IDETC-CIE 2025

International Design Engineering Technical Conferences & Computers and Information in Engineering Conference

CONFERENCE
August 17–20, 2025

Hilton Anaheim
Anaheim, California, USA

Program

event.asme.org/IDETC-CIE

The American Society of Mechanical Engineers®
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SETTING THE STANDARD

Welcome to IDETC-CIE 2025!

It is our great pleasure and honor as Chairs of the 2025 IDETC-CIE Conference Organizing Committee to welcome you to the Hilton Anaheim for this year's event!

The International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE) remains one of ASME's premier conferences. We are deeply grateful for the overwhelming response to our call for papers, which resulted in a record number of submissions—including over 550 full research papers and more than 760 technical presentations—a testament to our community's enthusiasm and commitment. This year's program features 12 parallel conferences and multiple special sessions spanning fundamental and applied research, as well as educational and technological innovations. Attendees can enjoy student poster sessions, networking events, design competitions, professional development courses, and lab tours at nearby universities. We are also privileged to host distinguished keynote speakers from industry, government, and academia, who will share insights on cutting-edge technologies. Continuing last year's success, all Sunday workshops and tutorials will be offered free with registration.

Located in Anaheim, California—just outside Los Angeles—the conference is easily accessible to participants worldwide. Beyond the technical program, attendees and their families can explore local attractions, including Disneyland. The organizing committee has partnered with UC Riverside, Cal State Fullerton, and USC to arrange exclusive lab tours. We are confident this conference week will be both productive and memorable, and we encourage you to actively engage—sharing knowledge, forging collaborations, and expanding your professional network at ASME IDETC-CIE 2025!

We extend our sincere appreciation to the 12 conference organizing committees, technical committees, volunteers, and ASME staff for their dedication in planning and executing this event. Special thanks also go to the authors, reviewers, and presenters for their invaluable contributions. Without your expertise and commitment, IDETC-CIE 2025 would not be possible.

Welcome—we hope you have a rewarding conference and a wonderful stay in Anaheim!

Sincerely,

Guangbo Hao, Dongming Gan, Mark Plecnik and Bingling Huang

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Conference Information

REGISTRATION INFORMATION

Second Floor, Ballroom Level

Registration Hours:

Sunday, August 17
7:00AM–5:00PM

Monday, August 18
7:00AM–6:00PM

Tuesday, August 19
7:00AM–5:00PM

Wednesday, August 20
7:00AM–12:00PM

EXHIBIT INFORMATION

Hours

Monday, August 18
7:00AM–5:00PM

Tuesday, August 19
7:00AM–5:00PM

Wednesday, August 20
7:00AM–3:00PM

AMERICAN SOCIETY OF MECHANICAL ENGINEERS INTERNATIONAL

ASME MISSION STATEMENT:
ASME's mission is to advance engineering for the benefit of humanity.

ASME VISION STATEMENT:
ASME's vision is to be the premier resource for the engineering community globally.

AUDIOVISUAL EQUIPMENT IN SESSION ROOMS

All technical sessions are equipped with one LCD projector, one laptop and one screen..

You may bring your presentation on a USB flash drive and load it onto the laptop in the session room.

BADGE REQUIRED FOR ADMISSION

All conference attendees must wear the official ASME 2025 IDETC-CIE badge at all times in order to gain admission to special sessions, technical sessions, exhibits, meals, and other conference events. Without a badge, you will NOT be allowed to attend any conference activities.

TICKETED FUNCTIONS

Access to awards luncheons and dinner will be confirmed by your badge code. If you wish to bring a guest to an awards luncheon, dinner or reception, you must purchase an additional ticket accordingly. Guests are NOT permitted to attend technical sessions, workshops, tutorials, or committee meetings. For questions regarding any possible ticketed items, you can ask a conference representative located in the registration area.

SWAPCARD CONFERENCE APP

IDETC-CIE will utilize a mobile event app in place of a printed program to enhance the conference experience for attendees, speakers, exhibitors, and sponsors, whether you are attending in-person or virtually.

You will be able to:

- Connect with Attendees
- View Speaker Profiles
- Access Session Information
- Watch On-Demand Content
- View Final Papers
- And More!

*All features may not be available at all events.

INTERNET ACCESS IN THE HOTEL

Wi-Fi is included in your guest room and in the meeting space:

Network: **Hilton Meeting**
Passcode: **IDETCCIE2025**

Please go to the registration desk and ask for details.

CONFERENCE PROCEEDINGS

Each attendee will receive an email with a unique code to access digital copies of all the papers accepted for presentation at the conference. The official conference archival proceedings will be published after the conference and will not include accepted papers that were not presented at the conference. The official conference proceedings are registered with the Library of Congress and are submitted for abstracting and indexing. The proceedings are published on the ASME Digital Library. You will be provided with an individual link to the online papers via email. In the event you do not receive the email, send a request to conferencepubs@asme.org.

QUIET ROOM

Catalina 5, Lower Lobby Level, will serve as a Quiet Room from **7:00AM to 5:00PM** on **Monday** and **Tuesday**, and **7:00AM to 3:00PM** on **Wednesday**.

SPEAKER PRACTICE ROOM

Catalina 6, Lower Lobby Level, will serve as the Speaker Practice/ Speaker Ready Room from **7:00AM to 5:00PM** on **Monday** and **Tuesday**, and **7:00AM to 3:00PM** on **Wednesday**. An LCD projector and screen will be available for speakers to practice their presentations. All necessary connecting cables will be provided. Please bring your own laptop.

PRESENTER ATTENDANCE POLICY

According to ASME's Presenter Attendance Policy, if a paper is not presented at the conference, the paper will not be published in the official Archival Proceedings, which are registered with the Library of Congress and are abstracted and indexed. The paper also will not be published in the ASME Digital Collection and may not be cited as a published paper.

FOOD FUNCTIONS & NETWORKING

Breakfasts

Please join our sponsors, exhibitors, conference organizers, and division leadership each morning at **7:00AM in California C (Ballroom Level)**.

Network with your fellow attendees and discuss new ideas, programs, and activities. Badges Required. Guests not permitted.

Awards Luncheons

One Division Awards Luncheon or Dinner is included in each Full Conference Registration. Attendees have pre-selected a specific meal during the registration process. For those who would like to attend both luncheons, additional tickets may be purchased at the registration desk as well as guest tickets. Badges will be scanned to verify the lunch selection.

- Design Engineering Division (DED) Awards Luncheon |
  - Monday, August 18, 12:10PM–2:10PM
  - Location: California ABC (Ballroom Level)
  - Advanced Selection or Purchase Required

- Computers & Information in Engineering (CIE) Awards Luncheon
  - Tuesday, August 19, 12:20PM–2:20PM
  - Location: California C (Ballroom Level)
  - Advanced Selection or Purchase Required

Awards Dinner

- Fluid Power and Motion Control Symposium (FPMC) Awards Dinner
  - Tuesday, August 19, 6:00PM–8:00PM
  - Location: California A (Ballroom Level)
  - Advanced Selection or Purchase Required

Opening Reception

- IDETC-CIE Conference Opening Reception |
  - Monday, August 18, 7:00PM–9:00PM
  - Location: California Ballroom B (Ballroom Level)
  - Included in each Full Conference Registration.
  - Additional or Guest Tickets may be purchased.

Conference Sponsors

THANK YOU TO ALL OF THE SPONSORS AND EXHIBITORS FOR THEIR SUPPORT

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AUTODESK

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Autodesk is changing how the world is designed and made. From the buildings we live in to the products we use to the movies that inspire us, Autodesk software helps our customers design and make a better world for all.

MATHWORKS

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The MATLAB and Simulink product families are fundamental applied math and computational tools adopted by more than 6,500 universities and colleges. MathWorks products help prepare students for careers in industry, where the tools are widely used for data analysis, mathematical modeling, and algorithm development in collaborative research and new product development.

NIST OFFICE OF ADVANCED MANUFACTURING

Manufacturing USA is a national network of manufacturing innovation institutes created to secure U.S. global leadership in advanced manufacturing through large-scale public-private collaboration on technology, supply chain, and education and workforce development. The institutes convene business competitors, academic institutions, and other stakeholders to test applications of new technology, create new products, reduce cost and risk, and enable the manufacturing workforce with the skills of the future.

NTOP

https://www.ntop.com/education/

nTop is a computational design software that helps engineers close the loop between geometry and physics for faster, smarter iteration. Trusted by 450+ leading engineering teams from across Aerospace & Defense, Automotive, Medical Device, and Consumer Product industries, nTop allows you to quickly make changes to your design and instantly understand how it impacts performance. To help the next generation of engineers, nTop provides free educational licenses to students and educators.

SOLIDPROFESSOR

www.SolidProfessor.com

SolidProfessor is an e-learning platform designed to support engineering, architecture, drafting, and manufacturing pathways by providing bite-sized video tutorials, exercises, quizzes, projects, and industry-ready certification prep. We work with over 100 postsecondary institutions across the country to support these programs and aim to help more institutions access resources that prepare students for certifications in SOLIDWORKS, AutoDesk, and Onshape.

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Springer is the leading book publisher in the field of engineering, with particular strengths in design, manufacturing, industrial engineering, mechanics, and automotive engineering. Our portfolio includes textbooks for both undergraduate and graduate students, as well as books targeted at professionals in industry and cutting-edge titles on the latest research.

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X-Sight optical extensometers and DIC systems are designed to test materials and perform experimental structural analysis. The outstanding CAE solution supports research, quality control, and industrial applications worldwide.

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Schedule at a Glance

SUNDAY, AUGUST 17					
Rooms	**9:00am - 5:00pm**				
Avila A	Student Hackathon				
San Simeon A/B					
Huntington A					
Malibu	Workshop: From Data to Design: Challenges and Opportunities across Industry and Academia				
Monterey	Workshop: Getting Started with TRIZ				
Rooms	**9:00am - 1:00pm**	**2:00pm - 5:00pm**	**5:30pm - 6:30pm**	**6:30pm - 8:00pm**	**7:30pm - 8:30pm**
Santa Monica	Generative Design Thinking: A Convergence from Evolutionary Computation, Topology Optimization, and Generative AI	4th Workshop on Trends in Human-AI Teaming for Engineering Design: All About CAD			
El Capitan A	Data Management and Digital Twins for Advanced Manufacturing	From Lab to Market: Innovation, Licensing, and Entrepreneurship for Engineering Faculty			
El Capitan B	Optimal Control: A Hands-On Introduction in MATLAB and Simulink	Sustainable Optimal Engineering Design			
Avila B	Applying the Montessori Principles in Higher STEM Education: What Professors Can Learn From Kindergarten	Adventures in Tradespace Exploration			
Carmel	Simscape Multibody – An introductory hands-on workshop	Gendered Product Design: How Implicit Associations of Social Norms can be Operationalized in Engineering Design Practice and Education			
Capistrano B		DED Executive Committee Meeting			
Laguna A			Student Networking Event		
Huntington B				Women in CIE Panel	
Salinas					CIE Executive Committee Meeting

Schedule at a Glance

MONDAY, AUGUST 18											
Rooms	**7:00am - 7:50am**	**8:00am - 9:00am**	**9:10am - 10:30am**	**10:30am - 10:50am**	**10:50am - 12:10pm**	**12:10pm - 2:10pm**	**2:10pm - 3:50pm**	**3:50pm - 4:10pm**	**4:10pm - 5:50pm**	**6:00pm - 7:00pm**	**7:00pm - 9:00pm**
California Foyer	Exhibits			Refreshment Break				Refreshment Break			
California Promenade	Breakfast										
California A										CIE Student Poster Session	
California B											Opening Reception
California C						DED Award Lunch					
Malibu		MR-01-01	MR-10: Keynote I		MR-02-02		MR-05/ MSNDC-08-02		MR-08-01		
Santa Monica		CIE-01-01	CIE-04		CIE Keynote I		CIE-02/03/05/06		CIE-32		
El Capitan B		CIE-17-01	CIE-19-01				CIE-27-01		CIE-27-02		
Avila A/B		DTM-01	DTM-02		DTM-03		DTM-04		DTM-05	DTM TC Meeting	
San Simeon A		VIB Mote keynote	MSNDC-03/VIB-03-01		VIB Hortage keynote		MSNDC-01/VIB-01/ MNS-01-01		Navigating Careers in Industry and Academia	TCVS Committee Meeting (6-8pm)	
San Simeon B			VIB-05/ MSNDC-05-01				VIB-07-01		VIB-07-02		
Carmel		CIE-16	CIE-15-01		CIE-14-01		CIE-14-02				
Monterey		CIE-09	CIE-07-01		CIE-07-02		CIE-08/11/12				
Salinas			AVT-01/ MSNDC-09-01		AVT-05/ 06		MSNDC-09/AVT-01-02		MSNDC-09/AVT-01-03	AVT Committee meeting	
Capistrano A		DAC-09	DAC-17		DAC-11-1 / DFMLC-7-1		DAC-01		DAC-22	CIE-Artificial Intelligence and Machine Learning (AI/ML)	
Capistrano B		DAC-08-1	DAC-05-1		DAC-12		DAC-02-1		DAC-06 / DFMLC-5		
Laguna A		DAC-23	DAC-04-3		DAC-13-1		DAC-03-1		DAC-04-1		
Laguna B					DEC-03		DEC-01		DEC Mentorship Session	DEC TC Meeting	
Huntington A		MSNDC Keynote	VIB-06/ MSNDC-06-01		MSNDC-08/MR-05-01		MSNDC-02/VIB-02-01		MSNDC-02/VIB-02-02		
Huntington B		MR-02-01			MR-03-02		MR-06-01		MR-03-03		
Huntington C		MR-03-01			MR-04-01		MR-07-01		MR-07-02		
Palos Verdes A					MSNDC-07-01		MSNDC-12: Student Paper Competition		VIB-04/ MSNDC-04-01		
Palos Verdes B			AI/ML Panel								
Catalina 1									DED General Meeting (5:00-5:50pm)		
Catalina 2										DAC Industry-Academia Networking Session	
Catalina 3			DFMLC Keynote		DFMLC-1		DFMLC-2		DFMLC-5	DFMLC TC Meeting and Awards	
Catalina 4		KEYNOTE	MESA-01		MESA-02		MESA-03		MESA-04		
Catalina 7							FPMC 1		FPMC 2	FPST Executive Committee	

Schedule at a Glance

TUESDAY, AUGUST 19												
Rooms	**7:00am - 8:00am**	**8:10am - 9:10am**	**9:20am - 10:40am**	**10:40am - 11:00am**	**11:00am - 12:20pm**	**12:20pm - 2:20pm**	**2:20pm - 4:00pm**	**4:00pm - 4:20pm**	**4:20pm - 6:00pm**	**6:00pm - 8:00pm**	**6:10pm - 7:10pm**	**7:10pm - 8:10pm**
California Foyer	Exhibits			Refreshment Break				Refreshment Break				
California Promenade	Breakfast								NSF Poster Session			
California A					CIE Keynote II					Koski Banquet Dinner-FPMC		
California B											DAC Committee/Town Hall Meeting (6:10 - 8:10pm)	
California C						CIE Award Lunch						
Malibu		MR-01-02	MR-10: Keynote II		MR-05/ MSNDC-08-03		MR-9		JMR Journal Spotlight		MR Committee Meeting (6:10pm-8:10pm)	
Santa Monica		CIE-01-02	CIE-25				CIE-23/24-01		CIE-23/24-02		CIE – Virtual Environments and Systems (VES)	CIE General Committee Meeting
El Capitan A		DAC-18	DAC-10-2		DAC-20		DAC-21-1					
El Capitan B		CIE-17-02	CIE-19-02				CIE-19-03		CIE-20		CIE – Advanced Modeling & Simulation (AMS)	
Avila A/B		DTM-06	DTM-07		DTM-08		DTM-09		DTM-10			
San Simeon A		VIB invited keynote	VIB-08-01		VIB-06/ MSNDC-06-02		VIB-08-02		VIB Panel: An Overview of the NSF DCSD Program		TCVS New Member and Industrial Liaison Subcommittee Meeting	
San Simeon B			VIB-09-01		VIB-10-01		VIB-07-03		VIB-10-02			
Carmel		CIE-18/21	CIE-22				CIE-34		CIE-35		CIE – Computer-Aided Product and Process Development (CAPPD)	
Monterey		CIE-10	CIE-28/29				CIE-13		CIE-30		CIE – Systems Engineering, Info., & Knowledge Management (SEIKM)	
Salinas		AVT-07	AVT-04-01		MILLIKEN LECTURE		AVT-04-02					
Capistrano A		DAC-11-3 / DFMLC-7-3	DAC-11-2 / DFMLC-7-2				DAC-21-2		DAC-16			
Capistrano B		DAC-08-2	DAC-05-2		DAC-24		DAC-02-2					

Schedule at a Glance

TUESDAY, AUGUST 19												
Rooms	**7:00am - 8:00am**	**8:10am - 9:10am**	**9:20am - 10:40am**	**10:40am - 11:00am**	**11:00am - 12:20pm**	**12:20pm - 2:20pm**	**2:20pm - 4:00pm**	**4:00pm - 4:20pm**	**4:20pm - 6:00pm**	**6:00pm - 8:00pm**	**6:10pm - 7:10pm**	**7:10pm - 8:10pm**
Laguna A		DAC-13-2	DAC-15-2		DAC-10-1		DAC-03-2		DAC Signature Event			
Laguna B			DEC Co-Design Workshop		DEC-04		DEC-02					
Huntington A		Keynote- MS	VIB-04/ MSNDC-04-02		MSNDC-03/VIB-03-02		Keynote-JCND		MSNDC-01/VIB-01/ MNS-01-02		MSNDC TC Meeting (6:10 - 8:10pm)	
Huntington B		MR-08-02			MR-07-03		MR-03-04					
Huntington C		MR-09-01			MR-09-02		MR-05/ MSNDC-08-04					
Palos Verdes A			VIB-05/ MSNDC-05-02		MSNDC-10				MSNDC-02/VIB-02-03			
Palos Verdes B					MNS-03		MNS-02				MNS Committee Meeting	
Catalina 1	JMR Editorial Board Meeting					JMR Lunch Meeting					Expanding Horizons subcommittee meeting	
Catalina 3			DFMLC-3		DFMLC-4		DFMLC-6					
Catalina 4		KEYNOTE II	MESA-05		MESA-06		MESA-07				MESA Committee Meeting	
Catalina 7		FPMC 3	FPMC Panel 1		FPMC: Koski Lecture		FPMC 4		FPMC 5			

Schedule at a Glance

WEDNESDAY, AUGUST 20								
Rooms	**7:00am - 7:50am**	**8:00am - 9:40am**	**9:40am - 10:00am**	**10:00am - 11:40am**	**11:40am - 1:15pm**	**1:15pm - 2:55pm**	**2:55pm - 3:15pm**	**3:15pm - 4:55pm**
California Foyer	Exhibits		Refreshment Break		Lunch on Own		Refreshment Break	
California Promenade	Breakfast							
Malibu		MR-09-03		MR-Industrial Session		MR-8 Students Competition		MR-8 Students Competition
Avila A/B		DTM-11		DTM-12		DTM-13		
San Simeon A		VIB-08-03		VIB Mary Baker keynote		VIB-09-02		VIB-04/MSNDC-04-03
San Simeon B		VIB-07-04				VIB-10-03		MSNDC-02/VIB-02-05
Carmel		CIE-15-02						
Monterey		CIE-31-01		CIE-31-02				
Capistrano A		DAC-10-3		DAC-07				
Capistrano B		DAC-15-1		DAC-04-4				
Laguna A		DAC-04-2						
Huntington A		Lyapunov Award keynote		MSNDC-07-02		VIB-06/MSNDC-06-03		
Huntington B		MR-06-02		MR-01-03		MR-04-02		MR-02-03
Huntington C		MR-07-04		MR-07-05		MR-01-04		
Palos Verdes A						MSNDC-02/VIB-02-04		
Palos Verdes B						MSNDC-01/VIB-01/MNS-01-03		
Catalina 1	IDETC-CIE 2026 Meeting							
Catalina 4		MESA-08		MESA-09				
Catalina 7		FPMC 6		FPMC Panel 2				

27th International Conference on Advanced Vehicle Technologies (AVT)

The Vehicle Design Committee (VDC) promotes innovative analytical, computational, and experimental investigations in the dynamics, control, and design of full vehicle systems, subsystems, and components. With the increasing demands on driving safety, performance and autonomy, the human–vehicle interaction, advanced driver assistance systems, connectivity features as well as electrification and emerging technologies for sustainable propulsion systems and their coupling with the driver/vehicle system are included in the spectrum of topics addressed by VDC. Our members perform fundamental and applied research, and they implement technology for light/heavy vehicle design, modeling, simulation, and validation.

