

# Automation 5.0: automation everywhere for better and smarter living

## Conference Handbook

2024 IEEE 20th International Conference on Automation Science and Engineering  
August 28 – September 1, 2024, Bari, Italy



The source code for this handbook can be found at  
<https://github.com/nicomignoni/case24-booklet>.  
This template originates from [LaTeXTemplates.com](https://github.com/maximelucas/AMCOS_booklet) and is based on the one at  
[https://github.com/maximelucas/AMCOS\\_booklet](https://github.com/maximelucas/AMCOS_booklet)





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# Welcome Message

On behalf of the Organizing Committee, it is our great pleasure to extend a warm welcome to all participants attending the *IEEE 20th International Conference on Automation Science and Engineering (CASE 2024)*, taking place in charming Puglia, Italy, from August 28 – September 1, 2024. As one of the flagship conferences of the IEEE Robotics & Automation Society, CASE is a prestigious international platform for researchers and practitioners to present and discuss their cutting-edge work in the automation field. We are delighted to host this significant event in Puglia, an idyllic, sun-kissed region on the Adriatic Sea coast, known for its rich history, vibrant culture, and warm hospitality.

CASE 2024 brings together various activities, including plenary and keynote sessions, contributed paper sessions, workshops, engaging industry panel discussions, and several social events. The conference will focus on the theme "Automation 5.0: Automation Everywhere for Better and Smarter Living" and will cover a wide range of topics such as Systems, Automation, Control Theory, Autonomous Systems, Discrete Event Systems, Smart Cities, Robotics, Building Automation, Smart Mobility, Information and Communication Technologies, and Factory 4.0.

This year marks a milestone in CASE's history as we celebrate the 20th anniversary of this conference. Since its first edition in 2005 in Edmonton, Alberta, Canada, CASE has become a cornerstone event in the automation community, fostering innovation, collaboration, and knowledge exchange. We invite you to commemorate this special anniversary with celebratory activities.

CASE 2024 is already a resounding success, drawing more than 900 participants from around the globe and more than 20 industrial, scientific, and institutional sponsors, making this conference an outstanding event. We received an overwhelming number of submissions from more than 50 countries. The conference saw a 28% increase in regular paper submissions and a 67% increase in special session paper submissions compared to last year. The conference received 44 special session proposals, marking a 29% increase from the previous year. In total, 721 regular and special session papers were submitted, of which 544 were accepted. Additionally, we received 133 presentation-only papers, including 48 RAL/T-ASE/T-RO papers. Lastly, CASE 2024 received 17 workshop proposals of extremely high quality.

This year, we introduced a Call for Application Video for the first time, receiving more than 80 submissions. In line with our commitment to diversity and inclusion, CASE 2024 also featured a new Call for Diversity and Inclusion Activities, encouraging proposals that broaden participation in automation science and engineering and encompass various dimensions of diversity.

Besides the traditional awards such as the *Best Conference Paper Award*, *Best Application Paper Award*, *Best Student Paper Award*, and the *Best Healthcare Automation Paper Award*, we are proud to present for the second time the *Peter Luh Memorial Best Paper Award for Young Researcher*, which has now become an official IEEE award. This award was established in honor of Professor Peter Luh's dedicated service to raising the profile of automation and supporting young researchers early in their careers. This year, the conference also established the *Best Short Paper Award* and

the *Best Application Video Award*. This year the *IEEE T-ASE Best Paper Award* and *IEEE T-ASE Best Application Paper Award* will be presented at CASE.

Several opportunities were available this year to participants. RAS established the traditional Travel Support, Social Media Ambassador, and IDEA Travel Support. This year, we introduced several new opportunities. We sent out a call for Student Volunteers, providing 15 students from all around the globe with the opportunity to participate in the conference for free. Furthermore, we are thrilled to introduce the RAS Member Support Program (MSP) for CASE for the first time. This program aims to provide financial support to members who contribute to activities aligned with the RAS mission. The MSP offers a significant discount on registration fees. Additionally, we are pleased to offer onsite childcare support to facilitate parents' participation, with discounted options for IEEE RAS members.

