motion (Invited Session)	
Chair: Piovesan, Davide	Biomedical Engineering Program - Gannon University
Co-Chair: Rose, Chad	Auburn University
Organizer: Piovesan, Davide	Biomedical Engineering Program - Gannon University
Organizer: Ji, Xiaoxu	Gannon University
Organizer: Gu, Yan	University of Massachusetts Lowell
Organizer: Samanta, Biswanath	Georgia Southern University

14:00-14:15	TuBT1.1

A Failure Identification and Recovery Framework for a Planar Reconfigurable Cable Driven Parallel Robot (I), pp. 388-394.

Raman Thothathri, Adhiti	Clemson University
Walker, Ian	Clemson Univ
Krovi, Venkat	Clemson University
Schmid, Matthias	Clemson University

14:15-14:30	TuBT1.2

Integrated Inverted Pendulum and Whole-Body Control Design for Bipedal Robot with Foot Slip (I), pp. 401-406.

Mihalec, Marko	Rutgers University
Han, Feng	Rutgers University
Yi, Jingang	Rutgers University

14:30-14:45	TuBT1.3

Assessment of Neuromuscular Fatigue from Muscle Synergies in Hand Poses (I), pp. 395-400.

Baskaran, Avinash	Auburn University
Rose, Chad	Auburn University

14:45-15:00	TuBT1.4

Assessment of Whole-Body Vibration Via Integrating a Stewart Platform and SimWise Simulation (I), pp. 407-412.

Piovesan, Davide	Biomedical Engineering Program - Gannon University
Ji, Xiaoxu	Gannon University

15:00-15:15	TuBT1.5

Electromagnetic Non-Contacting Position Estimation of a Centimetre-Scale Robot (I), pp. 413-418.

Pushpalayam, Navaneeth	University of Minnesota
Alexander, Lee	Univ of Minnesota
Rajamani, Rajesh	Univ. of Minnesota

15:15-15:30	TuBT1.6

Deep Reinforcement Learning Based Adaptation of Pure-Pursuit Path-Tracking Control for Skid-Steered Vehicles (I), pp. 419-426.

Joglekar, Ajinkya	International Center for Automotive Research Clemson University
Sathe, Sumedh	Clemson University
Misurati, Nicola	Clemson University
Srinivasan, Srivatsan	Clemson University
Schmid, Matthias	Clemson University
Krovi, Venkat	Clemson University

TuBT3	Liberty III
Robot Modeling, Estimation, and Controls (Regular Session)	
Chair: Wang, Cong	New Jersey Institute of Technology
Co-Chair: Yi, Jingang	Rutgers University

14:00-14:15	TuBT3.1

Gaussian Mixture Based Motion Prediction for Cluster Groups of Mobile Agents, pp. 427-432.

James, Anegi	University of Texas at Austin
Bakolas, Efstathios	The University of Texas at Austin

14:15-14:30	TuBT3.2

Data-Oriented State Space Discretization for Crowdsourced Robot Learning of Physical Skills, pp. 433-433.

Zhao, Leidi	New Jersey Institute of Technology
Lu, Lu	New Jersey Institute of Technology
Wang, Cong	New Jersey Institute of Technology

14:30-14:45	TuBT3.3

Coordinated Pose Control of Mobile Manipulation with an Unstable Bikebot Platform, pp. 434-434.

Han, Feng	Rutgers University
Jelvani, Alborz	Rutgers University
Yi, Jingang	Rutgers University
Liu, Tao	Zhejiang University

14:45-15:00	TuBT3.4

Pose Control of a Spherical Object Held by Deformable Sheet with Multiple Robots, pp. 435-440.

Hunte, Kyle	Rutgers, the State University of New Jersey
Yi, Jingang	Rutgers University

15:00-15:15	TuBT3.5

Modeling Quadruped Leg Dynamics on Deformable Terrains Using Data-Driven Koopman Operators, pp. 441-446.

Krolicki, Alexander	Clemson University
Rufino, Dakota	Clemson University
Zheng, Andrew	Clemson University
Krishnamoorthy Shankara Narayanan, Sriram Sundar	Clemson University
Erb, Jackson	Clemson University
Vaidya, Umesh	Clemson University

15:15-15:30	TuBT3.6

EMG-Based HCI Using CNN-LSTM Neural Network for Dynamic Hand Gestures Recognition, pp. 447-452.

Li, Qiyu	Texas A&M University

Langari, Reza	Texas A&M Univ

TuBT5	Liberty II
Rising Stars in Robotics (Special Session)	
Chair: Zheng, Minghui	University at Buffalo
Co-Chair: Mazumdar, Yi	Georgia Institute of Technology

14:00-14:15	TuBT5.1

Bounding the Distance to Unsafe Sets with Convex Optimization (I)*.

Miller, Jared	Northeastern University
Sznaier, Mario	Northeastern University

14:15-14:30	TuBT5.2

Swing up Control of a Soft Inverted Pendulum with a Revolute Base (I)*.

Weerakoon, Lasitha	University of Maryland
Chopra, Nikhil	Univ of Maryland

14:30-14:45	TuBT5.3

Nonlinear Dynamics of a Kresling-Pattern Origami under Harmonic Force Excitation (I)*.

Agarwal, Vipin	University of Michigan, Ann Arbor
Wang, Kon-Well	University of Michigan

14:45-15:00	TuBT5.4

Physics-Based Modeling of Twisted-And-Coiled Actuators for Programmable Soft Robots (I)*.

Sun, Jiefeng	Colorado State University
Zhao, Jianguo	Colorado State University

15:00-15:15	TuBT5.5

Fast and Robust Inverse Kinematics of Serial Robots Using Halley's Method (I)*.

Lloyd, Steffan	Carleton University
Irani, Rishad	Carleton University
Ahmadi, Mojtaba	Carleton University

15:15-15:30	TuBT5.6

Towards the Design, Modeling and Control of a Robotic Transcatheter Used for Implant Delivery to Treat Mitral Regurgitation (I)*.