The VDC is pleased to welcome you to the 27th International Conference on Advanced Vehicle Technologies, held as a part of the 2025 ASME IDETC-CIE. This year the AVT conference will consist of six symposia for a total of seven sessions in the areas of Ground Vehicles Dynamics and Controls; Methods for Ground Vehicle Systems Design; Vehicle Electrification and Powertrain Design; Lightweight and Energy Efficient Vehicles; Off-road Agriculture, Military, and Commercial Ground Vehicle Design and Testing; and Intelligent Vehicles. We sincerely appreciate the time and services of these symposium organizers.

This year the VDC is especially honored to host Professor Peter Lugner, former Professor at Institute of Mechanics of TU Vienna for the William Milliken Lecture, which is entitled “Fundamentals of Vehicle Handling Dynamics and Application.” In this lecture, Prof. Lugner presents a very fine summary and progression of vehicle dynamics modeling techniques, starting with the simple bicycle models and progressing up through cutting-edge complex vehicle system models. He then harnesses the latest modeling techniques to predict/simulate the dramatic state of stability during a power drift maneuver, which is potentially very useful to advanced vehicle stability systems.

A Best Paper and a Student Best Paper (for papers authored and submitted by a student as the primary author) are awarded for conference papers that best exemplify the research advances in ground vehicle engineering based on peer reviews and the award committee’s ranking.

We truly hope that this year’s AVT Conference will provide you with an exciting, enriching, and rewarding experience!

Angelo Bonfitto
Conference Chair

Joel Robert Anstrom
Program Chair

Conference Chair Welcomes

45th Computers and Information in Engineering Conference (CIE)

Dear IDETC-CIE 2025 Participants,

On behalf of the ASME Computers and Information in Engineering (CIE) Division, we are delighted to welcome you to the 45th Annual Computers and Information in Engineering Conference (CIE), taking place in Anaheim, California, USA. The CIE Conference remains a premier international venue for sharing groundbreaking research, novel ideas, and impactful applications of computing in engineering. It brings together scholars, practitioners, educators, and students from academia, industry, and government to exchange insights, tackle emerging challenges, foster interdisciplinary connections, and cultivate a dynamic and enduring research and education community.
The theme of this year's conference is Empowering Mechanical Engineering with Generative Computational Intelligence. We are excited to share that the program includes over 123 technical paper presentations and 23 presentation-only talks, featured across a diverse set of technical and special topic sessions. These sessions are organized under the five Technical Committees of the CIE Division: 1) Advanced Modeling and Simulation, 2) Computer-Aided Product and Process Design, 3) Systems Engineering and Information & Knowledge Management, 4) Virtual and Augmented Reality Environments, and 5) AI/ML Approaches for Engineering.

Advanced Modeling and Simulation (AMS):
- AMS General Session
- Inverse Problems in Science and Engineering
- Computational Multiphysics Applications
- Uncertainty Quantification in Simulation and Model Verification & Validation
- Simulation in Advanced Manufacturing
- Material Characterization Methods and Applications

Computer-Aided Product and Process Development (CAPPD):
- CAPPD General Session
- Human-in-the-Loop and Digital Human Modeling for Product Design and Manufacturing
- Product and Process Design Automation for Industry 4.0
- Computational Design and Planning for Extreme Manufacturing
- Integrating LLMs into Smart Manufacturing Systems
- Inverse Design for Materials, Structures, Products, and Manufacturing Processes

Systems Engineering Information Knowledge Management (SEIKM):
- SEIKM General Session
- Systems Engineering and Complex Systems
- Advanced Manufacturing and Supply Chain Systems Design and Analysis
- Digital Twin Modeling and Analytics for Advanced Manufacturing
- Physics-Informed Machine Learning for Advanced Design and Manufacturing
- Artificial Intelligence and Machine Learning in Design and Manufacturing
- Design, Simulation, and Optimization for Additive Manufacturing
- Knowledge Capture, Reuse, and Management
- Informatics for Design and Manufacturing

Virtual and Augmented Reality Environments (VARE):
- General Topics on Virtual and Augmented Reality
- User Experience (UX) and Human-Machine Interaction
- VARE Applications
- VR/AR Hardware, Accessibility, and Human Factors

AI/ML Approaches for Engineering (AI/ML):
• AI/ML General Session
• AI/ML Data
• AI/ML Knowledge-Informed AI and ML for Engineering
• AI/ML AI-Driven Innovation and Discovery with Vision and Imaging
• AI/ML Generative AI and Large Language Model (LLM) for Engineering

Joint Sessions:
• Digital Twin: Advanced Human Modeling and Simulation in Engineering
• Physics-Informed Machine Learning for Design and Advanced Manufacturing
• Artificial Intelligence and Machine Learning in Design and Manufacturing
• Design, Simulation, and Optimization for Additive Manufacturing

Beyond the technical presentations, this year's conference features a rich lineup of specialized events. These include two CIE Keynote Talks and a Women in CIE panel, where distinguished leaders from industry, government, and academia will explore the evolving future of computing and information in engineering. The JCISE Spotlight Panel will showcase standout articles published in the Journal of Computing and Information Science in Engineering over the past year. The Graduate Student Poster Session will highlight outstanding work by select graduate students, each recognized with an award stipend. In addition, the ASME-CIE Student Hackathon returns this year with a focus on cutting-edge topics, such as multimodal process monitoring, generative models, and large language models—underscoring the latest developments in machine learning for engineering applications.

We also look forward to celebrating excellence in research and service during the CIE Awards Ceremony Luncheon, where the Conference Best Paper Awards and CIE Division Awards will be presented. We warmly invite all attendees to join us on Tuesday, August 19, as we recognize the exceptional work of peers, colleagues, and students. As always, this conference would not be possible without the invaluable dedication and contributions of our ASME volunteers, whose efforts are deeply appreciated.

The CIE Technical Committee Meetings and Division Meeting will take place on the evening of Tuesday, August 19. These gatherings offer a moment to acknowledge the contributions of the past year and to lay the groundwork for the Division's initiatives in the year ahead. We encourage you to attend and consider joining one of the committees to become more actively involved in CIE activities. New participants are always welcome!

We would like to thank and recognize the Technical Committee leadership this year for their hard work and contributions:

Advanced Modeling and Simulation (AMS)
• **James Yang**, *Ashish Chaudhari Chairs*
• **Mike Xiang**, *Dehao Liu, Vice Chairs*

Computer Aided Product and Process Design (CAPPD)
• **Jun Wang**, *Chair*
• **Satchit Ramnath**, *Vice Chair*

Systems Engineering and Information Knowledge Management (SEIKM)
• **Shengyen Li**, *Chair*
• **Abheek Chatterjee**, *Vice Chair*

Virtual and Augmented Reality Environments (VARE)
• **Marco Rossoni**, *Chair*
• **Tsz-Ho Kwok**, *Vice Chair*

Conference Chair Welcomes

AI/ML Approaches for Engineering (AI/ML)
- **Zhengui Sha**, *Chair*
- **Ashly Joseph**, *Vice Chair*

We would like to use this opportunity to thank our symposium organizers, including Ahn Tran, Ashish Chaudari, Piyush Pandita, James Yang, Seung-Kyum Choi, Dehao Liu, John Michopoulos, Brian Dennis, Athanious Iliopoulos, Valeria Krzhizhanovskaya, Yan Wang, Zhimin Xi, Chao Hu, Gaurav Ameta, Bjorn Johansson, Yujiang Xiang, Xianlian Zhou, Tsz Ho Kwok, Hyunwoong Ko, Yanglong Lu, Jiarui Xie, Yaoyao Fiona Zhao, Jaehyuk Kim, Zhuo Yang, Fahad Milaat, Jida Huang, Jun Wang, Anand Balu Nellipallil, Chiradeep Sen, Ehsan Esfahani, Giorgio Colombo, Daniele Regazzoni, Lin Guo, Marco Rossoni, Giovanni Berselli, Miri Weiss Cohen, Satchit Ramnath, Guoxin Fang, Zipeng Guo, Yanlong Lu, Douglas Van Bossuyt, Zhuo Yang, Dazhong Wu, Ying Liu, Zhenghu Sha, Xin Guo, Shengyen Li, Yu Zheng, Boonserm Kulvatunyou, Farhad Ameri, Vincenzo Ferrero, Abheek Chatterjee, Wei Xie, Evan Wallace, Chris Hoyle, Mutahar Safdar, Senthil Chandrasegaran, Rebecca Friesen, Vinayak Krishnamurthy, Junfeng Ma, Jinjuan She, Shana Smith, Chih-Hsing Chu, Pietro Piazzolla, and Yunbo “WILL” Zhang for their dedication and hard work in paper review coordination, dealing with the ASME webtool, and making recommendations.
We extend our sincere thanks to all reviewers for their time and effort in providing thoughtful feedback, which has been essential in upholding the high standards of the conference, enhancing the quality of submissions, and supporting the organization of web tools and overall event logistics. Last but not least, we are grateful to all authors for contributing their latest research, helping to shape the evolving directions of innovation, collaboration, and discovery within our community.
We would like to thank the ASME staff—Laraine Lee (Webtool Specialist, Technical Support), Keli Bell-Cole (Meetings & Conference Manager), and Barbara Zlatnik (Senior Manager, TEC Operations)—for their invaluable assistance and unwavering support throughout the conference planning and organization process.
We sincerely thank all members of the CIE Executive Committee for their dedication and perseverance in making this year’s conference a memorable success.

Special appreciation goes to Drs. Guangbo Hao, Dongming Gan, Mark Plecnik, and Bingling Huang of the organizing committee for their outstanding efforts in supporting both the Design Engineering Division (DED) and the Computers and Information in Engineering Division (CIE) for IDETC 2025.

Finally, thank you for your active participation in the many activities of the CIE community. We look forward to welcoming you again at IDETC-CIE 2026!

Krishnanand Kaipa
CIE Conference Chair

John C. Steuben
CIE Conference Program Chair

51st Design Automation Conference (DAC)

Dear Colleagues,

On behalf of the DAC Executive Committee, welcome to the 51st ASME Design Automation Conference (DAC)!

Following a rigorous review process, this year's DAC technical program consists of 103 accepted papers in 21 active research areas, corresponding approximately to an acceptance rate of 85%. This year, we also solicited and accepted 45 presentation-only submissions for the third time at DAC. The technical program will be presented from Monday, August 18 to Wednesday, August 20.

Complementing our technical sessions, we will host the DAC Signature Event on the topic of "Generative, Generative Design, and Generative Design Thinking," consisting of a panel of five members of active contributors to DAC:
• Bradley Rothenberg (nTopology Inc.)
• Faez Ahmed (Massachusetts Institute of Technology)
• Ye Wang (EverCurrent Inc.)
• Leah Chong (The University of Texas at Austin)
• Vinayak Krishnamurthy (Texas A&M University)

Please join us for the DAC Technical Committee Meeting on the evening of Tuesday, August 19. During that meeting, we will also present the Design Automation Dissertation Award winner, the Design Automation Young Investigator Award winner, the Design Automaton Award winner, and the DAC Best Paper Award winner. We look forward to our community coming together, meeting old friends, and making new ones.

Ten papers were identified as "Papers of Distinction" from the accepted papers. These papers are listed below, ordered by paper number (and including the assigned session):

- DETC2025-166767 (DAC-03): "Gencad-3d: Cad Program Generation Using Multimodal Latent Space Alignment and Synthetic Dataset Balancing," Nomi Yu, Md Ferdous Alam, A. John Hart, Faez Ahmed
- DETC2025-168615 (DAC-06): "Multimodal Rag-Driven Anomaly Detection and Classification in Laser Powder Bed Fusion Using Large Language Models," Kiarash Naghavi Khanghah , Zhiling Chen, Lela Romeo, Qian Yang, Rajiv Malhotra, Farhad Imani, Hongyi Xu
- DETC2025-168619 (DAC-03): "Heterogeneous Metamaterials Design via Multiscale Neural Implicit Representation," Hongrui Chen, Liwei Wang, Levent Burak Kara.
- DETC2025-168723 (DAC-10): "Localized Physics-Informed Gaussian Processes With Curriculum Training for Topology Optimization," Amin Yousefpour, Shirin Hosseinmardi, Xiangyu Sun, Ramin Bostanabad
- DETC2025-168726 (DAC-01): "Multi-Generation Control Co-Design for Digital Twin-Enabled Systems With Deep Reinforcement Learning," Ying-Kuan Tsai, Vispi Karkaria, Yi-Ping Chen, Wei Chen
- DETC2025-168868 (DAC-05): "Fluid-Thermal Topology Optimization With Applications to Heat Sinks, Cooling Jackets and Battery Cooling Plates," Dimitrios Papadimitriou, Robert Sandboge

Conference Chair Welcomes

- DETC2025-169099 (DAC-20): “Exploring Efficient Quantification of Modeling Uncertainties With Differentiable Physics-Informed Machine Learning Architectures,” Manaswin Oddiraju, Bharath Varma Penumatsa, Divyang Amin, Michael Piedmonte, Souma Chowdhury
- DETC2025-169141 (DAC-20): “Seek: Self-Adaptive Explainable Kernel for Nonstationary Gaussian Processes,” Nima Negarandeh, Carlos Mora, Ramin Bostanabad
- DETC2025-169512 (DAC-08): “Remaining Useful Life Prediction for Hall Thrusters Based on Adaptive Self-Cognizant Dynamic System and Multi-Physics Modeling,” Yuan Jiang Jiang, Alexandra N. Leeming, Joshua L. Rovey, Pingfeng Wang
- DETC2025-169758 (DAC-04): “CAD-Coder: An Open-Source Vision-Language Model for Computer-Aided Design Code Generation,” Anna Doris, Md Ferdous Alam, Amin Heyrani Nobari, Faez Ahmed

Authors from our community will present these and many other excellent papers throughout the conference. We encourage you to support your colleagues by attending their presentations and participating in the discussions.

Finally, organizing the conference requires the generous effort of many individuals. We are particularly grateful to all session organizers and paper review coordinators:

Faez Ahmed, Saeed Azad, A. Emrah Bayrak, Amir Behjat, Amy Bilton, Ramin Bostanabad, Hannah Budinoff, Grace Burleson, Cheng Chen, Jie Chen, Wei (Wayne) Chen, Souma Chowdhury, Abigail Clarke-Sather, Daniel Cooper, Shiguang Deng, Xiaoping Du, Bryony DuPont, Ehsan Esfahani, Yan Fu, Payam Ghassemi, Daniel Herber, Zhen Hu, Horea Ilies, Roshni Anna Jacob, Namwoo Kang, Leifur J Leifsson, Ting Liao, Ketki Lichade, Po Ting Lin, Hemanth Manjunatha, Ali Mehmani, Seung Ki Moon, Steve Paul, Cyril Picard, Lyle Regenwetter, Anabel Renteria, Daniel Selva, Zhenghui Sha, Gulai Shen, Ada-Rhodes Short, Binyang Song, Eun Suk Suh, Andres Tovar, Anh Tran, Liwei Wang, Zequn Wang, Kate Whitefoot, Natasha Wright, Zhimin Xi, Xinyi Xiao, Yinshuang Xiao, Hongyi Xu, Yanwen Xu, Kentaro Yaji, Nita Yodo, Chen Zeng, Fiona Zhao

On behalf of the entire DAC community, we welcome you to another enjoyable and thought-provoking Design Automation Conference.

We look forward to seeing you in Anaheim, CA!