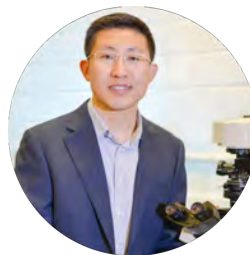
We extend our heartfelt gratitude to the Authors, Reviewers, Conference Editorial Board, Steering Committee, Organizing Committee, and volunteers whose dedication and hard work have made CASE 2024 possible.

Thank you for joining us in Bari for CASE2024. We look forward to a vibrant and enriching conference experience and to seeing the innovative contributions that will shape the future of automation.

*On behalf of the Organising Committee of IEEE CASE 2024*



Mariagrazia DOTOLI  
*General Chair*



Yu SUN  
*General Co-Chair*



Carla SEATZU  
*Program Chair*

The 2024 IEEE 20th International Conference on Automation Science and Engineering (CASE 2024) is one of the three flagship conferences of the IEEE Robotics & Automation Society and provides a primary forum for cross-industry multidisciplinary research in automation.

CASE 2024 will be held on August 28 – September 1, 2024, in charming Puglia (or Apulia), Italy. Puglia is a little slice of idyllic, sun-kissed Italia on the Adriatic Sea coast. An important economic center in Southern Italy, it is also a bridge between West and East with a multicultural, open, and friendly community.

The conference will focus on Automation 5.0: automation everywhere for better and smarter living and will include tutorials and workshops, a technical program of presentations, keynote lectures, and social events. The conference will cover a wide range of topics on Systems, Automation, Control theory, Autonomous Systems, Discrete Event Systems, Smart Cities, Robotics, Building Automation, Smart Mobility, Information and Communication Technologies, and Factory 4.0.

## **History of CASE: Celebrating 20 Years of Innovation and Progress in Automation**

The Conference on Automation Science and Engineering (CASE) is an influential annual event organized by the IEEE Robotics and Automation Society. Since its establishment in Edmonton 2005, CASE has provided a dedicated platform for researchers, academics, and industry professionals to share and discuss advances in automation science and engineering. This initiative arose from the recognition of the increasing importance of automation in various industrial and research domains. In its early years, CASE focused on foundational topics such as control systems, robotics, discrete event systems, and manufacturing automation. The conference aimed to bridge the gap between theoretical advancements and practical applications, fostering interdisciplinary collaboration and innovation. This approach quickly garnered attention and the conference grew in prominence, attracting a global audience eager to explore the latest developments in automation.

Between 2011 and 2015, CASE broadened its thematic scope to include emerging areas such as biomedical and sustainable automation, service robotics, and smart systems. This period marked the conference's expansion in terms of both subject and geographic reach. By rotating its location globally between America, Asia, and Europe, CASE reflected its international significance and fostered greater diversity in participation. Additionally, the conference placed a stronger emphasis on workshops, special sessions, and industry panels, enhancing opportunities for networking and collaborative research. This focus on interaction and practical application helped solidify CASE's reputation as a premier event in the field.

From 2016 to the present, CASE has embraced and integrated advancements in artificial intelligence, machine learning, and the Internet of Things (IoT) into the realm of automation science and engineering. The conference has continued to promote interdisciplinary research, addressing

complex challenges in various sectors such as healthcare, transportation, and energy. This era also saw CASE adapting to global circumstances, particularly the COVID-19 pandemic, by adopting virtual and hybrid formats. These adaptations ensured that the conference could continue its mission of knowledge sharing and engagement despite the challenges posed by the pandemic. Recent conferences have also placed a spotlight on sustainability and ethical considerations in automation, reflecting broader societal concerns and the need for responsible innovation.

Throughout its history, CASE has significantly contributed to the body of knowledge in automation science and engineering. By publishing high-quality research and fostering a culture of innovation, CASE has built a strong community of professionals dedicated to advancing automation technologies and their applications. The conference has not only kept pace with technological advancements but has also anticipated and shaped future trends in the field. As it continues to evolve, CASE addresses new challenges and opportunities in automation, maintaining its relevance and leadership.

Overall, CASE has grown from a niche event to a key global forum that shapes the future of automation. Its comprehensive and inclusive approach has ensured that it remains at the forefront of the field, driving progress and fostering a collaborative international community. The conference's legacy of promoting interdisciplinary research, practical innovation, and ethical considerations continues to influence the direction of automation science and engineering worldwide.