Nayar, Namrata Unnikrishnan	Georgia Institute of Technology
Jeong, Seokhwan	Sogang University
Ravigopal, Sharan	Georgia Institute of Technology
Desai, Jaydev	UMD

TuBT4	America I & II
Toward Dynamic Learning and Decision Making Using Artificial Intelligence in Manufacturing Systems (Special Session)	
Chair: Kovalenko, Ilya	Pennsylvania State University
Co-Chair: Barton, Kira	University of Michigan
Organizer: Kovalenko, Ilya	Pennsylvania State University
Organizer: Moyne, James	Univ of Michigan
Organizer: Barton, Kira	University of Michigan
Organizer: Tilbury, Dawn M.	Univ of Michigan

14:00-14:15	TuBT4.1

Towards an Automated Learning Control Architecture for Cyber-Physical Manufacturing Systems (I)*.

Kovalenko, Ilya	Pennsylvania State University
Barton, Kira	University of Michigan
Tilbury, Dawn M.	Univ of Michigan

TuCT2	Liberty II
System Identification (Regular Session)	
Chair: Takahashi, Atsushi	RIKEN Center for Advanced Intelligence Project
Co-Chair: Martin, Anne	Pennsylvania State University

16:00-16:15	TuCT2.1

Using System Identification and Central Pattern Generators to Create Synthetic Gait Data, pp. 453-459.

Li, Mengyao	Pennsylvania State University
Martin, Anne	Pennsylvania State University

16:15-16:30	TuCT2.2

Frequency Response Function Identification from Incomplete Data: A Wavelet-Based Approach, pp. 460-465.

Dirkx, Nic	ASML
Tiels, Koen	Eindhoven University of Technology
Oomen, Tom	Eindhoven University of Technology

16:30-16:45	TuCT2.3

Parameter Estimation and Adaptive Control of Super-Coiled Polymer Artificial Muscles, pp. 466-471.

Tsabedze, Thulani	University of Nevada, Reno
McLelland, Florian	University of Nevada, Reno
van Breugel, Floris	University of Nevada, Reno
Zhang, Jun	University of Nevada Reno

16:45-17:00	TuCT2.4

Optimization Based Excitation Signal Design Tailored to Application Specific Requirements, pp. 472-477.

Kösters, Tarek	University of Siegen
Heinz, Tim Oliver	University of Siegen
Nelles, Oliver	University of Siegen

17:00-17:15	TuCT2.5

Modelling and System Identification of a Nonlinear Microreactor: A Dual Youla Approach, pp. 478-483.

Ajeni, Michael	The University of Manchester
Heath, William Paul	University of Manchester

17:15-17:30	TuCT2.6

Concise Parameter Identification Method for 1C1R Gray-Box Model Using Thermal Balance Points Associated with Active Cooling/Heating, pp. 484-489.

Takahashi, Atsushi	RIKEN Center for Advanced Intelligence Project
Hokari, Hiroaki	Mitsubishi Electric Corporation
Doi, Mamoru	Mitsubishi Electric Corporation
Yoshikawa, Nobuyuki	Mitsubishi Electric
Mariyama, Toshisada	Mitsubishi Electric
Ueda, Naonori	RIKEN AIP

TuCT3	Liberty III
Robotic Applications (Regular Session)	
Chair: Xu, Yunjun	University of Central Florida
Co-Chair: Naseradinmousavi, Peiman	San Diego State University

16:00-16:15	TuCT3.1

Row Allocation Negotiation for a Fleet of Strawberry Harvesting Robots, pp. 490-490.

Mapes, Madeline	University of Central Florida
Xu, Yunjun	University of Central Florida

16:15-16:30	TuCT3.2

Robots for Pharmaceutical Production: A Benchtop Robotic Automation Approach for Manufacturing Prefilled Syringes, pp. 491-496.

Chamberlin, Jared	Clemson University
Zhong, Yehua	Clemson University
Wang, Yue	Clemson Univeristy

16:30-16:45	TuCT3.3

Improving Experiment Design for Frequency-Domain Identification of Industrial Robots, pp. 497-502.

Zimmermann, Stefanie Antonia	Linköping University
Enqvist, Martin	Linköping University
Gunnarsson, Svante	Linkoping University
Moberg, Stig	ABB AB - Robotics
Norrlöf, Mikael	ABB AB

16:45-17:00	TuCT3.4

Experiment and Design of Prescribed-Time Safety Filter for a 7-DOF Robot Manipulator Using CBF-QP, pp. 503-509.

Bertino, Alexander	San Diego State University
Naseradinmousavi, Peiman	San Diego State University
Krstic, Miroslav	Univ. of California at San Diego

17:00-17:15	TuCT3.5

A Micro-Robotic Approach for the Intuitive Assembly of Industrial Electro-Optical Sensors Based on Closed-Loop Light Feeling, pp. 510-510.

Awde, Ahmad	Unversity of Bourgogne-Franche-Comté
Boudaoud, Mokrane	Université Pierre Et Marie CURIE, Institut Des Systèmes Intellig
Macioce, Mélanie	Aurea Technology Compagny
RÉGNIER, Stéphane	Université Pierre Et Marie CURIE, Institut Des Systèmes Intellig
Clevy, Cedric	University of Franche-Comté / FEMTO-ST

17:15-17:30	TuCT3.6

A Sliding Mode Fault Tolerant Control Method for a Manipulator in Task-Space under Dead Zone and Actuator Fault, pp. 511-516.

Bui, Tung	International School - Vietnam National University
Bui, Thang Quang	International School
H. Pham, Yen	International School, Vietnam National University
Nguyen, Tinh Van	International School, Vietnam National University, Hanoi

TuCT5	Newport III
Rising Stars in Vibrations and Energy (Special Session)	
Chair: Aureli, Matteo	University of Nevada, Reno

16:00-16:15	TuCT5.1

*Ocean Wave Powered Reverse Osmosis Desalination (I)**.

Mi, Jia	2768804508

16:15-16:30	TuCT5.2

*Renewables Integration to the Power System and Frequency Regulation (I)**.

Abdollahi Biroon, Roghieh	Clemson University

16:30-16:45	TuCT5.3

*Toward Intelligent Manufacturing Machines Enabled by Dynamics and Control (I)**.

Kim, Heejin	University of Michigan

16:45-17:00	TuCT5.4

High-Performance Regulation with Robustness and Safety for Robotic, Vehicular and Beam Systems (I)*.