Zhimin Xi
Conference Chair

Souma Chowdhury
Program Chair

22nd International Conference on Design Education (DEC)

On behalf of the Design Education Committee, we welcome you to the 22nd annual International Conference on Design Education. Our goal is to facilitate discussions on various dimensions of design education among educators, practitioners, and researchers. This year's conference program consists of four topical sessions:
(1) Research Across the Design Curriculum
(2) Social Topics in Design Education
(3) Innovative Practices in Design Education
(4) Project-Based Design Education

All four sessions will include a combination of full papers and presentation-only submissions to invite contributions from researchers at various stages of the research process. In addition to our technical sessions, we will also continue to host our mentorship program for graduate students and early-career researchers in engineering design. Please refer to the conference program for the times and locations of the various sessions.

This year, we are excited to introduce a series of Co-Design Workshops to identify strategies for expanding representation at IDETC. These workshops are designed to bring together faculty and students from underrepresented institutions—including, but not limited to, teaching faculty, PUIs, SLACs, and faculty at R2 institutions—to identify opportunities to increase representation for these institutions at IDETC. This workshop is a special initiative funded by the Design Engineering Division and is co-organized with Christine Toh.

We extend special appreciation to our technical session review coordinators: Shraddha Joshi, Rahul Renu, Rohan Prabhu, and Elizabeth Starkey. We also give our sincerest thanks to all the reviewers of technical papers; they have ensured the quality of this year's conference.

The details of the DEC technical committee meeting will be posted in the program. At the meeting, we will present the DEC Awards and plan for next year's conference, including the election of new committee leadership members. The meeting is open to everyone, including new attendees and graduate students, and will be streamlined to respect members' participation in other committees.

Nick Meisel
Conference Chair

Rohan Prabhu
Conference Chair

30th Design for Manufacturing and the Life Cycle Conference (DFMLC)

The ASME Design for Manufacturing and the Life Cycle Committee welcomes participants to the 30th Annual Design for Manufacturing and the Life Cycle Conference. The ASME Design for Manufacturing and the Life Cycle Conference is the main international forum for the exchange of technical and scientific information on the theory and practice of Integrated Product and Process Development, Sustainable Design and Manufacturing, Product Lifecycle Management (PLM), and Design for X (DFX) Methods. This conference provides a forum for researchers, practitioners, and educators from academia, government organizations, and industry to share their latest results and challenges with the research community.

We are happy to report that this year's conference continues to feature many new and exciting results and methods to be presented as part of the conference's technical sessions. This year's DFMLC conference, in partnership with the Design Automation Conference (DAC) for two sessions, includes 34 full technical papers and 15 technical presentations across seven regular sessions:

- DFMLC-1: Modeling and Optimization for Sustainable Design and Manufacturing
- DFMLC-2: Design for Manufacturing, Assembly, and Integration
- DFMLC-3: Design of Product-Service Systems and End of Life Design
- DFMLC-4: Circular Economy and Impact Assessment
- DFMLC-5/DAC-6: Joint Session with DAC - Design for Additive Manufacturing
- DFMLC-6: Decision-Making, Large Systems, and Remanufacturing
- DFMLC-7/DAC-11: Joint Session with DAC: Engineering for Sustainable Development

Of our 34 full accepted papers, one was awarded the 2025 DFMLC Best Paper Award and two were designated as Papers of Distinction:

- 2025 DFMLC Best Paper Award: DETC-168615 – Multimodal Rag-Driven Anomaly Detection and Classification in Laser Powder Bed Fusion using Large Language Models by Kiarash Naghavi Khanghah, Zhiling Chen, Lela Romeo, Qian Yang, Rajiv Malhotra, Farhad Imani, and Hongyi Xu
- DFMLC Paper of Distinction: DETC-168472 – Design Improvement for Facilitating Transmission Control Unit Remanufacturing by Elif Elcin Gunay, Riad Ramadani, Mohammad Mundiwala, Amirarash Kashef, Junfeng Ma, Chao Hu, Paul Kremer, and Gul E. Kremer
- DFMLC Paper of Distinction: DETC-186560 – Textile Circular Economy: Addressing Material Waste in Recycling and Product Development by Hira Durrani, Kendall Lidwig, Michelle Yatvitshiy, Sphia Gupman, Abigail Clarke-Sather, Kelly Cobb, and Huantian Cao

Conference Chair Welcomes

We would like to thank all the authors for submitting papers, the paper reviewers for sharing their time and expertise, and the session chairs/co-chairs for their participation. Special thanks go to the DFMLC Special Session Chair, Vincenzo Ferrero, and the paper review coordinators/co-coordinators for managing the papers through the review process: Sara Behdad, William Z. Bernstein, Amy Bilton, Hannah Budinoff, Grace Burlson, Abigail Clarke-Sather, Daniel Cooper, Paul Egan, Vincenzo Ferrero, Buddhika Hapuwatte, Ashley Hartwell, Yong Hoon Lee, Ketki Lichade, Junfeng Ma, Chrisopher Mabey, Amin Mirkouei, Vijitashwa Pandey, Albert Patterson, Satya R.T. Pedadda, Chad Peterson, Deverajan, Ramanujan, Natasha Wright, Xinyi Xiao, Hao Zhang, Fiona Zhao, and Yongxian Zhu. Your participation and hard work have been vital for the success of the DFMLC conference!

This year, Dr. Katja Holtta-Otto, Distinguished Professor at the University of Melbourne and head of the Department of Mechanical Engineering, will present the DFMLC keynote lecture. Professor Holtta-Otto has built a highly successful research program that spans the engineering design domain, focusing on design theory and methodology with specific emphasis on interdisciplinary topics linked to engineering design. Her expertise includes empathy and user centered design, design for circular economy, creativity in engineering, and design thinking and design methods in general. She is active in complex system design, including design of product families and repurposing of decommissioned systems.

There will be a presentation of the 2025 DFMLC Conference Kos Ishii-Toshiba Award for sustained and meritorious contributions to design for manufacturing and the life cycle awarded to Dr. K.C. Morris at the DFMLC Technical Committee Meeting on Monday, August 18.

The DFMLC technical committee meeting will include a review of DFMLC activities during the 2024–2025 cycle. The DFMLC Awards, including the Best Paper Award for the 2025 DFMLC conference, in addition to the two Papers of Distinction, will also be presented in this meeting, and the technical committee will plan for next year's conference. Everyone is welcome to attend. The meeting will be held on Monday, August 18, from 6:00 to 7:00pm in Catalina 3.

On behalf of the entire DFMLC community, we welcome you to the 30th Design for Manufacturing and the Life Cycle conference!

Albert Patterson
Conference Chair

Abigail Clarke-Sather
Program Chair

Conference Chair Welcomes

37th International Conference on Design Theory and Methodology (DTM)

On behalf of the ASME Design Theory and Methodology Committee, we would like to welcome you to the 37th International Conference on Design Theory and Methodology (DTM). Our conference focuses on fundamental design theory and methodologies, and how to apply them in an engineering context, with contributions provided by both researchers and practitioners. This 2025 DTM conference includes 50 technical papers and ten technical presentations presented across ten topics areas shown below:
Emergent Uses of AI in Design
Design Cognition and Design Models
Design Justice, Ethics, and Impact
Design Inspiration
Design Methods to Support Research and Practice
Design People
Design Teams
Human-AI Teams in Design Practice*
Insights from Design Practice
Theory Development in Design Research*
(* indicates special session)

We would like to thank the authors for submitting their research to the conference. The paper review process is essential to the success of the conference, and this year we are indebted to an excellent group of reviewers for committing their time and considerable expertise. As always, this peer review process was successfully managed by several DTM Review Coordinators: Anastasia Kouvaras Ostrowski, Anastasia Schauer, Astrid Layton, Bingling Huang, Chris Mabey, Eric Brubaker, Euiyoung Kim, Grace Burleson, Jinjuan She, Kate Fu, Madhurima Das, Phillip Cash, Sita Syal, Taylan Topcu, Ting Liao, Xingang Li Ye Wang, Yunjian Qiu, and Yutaka Nomaguchi. We sincerely appreciate the time and effort these individuals contributed to maintaining the high quality of this DTM conference.

This year Decoding Conflict: Linguistic Markers of Disagreement in Hackathon Design Teams (Paper #168650), by Meagan Flus and Alison Olechowski, was selected as the ASME Design Theory and Methods best paper for the 2025 IDETC conference. On Monday afternoon, from 4:10PM to 5:50PM, there will be a spotlight session highlighting the best paper award winners and nominees. Additionally, this session will highlight high-quality emergent work from the Journal of Mechanical Design from the past year. The spotlight session will precede the Design Theory and Methods Technical Committee meeting.

This year we have two special session themes, Human AI Teams in Design Practice (coordinated by Ting Liao and Ye Wang) and Theory Development in Design Research (coordinated by Eric Brubaker and Phillip Cash). These special sessions were solicited from the DTM community and highlight topics of growing interest and importance in our community.

Human-AI Teams in Design Practice—This special session will highlight emerging work exploring the integration of AI into design practice, and more specifically into design teams. This topic will have two sessions that will occur on Tuesday morning from 8:10AM to 9:10AM and the second session will occur on Wednesday afternoon from 1:15PM to 2:55PM.

Theory Development in Design Research—This special session will add new perspectives to the development of theory in design research, encouraging our community to critically evaluate the fundamental ways we develop, evaluate, and use theory. This topic will have two sessions.

The first will occur on Monday from 10:50AM to 12:10PM, and the second session will occur on Wednesday from 10:00AM to 11:40AM.

This year, the ASME Design Theory and Methodology Award will be presented to Dr. Yan Jin and the ASME Design Theory and Methodology Young Investigator Award will be presented to Dr. Astrid Layton. Notably, this year we had a number of papers exploring Design Justice, Ethics, and Impact, with multiple papers providing a reflective evaluation of research practices within the DTM community, demonstrating a shift toward more inclusive and introspective research efforts. We welcome you to Anaheim and the 37th International Conference on Design Theory and Methodology!

Thank you,

Christine Toh
Conference Chair
University of Nebraska-Omaha

Jessica Menold
Program Chair
The Pennsylvania State University

21st IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications (MESA)

We are pleased to welcome all of you to the Hilton Anaheim to attend the 21st IEEE/ASME International Conference on Mechatronic, Embedded Systems and Applications (MESA 2025).
The International Conference on Mechatronic, Embedded Systems and Applications (MESA) is widely recognized as one of the premier IEEE/ASME conferences. The goal of the MESA 2025 is to bring together experts from the fields of mechatronic and embedded systems, disseminate the recent advances in the area, discuss future research directions, and exchange application experience. MESA 2025 will especially bring out and highlight the latest research results and developments in Industry 4.0 and Artificial Intelligence (AI) in the fields of mechatronics and embedded systems, spanning a wide range of engineering topics on advances in fundamental and applied research as well as innovations in education and technology. We have the privilege to host outstanding keynote speakers who will address cutting-edge technologies related to key conference topics, serving as representatives from academic institutions.

The success of MESA 2025 would be impossible without the tireless effort and dedicated work of the Members of the Organizing Committees. The response to our calls for papers and presentations has exceeded our expectations, and we are grateful for the enthusiasm and dedication demonstrated by our community. We would like to express our sincere thanks to Symposium Chairs for their wisdom and hard work in coordinating the review of all submitted papers. We are grateful for Members of the International Program Committee and reviewers for their thorough review of the papers. This year the program committee selected about 38 technical presentations following a review process by two or more expert reviewers for each proposed paper. We sincerely hope that MESA 2025 will be a place for excellent discussions that will put forward new ideas, advance educational endeavors, and promote active research collaborations. This conference week promises to be an exceptional experience. We hope that each of you will take full advantage of this opportunity to share knowledge and expertise, collaborate, establish new collaborations within our community, and enlarge your network at 21st IEEE/ASME MESA!!
You are warmly welcome to enjoy the conference and your time in Anaheim, California!

Sincerely,

Prof. Peng Yan
General Chair
Shandong University, Jinan, China

Prof. Zhen Zhang
Program Chair
Tsinghua University, Beijing, China

49th Mechanisms and Robotics Conference (MR)

The Mechanisms and Robotics Technical Committee of the ASME Design Engineering Division would like to warmly welcome you to the 49th Mechanisms and Robotics Conference, the premier international forum for the exchange of technical and scientific information on the theory and application of mechanical systems, mechanisms, and robotics.

The first conference, as The Conference on Mechanisms, was held at Purdue University, West Lafayette, Indiana, in 1953. ASME took over the conference and formed the ASME Biennial Mechanisms Conference in 1964. The conference was renamed the ASME Biennial Mechanisms and Robotics Conference in 2000. Starting in 2005, the conference became an annual conference, the ASME Mechanisms and Robotics Conference. Nowadays, the Mechanisms and Robotics Conference is held annually as a part of the ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference.

This year we have assembled an exciting conference program and a slate of activities for the attendees, including eight technical symposia, two keynote speeches from Professor Lorenzo Masia (Technical University of Munich) and Professor Ritu Raman (Massachusetts Institute of Technology), an Industrial session and a Student Mechanism & Robot Design Competition (SMRDC). Paper topics range throughout areas central to the design of mechanical, mechatronic, and robotic systems, including kinematics, dynamics, design, analysis and validation, compliant mechanisms, origami-based design, metamaterials for mechanisms, novel mechanisms and robots, mobile robots, and various applications. The SMRDC will hold its final round, which includes demonstrations of mechanisms and robots by the finalists.

Submitted papers were eligible for several awards, including the Mechanisms and Robotics Best Paper Award, A.T. Yang Memorial Award in Theoretical Kinematics, and Ashok Midha Memorial Award in Compliant Mechanisms. We would like to thank Jian Dai, Chair of the Awards Committee, for coordinating the selection of the awards. The authors of selected papers of the Mechanisms and Robotics Conference are invited to submit enhanced archival versions of their papers to an IDETC Special Issue of the ASME Journal of Mechanisms and Robotics.

The conference and program chairs would like to extend special thanks to all of the volunteers who participated in the peer-review process to produce this high-quality program, especially the symposium organizers who coordinated the review process:

- MR-1: Mechanisms Synthesis & Analysis: Kuan-Lun Hsu, Jieyu Wang, Vu Linh Nguyen
- MR-2: Theoretical & Computational Kinematics (A.T. Yang Symposium): Carl Nelson, Mario Baggetta
- MR-3: Compliant Mechanisms (A. Midha Symposium): Suyi Li, Shikui Chen, Jared Butler
- MR-4: Origami-Based Engineering Design: Shikui Chen, Jared Butler
- MR-5: Motion Planning, Dynamics, and Control of Robots: Joo Kim, Andreas Müller, Jeffrey W. Herrmann

Conference Chair Welcomes

- MR-6: Medical & Rehabilitation Robotics: Abbas Fattah, Carlotta Mummolo
- MR-7: Novel Mechanisms, Robots, and Applications: Guowu Wei, Reza Fotouhi
- MR-8: Soft & Continuum Mechanisms: Vishesh Vikas, Girish Krishnan
- MR-09: MR/MESA Joint Symposium on Translational Robotics: Kuan-Lun Hsu, Damien Chablat, Po Ting Lin

We extend special thanks to all authors, reviewers, presenters, symposium organizers, session chairs, and other volunteers who have contributed to the overall success of the conference. We trust that you will enjoy the conference and look forward to your continued support to our future Mechanisms and Robotics Conferences.

Giovanni Berselli
Conference Chair

Haiyang LI
Program Chair

Sree Patiballa
Conference Co-Chair

Nilanjan Chakraborty
Program Co-chair

19th International Conference on Micro- and Nanosystems (MNS)

Welcome to the19th International Conference on Micro- and Nano-systems (MNS) with the topic of “The Next Advances in MEMS.” We would like to welcome you and thank you for participating. This conference, sponsored by the Technical Committee of Micro and Nano- systems, an integral part of the ASME Design Engineering Division, will provide researchers in industry, academia, and government a forum to exchange scientific and technical information related to recent developments and emerging issues in the design, mechanics, dynamics, control, and fabrication of micro- (MEMS) and nano-scale (NEMS) systems.

This conference is organized around three technical sessions, one of which is jointly offered with the 21st International Conference on Multibody Systems, Nonlinear Dynamics, and Control and the 37th Conference on Mechanical Vibration and Noise:

- MNS-1: Nonlinear Dynamics and Control of Smart Structures and Systems (joint session with MSNDC and VIB)
  Organizers: **Najib Kacem** (najib.kacem@femto-st.fr), **Hanna Cho** (cho.867@osu.edu)
- MNS-2: Micro/Nano Bioengineering, IoT, Sensors and Computing
  Organizers: **Dumitru Caruntu** (Dumitru.Caruntu@utrgv.edu), **Brian Jensen** (bdjensen@byu.edu), **Mohammad Shavezipur** (mshavez@siue.edu)
- MNS-3: Micro/Nano Robotics and Functional Materials
  Organizers: **Lin Dong** (lin.dong@njit.edu), **Nicola Pio Belfiore** (nicolapio.belfiore@uniroma3.it)

This conference provides a forum for researchers, practitioners, educators, and students from industry, academia, and government research labs to share their latest findings and challenges with the broader research community, foster collaborations, and build a sustainable research community.

We would like to thank all the authors for submitting papers and talks and sharing their work in our conference. We would also like to thank the reviewers for providing valuable feedback to help improve the reporting and the quality of the conference, and finally the session chairs and co-chairs that worked on coordinating the paper review process.

We welcome conference participants to become involved with our technical committee. If you are interested in becoming involved in helping to organize our conference, please contact a conference organizer to inquire and feel free to attend the technical committee meeting, which will be held on Tuesday evening, August 19, from 6:00PM to 7:00PM. This meeting is open to all. Room locations are announced in the program. Our community will continue to grow and flourish with your active participation as we work to define our vision for future events.

We welcome you to the19th International Conference on Micro- and Nanosystems (MNS)!

Sincerely,

Najib, **Hongwei**, **Lin**, **Nicola**, and the entire 2025 MNS Conference team.