Since CASE 2024 is the 20th CASE conference, this anniversary will be celebrated at the conference through different events, including videos and presentations. We will hear how CASE was initiated and get short memories from the former conferences in Edmonton 2005, Shanghai 2006, Scottsdale 2007, Arlington 2008, Bangalore 2009, Toronto 2010, Trieste 2011, Seoul 2012, Madison 2013, Taipei 2014, Gothenburg 2015, Fort Worth 2016, Xi'an 2017, Munich 2018, Vancouver 2019, Hong Kong 2020, Lyon 2021, Mexico City 2022, and Auckland 2023. Some statistics will also confirm the conference's growth, for instance, the increase by a factor of seven in the number of papers from the first CASE conference to this year's CASE in Bari.

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IEEE RAS (Robotics and Automation Society) is a global society within the IEEE focused on advancing the theory and practice of robotics and automation engineering and science. It supports research, development, and education in these fields, providing a platform for professionals, researchers, and students to collaborate, share knowledge, and promote technological innovation in robotics and automation.



IEEE (Institute of Electrical and Electronics Engineers) is a global professional association dedicated to advancing technology for the benefit of humanity. It provides resources for professionals in electrical engineering, computing, and other technological fields, promoting innovation and excellence.

## Sponsors and Exhibitors

### Silver Sponsors



Intesa Sanpaolo, with over €422 billion in loans and €1.35 trillion in customer financial assets at the end of June 2024, is the largest banking group in Italy, with a significant international presence. It is a European leader in wealth management, with a strong focus on digital and fintech. The Group will provide €115 billion of Impact lending by 2025 to support communities and the green transition, together with a €1.5 billion program (2023-2027) to help people in need. The Bank's network of museums, the Gallerie d'Italia, hosts its owned artistic heritage and cultural projects of recognized value.

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Istituto MINDS is an Italian research organization that specializes in innovation across various fields, functioning as a social enterprise and promoting technological competitiveness through Open Innovation. It collaborates with universities and companies, offering professional training and strategic consultancy to enhance processes and support research and development.



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# BECKHOFF

Beckhoff is a German company known for its PC-based automation solutions, integrating open automation systems for machine building, manufacturing, and building automation. The company emphasizes innovation, flexibility, and high performance in its products.



BionIT Labs is an Italian medtech company specializing in the development of innovative prosthetic devices. The company combines advanced technology with user-centered design to create highly functional and intuitive solutions that improve the quality of life for individuals with limb loss.



E80 Group is one of the leading providers of automated intralogistics solutions, offering advanced hardware and software systems for materials handling and management. Their portfolio covers the entire process from raw material receiving to warehousing and shipping. The company's integrated solutions are designed to improve factory and distribution center efficiency, flexibility, and safety.

e-distribuzione

e-distribuzione Spa is the largest electricity Distribution System Operator (DSO) in Italy, serving approximately 32 million consumers through a network of over 1.1 million kilometers. As a subsidiary of the Enel Group, it focuses on enhancing grid resilience, integrating renewable energy sources and developing smart grid technologies to improve service quality and support energy transition initiatives.



ICAM, an Italian logistics company established in 1957, specializes in automated storage and retrieval systems for various industries, including industrial, retail, healthcare, and city logistics sectors. The company focuses on innovation and sustainability, offering solutions that enhance efficiency and interconnectivity within supply chains.



Magna is more than one of the world's largest suppliers in the automotive space. Magna is a mobility technology company built to innovate, with a global, entrepreneurial-minded team of over 179,000 employees across 343 manufacturing operations and 105 product development, engineering and sales centres spanning 28 countries. With 65+ years of expertise, their ecosystem of interconnected products combined with their complete vehicle expertise uniquely positions them to advance mobility in an expanded transportation landscape. For further information about Magna (NYSE:MGA; TSX:MG), please visit [www.magna.com](http://www.magna.com) or follow them on social.

# MASMEC

MASMEC is an Italian company that excels in precision engineering, particularly in the automotive and biomedical sectors. It is known for its advanced automation systems and commitment to innovation, ensuring high-quality, reliable products.