Steeves, Drew	University of California, San Diego

17:00-17:15	TuCT5.5

Distributionally Robust Surrogate Optimal Control for High-Dimensional Systems (I)*.

Kandel, Aaron	UC Berkeley
Park, Saehong	University of California, Berkeley
Moura, Scott	UC Berkeley

WePP — Newport III,IV,&V

Plenary: "Mechanical Intelligence" in Robotic Manipulation: Good Design Makes Everything Easier (Plenary Session)

Chair: Chen, Xu	University of Washington
Co-Chair: Zou, Qingze	Rutgers, the State University of New Jersey

08:30-09:30 — WePP.1

"Mechanical Intelligence" in Robotic Manipulation: Good Design Makes Everything Easier*.

Dollar, Aaron	Yale University

WeAT1 — Liberty I

Advanced Driver-Assistance System and Safety Control (Invited Session)

Chair: Bevly, David M.	Auburn University
Co-Chair: Chen, Yan	Arizona State University
Organizer: Ghasemi, Amirhossein	University of North Carolina Charlotte
Organizer: Amini, Mohammad Reza	University of Michigan
Organizer: Chen, Pingen	Tennessee Technological University

10:00-10:15 — WeAT1.1

Cluster-Based Wall Curvature Detection and Parameterization for Autonomous Racing Using LiDAR Point Clouds (I), pp. 517-522.

Meyer, Stephanie	Auburn University
Bevly, David M.	Auburn University

10:15-10:30 — WeAT1.2

Safety-Guaranteed Control of Coupled Longitudinal and Lateral Vehicle Dynamics by Considering Tire Stability Via CDBFs (I), pp. 523-528.

Wang, Yanze	Arizona State University
Liu, Mingzhe	Arizona State University
Chen, Yan	Arizona State University

10:30-10:45 — WeAT1.3

Convention-Based Intent Integration in a Haptic Shared Control Paradigm (I), pp. 529-534.

Izadi, Vahid	UNC Charlotte
Saraphis, Daniel	University of North Carolina Charlotte
Ghasemi, Amirhossein	University of North Carolina Charlotte

10:45-11:00 — WeAT1.4

Dynamic Control Authority Arbitration for Resolving a Reverse-Intent Conflict in a Haptic Shared Control Paradigm (I), pp. 535-540.

Izadi, Vahid	UNC Charlotte
Saraphis, Daniel	University of North Carolina Charlotte
Ghasemi, Amirhossein	University of North Carolina Charlotte

11:00-11:15 — WeAT1.5

Individualizable Vehicle Lane Keeping Assistance System Design: A Linear-Programming-Based Model Predictive Control Approach (I), pp. 541-546.

Zhou, Xingyu	University of Texas at Austin
Shen, Heran	The University of Texas at Austin
Wang, Zejiang	Oak Ridge National Laboratory
Wang, Junmin	University of Texas at Austin

11:15-11:30 — WeAT1.6

Adaptive Spacing Policy Design of Flocking Control for Multi-Agent Vehicular Systems (I), pp. 547-552.

Wang, Fengchen	The MathWorks, Inc
Wang, Gang	Arizona State University
Chen, Yan	Arizona State University

WeAT2 — Liberty II

Ground and Aerial Vehicles (Regular Session)

Chair: Kumar, Manish	University of Cincinnati
Co-Chair: Yao, Bin	Purdue University

10:00-10:15 — WeAT2.1

Physics-Informed Disturbance Estimation and Nonlinear Controller Design for a Multi-Axis Gimbal System, pp. 553-558.

Leblebicioglu, Damla	Bilkent University
Atesoglu, Özgür	Bilkent University
Cakmakci, Melih	Bilkent University

10:15-10:30 — WeAT2.2

On Enhancing the Bandwidth of the Actuator Dynamics in a Multi-Rotor Aerial Vehicle, pp. 559-564.

Charla, Sesha	Purdue University
Yao, Bin	Purdue University
Voyles, Richard	Purdue Univesity

10:30-10:45 — WeAT2.3

Prototype Development and Flight Controller Implementation of the Sliding-Arm Quadcopter, pp. 565-570.

Kumar, Rumit	University of Cincinnati
Wells, James Z.	University of Cincinnati
Jhawar, Devansh	University of Cincinnati
Ranjan, Kunal	University of Cincinnati
Kumar, Manish	University of Cincinnati

10:45-11:00 — WeAT2.4

Application of Distributed Linear Multi-Agent Containment Control to Robotic Systems, pp. 571-576.

Tauchnitz, Stefan	University of Rhode Island
Yuan, Chengzhi	University of Rhode Island
Stegagno, Paolo	University of Rhode Island

11:00-11:15 — WeAT2.5

Control of Hybrid Transitioning Morphing-Wing VTOL UAV, pp. 577-582.

Patel, Twinkle	University of Cincinnati
Kumar, Manish	University of Cincinnati
Abdallah, Shaaban	University of Cincinnati

11:15-11:30 — WeAT2.6

Stochastic Trajectory Optimization of a Swarm of Spacecraft Exploring the Rings of Saturn, pp. 583-589.

Le Compte, Shane	Rutgers University
Scacchioli, Annalisa	Rutgers University

WeAT3 — Liberty III

Path Planning and Motion Control (Regular Session)

Chair: Caverly, Ryan James	University of Minnesota
Co-Chair: Kosieradzki, Shane	Georgia Institute of Technology

10:00-10:15 — WeAT3.1

Using Spherical Harmonics for Navigating in Dynamic and Uncertain Environments, pp. 590-595.

Patrick, Steven	University of Texas at Austin
Bakolas, Efstathios	The University of Texas at Austin

10:15-10:30	WeAT3.2

A Proposal of Path Planning for Robots in Warehouses by Model Predictive Control without Using Global Paths, pp. 596-601.

Ishihara, Shinji	Hitachi, Ltd., Research & Development Group
Kanai, Masaki	Hitachi, Ltd
Narikawa, Ryu	Hitachi, Ltd
Ohtsuka, Toshiyuki	Kyoto University

10:30-10:45	WeAT3.3

A Novel Decentralized Consensus-Based Tracking Control for Exploration of Saturn's Rings, pp. 602-609.