21st International Conference on Multibody Systems, Nonlinear Dynamics, and Control (MSNDC)

On behalf of the ASME Technical Committee on Multibody Systems and Nonlinear Dynamics, we extend a wholehearted welcome to the attendees of the 21st International Conference on Multibody Systems, Nonlinear Dynamics, and Control (MSNDC). The conference includes 11 symposia and features nearly 60 contributions on both traditional and emerging topics in the broad areas of multibody systems and nonlinear dynamics. Selected symposia are cross-listed with the 27th International Conference on Advanced Vehicle Technologies (AVT), the 49th Mechanisms and Robotics Conference (MR), the 19th International Conference on Micro- and Nanosystems (MNS), and the 37th Conference on Mechanical Vibration and Noise (VIB), adding a significant number of relevant contributions for the MSNDC community. This event presents a unique opportunity for researchers, practitioners, educators, and students to report their accomplishments, exchange ideas, and become familiar with emerging trends in the field. The conference is organizing the MSNDC Best Paper and Best Student Paper competitions.

This year, we are honored to recognize Professor George Haller as the recipient of the Lyapunov Award, established in 2003, for his lifelong contributions to research, practice, and education in the field of nonlinear dynamics. Dr. George Haller is a professor of Mechanical Engineering at ETH Zürich, where he holds the Chair in Nonlinear Dynamics and heads the Institute for Mechanical Systems. His prior appointments include tenured faculty positions at Brown, McGill, and MIT. He also served as the inaugural director of Morgan Stanley's Fixed Income Modeling Center. He currently serves as feature editor at Nonlinear Dynamics and senior editor at the Journal of Nonlinear Science. His research focuses on nonlinear dynamical systems with applications to mechanical vibrations, coherent structures in turbulence, and data- and equation-driven model reduction for physical systems. He has authored three monographs in these areas.

We are also honored to host three keynote lectures featuring distinguished speakers, Professor Johannes Gerstmayr and Professor Walter Lacarbonara, as well as the winners of the 2024 ASME Journal of Computational and Nonlinear Dynamics Best Paper Award.

Dr. Johannes Gerstmayr earned his doctorate from JKU Linz in 2001 and completed his habilitation in Technical Mechanics in 2007, following research visits to UIC at Chicago, IST Lisbon, and the University of Duisburg-Essen, where he focused on computational methods for flexible multibody systems. That same year, he joined the Linz Center of Mechatronics (LCM) as a key researcher and became head of the Dynamics and Control unit. In 2014, he was appointed full professor at the newly founded Department of Mechatronics at the University of Innsbruck. His research interests include computational methods for multibody systems, deformable bodies, robotics, machine learning, and AI. He is associate editor of Multibody System Dynamics and serves on the editorial advisory board of Acta Mechanica.

Dr. Walter Lacarbonara is a Professor of Nonlinear Dynamics at Sapienza University and Director of the Sapienza Center for Dynamics. His research interests encompass nonlinear structural dynamics, metamaterials and nanostructured composites, asymptotic techniques, nonlinear control of vibrations, experimental nonlinear dynamics, and the dynamic stability of structures. He is Editor-in-Chief of Nonlinear Dynamics and former Associate Editor for ASME Journal of Applied Mechanics, Journal of Vibration and Acoustics, and Journal of Sound and Vibration. He has organized over ten international symposia/conference sessions and, very recently, the 1st, 2nd, 3rd, and 4th International Nonlinear Dynamics Conferences (NODYCON). His research is supported by national and international sources (EOARD/AFOSR, NSF, European Commission, and Italian Ministry of Science and Education).

The winners of the 2024 ASME Journal of Computational and Nonlinear Dynamics Best Paper Award are Moataz Abdalla and Ahmed A. Shabana, both from the University of Illinois Chicago. Their award-winning paper, titled “Kinetic- and Strain-Energy Approaches in the Thermal Analysis of Constrained Mechanical Systems: A Comparative Study,” explores the fundamental differences between kinetic- and strain-energy approaches in thermal analysis. The objective is to clarify key thermo-elasticity implementation issues that are highly relevant to widely used commercial finite element (FE) software.

Last but not least, we would like to acknowledge the all-important efforts and contributions made by the symposium organizers as well as manuscript reviewers—thank you very much; your help has been essential. We would also like to thank all contributors for choosing this conference as the venue for sharing the outcomes of their intellectual pursuits.

Conference Co-Chairs:
Andrea Arena
Sapienza University of Rome

Andreas Zwölfer
Technische Universität München

Program Co-Chairs:
James R. Chagdes
Miami University

Andrea Zanoni
Politecnico di Milano

37th Conference on Mechanical Vibration and Noise (VIB)

On behalf of the Technical Committee on Vibration and Sound (TCVS), we cordially welcome you to the 37th Conference on Vibration and Noise (VIB). This conference covers a broad spectrum of topics related to vibratory systems, including those at emerging frontiers of science and engineering as well as traditional fields where mechanical vibrations are essential. VIB provides a setting for dissemination and discussion of the state of the art of modeling, analysis, and experimentation in all aspects of vibration and noise research. This year's conference includes close collaborations with other IDETC tracks to bring together researchers with similar interests, enhance the technical program, and improve the attendee experience. The following symposia make up this year's VIB:

- VIB-01: Nonlinear Dynamics and Control of Smart Structures and Systems
- VIB-02: Nonlinear Dynamics of Systems and Nonlinear Phenomena
- VIB-03: Contact Dynamics of Mechanical Structures
- VIB-04: Data-Driven and Machine Learning Techniques in Vibrations and Dynamics
- VIB-05: Dynamics of Biological, Bio-Inspired and Biomimetic Systems
- VIB-06: Industry Applications of Vibration, Shock, Acoustics and Dynamics
- VIB-07: Dynamics & Waves in Solids, Acoustic Metamaterials, and Architected Materials
- VIB-08: Energy Harvesting
- VIB-09: Vibration Measurement, Signal Processing, and Structural Damage Detection
- VIB-10: General Dynamics, Vibration, and Acoustics

VIB is excited to announce several keynote lectures by prestigious researchers in the field of dynamics, vibration, and acoustics.

- Invited Keynote: Professor Chiara Daraio, California Institute of Technology
- 2025 ASME J.P. Den Hartog Award: Professor Richard Rand, Cornell University
- 2025 ASME C.D. Mote Jr., Early Career Award: Professor Malte Krack, University of Stuttgart, Germany
- 2025 ASME Mary Baker Industry Achievement Award: Dr. Stephen Spottswood, Senior Technical Staff, Aerospace Systems Directorate

We will also host 11 renowned invited speakers by senior and mid-career ASME faculty members to kick off each technical session area. We thank the ASME Design Engineering Division for their support of this initiative.

As part of VIB, NSF DCSD Program sponsors several student-oriented supports and events, including:

- Student paper competition with cash prizes
- Travel supports for students and postdocs
- Childcare supports for VIB attendees
- Industry-Academia career panel

We are also excited to share that VIB organizes NSF workshop and office hours by Program Directors of NSF DCSD program. We thank the NSF DCSD Program Directors for their support of this initiative.
In addition, in collaboration with ASME Journal of Vibration and Acoustics, the high-quality papers were considered for publication in a Special Issue of that journal.

We gratefully acknowledge the efforts of the VIB symposium organizers, reviewers, and authors. It is your efforts that make this conference vibrant.

Neda Maghsoodi
University of Southern California
Conference Chair

Mohammad Bukhari
Wayne State University
Technical Program Chair

Keegan Moore
Georgia Institute of Technology
Technical Program Chair

Conference Chair Welcomes

Fluid Power and Motion (FPMC)

Dear Colleagues,

Welcome to the 2025 ASME/Bath Symposium on Fluid Power and Motion Control held at the IDETC-CIE in Anaheim, California. Fluid Power Technology plays a vital role in addressing the technical challenges the world is currently facing. To discuss the newest findings and future topics, this conference aims to give inspiration and time for discussions. By co-locating this year with the IDETC-CIE, attendees will benefit from attending other tracks within the partner conferences, allowing for joint discussions with design engineering and computer sciences. We have developed a great program and hope you will find the technical program of the symposium engaging. We also hope that you will enjoy the social events and further develop your network with colleagues.

The symposium has been jointly organized by the University of Bath and the American Society of Mechanical Engineers (ASME), being held every year alternating between Bath and locations in the U.S. since 2009. This conference provides a forum for the international fluid power community from academia and industry to discuss recent developments and future challenges in fluid power technology. This year we give special focus to electrification of fluid power systems and utilization of machine learning and artificial intelligence in fluid power through panel discussions.

On Tuesday, we will have the Koski Lecture, presented by Dr. Adolfo Senatore (the 2025 Koski Medal awardee). On Tuesday evening, we will be holding the Koski Banquet to officially award the ASME Robert Koski Medal. We wish to thank Sun Hydraulics for generously sponsoring the banquet dinner.

In addition to the formal dinner on Tuesday, there are numerous social activities to engage with the fluid power community. On Monday evening, we will be hosting an informal dinner at a nearby restaurant. Everyone will be paying for their own meal, but the good company is free. Beyond the evening events, there will be lunches and coffee breaks for continued discussions.

Many individuals have generously given their time to make the 2025 ASME/Bath Symposium a success. We are grateful to all the volunteers on the Organizing Committee, Program Committee, Editorial Board, and numerous others, who have given their support behind the scenes.

We are confident that you will find this conference an exciting and technically rewarding event. Again, welcome, and thank you for your participation. Please enjoy the conference.

Sincerely,

Katharina Schmitz and **Jim Van de Ven**
General Chairs

AVT MILLIKEN LECTURE

TUESDAY, AUGUST 19 **11:00AM–12:20PM**
SALINAS

FUNDAMENTALS OF VEHICLE HANDLING DYNAMICS AND APPLICATION

Prof. Peter Lugner
Institute of Mechanics
TU Vienna

Abstract: Linear vehicle system models are essential for the principal understanding and interpretation of the dynamical behavior. It is also very important to be aware of the limits of validity of a model. The first step to having a proper simple model of a passenger car was the establishment of the well-known two-wheel model. This model provides the characterization of over- and understeer and stability information for cornering. A separate model for the longitudinal dynamics includes the properties of drivetrain and braking system, rotation of the wheels, and tire forces. For both models, the description of the tire road force transfer is essential. It can be used to analyze brake force distribution and acceleration properties. The mathematical description of the tire behavior was based on road and test rig measurements or also established by complex descriptions from the tire finite element models. The mutual influences of lateral and longitudinal tire forces are essential for the handling. The combination of these two vehicle models with considering the suspension characteristics, at least with its vertical properties, provides a 3D model that is capable to calculate the tire normal forces and the force transfer of each wheel individually.

With the established vehicle multibody system, it was possible to obtain first information and conduct simulation analysis of emergency braking during cornering. Uncertainties of parameters like joint friction and tire force approximation remained and were investigated.

Further on the introduction of control systems allowed for improving vehicle handling. Integrated with a model for the driver behavior, an essential analytical tool for vehicle driving modeling and simulation of the driver's reactions became available. The Lecture provides examples of modeling a power drift during cornering. For steady-state cornering with a power drift (the front wheels are steered to the outside of the curve), the state/equilibrium is unstable. Using the two-wheel model with a nonlinear tire description, it was found that for a range of constant steering angles and drive torques the vehicle motion converges to a small limit circle orbiting the unstable equilibrium. Further detailed investigations lead to the creation of a controller that can stabilize the motion. Using the established simulation environment and the driver model, a successfully performed power drift was accomplished and also illustrated in an experimental set up with a test vehicle on low friction surface.

Biography: Peter Lugner was born in 1939 in Vienna, Austria, studied Mechanical Engineering at the Vienna University of Technology, and has been a full Professor at the Institute of Mechanics and Mechatronics and head of Division of Mechanics and Biomechanics from 1994 to 2008. Since 2008, he is still in contact with the Institute by part of lectures and projects. He authored four book and more than 160 publications in rail and road dynamics and biomechanics. He has been Editor-in-Chief of the journal, Vehicle System Dynamics, for 18 years from 1990 to 2008 and Member of the presidential council of the EVU (European Association for Accident Research and Analysis) from 2000 to 2022.

CIE

MONDAY, AUGUST 18 **10:50AM–12:10PM**
SANTA MONICA

Dr. Yan Fu
Senior Director of Strategy and Enterprise Analytics
Ford Motor Company

Biography: Dr. Yan Fu is the Senior Director of Strategy and Enterprise Analytics within Global Data, Insight and Analytics at Ford Motor Company. In this role, Dr. Fu leads a large, global team at the forefront of developing cutting-edge data science, artificial intelligence, optimization, and decision support tools. These innovative solutions are instrumental in driving billions of dollars in financial impact and are leveraged by over 10,000 Ford users daily. Her team's work is critical to ensuring regulatory compliance, advancing Ford's electrification strategy, and enabling holistic, data-driven decision-making across the entire enterprise, directly impacting areas fundamental to mechanical engineering, product development, and manufacturing efficiency.

An exceptional technical leader and innovator, Dr. Fu's profound contributions have not only supported Ford's success and growth but have also been pivotal in solving complex challenges in areas such as vehicle safety and sustainability through advanced computational methods. She earned her Ph.D. from Carnegie Mellon University in 2000 and began her distinguished career at Ford Motor Company in 1999. Her prolific research and development efforts have resulted in an impressive 162 technical papers published in highly recognized journals and conferences, along with book chapters, and she holds 16 granted and filed patents, trade secrets, and defensive publications. Dr. Fu has been honored with numerous prestigious awards, including the 2011 Society of Automotive Engineers (SAE) Henry Ford II Distinguished Award for Excellence in Automotive Engineering, three Henry Ford Technology Awards (2005, 2008, 2018) – Ford's highest technical achievement, and the 2022 Women of Color STEM DTX Conference Technology All-Star Outstanding Achievement Award.

In addition to her significant technical contributions, Dr. Fu is a dedicated mentor and powerful role model, particularly for women in STEM. She actively champions Women of Ford and promotes STEM careers through organizations like SAE and ASME. Her commitment to fostering inclusion is evident through her mentorship of hundreds of employees and student interns, earning her the 2014 SAE International Forest R. McFarland Award and four Ford Global Diversity & Inclusive Summit Awards.

Dr. Fu's exceptional contributions to the field have been further recognized by her election as a Fellow of the American Society of Mechanical Engineers (ASME) in 2018 and a Fellow of the Society of Automotive Engineers (SAE) in 2019.

TUESDAY, AUGUST 19 **11:00AM–12:20PM**
CALIFORNIA BALLROOM A

PHYSICAL AI FOR POWERING SMART ROBOTIC CELLS IN MANUFACTURING APPLICATIONS

Dr. Satyandra K. Gupta
Director of the Center for Advanced Manufacturing
University of Southern California
Co-Founder and Chief Scientist at GrayMatter Robotics

Abstract: Many manufacturing companies are facing an acute shortage of qualified workers. Deploying robotic cells is a potential solution to address this challenge. Historically robots have been deployed only in mass production applications in manufacturing. A large fraction of manufacturing is classified as high-mix manufacturing where a large variety of products are produced. Manual programming of robots is not a viable solution in high-mix manufacturing applications. Robotic cells need to be powered by physical AI to make them useful in high-mix manufacturing applications. Realizing such robotic cells will require new advances in AI to address the risk considerations in manufacturing applications. Physical AI needed in manufacturing applications cannot be realized as a monolithic system running on the cloud. Physical AI in the context of manufacturing should be viewed as a complex system that involves interactions among multiple AI components. The system should use the right functional decomposition to ensure that it is able to achieve the desired trade-off in performance and modularity. Many different AI approaches exist. It is unlikely that a single approach will suffice to deliver the desired performance. Therefore, each functional block should use the right AI approach by carefully considering pros and cons. Therefore, having the right system architecture in the physical AI system is the key to success in manufacturing applications. Humans are important parts of manufacturing operations and therefore a human-centered approach needs to be followed during system design. AI can be used to revolutionize human-machine interfaces in manufacturing applications by fostering flexibility in processes and promoting more intuitive interactions for workers. This talk highlights key requirements for developing physical AI for powering robotic cells for high-mix manufacturing applications. It also makes the case for approaches that combine model-based and data-driven methods to meet the needs of physical AI in manufacturing applications and describes the role of generative AI approaches in smart manufacturing applications. Finally, it describes how AI can be used to enhance digital twins and augment human-machine interfaces in manufacturing applications.

Biography: Dr. Satyandra K. Gupta holds Smith International Professorship in the Viterbi School of Engineering at the University of Southern California and serves as the Director of the Center for Advanced Manufacturing. He is also Co-Founder and Chief Scientist at GrayMatter Robotics. His research interests are embodied artificial intelligence, computational foundations for decision-making, and human-centered automation. He works on applications related to Manufacturing Automation and Robotics. He has published more than five hundred technical articles in journals, conference proceedings, and edited books. He also holds twenty four patents. He is a fellow of the American Association for the Advancement of Science (AAAS), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), Solid Modeling Association (SMA), and Society of Manufacturing Engineers (SME). He is a former editor-in-chief of the ASME Journal of Computing and Information Science in Engineering. He has received numerous honors and awards for his scholarly contributions. Representative examples include a Young Investigator Award from the Office of Naval Research in 2000, Robert W. Galvin Outstanding Young Manufacturing Engineer Award from SME in 2001, a CAREER Award from the National Science Foundation in 2001, a Presidential Early Career Award for Scientists and Engineers in 2001, Invention of the Year Award at the University of Maryland in 2007, Kos Ishii-Toshiba Award from ASME in 2011, Excellence in Research Award from ASME Computers and Information in Engineering Division in 2013, Distinguished Alumnus Award from Indian Institute of Technology, Roorkee in 2014, ASME Design Automation Award in 2021, Distinguished Alumni Award from Indian Institute of Technology, Delhi in 2022, and Lifetime Achievement Award from ASME Computers and Information in Engineering Division in 2024. He has also received eleven best paper awards at international conferences. He serves as a member of the Technical Advisory Committee for Advanced Robotics for Manufacturing (ARM) Institute and a member of the National Materials and Manufacturing Board (NMMB).