MediTech 4.0 - Mediterranean Competence Center 4 Innovation is the multi-regional Competence Center, selected in 2018 by the MISE among the eight centers of national importance, active in Puglia and Campania, born as a facilitator of the adoption of Industry 4.0 enabling technologies by SMEs and Public Administration and to be a tool for disseminating culture and innovation practices in the production of goods and services on the national territory, in particular in the Mediterranean basin. Meditech counts on the collaboration of 5 Universities from Campania, 3 Universities from Puglia and 21 cutting-edge industrial players.



Since 2004, PAL Robotics has focused on improving people's quality of life through service robotics. Their robots support domestic tasks and enhance industrial efficiency. Specializing in customizable robotic platforms, PAL Robotics introduced Europe's first fully autonomous humanoid biped robot. Now expanding into Italy, PAL Robotics brings over two decades of expertise, contributing to EU collaborative projects

and exploring opportunities for PNRR submissions. By collaborating on these initiatives, PAL Robotics aims to drive innovative research and deliver impactful results across various sectors in Italy, supporting both service industries and research institutions while pushing technological boundaries.



MICS (Made in Italy Circolare e Sostenibile) is a partnership between universities, research centers, and enterprises funded by the Italian Ministry of University and Research with support from the EU's NextGenerationEU (PNRR) program. It links businesses and research across public and private sectors, uniting their efforts. Currently, it involves three key Italian industrial sectors: Fashion, Furniture, and Factory Automation.



Tesmec Group is a leader in the market of technologies for infrastructures (overhead, underground and railway networks) related to the transport of energy, data and materials, and of technologies in surface mining. Born in Italy in 1951, the Group has expanded internationally thanks to its commitment to provide innovative and technologically advanced solutions for the development of infrastructure projects in the strategic macro sectors of energy transition, digitalization and sustainability.

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*G-nous Tech is an Italian company specialised in the integration of advanced solutions based on collaborative robotics and Artificial Intelligence, to streamline and enhance production processes. The company is an Universal Robots Certified System Integrator.*



*IEEE RAS (Robotics and Automation Society) Italy is a branch of IEEE dedicated to robotics and automation. It supports research, development, and education in these fields, fostering collaboration among professionals and researchers in Italy.*

## Technical Sponsors and Patronages



# Politecnico di Bari

*Politecnico di Bari is a prestigious Italian technical university known for its engineering, architecture, and industrial design programs. It emphasizes research and innovation, preparing students for successful careers in technology and engineering.*



*DEI (Dipartimento di Ingegneria Elettrica e dell'Informazione) at Politecnico di Bari specializes in electrical engineering and information technology. The department is committed to cutting-edge research, high-quality education, and fostering innovation in these fields.*



*SIDRA (Società Italiana Docenti e Ricercatori in Automatica) is an Italian association dedicated to professors and researchers in the field of automatic control. It promotes research, education, and the dissemination of knowledge in automation and control systems. SIDRA aims to foster collaboration among academia, industry, and research institutions to advance the development and application of automatic control technologies in various sectors.*



*I-RIM (Istituto di Robotica e Macchine Intelligenti) is an Italian institute dedicated to robotics and intelligent machines. It focuses on research, innovation, and the development of advanced*

robotic technologies to improve various industries.



## REGIONE PUGLIA

Regione Puglia is the regional government of the Puglia region in southern Italy. It is responsible for local administration, economic development, public services, and cultural promotion, focusing on enhancing the quality of life for its residents and fostering sustainable regional growth.



## COMUNE DI BARI

Città di Bari is the municipal government of Bari, Italy, responsible for local administration, public services, and urban development. It focuses on improving the quality of life for residents and fostering economic growth.



## Fondazione Puglia

Fondazione Puglia is a foundation that supports cultural, scientific, and social initiatives in the Puglia region of Italy. It funds projects that promote regional development, innovation, and community welfare.



## OIBA

ORDINE DEGLI INGEGNERI  
della Provincia di Bari

OIBA (Ordine degli Ingegneri della Provincia di Bari) is the professional association of engineers in Bari, Italy. It supports the professional development of its members, promotes engineering excellence, and ensures adherence to ethical standards.