Le Compte, Shane	Rutgers University
Scacchioli, Annalisa	Rutgers University

10:45-11:00	WeAT3.4

Vector Field-Based Collision Avoidance for Moving Obstacles with Time-Varying Elliptical Shape, pp. 610-615.

Braquet, Martin	University of Texas at Austin
Bakolas, Efstathios	The University of Texas at Austin

11:00-11:15	WeAT3.5

Passivity-Based Adaptive Trajectory Control of an Underactuated 3-DOF Overhead Crane, pp. 616-616.

Shen, Ping-Yen	University of Minnesota
Schatz, Julia	University of Minnesota
Caverly, Ryan James	University of Minnesota

11:15-11:30	WeAT3.6

Secure Teleoperation Control Using Somewhat Homomorphic Encryption, pp. 617-624.

Kosieradzki, Shane	Georgia Institute of Technology
Zhao, Xiaofeng	Georgia Institute of Technology
Kawase, Hiroaki	The University of Electro-Communications
Qiu, Yingxin	Georgia Institution of Technology
Kogiso, Kiminao	University of Electro-Communications
Ueda, Jun	Georgia Institute of Technology

WeAT4	America I & II
Machine Learning and Data-Driven Control of Automotive Systems (Invited Session)	

Chair: HomChaudhuri, Baisravan	Illinois Institute of Technology
Co-Chair: Borhan, Hoseinali (Ali)	Cummins
Organizer: HomChaudhuri, Baisravan	Illinois Institute of Technology
Organizer: Borhan, Hoseinali (Ali)	Cummins
Organizer: Chen, Pingen	Tennessee Technological University

10:00-10:15	WeAT4.1

Machine Learning-Based Classification of Combustion Events in an RCCI Engine Using Heat Release Rate Shapes (I), pp. 625-631.

Sitaraman, Radhika	Cummins Inc, Columbus, in 47201 USA
Batool, Sadaf	Michigan Technological University
Borhan, Hoseinali (Ali)	Cummins
Mohammadpour Velni, Javad	The University of Georgia

Naber, Jeffrey	Michigan Technological University
Shahbakhti, Mahdi	University of Alberta

10:15-10:30	WeAT4.2

Data-Driven Model Learning and Control of RCCI Engines Based on Heat Release Rate (I), pp. 632-638.

Radhika Sitaraman, Radhika Sitaraman	Cummins Technical Center, Columbus, in 47201 USA
Batool, Sadaf	Michigan Technological University
Borhan, Hoseinali (Ali)	Cummins
Mohammadpour Velni, Javad	The University of Georgia
Naber, Jeffrey	Michigan Technological University
Shahbakhti, Mahdi	University of Alberta

10:30-10:45	WeAT4.3

Safe Reinforcement Learning for an Energy-Efficient Driver Assistance System (I), pp. 639-644.

Hailemichael, Habtamu	Clemson University
Ayalew, Beshah	Cemson University
Kerbel, Lindsey	Clemson University
Ivanco, Andrej	Allison Transmission
Loiselle, Keith	Allison Transmission, Inc

10:45-11:00	WeAT4.4

Hybrid Physics-Based Neural Network Models for Diesel Combustion Phasing Prediction (I), pp. 645-650.

Ankobea-Ansah, King	Illinois Institute of Technology
Hall, Carrie	Illinois Institute of Technology

11:00-11:15	WeAT4.5

Data Driven Feedforward Control Strategy for Multi-Fuel UAS Engine (I), pp. 651-656.

Dong, Xiaonan	University of Minnesota, Twin Cities
Goertemiller, Clifford	University of Minnesota - Twin Cities
Pal, Anuj	University of Minnesota Twin Cities
Sun, Zongxuan	University of Minnesota
Kim, Kenneth	DEVCOM Army Research Laboratory
Kweon, Chol-Bum	DEVCOM Army Research Laboratory

11:15-11:30	WeAT4.6

Data-Driven Prediction and Predictive Control Methods for Eco-Driving in Production Vehicles (I), pp. 657-662.

Vellamattathil Baby, Tinu	Illinois Institute of Technology
Sotoudeh, Seyedeh Mahsa	Illinois Institute of Technology
HomChaudhuri, Baisravan	Illinois Institute of Technology

WeBT1	Liberty I
Optimal and Collaboration Controls (Regular Session)	

Chair: Mohammadpour Velni, Javad	The University of Georgia
Co-Chair: Ashrafiuon, Hashem	Villanova Univesity

14:00-14:15	WeBT1.1

Optimal Supplemental Lighting Control for an Extended Photoperiod in Controlled Environment Agriculture, pp. 663-668.

Alaviani, Seyyed Shaho	University of Georgia
van Iersel, Marc	University of Georgia
Mohammadpour Velni, Javad	The University of Georgia

14:15-14:30	WeBT1.2

Nonlinear Model Predictive Control for Optimal Motion Planning in Autonomous Race Cars, pp. 669-674.

Sivashangaran, Shathushan	Virginia Polytechnic Institute and State University
Patel, Darshit Satishkumar	Virginia Polytechnic Institute and State University
Eskandarian, Azim	Virginia Polytechnic Institute and State University

14:30-14:45	WeBT1.3

Cooperative Localization of 3D Vehicle Networks - the Dynamic Model, pp. 675-680.

Oliveros, Juan Carlos	Villanova University
Ashrafiuon, Hashem	Villanova Univesity

14:45-15:00	WeBT1.4

Formation Control for Heterogeneous Spatial Underactuated Vehicles Using Bearing Measurements, pp. 681-686.

Wang, Bo	Villanova University
Nersesov, Sergey G.	Villanova Univ
Ashrafiuon, Hashem	Villanova Univesity

15:00-15:15	WeBT1.5

H-Infinity Optimal Control for Maintaining the R2R Peeling Front, pp. 687-692.

Martin, Christopher	University of Texas at Austin
Zhao, Qishen	University of Texas at Austin
Bakshi, Soovadeep	University of Texas at Austin
Chen, Dongmei	UT Austin
Li, Wei	University of Texas at Austin

15:15-15:30	WeBT1.6

Combined Macroscopic and Microscopic Multi-Agent Control for Multi-Target Tracking, pp. 693-698.