DAC SIGNATURE EVENT: GENERATIVE, GENERATIVE DESIGN, AND GENERATIVE DESIGN THINKING

TUESDAY, AUGUST 18 **4:20PM–6:00PM**
LAGUNA A

Panelists

Bradley Rothenberg is the CEO and founder of nTop, an engineering software company based in New York City. Since its founding in 2016, nTop has served the aerospace, defense, automotive, and industrial markets with computational design software enabling users to design, test, and iterate faster to deliver some of the world's most advanced products. Bradley has been developing computational design tools for more than 15 years. He studied architecture at Pratt Institute in Brooklyn, New York.

Prof. Faez Ahmed is an Associate Professor in the Department of Mechanical Engineering at the Massachusetts Institute of Technology, where he directs the Design Computation and Digital Engineering (DeCoDE) Lab. His research interests lie at the intersection of Artificial Intelligence and engineering design, focusing particularly on first principle generative AI and optimization algorithms, multi modal representation learning, and engineering design methodology with human–AI design copilots. Before joining MIT, Prof. Ahmed was a postdoctoral fellow at Northwestern University and earned his Ph.D. in Mechanical Engineering from the University of Maryland. He also spent several years in Australia's railway and mining sectors, leading data-driven predictive maintenance initiatives. Prof. Ahmed has received the AFOSR YIP Award, the NSF CAREER Award, the ASME DTM Young Investigator Award, and the Google Research Scholar Award. At MIT he has held the Doherty, d'Arbeloff, and ABS Career Development Chairs. He currently serves as an Associate Editor for Computer Aided Design and as the Featured Articles Editor for the ASME Journal of Mechanical Design.

Leah Chong is an assistant professor in the Walker Department of Mechanical Engineering at the University of Texas (UT) at Austin. Prior to UT, she was a postdoctoral associate at Massachusetts Institute of Technology and received her Ph.D. and M.S. degrees at Carnegie Mellon University and B.S. degree at Rice University, all in Mechanical Engineering. Her research focuses on human-AI collaboration in engineering design and human-centered engineering design, using a combination of quantitative and qualitative research methods. She is interested in understanding how the integration of computational tools/agents in the engineering design process affects the way designers think, feel, and make decisions, as well as exploring opportunities for complementary partnership between human designers and AI to enable effective and human-centered design. Some ongoing topics of research include AI-assisted decision-making, qualitative design with AI, and artificial empathy. She has been recognized for her contributions to research through ASME DTM Best Paper Awards and CMU's Milton Shaw Ph.D. Research Award and Presidential Fellowship.

Vinayak Krishnamurthy is an Associate Professor in the J. Mike Walker'66 Department of Mechanical Engineering and an affiliated faculty in the Department of Computer Science at Texas A&M University. He currently holds the J. Mike Walker '66 Career Development Professorship at Texas A&M. He earned his Ph.D. in 2015 from the School of Mechanical Engineering at Purdue University and joined Texas A&M in Fall 2016. Krishnamurthy currently directs the Mixed-Initiative Design Lab (MIDL) at Texas A&M University. His research is at the interface of geometric and topological computing, human-computer interaction, and artificial intelligence. He applies the knowledge gained in these areas to various domains, such as metamaterial design, extended reality for design, computational fabrication, data-driven design, collaborative design, autonomous systems, surgical training, and engineering education. His dissertation research led to the commercial deployment of zPots, a virtual pottery app using Leap Motion controller in collaboration with zeroUI, a California-based startup. He is the recipient of multiple awards including the NSF CAREER award, ASME CIE Young Engineer Award, 2024 ASME Rising Stars of Mechanical Engineering award, and three best paper awards at the ASME IDETC/CIE conferences. He is also the recipient of the Peggy L. and Charles L. Brittan Teaching Award for Outstanding Undergraduate Teaching and the TAMU Association of Former Students College Level Teaching Award at Texas A&M.

Ye Wang is an entrepreneur, research scientist, and engineer, and the founder of EverCurrent—an AI-native platform that serves as the connective layer for hardware and manufacturing teams. Her work focuses on enabling workflows where humans and AI collaborate by default, helping teams capture tacit knowledge, surface critical context, and build with clarity. Previously, she was a Senior Principal Research Scientist at Autodesk, where she led pioneering efforts in generative AI for design, including collaborations with major industry partners such as Kia, where she explored how generative systems could support early-stage automotive design and augment human creativity. Her earlier contributions include shaping tools like Onshape, the first cloud-native version-controlled CAD platform, and Join, a platform for collaborative project delivery in the architecture and construction industry. Ye began her research career at MIT, where she worked on advanced manufacturing and generative design—a foundation that continues to inform her hybrid approach to building impactful tools that bridge research and real-world application.

Moderator

Dr. Zhenghui Sha is an Associate Professor in the Walker Department of Mechanical Engineering at the University of Texas (UT) at Austin. Dr. Sha received a Ph.D. in Mechanical Engineering from Purdue University. Dr. Sha's research focuses on system science and design science as well as the intersection between these two areas. His research projects span across design

theory, AI for design, human-machine interaction, swarm manufacturing, and complex sociotechnical systems. Dr. Sha is a Walker Scholar in UT ME. He received the 2022 Young Engineering Award (YEA) and the 2017 Best Dissertation of the Year Award from the ASME CIE Division. He was the recipient of the 2023 ASME Journal of Mechanical Design (JMD) Editor's Choice with Honorable Mention. He served as the Chair of the ASME SEIKM Technical Committee and the Chair of the ASME AI and Machine Learning Technical Committee. He has been serving on the Executive Committee of the ASME Design Automation Conference (DAC) since 2024.

FPMC KEYNOTE

TUESDAY, AUGUST 19 **6:00PM–8:00PM**
CALIFORNIA A

FORTY YEARS OF FLUID POWER: OUR JOURNEY, OUR FUTURE,... AND STILL AS PASSIONATE AS EVER

Adolfo Senatore
Industrial Engineering Department
University of Naples "Federico II"

Abstract: This presentation offers a comprehensive overview of the Italian Fluid Power industry. I will explore the legacy of its historically significant companies, many of which have achieved international recognition. The discussion will also highlight the vital role of industry associations and their technical dissemination activities in fostering growth and knowledge sharing.

I will then turn the attention to Italian universities that offer specialized courses in fluid power, showcasing the academic foundation supporting this sector. Finally, I will introduce my research group naimed "FPRG- Fluid Power Research Group", briefly outlining some of my most significant scientific contributions.

I will conclude by expressing gratitude to those who have enabled me to pursue this path, always with unwavering commitment and great passion.

MECHANICS AND ROBOTICS KEYNOTE I

MONDAY, AUGUST 18 **9:10AM–10:30AM**
MALIBU

ENHANCING HUMAN PERFORMANCE WITH WEARABLE ROBOTICS AND MACHINE LEARNING

Lorenzo Masia, Ph.D.
Professor Dr (W3)
Chair in "Intelligent BioRobotics Systems"
Executive Director of Munich Institute for Robotics and Machine Intelligence (MIRMI)
School of Computation Information and Technology
Department of Computer Engineering
Technische Universität München, Germany

Abstract: In the dynamic field of assistive technology, soft wearable exosuits represent a significant breakthrough, setting them apart from traditional rigid exoskeletons. However, the complexity of mastering soft structures is significant: it involves not just handling the nonlinear dynamics of the device but also accurately interpreting the physiological signals that are crucial to the exploit a human control loop control. My talk will cover the latest advancements from my team over the past five years, detailing our development of compact, robust, reliable, and efficient exosuits. I will discuss the critical role of integrating biomechanical modeling into control strategies to customize how the machine interacts with the user's biomechanics, aiming to enhance human performance in tasks like collaborating with industrial manipulators or improving running endurance. I will also introduce a new method called 'Context Aware Control,' which combines traditional control techniques with machine learning, including artificial vision, to fine-tune the assistance provided. This approach endows our exosuits with the unique ability to adapt to varying external conditions or environmental changes, significantly improving the user's integration with these wearable robotic systems.

Biography: Lorenzo Masia began his career in mechanical engineering with a degree from Sapienza University of Rome in 2003, followed by a Ph.D. from the University of Padua in 2007. His initial steps into robotics were marked by two-year as researcher at MIT's Newman Lab for Biomechanics and Human Rehabilitation, spanning from January 2005 to December 2006. He took on the role of Team Leader at the Italian Institute of Technology, specifically in the Robotics Brain and Cognitive Sciences Department. By 2013, Masia was an Assistant Professor at Nanyang Technological University of Singapore in the School of Mechanical & Aerospace Engineering, where he remained until 2018 and later progressed at the University of Twente, where he held the position of Associate Professor in Biodesign. Professor Masia has been at Heidelberg University in Germany (2019–2024), serving as a Full Professor in Biorobotics & Medical Technology, where he founded the ARIES Lab, focusing on Assistive Robotics and Interactive ExoSuits at the Institute of Computer Engineering (ZITI). From the 1st of October 2024, he is Professor in "Intelligent BioRobotic Systems" and Deputy Director of the Munich Institute for Robotics and Machine Intelligence (MIRMI) at the Technical University of Munich (TUM).

Professor Masia's work has garnered international acclaim, evidenced by multiple awards at leading conferences in Biorobotics and Robotic Rehabilitation, including two IEEE Best Paper Awards and three IEEE Best Student Paper Awards, among others. In addition to his research and teaching, Professor Masia holds significant editorial roles with several prestigious journals, IEEE TRO, IEEE RAL, IEEE TNSRE, JNER and Wearable Technologies. He has also played key roles as Program Chair in organizing major IEEE RAS conferences in the field, and he has been the General Chair for IEEE RAS EMBS BIOROB 2024 (1–4 September 2024, Heidelberg, Germany).

MECHANICS AND ROBOTICS KEYNOTE II

TUESDAY, AUGUST 19 **9:20AM–10:40AM**
MALIBU

LEVERAGING BIOLOGICAL ACTUATORS FOR SOFT ROBOTICS

Ritu Raman, Ph.D.
Eugene Bell Career Development Assistant Professor
Massachusetts Institute of Technology (MIT)

Abstract: Human beings and other biological creatures navigate unpredictable and dynamic environments by combining compliant mechanical actuators (skeletal muscle) with neural control and sensory feedback. Abiotic actuators, by contrast, have yet to match their biological counterparts in their ability to autonomously sense and adapt their form and function to changing environments. We have shown that engineered skeletal muscle actuators, controlled by neuronal networks, can generate force and power functional behaviors, such as walking and pumping in a range of untethered robots. These muscle-powered robots are dynamically responsive to mechanical stimuli and are capable of complex functional behaviors like exercise-mediated strengthening and healing in response to damage. Our lab uses engineered bioactuators as a platform to understand neuromuscular architecture and function in physiological and pathological states, restore mobility after disease and damage, and power adaptive soft machines. This talk will cover the advantages, challenges, and future directions of understanding and manipulating the mechanics of biological motor control systems.

Biography: Ritu Raman, Ph.D. is the Eugene Bell Career Development Assistant Professor of Mechanical Engineering at MIT. Her lab is centered on 4D tissue engineering of biological actuators for applications in medicine and machines. Ritu's research has received several recognitions, including the PECASE, the NSF CAREER Award, the Army Research Office YIP Award, and the Office of Naval Research YIP Award, as well as Rising Star Junior Faculty Awards from the Biomedical Engineering Society and the American Society of Mechanical Engineers. She is also the recipient of the Spira Award for Excellence in Teaching at MIT and the author of the MIT Press book, Biofabrication. Ritu received her B.S. from Cornell University and her Ph.D. as an NSF Fellow with Prof. Rashid Bashir at the University of Illinois at Urbana-Champaign. She completed her postdoctoral research as a L'Oréal For Women in Science Fellow and NASEM Ford Foundation Fellow with Prof. Robert Langer at MIT.

MSNDC KEYNOTE: JCND BEST PAPER AWARD LECTURE

TUESDAY, AUGUST 19 **2:20PM–4:00PM**
HUNTINGTON A

KINETIC- AND STRAIN-ENERGY APPROACHES IN THE THERMAL ANALYSIS OF CONSTRAINED MECHANICAL SYSTEMS: A COMPARATIVE STUDY

Abstract: Despite the unconstrained thermal expansion is assumed stress-free, the conventional FE approach requires formulating elastic forces, and this in turn leads to elastic stresses. A displacement-based formulation, on the other hand, can be used to address this limitation by converting the thermal energy to kinetic energy instead of strain energy. The fundamental differences between the strain- and kinetic-energy approaches are discussed. It is shown that the unconstrained thermal expansion predicted using the kinetic-energy approach is independent of the continuum constitutive model, and consequently, such a formulation can be used for both solids and fluids. The displacement (kinetic) and strain (stress) formulations are discussed to shed light on the mechanism of thermal expansion at the macroscopic level. The thermal-expansion displacement formulation (TEDF) and position-gradient multiplicative decomposition into thermal and mechanical parts are used to compute the thermal stresses due to boundary and motion constraints (BMC). TEDF implementation issues are discussed and constant matrices evaluated at a preprocessing stage after applying the sweeping matrix technique to eliminate rigid-body thermal-displacement translational modes are identified. Furthermore, the softening effect due to the constitutive-model dependence on the temperature is investigated at high temperatures. Numerical results are presented to show fundamental differences between the TEDF approach that converts heat energy to kinetic energy and conventional FE approach that converts heat energy to strain energy that produces elastic stresses.

Moataz Abdalla
University of Illinois Chicago (UIC)

Moataz Abdalla is a PhD candidate in Mechanical Engineering at the University of Illinois Chicago (UIC). Since joining the Dynamic Simulation Laboratory (DSL) in 2021, his research has focused on developing advanced numerical methods for thermoelasticity and flexible multibody dynamics. He holds a Master's degree in Mechanical Engineering from the University of Tennessee at Chattanooga, where he conducted research on the computational modeling of absorbable medical implants. Moataz' current work at UIC combines the Absolute Nodal Coordinate Formulation (ANCF) with a novel kinetic-energy-based approach to simulate coupled thermomechanical behavior in flexible multibody systems. This work aims to overcome key limitations in conventional FE methods commonly used for modeling thermomechanical problems, particularly in the context of large deformation and complex material behavior.

Keynotes

Ahmed A. Shabana
Professor of Mechanical Engineering, University of Illinois at Chicago (UIC)

Ahmed A. Shabana is a Professor of Mechanical Engineering at the University of Illinois at Chicago (UIC). He teaches dynamics, vibration, and computational mechanics courses and has book and technical-paper publications in these areas. He is a Fellow of ASME and served as the Chair of the ASME Design Engineering Division (DED). He is the Founding Chair of the ASME Technical Committee on Multibody Systems and Nonlinear Dynamics and Founding Chair of the ASME International Conference on Multibody Systems, Nonlinear Dynamics, and Control.

MSNDC NONLINEAR DYNAMICS KEYNOTE

MONDAY, AUGUST 18 **8:10AM–9:10AM**
HUNTINGTON A

MULTI-BANDGAP NONLINEAR METAMATERIALS

Walter Lacarbonara
Sapienza University of Rome

Abstract: This talk explores 1D and 2D metamaterials featuring a periodic arrangement of highly tunable infinite-dimensional resonators, such as cantilevers with tip masses and spider-web membranes. These resonator-embedded metamaterials exhibit distinctive dispersion characteristics, including the emergence of single and multiple band gaps. The sensitivity of these band gaps to key design parameters is examined. By harnessing tailored geometric and material nonlinearities, the resonators significantly enhance band gap behavior. Using a perturbation approach, we compute nonlinear wave frequencies and waveforms both near and away from internal resonances, showcasing remarkable nonlinear tunability—an essential attribute for advanced applications. To validate our theoretical predictions, we experimentally test various 3D-printed metamaterial samples using 3D laser scanning vibrometry. The results reveal fascinating wave propagation properties and confirm the enhanced performance driven by nonlinear effects.

Biography: Walter Lacarbonara is a Professor of Nonlinear Dynamics at Sapienza University and Director of the Sapienza Center for Dynamics. During his graduate education he was awarded a M.S. in Structural Engineering (Sapienza University) and a M.S. in Engineering Mechanics (Virginia Tech, USA), and a Ph.D. in Structural Engineering (Sapienza/Virginia Tech). His research interests cover nonlinear structural dynamics; metamaterials and nanostructured composites; asymptotic techniques; nonlinear control of vibrations; experimental nonlinear dynamics; and the dynamic stability of structures. He is Editor-in-Chief of Nonlinear Dynamics, former Associate Editor for ASME Journal of Applied Mechanics, Journal of Vibration and Acoustics, and Journal of Sound and Vibration. He served as Chair of the ASME Technical Committee on Multibody Systems and Nonlinear Dynamics, General Co-Chair and technical program Co-Chair of the ASME 2015 (Boston, USA) and 2013 (Portland, USA) IDETC Conferences. He has organized over ten international symposia/conference sessions and, very recently, the 1st, 2nd, 3rd, and 4th International Nonlinear Dynamics Conferences (NODYCON). His research is supported by national and international sources (EOARD/AFOSR, NSF, European Commission, and Italian Ministry of Science and Education). He has published over 250 papers and conference proceedings, five international patents (EU/USA/China), 26 book chapters, nine co-edited Springer books, and a single-authored book (Nonlinear Structural Mechanics, Springer, NY) for which he received the 2013 Texty Award nomination by Springer US.