## Official Carrier

## AIR FRANCE KLM

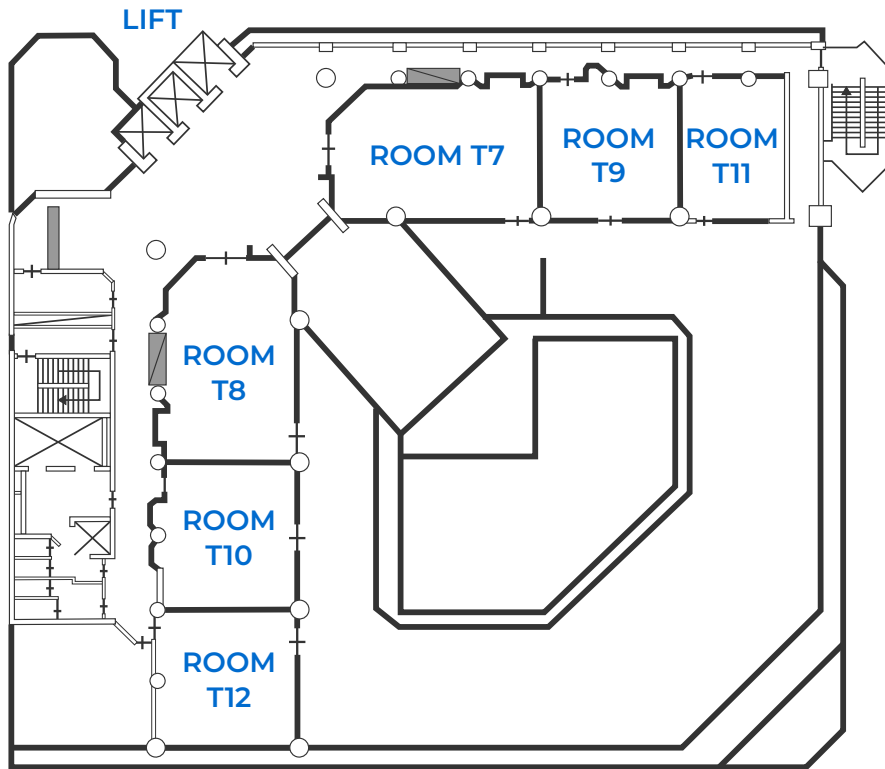
Air France-KLM is a major European airline group formed by the merger of Air France and KLM in 2004. It offers a wide range of passenger and cargo air transport services globally. The company is committed to providing high-quality service, operational efficiency, and sustainability in aviation, with a strong focus on innovation and customer experience.

# Main Conference Venue

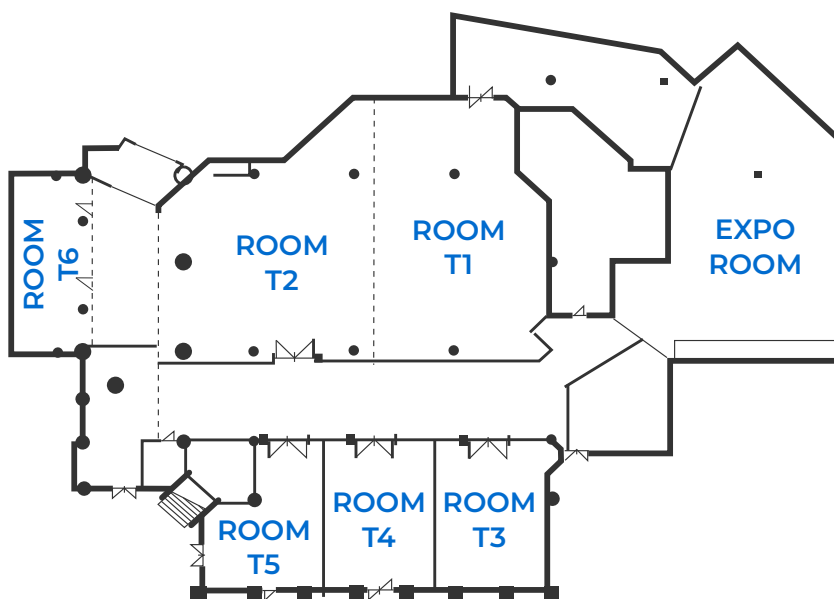
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2nd FLOOR



UNDERGROUND



# Timetable

Join us at the 20th International Conference on Automation Science and Engineering (CASE 2024) in Puglia (or Apulia), Italy, from August 28 to September 1, 2024. The conference will feature tutorials, workshops, technical presentations, keynote lectures, and social events, covering a wide range of topics such as Systems, Robotics, Smart Cities, and more.