Abdulghafoor, Alaa	University of Texas at Austin
Bakolas, Efstathios	The University of Texas at Austin

WeBT2	Liberty II
Advanced Modeling and Controls of Automotive Systems (Invited Session)	

Chair: Chen, Pingen	Tennessee Technological University
Co-Chair: HomChaudhuri, Baisravan	Illinois Institute of Technology
Organizer: Chen, Pingen	Tennessee Technological University
Organizer: HomChaudhuri, Baisravan	Illinois Institute of Technology
Organizer: Ghasemi, Amirhossein	University of North Carolina Charlotte

14:00-14:15	WeBT2.1

A Koopman Operator Approach for the Vertical Stabilization of an Off-Road Vehicle (I), pp. 699-704.

Buzhardt, Jake	Clemson University
Tallapragada, Phanindra	Clemson University

14:15-14:30	WeBT2.2

Ground-Vehicle Relative Position Estimation with UWB Ranges and a Vehicle Dynamics Model (I), pp. 705-711.

Jones, Benjamin	Auburn University
Thompson, Kyle	Auburn University
Pierce, John, Dan, Daniel	Auburn University GPS and Vehicle Dynamics Lab
Martin, Scott	Auburn University

Bevly, David M.	Auburn University

14:30-14:45	WeBT2.3

An Integrated Tread Beam/LuGre Tire-Road Friction Model (I), pp. 712-717.

Chen, Xunjie	Rutgers University
Yi, Jingang	Rutgers University
Qian, Junyu	Rutgers University
Wang, Hao	Rutgers University

14:45-15:00	WeBT2.4

Designing Traffic Management Strategies for a Heterogeneous Traffic Network (I), pp. 718-723.

Karimi Shahri, Pouria	University of North Carolina at Charlotte
HomChaudhuri, Baisravan	Illinois Institute of Technology
Ghaffari, Azad	Wayne State University
Ghasemi, Amirhossein	University of North Carolina Charlotte

15:00-15:15	WeBT2.5

Eco-Driving for Battery Electric Vehicles Using Traffic-Aware Computationally Efficient Model Predictive Control (I), pp. 724-729.

Su, Zifei	Tennessee Technological University
Chen, Pingen	Tennessee Technological University

15:15-15:30	WeBT2.6

Data-Driven Driver Model for Speed Advisory Systems in Partially Automated Vehicles (I), pp. 730-735.

Gupta, Shobhit	The Ohio State University
Jacome, Olivia	The Ohio State University
Stockar, Stephanie	The Ohio State University
Canova, Marcello	The Ohio State University

WeBT3	Liberty III
Modeling, Estimation, and Control of Batteries (Invited Session)	

Chair: Dey, Satadru	The Pennsylvania State University
Co-Chair: Docimo, Donald	Texas Tech University
Organizer: Lin, Xinfan	University of California, Davis
Organizer: Dey, Satadru	The Pennsylvania State University
Organizer: Fang, Huazhen	University of Kansas
Organizer: Moura, Scott	UC Berkeley
Organizer: Docimo, Donald	Texas Tech University
Organizer: Song, Ziyou	The University of Michigan
Organizer: Vermillion, Christopher	NC State
Organizer: Stockar, Stephanie	The Ohio State University
Organizer: Pangborn, Herschel	Pennsylvania State University

14:00-14:15	WeBT3.1

Low-Cost Inductive Sensor and Fixture Kit for Measuring Battery Cell Thickness under Constant Pressure (I), pp. 736-741.

Pannala, Sravan	University of Michigan
Fischer, Ian	University of Michigan
Weng, Andrew	University of Michigan
Siegel, Jason	University of Michigan
Stefanopoulou, Anna G.	Univ of Michigan

14:15-14:30	WeBT3.2

Reduction of Lithium-Ion Battery Models with Degradation Dynamics: A Comparison of Techniques (I), pp. 742-749.

Moon, Jihoon	Texas Tech University
Docimo, Donald	Texas Tech University

14:30-14:45	WeBT3.3

A Framework for Analysis of Lithium-Ion Battery Pack Balancing Including Cell Parameter Heterogeneity (I), pp. 750-757.

Abadie, Preston	Texas Tech University
Docimo, Donald	Texas Tech University

14:45-15:00	WeBT3.4

Reduced and Reformulated Electrochemical Model-Based Detection and Isolation of Electrode-Level Faults in Lithium-Ion Battery Cells (I), pp. 758-763.

Padisala, Shanthan Kumar	The Pennsylvania State University
Sattarzadeh, Sara	Pennsylvania State University
Dey, Satadru	The Pennsylvania State University

15:00-15:15	WeBT3.5

Effect of State of Charge Uncertainty on Battery Energy Storage Systems, pp. 764-769.

Martin, Sonia	Stanford University
Onori, Simona	Stanford University
Rajagopal, Ram	Stanford University

WeBT4	America I & II
Modal Analysis, Estimation, and Prediction (Regular Session)	
Chair: Das, Tuhin	University of Central Florida
Co-Chair: Fathy, Hosam K.	University of Maryland

14:00-14:15	WeBT4.1

Fault Detection for Precision Mechatronics: Online Estimation of Mechanical Resonances, pp. 770-775.

Classens, Koen	Eindhoven University of Technology
Mostard, Mike	Eindhoven University of Technology
van de Wijdeven, Jeroen	ASML
Heemels, Maurice	Eindhoven University of Technology
Oomen, Tom	Eindhoven University of Technology

14:15-14:30	WeBT4.2

Experimental Parameterization of a Model of Hypoxia Dynamics in Yorkshire Swine, pp. 776-781.

Wood, Sam	University of Maryland
Commins, Annina	University of Maryland
Doosthosseini, Mahsa	The University of Maryland
Naselsky, Warren	University of Maryland, School of Medicine
Culligan, Melissa	Temple University
Aroom, Kevin	University of Maryland
Aroom, Majid	University of Maryland
Kadkhodaeielyaderani, Behzad	University of Maryland, College Park
Moon, Yejin	University of Maryland
Leibowitz, Joshua	University of Maryland
Stewart, Shelby	University of Maryland
Yu, Miao	University of Maryland
Friedberg, Joseph	Temple University

Hahn, Jin-Oh	University of Maryland
Fathy, Hosam K.	University of Maryland

14:30-14:45	WeBT4.3

A Physics-Based Data-Driven Approach for Finite Time Estimation of Pandemic Growth, pp. 782-787.