MSNDC MULTIBODY SYSTEMS KEYNOTE

TUESDAY, AUGUST 19 **8:10AM–9:10AM**
HUNTINGTON A

APPLICATIONS AND OPPORTUNITIES FOR AI IN MULTIBODY DYNAMICS

Johannes Gerstmayr
University of Innsbruck

Abstract: Artificial intelligence (AI) and machine learning are redefining the landscape of engineering, in particular multibody dynamics (MBD), opening unprecedented opportunities in simulation, teaching, and industrial applications. Large language models (LLMs) and advanced neural networks are driving innovations that enhance computational efficiency, accuracy, and accessibility in this traditionally complex domain. We present a novel “lab-in-the-loop” approach to systematically evaluate and validate the ability of LLMs to perform virtual MBD experiments. This framework automates the generation of simulation code, validation of conjectures, and extraction of results. For example, the LLM generates a Python-based simulation model to validate a hypothesis about the degrees of freedom in an MBD system, leading to the creation of a synthetic yet validated knowledge base. Preliminary results highlight the potential of this method to automate the assessment of LLM capabilities and fine-tune models for MBD tasks, enabling direct interaction with simulation tools using natural language. We also show that neural networks provide computationally efficient alternatives for tasks like simulating multibody systems at the component level, integrating seamlessly with classical numerical methods such as implicit time integration methods. Furthermore, machine learning techniques excel in real-world applications, such as classifying operating states in multibody dynamic systems using raw acceleration signals, overcoming challenges posed by limited and noisy datasets. Finally, we introduce SLIDE, a deep-learning-based method for predicting dynamic responses in MBD systems. In case of forced oscillations or controlled machines, this method allows to independently estimate input-output sequences, achieving remarkable speedups—up to million times faster—compared to traditional simulations. This method incorporates an error estimator, ensuring a safe application of the method. By highlighting the latest advancements of AI

applications for engineering, this presentation emphasizes the outstanding potential of AI in MBD and beyond.

Biography: After finishing his studies in mechatronics, Johannes Gerstmayr started as a research assistant in the special research area SFB13 on Numerical and Symbolical Mathematics within the project "Structural dynamics of elasto-plastic multibody systems" in 1998. He received his doctoral degree at the Johannes Kepler University Linz in 2001. After several research visits to UIC Chicago, IST Lisbon and University Duisburg-Essen with research focus on computational methods for flexible multibody systems, he finished his habilitation in Technical Mechanics in 2007. In the same year, he joined the Linz Center of Mechatronics (LCM) as a key researcher and became leader of the business unit Dynamics and Control. In 2014, he became full professor at the newly funded Department of Mechatronics at the University of Innsbruck. He received the Wilhelm Macke-Prize in 2005, the Upper Austrian Innovation Award in 2013, and several best paper awards hereafter. His research interests are computational methods for multibody systems, deformable bodies, robotics, machine learning methods and AI. He is associate editor of Multibody System Dynamics and in the editorial advisory board of Acta Mechanica. He served as a reviewer for more than 25 scientific journals, co-authored 70 papers in scientific journals and more than 120 proceedings papers, book chapters, and patents.

MSNDC LYAPUNOV AWARD LECTURE

WEDNESDAY, AUGUST 20 **8:00AM– 9:40AM**
HUNTINGTON A

NONLINEAR SPECTRAL MODELING FROM DATA

George Haller
ETH

Abstract: I discuss a dynamical systems alternative to neural networks in the data-driven reduced-order modeling of nonlinear phenomena. Specifically, I show that the recent concept of spectral submanifolds (SSMs) provides very low-dimensional attractors in a large family of mechanics problems ranging from wing oscillations to transitions in shear flows. A data-driven identification of the reduced dynamics on these SSMs gives a mathematically justified way to construct accurate and predictive reduced-order models for solids, fluids, and controls without the use of governing equations. I illustrate this on physical problems including the accelerated finite-element simulations of large structures, prediction of transitions to turbulence, reduced-order modeling of fluid-structure interactions, extraction of reduced equations of motion from videos, and model-predictive control of soft robots.

Biography: George Haller is a professor of Mechanical Engineering at ETH Zürich, where he holds the Chair in Nonlinear Dynamics and heads the Institute for Mechanical Systems. His prior appointments include tenured faculty positions at Brown, McGill, and MIT. He also served as the inaugural director of Morgan Stanley's fixed income modeling center. Professor Haller is a recipient of a Sloan Fellowship, an ASME Thomas Hughes Young Investigator Award, the Stanley Corrsin Award of the APS, and the Lyapunov Award of the ASME. He is an external member of the Hungarian Academy of Science and an elected fellow of SIAM, APS and ASME. He currently serves as feature editor at Nonlinear Dynamics and senior editor at the Journal of Nonlinear Science. His research focuses on nonlinear dynamical systems with applications to mechanical vibrations, coherent structures in turbulence, and data- and equation-driven model reduction for physical systems. He has authored three monographs in these areas.

VIB KEYNOTE: 2025 ASME C.D. MOTE JR., EARLY CAREER AWARD

MONDAY, AUGUST 18 **8:00AM–9:00 AM**
SAN SIMEON A

HOW TO DEAL WITH NONLINEAR CONTACT IN STRUCTURAL DYNAMICS?

Professor Malte Krack
University of Stuttgart, Germany

Abstract: Contact interactions are found everywhere in technology, nature, and everyday life. Dry friction causes most of the damping of aerospace structures; without it, the blades of aircraft engines would break during operation due to fatigue under high vibrations. Impacts are exploited for new technologies to mitigate vibrations and for energy harvesting. In spite of their pervasiveness, it remains a huge challenge to accurately predict the dynamics of structures subjected to contact interactions. Most computational methods are restricted to smooth behavior and fail in the presence of discontinuous transitions between opening/closing, sticking/sliding contact. In this talk, I share the experience we gained over the past decade on what approaches seem most suitable for this problem class. Our numerical simulation methods reduce the computational effort by several orders of magnitude compared to conventional finite element tools. We also develop methods for the precise experimental quantification of damping and experimental continuation. To make friction damping predictable, multi-scale approaches are developed, along with measurement technology for contact mechanical investigations with nanometer resolution. I am extremely excited not only to see our fundamentally researched theories and methods being validated in our laboratories, but also to see them through to technological maturity together with our partners from industry, who use our tools to design better and vibration-safe engines/ turbomachines.

Biography: Malte Krack is a Professor at the University of Stuttgart. After obtaining his doctoral degree in Mechanical Engineering 2014 at the University of Hannover, he was postdoctoral researcher at the University of Illinois at Urbana-Champaign, before he started as a tenure-tracked professor 2016 at the University of Stuttgart, where he was promoted to

Full Professor 2021. His research revolves around nonlinear structural dynamics with a particular focus on contact (dry friction; impacts). It spans the complete range from the fundamental development of computational and experimental methods to real-world engineering applications such as bladed disks in aircraft engines. He received six Best Paper Awards (5 from the ASME), and 3 best graduation awards. He is an Associate Editor of Mechanical Systems and Signal Processing, served as Lecturer in two CISM Advanced Schools and was invited as Keynote Speaker to three international meetings/conferences. He has published about 70 articles in peer-reviewed high impact journals, four book chapters, several open source tools (incl. NLvib) and a monograph (Harmonic Balance for Nonlinear Vibration Problems, Springer), and holds three international patents.

VIB KEYNOTE: 2025 ASME J.P. DEN HARTOG AWARD

MONDAY, AUGUST 18 **10:50AM–12:10PM**
SAN SIMEON A

THE NONLINEAR DYNAMICS OF THE MOON-RAND EQUATIONS

Professor Richard Rand
Cornell University

Abstract: The so-called Moon-Rand equations were developed in 1985 [1] to describe the stiffness control of flexible space structures. The equations take the form of a linear oscillator in x,y coordinates with a control parameter z:

(1) dx/dt = y
(2) dy/dt = -x - z x

The control parameter z satisfies the equation:

(3) dz/dt = - k z + f(x,y)

where f(x,y) is modeled as a truncated power series in x,y:

(4) f(x,y) = G_20 x2 + G_11 xy + G_02 y2

The question is to determine the nonlinear dynamical behavior in the neighborhood of the origin. This includes stability of the equilibrium point at the origin, Hopf bifurcation of limit cycles, and so on. See [2] Exercise 5, Section 5.5, [3],[4],[5],[6],[7].

List of recent publications which refer to the Moon-Rand equations:

[1] F.C. Moon, R.H. Rand, Parametric stiffness control of flexible structures, in: Jet Propulsion Laboratory Publication 85-29, vol. II, California Institute of Technology, 1985, pp. 329–342.
[2] Y.A. Kuznetsov, Elements of Applied Bifurcation Theory, Third Ed., Springer-Verlag, New York, 2004.
[3] A. Mahdi, V.G. Romanovski, D.S. Shafer, Stability and periodic oscillations in the Moon–Rand systems, Nonlinear Anal.: Real World Appl. 14 (2013) 294–313.
[4] L. Barreira, C. Valls, J. Llibre, Integrability and limit cycles of the Moon-Rand system, Int. J. Nonlin. Mech. 69 (2015) 129–136.
[5] J. Llibre, C. Valls, Hopf bifurcation of a generalized Moon–Rand system, Commun. Nonlin. Sci. Numer. Simul., 20 (2015) 1070–1077.
[6] B. Sang, Q. Wang, B. Fercec, Four Limit Cycles in a Generalized Moon-Rand System with Fifth-Order Perturbation, J. Nonlinear Funct. Anal. (2016), 1-12.
[7] J. Giné, C. Valls, The generalized polynomial Moon–Rand system, Nonlin. Anal.: Real World Applications, 39 (2018) 411–417

Biography: Rand joined the Cornell faculty in 1967 after receiving his doctorate from Columbia University. He was a visiting professor at the University of California at Berkeley in 1981 and at the University of California at Los Angeles in 1989. Rand received teaching awards from the Engineering College at Cornell in 1986, 1993, 1995, 2005, and 2008, and from the Mathematics Department in 2013. In 2017, Rand received the Thomas K. Caughey Dynamics Award from the ASME Applied Mechanics Division.

VIB INVITED KEYNOTE

TUESDAY, AUGUST 19 **8:10AM– 9:10AM**
SAN SIMEON A

POLYCATENATED ARCHITECTED MATERIALS FOR LOAD ADAPTIVE SOFT STRUCTURES

Chiara Daraio
G. Bradford Jones Professor
Mechanical Engineering and Applied Physics
California Institute of Technology

Abstract: In recent years, the development of architected materials has led to exciting advancements in mechanical metamaterials, particularly those exhibiting tunable mechanical properties. We recently introduced polycatenated architected materials (PAMs) that consist of topologically interlinked wireframe structures, like 3D chainmail fabrics. These materials can transition between fluid-like and rigid states, adapting to different loading conditions and external stimuli. The response of these materials depends on the particles' geometry and on the topology of their interlocks, transitioning between truss-like to granular-like as a function of the type of the external load applied. This talk will explore a few PAMs designs and their emerging responses governed by different contacts and interlocking mechanisms. These materials show potential applications in wearable impact protection, soft robotics, and stimuli-responsive technologies.

Biography: Prof. Daraio's work is focused on developing new materials with advanced mechanical and sensing properties, for application in soft robotics, wearable devices, and shock/vibration absorption. Her lab is interested in understanding how different physical functions in new materials arise from their micro- and meso-structure, in both ordered and disordered media. Some of the applications of her research include new materials and methods for acoustic imaging and thermal sensing for health monitoring, smart and tunable fabrics, as well as sustainable materials for packaging and construction. Her work is primarily experimental, but it is informed by numerical and analytical studies, which serve as a guide in new material design, fabrication, and validation of their properties.

VIB KEYNOTE: 2025 ASME MARY BAKER INDUSTRY ACHIEVEMENT AWARD

WEDNESDAY, AUGUST 20 **10:00AM–11:40AM**
SAN SIMEON A

AEROTHERMOELASTIC BEHAVIOR OF AEROSPACE STRUCTURES

Dr. Stephen "Michael" Spottswood
Senior technical staff, Aerospace Systems Directorate
Principal Aerospace Engineer, Structural Sciences Center
Air Force Research Laboratory, Wright-Patterson Air Force Base, Ohio

Abstract: Coupled aerothermoelastic, or fluid-thermal-structural interaction (FTSI), behavior is a necessary consideration for high-speed vehicles when assuming a "hot-structure" design approach. Hot structures, versus thermally protected ones, are weight-constrained (thinner-gauge metallic or composite) with (in-plane) confining sub- and surrounding structure. These constraints, along with the extreme and transient thermal and aero-induced loadings, result in nonlinear structural behavior that can be very challenging to predict. These prediction challenges manifest in uncertain and quite possibly non-conservative limit-state margins. To alleviate these challenges, the USAF Structural Sciences Center at Wright-Patterson AFB has been actively pursuing numerous unique and consequential FTSI experiments. The design and observations of these experiments has resulted in several validation challenge problems for the larger industry, academic, and laboratory communities, and complete datasets are available for distribution. The USAF has continued to pursue research relevant to hot-structures – designing/refining a series of experiments, measurement techniques and predictive capabilities with ongoing activities in USAF and international facilities. A historical overview, notable highlights, and recent results from these experimental campaigns will be shared to motivate FTSI research and provide greater context for collaboration with the aerothermoelastic research and technology communities.

Biography: Dr. Stephen "Michael" Spottswood is a member of the senior technical staff of the Air Force Research Laboratory, Aerospace Systems Directorate (AFRL/RQ), at Wright-Patterson Air Force Base, Ohio, and a Principal Aerospace Engineer in the Structural Sciences Center (SSC), where he leads a highly capable government, post-doctoral and academic research team. As a long-serving member of the SSC, Michael has led numerous basic-to-advanced development projects/programs and made lasting connections with the aerospace industry. He was the technical manager for the first SSC-led academic collaborative center—the Midwest Structural Sciences Center, U. of Illinois, Urbana-Champaign, 2006–2013. In 2012, Michael was selected to head the basic research mission of the SSC, leading the AFOSR interactions and forging strong connections with Arlington, EOARD and AOARD program officers. Michael's SSC aerothermoelastic research team is well recognized for their hypersonic structures research, e.g., 1st ever successful high-supersonic full-field observations/validation of aerospace structure at the Arnold Engineering Development Center (AEDC) von Kármán aerothermal wind tunnel (VKF-C). Michael excels at leading diverse teams focusing on multi-discipline aerospace problems and enjoys designing and executing complex experiments exploring deleterious structural behavior and then reconciling predictions and measurements. Michael was the first USAF recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE, 2010), a 2015 AFRL Commander's Cup/Richard Neal Special Recognition Award winner, 2017 Courtland D. Perkins Award winner, 2022 S.D. Heron Award winner, and is a Fellow of the American Society of Mechanical Engineers.

Special Sessions & Panels

STUDENT HACKATHON

SUNDAY, AUGUST 17 **9:00AM–6:00PM**
AVILA A & SAN SIMEON A/B & HUNTINGTON A

Description: The Computer & Information in Engineering (CIE) Division of the American Society of Mechanical Engineers (ASME) held past hackathon events at the IDETC/CIE 2020, 2021, 2022, 2023, and 2024 Conferences. These hackathon events provide students and engineering practitioners with a unique opportunity to learn how data science and

machine learning techniques can be leveraged to solve real-world engineering problems.

STUDENT NETWORKING EVENT

SUNDAY, AUGUST 17 **5:30PM–6:30PM**
LAGUNA A

We've put together an engaging and fun student networking event that we're confident you'll find valuable. The networking event will serve as an opportunity to kickstart your IDETC.CIE experience and foster valuable relationships with fellow students. Expand your professional network and connect with like-minded peers throughout the conference. We hope you can attend.

WOMEN IN CIE NETWORKING EVENT

SUNDAY, AUGUST 17 **6:30PM–8:00PM**
HUNTINGTON B

Description: The CIE Division is hosting a one-hour networking event at the 2025 IDETC-CIE on Sunday, August 17, from 6:30 PM to 7:30 PM, including a reception. This event is designed to recognize the contributions of those from nontraditional backgrounds in engineering, celebrate achievements within the ASME community, and foster professional networking and mentorship opportunities.

The event will be kicked off by Tom Costabile, Executive Director of ASME, and will feature a panel discussion. Topics will include the impact of emerging technologies—such as Modeling and Simulation, Digital Twins, Machine Learning, and Artificial Intelligence—and how these innovations are helping to broaden access and opportunity across the field.
All IDETC-CIE 2025 participants are welcome to attend this networking event.

Moderator:
Dr. Christina Wang, *ABS*

Panelists:
Dr. Uma Jayaram, *Electronic Arts*
Dr. Mareike Kritzler, *Siemens*
Dr. Astrid Layton, *Texas A&M University*
Dr. Janis Terpenny, *George Mason University*
Dr. Christine Toh, *James Madison University*

MSNDC STUDENT BEST PAPER COMPETITION

MONDAY, AUGUST 18 **2:10PM–3:50PM**
PALOS VERDES A

Description: Presentations by Student Paper Competition finalists—Come learn about the latest research in multibody systems, nonlinear dynamics, and control conducted by your student peers.

NAVIGATING CAREERS IN INDUSTRY AND ACADEMIA PANEL

MONDAY, AUGUST 18 **4:10PM–5:50PM**
SAN SIMEON A

Description: This panel is designed by Track VIB for graduate students and postdocs who are in the process of exploring career opportunities. The goal is to provide an informal discussion and Q&A session on career paths in industry, academia, and national labs. We hope to offer attendees insights on:

- The skills needed for success in different career paths
- Building a strong CV and professional network
- Preparing for the job market and job interviews
- Work-life balance and long-term career growth

Panel chair:
Brian Olson *(Chief Scientist, Johns Hopkins University)*

Panelists:
Games Gibert *(Associate Professor, Purdue),*
Ryan Monroe *(Assistant Professor, Oakland University),*
Garrison Flynn *(R&D Engineer, Los Alamos National Lab),*
Paul-Camille Kakou *(Senior Engineer, Tesla).*

We thank NSF DCSD Program for supporting this event within Track VIB.

CIE STUDENT POSTER SESSION

MONDAY, AUGUST 18 **6:00PM–7:00PM**
CALIFORNIA PROMENADE

Description: Join the CIE community in celebrating and viewing these student posters in a networking setting.

NSF/ASME STUDENT DESIGN ESSAY COMPETITION

TUESDAY, AUGUST 19 **4:20PM–6:00PM**
CALIFORNIA PROMENADE

Description: Students are invited to write essays on their vision for the future of design and manufacturing. These essays are then judged by a panel of faculty from across the United States. This contest has been going on since 1998, and at least ten previous winners have gone on to become faculty members. Essay winners receive funding to attend IDETC and present their work in the form of a poster. We gratefully acknowledge support from NSF.

AN OVERVIEW OF THE NSF DCSD PROGRAM/ VIB TRACK

TUESDAY, AUGUST 19 **4:20PM–6:00PM**
SAN SIMEON A

Session Organizers:
Marcello Canova, *National Science Foundation,*
Alexander Leonessa, *National Science Foundation*
Alena Talkachova, *National Science Foundation*
Yue Wang, *National Science Foundation*

Description: This panel is organized under Track VIB for faculty seeking funding support from the National Science Foundation (NSF), the Civil, Mechanical and Manufacturing Innovation (CMMI) Division, the Dynamic, Control and System Diagnostics (DCSD) Program. Program Directors of the DCSD program will lead this session. The session begins with an overview of the DCSD program, highlighting funding opportunities for the research communities engaged in nonlinear dynamics, structural dynamics, vibrations, acoustics, fluid-structure interactions, and metamaterials. Participants will also learn about specific initiatives aimed at supporting junior investigators, along with essential guidelines for preparing proposals. Key aspects of NSF's criteria for Intellectual Merit and Broader Impacts will be discussed to aid in writing competitive proposals. The session will include a Q&A segment. Participation is highly encouraged.

INVITED TECHNICAL SESSION SPEAKERS

MSNDC-01/VIB-01/MNS-01-01: NONLINEAR DYNAMICS AND CONTROL OF SMART STRUCTURES AND SYSTEMS

MONDAY, AUGUST 18 **2:10PM**
SAN SIMEON A

Kon-Well Wang, *University of Michigan*

Programming Smart Structures – From Wave Control to Mechano-Intelligence and Computing Embodiment

MSNDC-02/VIB-02-02: NONLINEAR DYNAMICS OF SYSTEMS AND NONLINEAR PHENOMENA

MONDAY, AUGUST 18 **4:10PM**
HUNTINGTON A

Alexander Vakakis, *University of Illinois at Urbana-Champaign*

Constructive Use of Intentional Nonlinearity in Dynamics and Acoustics

MSNDC-02/VIB-02-03: NONLINEAR DYNAMICS OF SYSTEMS AND NONLINEAR PHENOMENA

TUESDAY, AUGUST 19 **4:20PM**
PALOS VERDES A

James Gibert, *Purdue University*

Harnessing Viscoelasticity and Instability: From Snap-Through Structures to Bioacoustics and Mechanical Computation

VIB-04/MSNDC-04-02: DATA-DRIVEN AND MACHINE LEARNING TECHNIQUES IN VIBRATIONS AND DYNAMICS

TUESDAY, AUGUST 19 **9:20AM**
HUNTINGTON A

Keegan Moore, *Georgia Institute of Technology*

Data-Driven, Physics-Based Identification and Modeling of Nonlinear Vibrating Structures

VIB-05/MSNDC-05-01: DYNAMICS OF BIOLOGICAL, BIO-INSPIRED AND BIOMIMETIC SYSTEMS

MONDAY, AUGUST 18 **9:10AM**
SAN SIMEON B

Nick Gravish, *UC San Diego*

The Mechanics of Spring-Wing Flight and Self-Excited Oscillations in Insects and Robots

VIB-06/MSNDC-06-02: INDUSTRY APPLICATIONS OF VIBRATION, SHOCK, ACOUSTICS AND DYNAMICS

TUESDAY, AUGUST 19 **11:00AM**
SAN SIMEON A

Ali Kolaini, *JPL-California Institute of Technology/NASA*

Shock Testing and Analysis of Space Structures: Challenges Facing the Community

VIB-07-01: DYNAMICS AND WAVES IN SOLIDS, ACOUSTIC METAMATERIALS, AND ARCHITECTED MATERIALS

MONDAY, AUGUST 18 **2:10PM**
SAN SIMEON B

Pablo Tarazaga, *Texas A&M University*

A decade of non-reflective traveling waves in finite media and its applications

VIB-07-02: DYNAMICS AND WAVES IN SOLIDS, ACOUSTIC METAMATERIALS, AND ARCHITECTED MATERIALS

MONDAY, AUGUST 18 **4:10PM**
SAN SIMEON B

Mostafa Nouh, *University at Buffalo (SUNY)*

Acoustic Wave-Based Parallel Computing in Architected Materials

VIB-07-03: DYNAMICS AND WAVES IN SOLIDS, ACOUSTIC METAMATERIALS, AND ARCHITECTED MATERIALS

TUESDAY, AUGUST 19 **2:20PM**
SAN SIMEON B

Fabio Semperlotti

Exploring the Path to Non-Abelian Behavior in Topological Continuous Elastic Waveguides

VIB-07-04: DYNAMICS AND WAVES IN SOLIDS, ACOUSTIC METAMATERIALS, AND ARCHITECTED MATERIALS

WEDNESDAY, AUGUST 20 **8:00AM**
SAN SIMEON B

Parisa Shokouhi, *Purdue University*

Resonant Meta-Surface Design for Controlling Elastic Guided Waves

VIB-10-01: GENERAL DYNAMICS, VIBRATION, AND ACOUSTICS

TUESDAY, AUGUST 19 **11:00AM**
SAN SIMEON B

Michael Haberman, *The University of Texas at Austin*

Acoustic Scattering From Domains With Spatiotemporally Modulated Boundaries

Workshops & Tutorials

All workshops will be held on Sunday, August 17.

GETTING STARTED WITH TRIZ

9:00AM– 5:00PM
MONTEREY

Presenter: Jack Hipple, *TRIZ and Engineering Training Services*

Description: This workshop will provide an overview of the origin and basis of TRIZ problem solving, its basic fundamentals, the TRIZ algorithm, and its role in improving the efficiency of problem solving and contradiction resolution, including applications in the business arena.

Morning

- History, Uniqueness, and Basis of TRIZ
- TRIZ versus Psychological Approaches
  - o Examples and Illustrations
- Patterns of Invention
  - o Examples
- TRIZ Algorithm
- Concepts of Ideal Final Result and Resource Utilization
  - o Examples and Case Studies

Afternoon

- Concepts of Ideal Final Result, Resource Identification and Use
  - o Examples and Case Studies
- Contradiction Resolution: Key to Breakthrough Inventions
- Contradiction Table and 40 Inventive Principles
  - o Examples and Case Studies
- Applications in the Business Area

APPLYING THE MONTESSORI PRINCIPLES IN HIGHER STEM EDUCATION: WHAT PROFESSORS CAN LEARN FROM KINDERGARTEN

9:00AM–1:00PM
AVILA B

Presenters: Ada-Rhodes Wish and Lauren Bertelsen

Description: While the principles of Montessori education have been widely studied and implemented for learners from birth through adolescence, its principles remain largely unexplored in higher education. This workshop invites participants to reimagine graduate education through a Montessori lens, exploring how Montessori approaches and the principles of prepared environment, play is work, freedom within limits, observation, independence, hands on learning, and respect can be adapted to undergraduate and graduate education. This workshop will present a two-year case study at the University of Nebraska Omaha on the design and outcomes of Technology and Innovation Studio, a unqiue Montessori-inspired graduate course at the center of our Human-Centered Computing (HCC) master's degree.

Participants in this hands-on workshop will:

- Learn how Montessori principles were adapted for a higher education
- Examine data on student outcomes
- Engage in collaborative work to map Montessori principles onto their own programs or courses
- Learn from what K-12 does well
- Gain practical tools for designing Montessori-inspired learning environments

The objective of this workshop is for educators, administrators, and curriculum designers to rethink what design, engineering, and technology education can look like.

Agenda

- 0:00-0:10 – Introductions and Icebreaker
- 0:10-0:20 – Montessori History, Principles, and Methods
- 0:20-0:30 – Case Study: Technology Innovation Studio
- 0:30-1:00 – Small Groups 1: Identify which principles you are and are not already addressing and ideate on ways to address gaps in existing structure
- 1:00-1:30 – Discussion 1: Present what people observed in small groups and discuss shared insights and challenges on implementing Montessori principles
- 1:30-2:00 – Small Groups 2: Ideate on how to address discussed challenges
- 2:00-2:30 – Discussion 2: Present ideated solutions to challenges and how to apply them to your own courses
- 2:30-3:30 – Small Groups 3 (sorted by area of interest): Layout a rough 16 week curriculum applying the Montessori principles and describe the Prepared Environment
- 3:30-4:00 – Discussion 3: Present Develop Course Concepts

4TH WORKSHOP ON TRENDS IN HUMAN-AI TEAMING FOR ENGINEERING DESIGN: ALL ABOUT CAD

2:00PM–5:00PM
SANTA MONICA

Presenter: Christopher McComb

Description: Advances in AI, particularly large language models and generative methods, are creating new opportunities for human-AI teaming within engineering design workflows. Nowhere is this more apparent than in the integration of AI with CAD and simulation tools, where human designers and AI agents can collaboratively model, analyze, and refine complex systems. This workshop brings together researchers exploring how AI can become an effective teammate in these environments, with a focus on novel interaction paradigms, co-creative workflows, and the evolving role of engineers in AI-augmented design processes.

HOW IMPLICIT ASSOCIATIONS OF SOCIAL NORMS CAN BE OPERATIONALIZED IN ENGINEERING DESIGN PRACTICE AND EDUCATION

2:00PM–5:00PM
CARMEL

Presenter: Samantha Kang, *Oregon State University*

Description: Social norms and biases, like implicit gender bias, play a critical yet overlooked role in shaping design decision-making, engineering outcomes, and human computer interaction futures. Implicit gender bias has been shown to significantly limit problem solving capabilities important to design innovation and create design outcomes that unintentionally exclude or harm users. Explicit debiasing methods in engineering design present an opportunity to understand and actualize inclusive product innovation for all individuals.

In this workshop, we present the ASME design community with research on the intersection of implicit gender biases and design. We provide an alternative framework to conceptualize how technologies can evolve over time. Through interactive discussion and reflection, participants will explore how social norms intersect with product development through activities such as:

- Taking the Gender-Design Implicit Association Test (IAT) to gain firsthand insight of your gendered associations in a design context
- Developing IATs or related implicit association measures for use in their own research agendas
- Engaging in gender-inclusive curriculum development that can be implemented into researcher's own teaching and research
- Brainstorming stimuli for the iterative development of the Gender-Design IAT or other social norm IATs and helping to refine the tool for future use in research and education

By the end of the workshop, participants will leave with a deeper understanding of implicit gender bias and its role in design cognition, how the IAT can be implemented into their own research, and pedagogical tools to challenge bias in engineering education and practice.

OPTIMAL CONTROL: A HANDS-ON INTRODUCTION IN MATLAB AND SIMULINK

9:00AM–1:00PM
EL CAPITAN B

Presenter: Jordan Olson

Description: In today's complex systems, traditional control techniques often fall short when faced with multiple competing objectives. Optimal control techniques address these challenges by defining and adhering to control laws based on optimality criteria.

This workshop will delve into three such techniques:

- Extremum Seeking Control (ESC)
- Model Predictive Control (MPC)
- Reinforcement Learning (RL)

These methods are revolutionizing decision-making across various industries, including industrial automation, energy production, aerospace, autonomous driving, and robotics.

In this hands-on workshop, you will not only learn the fundamentals of ESC, MPC, and RL but also apply these techniques to real-world control problems. The hands-on segment of the workshop will use specialized tools in MATLAB and Simulink that are purpose-built for designing, tuning, and simulating optimal controllers.

SUSTAINABLE OPTIMAL ENGINEERING DESIGN

9:00AM–1:00PM
EL CAPITAN B

Organizer: Nand K Jha, Professor, *Mechanical Engineering Department, Manhattan College*

Description: There are many sound reasons why environmental issues should be considered in the design and product development process. They help us meet customer and legislative requirements. They put us in a stronger competitive and commercial position. They play a major part in ensuring we maintain innovative credibility. But most of all, they help us achieve our ambition of reducing the overall environmental impact of our products across their lifecycle.

Here we want to demonstrate the environmental impacts of bearings in terms of embodied energy (energy consumed during production), carbon footprint, and eco-indicators of bearing range for a variety of application. New bearings designed on the concept of green design include seal technologies (hard seal coatings and surface design); light-weight parts

(polymers), and “lub-for-life” thin film lubrication, which makes re-lubrication unnecessary throughout a bearing’s lifespan. An estimated 50 billion bearings are in use at any time and reduction in energy consumption by a 30–70% depending on the type of use can be tremendous savings in energy. It would consequently reduce carbon dioxide emissions in atmosphere as well as savings in resources and money. It will also lead to enormous reduction in the lubricant disposal. Ships trading in the world’s oceans and seas can eliminate both operational and accidental stem tube oil pollution, while also reducing their operating costs.

In this age of Industry 4.0, the design principles and practice must include the nature of industry today not 100 years old practices. The topics included are most of the concerns and ideas discussed briefly above.

The lecture and presentation should attract experts and professionals from industry as well as academia. I have noticed in past instructors teaching such courses and researchers including Ph.D. candidates are interested in such topics and lectures.

Topics:

- 1. Sustainability and Ecological Considerations in Engineering Product Development
- 2. Mathematical techniques used in sustainable optimal design, including Life Cycle Analysis (LCA) for engineering design
- 3. Sustainable Consideration and Mathematics of Recyclability, Reuse, and Circular Economy
- 4. Practical and useful applications of sustainability in green power generation, disassembly and recycling, and time elements in assembly and disassembly
- 5. Ecological considerations and sustainability in manufacturing
- 6. Green design and manufacture of sustainable products in the age of Industry 4.0

GENERATIVE DESIGN THINKING: A CONVERGENCE FROM EVOLUTIONARY COMPUTATION, TOPOLOGY OPTIMIZATION, AND GENERATIVE AI

9:00AM–1:00PM
SANTA MONICA

Presenter and Moderator: Zhenghui Sha, *Assistant Professor, UT Austin*

Invited Speakers:

Molly Goldstein, *Teaching Assistant Professor, Product Design Lab Director, UIUC*
Anastasia Schauer, *Assistant Professor, UT Austin*
John Clay, *Research Scientist Assistant, UT Austin*
Charles Xie, *Founder and CEO, Institute for Future Intelligence*
Daniel Banach, *Senior Technical Manager, Education Group at Autodesk Inc.*

Description: The overall goals of our proposed workshop are to 1. present invited speakers’ research and 2. promote discussion on (a) Generative Design (GD), a new paradigm for engineering design which uses generative artificial intelligence (AI) to automate design space exploration and provide high-performance designs unattainable via traditional human-driven design, and (b) Generative Design Thinking (GDT), the high-level cognitive approach of the human designer using generative-AI tools in the design process. The first half of the half-day workshop will feature presentations and Q&A sessions on GD and GDT from researchers, domain experts, and industry practitioners outlining their previous work, experience, and/or opinions on GD/GDT in academia and industry. The second half will consist of a hands-on group activity/discussion in which each attendee will solve a design prompt using one of three computational approaches (evolutionary computation, topology optimization, or generative AI and then (as a group) describe their cognitive approach to using these tools as well as the implications to design research and education.

FROM LAB TO MARKET: INNOVATION, LICENSING, AND ENTREPRENEURSHIP FOR ENGINEERING FACULTY

2:00PM–5:00PM
EL CAPITAN A

Presenter: Anurag Purwar, PhD., *NSF I-Corps PI and Direct*

Description: To equip engineering faculty with practical tools and frameworks to translate research into impactful ventures, understand commercialization pathways, and explore federal funding opportunities through programs like NSF I-Corps and SBIR/STTR. We will also delve deeper in business model canvas, value propositions, and customer segments.

FROM DATA TO DESIGN: CHALLENGES AND OPPORTUNITIES ACROSS INDUSTRY AND ACADEMIA

9:00AM–5:00PM
MALIBU

Presenters:
Dr. Faez Ahmed, *Associate Professor, Massachusetts Institute of Technology*
Dr. Wei Chen, *Assistant Professor, Texas A&M University*
Dr. Namwoo Kang, *Associate Professor, Korea Advanced Institute of Science & Technology*
Dr. Yanxia Zhang, *Senior Research Scientist, Toyota Research Institute*

Description: This workshop builds upon our successful sessions from the last two years (2023 and 2024), which attracted a broad range of participants from academia and industry. Over the past editions, we explored recent advances and best practices in data-driven engineering design, featuring invited speakers and interactive discussions on how data can streamline, optimize, and revolutionize design processes. For the 2025 edition, we will extend these conversations to encompass emerging topics such as foundation models, advanced simulation methods, and commercial integration strategies. By bringing together experts from both academic and industrial research, we aim to foster cross-disciplinary collaborations and insightful discussions about the future of engineering. Attendees will engage in hands-on activities to identify critical challenges, brainstorm innovative solutions, and network with leaders in the field. Participants can expect practical insights into new methodologies, exposure to cutting-edge software demonstrations, and opportunities to form interdisciplinary collaborations.

DATA MANAGEMENT AND DIGITAL TWINS FOR ADVANCED MANUFACTURING

9:00AM–1:00PM
EL CAPITAN A

Presenters:
Abheek Chatterjee
Shengyen Li
Hyunwoong Ko
Farhad Imani
Dawn Tilbury

Description: The advanced manufacturing paradigm is to create products using innovative technologies and qualify the products in real-time. Digital twins (DTs), employing advanced data, computations, and software tools with physical assets, have the potential to design, monitor, and qualify manufacturing processes and products. For example, machine learning algorithms can cost-effectively recognize the patterns of real-time sensing signals and identify the abnormal steps. The DT technology can help address issues at each stage of the product development lifecycle, including design, manufacturing planning, process control, and product qualification. Many DT examples have proven its capability; however, the development of DTs requires large amounts of high-quality data and an advanced integration infrastructure for combining digital information from multiple sources. Additionally, statistical tools and machine learning models are needed to ensure data quality and consistency efficiently and effectively. Thus, integrating data, computations, and software tools is critical to helping realize DTs for AM.