Uppaluru, Harshvardhan	University of Arizona
Rastgoftar, Hossein	University of Arizona

14:45-15:00	WeBT4.4

Stabilization of an Inverted Pendulum on a Nonholonomic System, pp. 788-793.

Loya, Kartik	Clemson University
Tallapragada, Phanindra	Clemson University

15:00-15:15	WeBT4.5

Equations of Motion of Dynamical Systems from Kinematic Characteristics of the Phase Space, pp. 794-794.

Das, Tuhin	University of Central Florida

15:15-15:30	WeBT4.6

Optimal Spin-Up Motion of Wind Turbine Using Deterministic Dynamic Programming, pp. 795-800.

Moon, Yejin	University of Maryland
Nozarijouybari, Zahra	University of Maryland College Park
Handler, Chenchen	University of Maryland

WeBT6	Newport IV
Vibrations: Modeling, Analysis, and Control (Invited Session)	
Chair: Tang, Jiong	University of Connecticut
Co-Chair: Zheng, Minghui	University at Buffalo
Organizer: Tallapragada, Phanindra	Clemson University

14:00-14:15	WeBT6.1

Condition Monitoring in Wind Turbine Planetary Gearbox Using Sensor Fusion and Convolutional Neural Network (I), pp. 801-806.

Amin, Abdelrahman	Clemson University
Bibo, Amin	Clemson University
Panyam, Meghashyam	Clemson University
Tallapragada, Phanindra	Clemson University

14:15-14:30	WeBT6.2

Ocean Wave Powered Reverse Osmosis Desalination: Design, Modeling and Test Validation (I), pp. 807-812.

Mi, Jia	2768804508
Shalaby, Ahmed	Stevens Institute of Technology
Datla, Raju	Stevens Institute of Technology
Hajj, Muhammad	Stevens Institute of Technology
Zuo, Lei	Virginia Tech

14:30-14:45	WeBT6.3

A New Iterative Learning Control Algorithm for Final Error Reduction (I), pp. 813-819.

Chen, Zhu	University at Buffola
Liang, Xiao	University at Buffalo
Zheng, Minghui	University at Buffalo

14:45-15:00	WeBT6.4

Probabilistic Gear Fault Diagnosis Using Bayesian Convolutional Neural Network (I), pp. 820-824.

zhou, kai	Michigan Technological University
Tang, Jiong	University of Connecticut

15:00-15:15	WeBT6.5

An Image Segmentation Framework for In-Situ Process Monitoring of Laser Powder Bed Fusion Additive Manufacturing (I), pp. 825-831.

Xie, Jason	University of Washington
Jiang, Tianyu	Western Digital Corporation
Chen, Xu	University of Washington

15:15-15:30	WeBT6.6

Asymptotic Stability of the Sphere's Rolling Equilibrium, pp. 832-832.

Das, Tuhin	University of Central Florida

WeBT5	Newport III

Rising Stars in Biomechanical Systems (Special Session)

Chair: Zheng, Minghui	University at Buffalo
Co-Chair: Mazumdar, Yi	Georgia Institute of Technology

14:00-14:15	WeBT5.1

Evaluation of a Fused Sonomyography and Electromyography-Based Control on a Cable-Driven Ankle Exoskeleton (I)*.

Zhang, Qiang	The University of North Carolina at Chapel Hill
Lambeth, Krysten	North Carolina State University
Sun, Ziyue	The University of PIttsburgh
Bao, Xuefeng	University of Pittsburgh
Sharma, Nitin	North Carolina State University

14:15-14:30	WeBT5.2

Learning As a Tool for Agile Bipedal Locomotion (I)*.

Green, Kevin	Oregon State University
Hatton, Ross	Oregon State University

14:30-14:45	WeBT5.3

Disentangling the Human Neural Controller by System Identification (I)*.

Ramadan, Ahmed	University of Minnesota Twin Cities
Cholewicki, Jacek	Michigan State University
Reeves, N. Peter	Sumaq Life LLC
Popovich, John M.	Michigan State University
Radcliffe, Clark J.	Michigan State Univ
Yu, Heejin	Yonsei University
Choi, Jongeun	Yonsei University

14:45-15:00	WeBT5.4

Multi-Modal Vision-Language Modeling for Dementia Diagnosis (I)*.

Liu, Ziming	University of Tennessee
Paek, Eun Jin	University of Tennessee
Casenhiser, Devin	University of Tennessee
Zhou, Wenjun	University of Tennessee
Zhao, Xiaopeng	University of Tennessee

15:00-15:15	WeBT5.5

Cognitive Rehab for People with Dementia Based on Human-Robot Communication Modeling (I)*.

Yuan, Fengpei	University of Tennessee, Knoxville
Boltz, Marie	Penn State University
Bilal, Dania	University of Tennessee, Knoxville
Duzan, Joshua	University of Tennessee, Knoxville
Crane, Monica	Genesis Neuroscience Clinic
Zhao, Xiaopeng	University of Tennessee

15:15-15:30	WeBT5.6

Neurological Disease Diagnosis and Treatment Via Precise Robotic Intervention (I)*.

Meinhold, Waiman	Georgia Institute of Technology
UEDA, JUN	Georgia Tech

WeBT7	Newport V

Rising Stars in Automotive and Transportation Systems (Special Session)

Chair: Shahbakhti, Mahdi	University of Alberta
Co-Chair: Chen, Yan	Arizona State University

14:00-14:15	WeBT7.1

Designing Explainable Autonomous Driving System for Trustworthy Interaction (I)*.

Tang, Chen	UC Berkeley

14:15-14:30	WeBT7.2

Socially Compatible Control Design of Automated Vehicle in Mixed Traffic (I)*.

Ozkan, Mehmet	Texas Tech University
Ma, Yao	Texas Tech University

14:30-14:45	WeBT7.3

Comprehensive Energy Footprint Benchmarking Framework for Electrified Commercial Vehicles (I)*.