This workshop contains three main topics:

- 1. Overview of the digital thread and digital twin concepts throughout the manufacturing lifecycle (key principles of these concepts)
- 2. Data management infrastructure for DTs
- 3. Modeling and machine learning
- 4. Use Cases: DTs for robotics and additive manufacturing

ADVENTURES IN TRADESPACE EXPLORATION

2:00PM–5:00PM
AVILA B

Presenter: Meredith Sutton

Description: This workshop will provide participants with an understanding of tradespace exploration (TSE) and its role in the design process. Participants will be introduced to the activities involved in tradespace exploration and analysis, as well as comparisons between TSE and similar exploration and analysis approaches including Design Space Exploration and Analysis of Alternatives. Potential use cases and opportunities for TSE implementation in existing design processes will also be presented.

Participants will then take part in a discussion about their current practice of TSE, highlighting the challenges and successes of the process. They will then collectively develop recommendations for improving the practice and instruction of TSE. An example tradespace will be presented to demonstrate the stages of the TSE process and how simple TSE activities can be integrated into academic settings. Participants will then complete a design activity in teams using the introduced tradespace, simulating a multi-stakeholder tradespace exploration problem.

SIMSCAPE MULTIBODY – AN INTRODUCTORY HANDS-ON WORKSHOP

9:00AM–1:00PM
CARMEL

Presenter: Mehdi Vahab

Description: This is an introductory interactive workshop on the fundamentals of rigid-body multibody modeling and simulation with Simscape Multibody. The audience will gain a working knowledge of modeling such systems to create the systems of their choice for academic and industry applications. They will learn how to model bodies based on the fundamental geometries and operations (or import CAD files), use frames for positioning and orientation, and assembling and actuation of multibody systems. The multibody systems will be used for system design, analysis, and control in Simulink. We model robotic arms as a sample project. We also share multibody models in automotive, aerospace, and manufacturing with the attendees to facilitate starting their own multibody system modeling and simulation. This is a hands-on workshop. Attendees are encouraged to bring their own laptops to accomplish simple tasks and exercises during the workshop. Required software licenses will be shared with the attendees.

Committee Meetings

ROOM	EVENT	TIME
SUNDAY, AUGUST 17		
Capistrano B	DED Executive Committee Meeting (Closed)	2:00PM-5:00PM
Salinas	CIE Executive Committee Meeting (Closed)	7:30PM-8:30PM
MONDAY, AUGUST 18		
Catalina 1	DED General Meeting	5:00PM-5:50PM
Salinas	AVT Committee meeting	6:00PM-7:00PM
Laguna B	DEC TC Meeting	6:00PM-7:00PM
Catalina 3	DFMLC TC Meeting and Awards	6:00PM-7:00PM
Avila A/B	DTM TC Meeting	6:00PM-7:00PM
Catalina 7	FPST Exec Committee	6:00PM-7:00PM
San Simeon A	TCVS Committee Meeting	6:00PM-8:00PM
San Simeon B	TCVS Committee Meeting	6:00PM-8:00PM
TUESDAY, AUGUST 19		
Catalina 1	JMR Meeting	12:20PM-2:20PM
El Capitan A	CIE – Artificial Intelligence and Machine Learning (AI/ML)	6:10PM-7:10PM
El Capitan B	CIE – Advanced Modeling & Simulation (AMS)	6:10PM-7:10PM
Carmel	CIE – Computer-Aided Product and Process Development (CAPPD)	6:10PM-7:10PM
Monterey	CIE – Systems Engineering, Info., & Knowledge Management (SEIKM)	6:10PM-7:10PM
Santa Monica	CIE – Virtual Environments and Systems (VES)	6:10PM-7:10PM
Laguna A	DAC Committee/Town Hall Meeting	6:10PM-8:10PM
Catalina 4	MESA Committee Meeting	6:10PM-7:10PM
Palos Verdes B	MNS Committee Meeting	6:10PM-7:10PM
San Simeon A	TCVS New Member and Industrial Liaison Subcommittee Meeting	6:10PM-7:10PM
Malibu	MR Committee Meeting	6:10PM-8:10PM
Huntington A	MSNDC TC Meeting	6:10PM-8:10PM
Santa Monica	CIE General Committee Meeting	7:10PM-8:10PM

Division Leadership

COMPUTERS & INFORMATION IN ENGINEERING DIVISION EXECUTIVE COMMITTEE (CIE)

Krishnanand Kaipa
Old Dominion University
Chair

John Steuben
Naval Research Laboratory
Vice Chair

Gaurav Ameta
Siemens
Member

Xiaozhi (Christina) Wang
American Bureau of Shipping
Member

Satchit Ramnath
Clemson University
Member

Marc Halpern
Gartner Inc.
Industry Liaison

Robert Wendrich
Rawshaping Technology Research & Innovation RBSO
Chair

DESIGN ENGINEERING DIVISION EXECUTIVE COMMITTEE (DED)

Scarlett Miller
Pennsylvania State University
Chair

Mary Frecker
Pennsylvania State University
Vice Chair

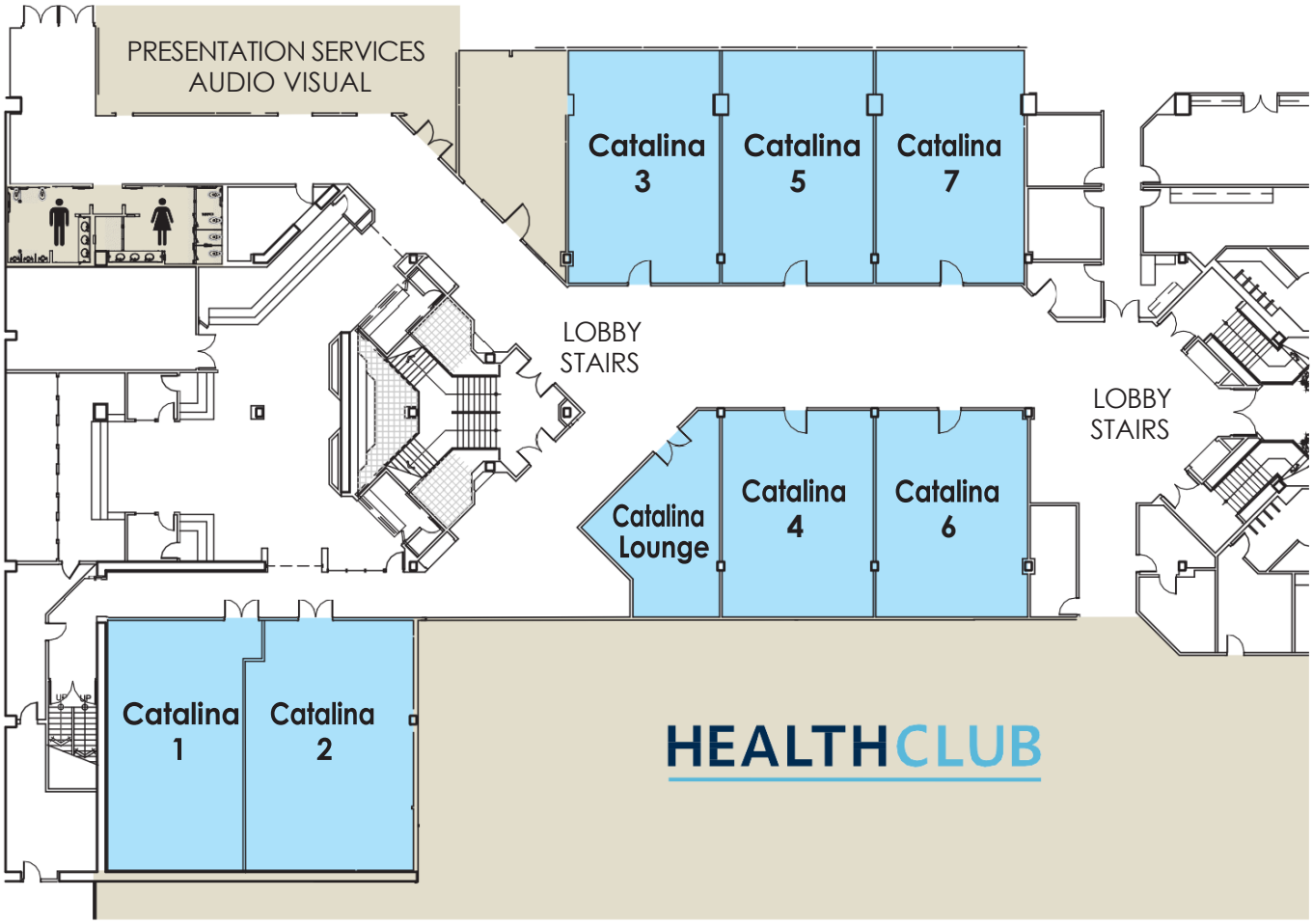
Christine Toh
University of Nebraska Omaha
Technical Committee Executive

Brian Feeny
Michigan State University
Conference Executive

Stefano Lenci
Polytechnical University of Marche
Awards

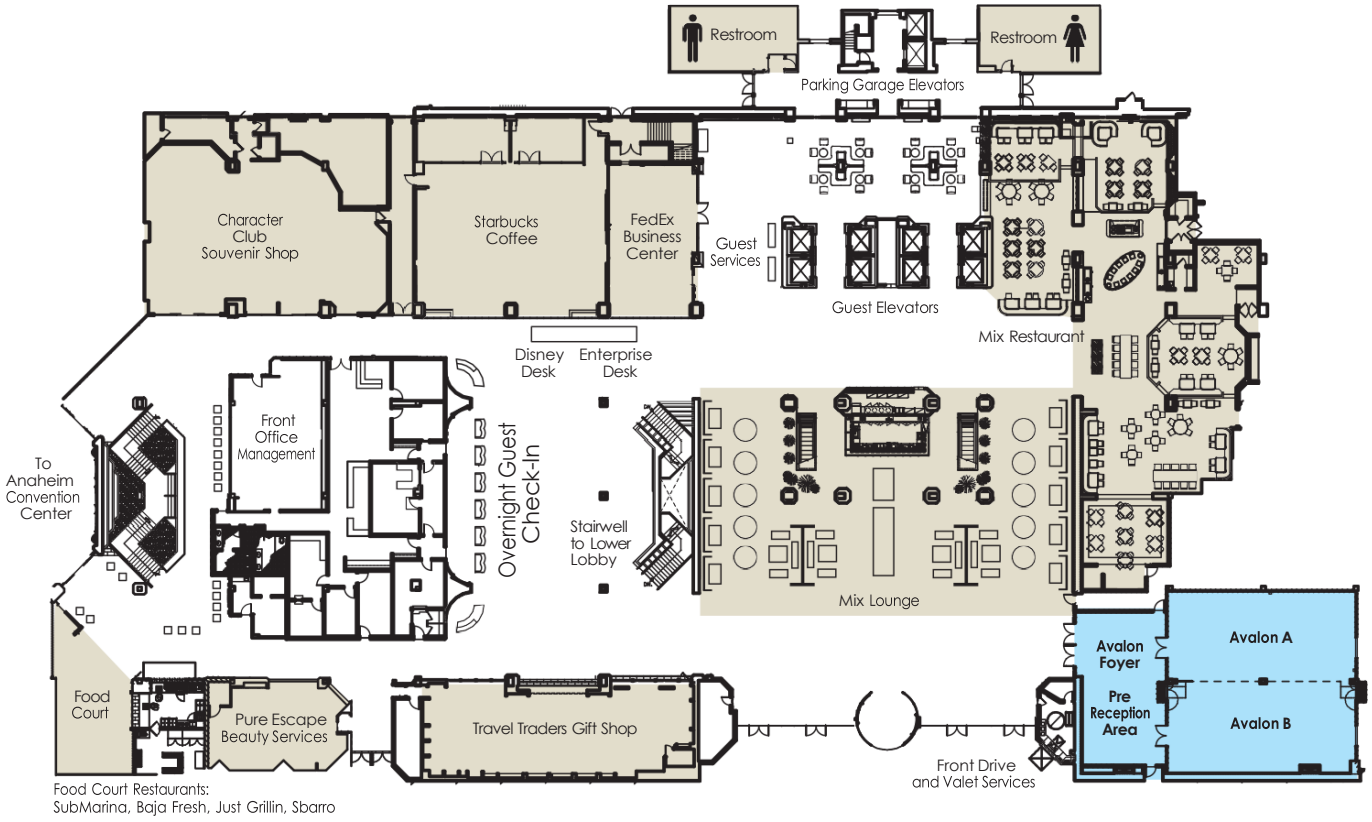
Scott Ferguson
North Carolina State University
Past Chair

CATALINA MEETING ROOMS - LOWER LOBBY

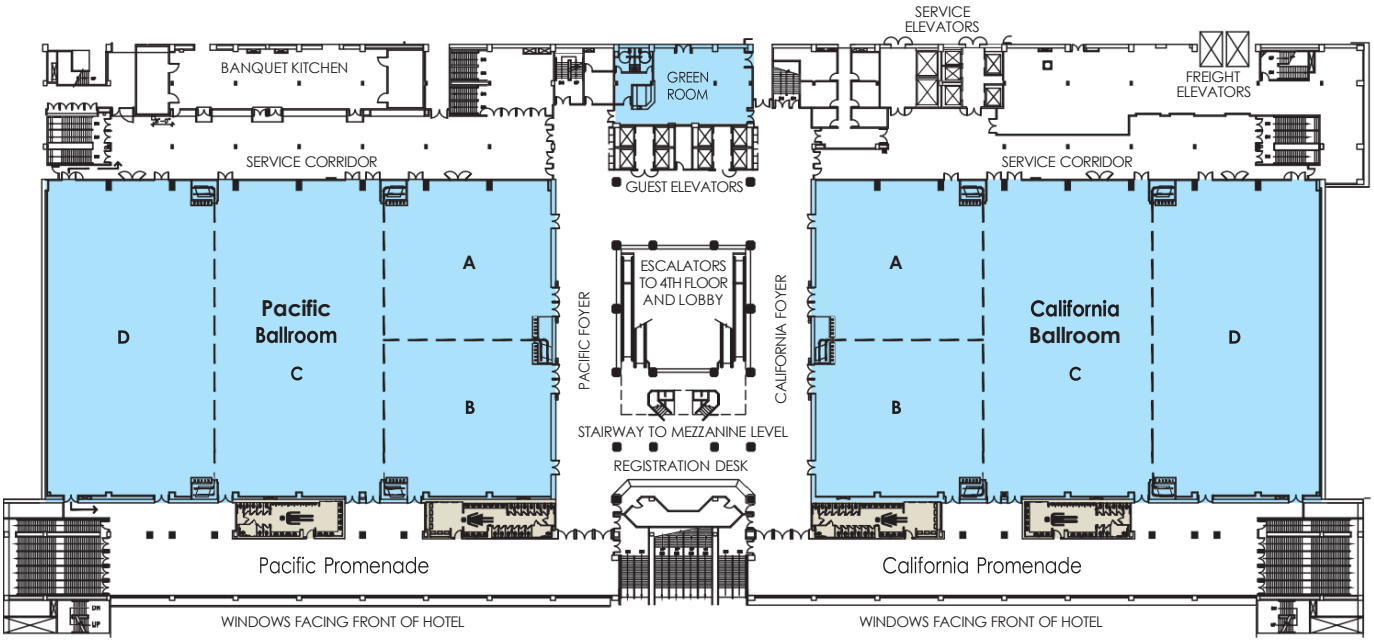


Hotel Floor Plans

LOBBY LEVEL - FIRST FLOOR

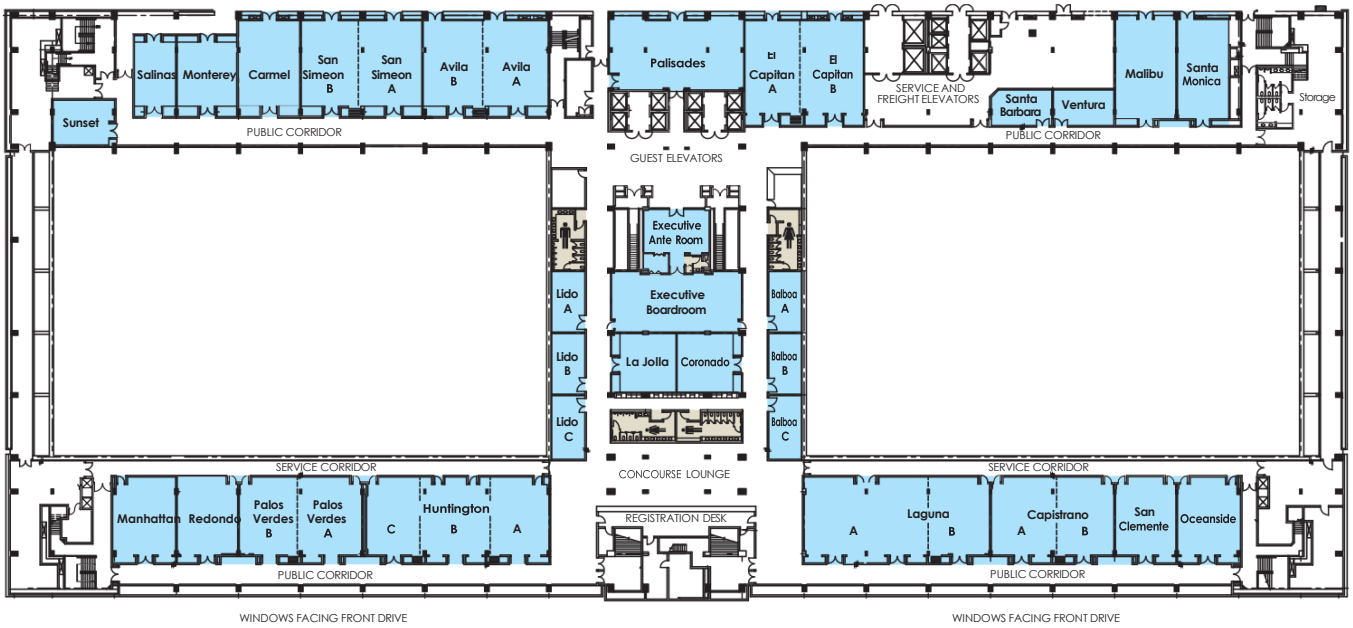


BALLROOM LEVEL - SECOND FLOOR



Hotel Floor Plans

CONCOURSE LEVEL - FOURTH FLOOR



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