Anwar, Hamza	Ohio State University
Ahmed, Qadeer	The Ohio State University

14:45-15:00	WeBT7.4

Energy-Efficiency Improvement of Connected and Automated Vehicles (I)*.

Gupta, Shobhit	The Ohio State University

15:00-15:15	WeBT7.5

Learning and Control of Multiagent Systems through Interactions (I)*.

Grover, Jaskaran Singh	Carnegie Mellon University
Liu, Changliu	Carnegie Mellon University
Sycara, Katia	Carnegie Mellon

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Places to Eat

There are many restaurants within walking distance from The Westin Jersey City Newport Hotel. A few examples are listed below for your reference:

Fire & Oak, an American Grill, $$, (lobby level of The Westin), (201)610-9610, www.fireandoak.com, **American/Seafood/Steak**

Automat Kitchen, $$, 525 Washington Boulevard, (201)918-5131, www.automatkitchen.com, **American/Salads/Sandwiches**

Battello, $$, 502 Washington Boulevard, (201)798-1798, www.battellojc.com, **Italian/Seafood/Lounge**

Cheesecake Factory, $$, 30 Mall Drive at Newport Centre Mall, (201)876-5810, www.cheesecakefactory.com, **American/Bar**

Chef Tan, $$, 558 Washington Boulevard, (201)222-3767, no website, **Chinese**

Chipotle Mexican Grill, $, 525 Washington Boulevard at Newport Tower, (201)222-3767, www.chipotle.com, **Mexican**

Cosi, $, 535 Washington Boulevard, (201)963-0533, www.getcosi.com, **Sandwiches/Salads/Soups**

Dorrian's Red Hand, $$, 555 Washington Boulevard, (201)626-6660, www.dorrians-jerseycity.com, **Irish/Bar**

Hoots Wings, $$, 525 Washington Boulevard, (551)325-6222, www.hootswings.com, **Chicken Wings**

Just Salad, $$, 525 Washington Boulevard, (212)244-1111, www.justsalad.com, **Salad, Vegetarian**

Komegashi Too, $$, 99 Town Square Place, (201)533-8888, www.komegashi.com, **Japanese/Pan Asian/Sushi**

Loradella's Family Pizzeria, $$, 126 River Drive South, (201)963-4900, www.loradellaspizza.com, **Italian/Pizza**

Los Cuernos, $$, 499 Washington Boulevard, (201)222-5700, no website, **Mexican**

Menya Sandaime, $, 570 Washington Boulevard, (201)588-1575, www.menyausa.com, **Japanese/PanAsian**

Raaz,$$, 537 Washington Boulevard, (201)533-0111, www.raaz.us.com, **Indian**

Ruth's Chris Steakhouse, $$$, 499 Washington Boulevard, (201)448-8664, www.ruthschris.com, **American/Seafood/Steak**

Villa Borghese III, (VB3), $$, 475 Washington Boulevard, (201)420-4823, www.vb3restaurant.com, **Italian/Pizza/Sandwiches**
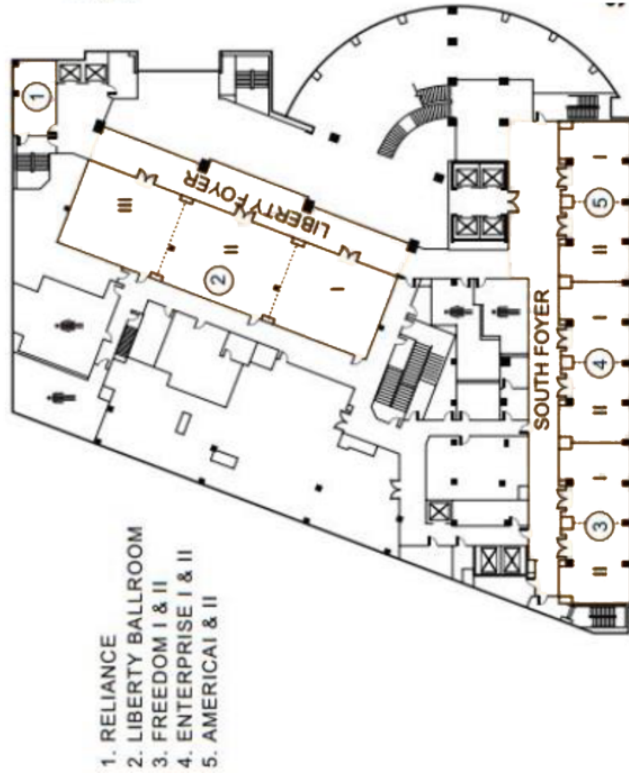
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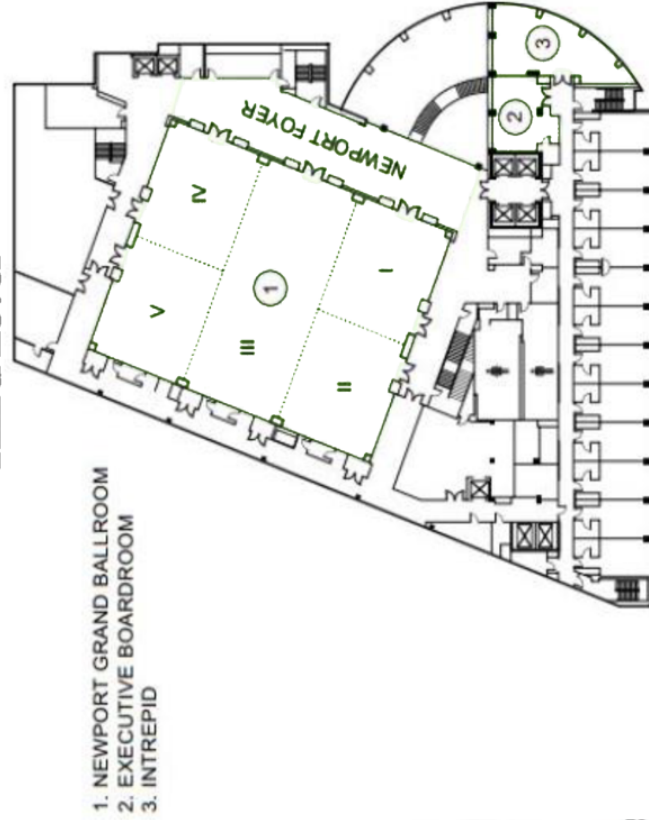
Notes

Floor Plans
Capacity Chart

Floor Plan

Third Level

NEWPORT FOYER

1. NEWPORT GRAND BALLROOM
2. EXECUTIVE BOARDROOM
3. INTREPID

Second Level

LIBERTY FOYER

SOUTH FOYER

1. RELIANCE
2. LIBERTY BALLROOM
3. FREEDOM I & II
4. ENTERPRISE I & II
5. AMERICA I & II

MECC 2022 Technical Program Monday October 3, 2022

Track 1	Track 2	Track 3	Track 7	Track 5	Track 6	Track 4
08:30-09:30 Newport III,IV,&V Plenary Session MoPP — *Plenary: Exploration in the Forest of Mechanical Systems Control*						
10:00-11:30 Liberty I Regular Session MoAT1 — *Estimation Theory and Applications*	10:00-11:30 Liberty II Invited Session MoAT2 — *Modeling and Control of Electric Vehicles*	10:00-11:30 Liberty III Regular Session MoAT3 — *Modeling: Recent Advance and Emerging Applications*	10:00-11:20 Newport III,IV,&V Special Session MoAAT7 — *Rapid Fire Poster Presentations*	10:00-11:30 Newport I Regular Session MoAT5 — *Precision Systems*	10:00-11:30 Newport II Invited Session MoAT6 — *Estimation, Control, and Optimization of Energy Storage and Conversion Systems*	10:00-11:30 America I & II Special Session MoAT4 — *Newest Advances in Systems and Control from Recent DCSD CAREER Awardees (I)*
13:00-13:50 Newport III,IV,&V Social Session MoNT7 — *Rising Star Networking*						
14:00-15:30 Liberty I Special Session MoBT1 — *Funding Agency Talk I*	14:00-15:30 Liberty II Regular Session MoBT2 — *Machine Learning, Modeling, and Controls*	14:00-15:30 Liberty III Regular Session MoBT3 — *Modeling and Controls in Automotive Systems*	14:00-15:30 Newport III,IV,&V Special Session MoBT7 — *Rising Stars in Mechatronics*	14:00-15:30 Newport I Special Session MoBT5 — *Industry Stories in Controls*	14:00-15:30 Newport II Regular Session MoBT6 — *Feedforward and Motion Control*	
16:00-17:00 Newport III,IV,&V Special Session MoCP — *Nyquist Lecture*						

MECC 2022 Technical Program Tuesday October 4, 2022

Track 1	Track 2	Track 3	Track 5	Track 4
08:30-09:30 Newport III, IV & V Plenary Session TuPP — *Plenary: Bridging the Gap in Prediction, Estimation, and Control of Integrated Systems*				
10:00-11:30 Liberty I Regular Session TuAT1 — *Adaptive and Learning Systems*	10:00-11:30 Liberty II Regular Session TuAT2 — *Mechatronic Design and Analysis*	10:00-11:30 Liberty III Special Session TuAT3 — *Newest Advances in Systems and Control from Recent DCSD CAREER Awardees (II)*		10:00-11:30 America I & II Regular Session TuAT4 — *Tracking and Following Controls*
11:35-13:50 Newport III, IV & V Special Session TuNP — *Awards & Banquet*				
14:00-15:30 Liberty I Invited Session TuBT1 — *Bioinspired Techniques for the Control and Assessment of Robotic Motion*	14:00-15:30 tinyurl.com/237e7y43 Special Session TuBT2 — *Funding Agency Talk II*	14:00-15:30 Liberty III Regular Session TuBT3 — *Robot Modeling, Estimation, and Controls*	14:00-15:30 Liberty II Special Session TuBT5 — *Rising Stars in Robotics*	14:00-15:30 America I & II Special Session TuBT4 — *Toward Dynamic Learning and Decision Making Using Artificial Intelligence in Manufacturing Systems*
16:00-17:30 Liberty I Tutorial Session TuCT1 — *Tutorial: Control and Testing of Connected and Automated Vehicles*	16:00-17:30 Liberty II Regular Session TuCT2 — *System Identification*	16:00-17:30 Liberty III Regular Session TuCT3 — *Robotic Applications*	16:00-17:30 Newport III Special Session TuCT5 — *Rising Stars in Vibrations and Energy*	16:00-17:30 America I & II Tutorial Session TuCT4 — *Tutorial: Modeling, Estimation, and Control for Single Molecule Investigation*

MECC 2022 Technical Program Wednesday October 5, 2022

Track 1	Track 2	Track 3	Track 4	Track 6	Track 5	Track 7
08:30-09:30 Newport III,IV,&V Plenary Session WePP — *Plenary: "Mechanical Intelligence" in Robotic Manipulation: Good Design Makes Everything Easier*						
10:00-11:30 Liberty I Invited Session WeAT1 — *Advanced Driver-Assistance System and Safety Control*	10:00-11:30 Liberty II Regular Session WeAT2 — *Ground and Aerial Vehicles*	10:00-11:30 Liberty III Regular Session WeAT3 — *Path Planning and Motion Control*	10:00-11:30 America I & II Invited Session WeAT4 — *Machine Learning and Data-Driven Control of Automotive Systems*			
12:00-13:00 America I & II Special Session WeN2T4 — *Careers in Academia*						
14:00-15:30 Liberty I Regular Session WeBT1 — *Optimal and Collaboration Controls*	14:00-15:30 Liberty II Invited Session WeBT2 — *Advanced Modeling and Controls of Automotive Systems*	14:00-15:30 Liberty III Invited Session WeBT3 — *Modeling, Estimation, and Control of Batteries*	14:00-15:30 America I & II Regular Session WeBT4 — *Modal Analysis, Estimation, and Prediction*	14:00-15:30 Newport IV Invited Session WeBT6 — *Vibrations: Modeling, Analysis, and Control*	14:00-15:30 Newport III Special Session WeBT5 — *Rising Stars in Biomechanical Systems*	14:00-15:30 Newport V Special Session WeBT7 — *Rising Stars in Automotive and Transportation Systems*