The detailed CASE 2024 programme including papers, paper presentations and virtual access for remote registrants can be found through the InfoVaya Conference Platform and the InfoVaya Conference App.

## Legend

<b>Special Session</b>	<b>Virtual Session</b>
<b>Keynote</b>	<b>RAS SAC Social Event</b>

## Wednesday, 28 of August

9:30 11:00		<b>Free visit at Polytechnic University of Bari</b>	<b>CASE24 Summer School</b>
11:00 13:00	Registration Foyer		
13:00 14:00		Lunch Break	
14:00 16:00		<b>Technical tours at industrial companies</b>	
16:00 16:30		Coffee Break	
16:30 17:30		<b>Technical tours at industrial companies</b>	

## Thursday, 29 of August

		Room T1	Room T2	Room T3	Room T4	Room T5
9:30 10:00	Registration Foyer	<b>Opening Plenary</b> <i>Plenary Room</i>				
10:00 11:00		<b>Driving the Biological Transformation with Automation</b> <i>Plenary Room</i>				
11:00 11:30		Coffe Break				
11:30 13:00		<b>Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing I</b>	<b>Drivers and Tools for Efficiency Improvement in Industrial and Non-Industrial Processes</b>	<b>In-Field Digital Technologies, Robotics and AI for Sustainable Agriculture I</b>	<b>Advancements in Intelligent Transportation Systems: Modeling, Control, and Optimization I</b>	<b>Digital Twin for Smart Engineering System Development, Operation and Optimization I</b>
13:00 14:00		Lunch Break		Conference Editorial Board Lunch		
14:00 15:30		<b>Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing II</b>	<b>Optimization and Distributed Control in System of Systems Engineering</b>	<b>In-Field Digital Technologies, Robotics and AI for Sustainable Agriculture II</b>	<b>Advancements in Intelligent Transportation Systems: Modeling, Control, and Optimization II</b>	<b>Digital Twin for Smart Engineering System Development, Operation and Optimization II</b>
15:30 16:00		Coffe Break				
16:00 18:00		<b>Industrial Panel &amp; RAS IAB Standardization Session</b> <i>Plenary Room</i>				
20:00 21:00		Welcome Reception				

Thursday, 29 of August - Continued

		Room T6	Room T7	Room T8	Room T9	Room T10
9:30 10:00	Registration Foyer	<b>Opening Plenary</b> <i>Plenary Room</i>				
10:00 11:00		<b>Driving the Biological Transformation with Automation</b> <i>Plenary Room</i>				
11:00 11:30		Coffe Break				
11:30 13:00		<b>Innovative Applications of AI and Automation in Industrial Scenarios</b>	<b>Optimized UAV Systems</b>	<b>Big-Data and Data Mining Applications</b>	<b>Optimization and Automation in Logistics</b>	<b>Energy and Environment-Aware Automation</b>
13:00 14:00		Lunch Break		Conference Editorial Board Lunch		
14:00 15:30		<b>Safety in Autonomous Systems: From Fault Detection to Fault Prognosis</b>	<b>Advanced Sensing and Control Techniques</b>	<b>Advancements in Autonomous Systems</b>	<b>Predictive Process Engineering for the Construction Industry</b>	<b>Robust Point Cloud Estimation</b>
15:30 16:00		Coffe Break				
16:00 18:00			<b>Emerging Technologies in Robotics and Data Integration</b>	<b>Formal Methods in Robotics and Automation</b>	<b>Solutions for Sustainable and Resilient Systems</b>	<b>Optimization and Optimal Control</b>
20:00 21:00	Welcome Reception					



Thursday, 29 of August - Continued

		Room T11	Room T12	Virtual T1	Virtual T2
9:30 10:00	Registration Foyer	<b>Opening Plenary</b> <i>Plenary Room</i>			
10:00 11:00		<b>Driving the Biological Transformation with Automation</b> <i>Plenary Room</i>			
11:00 11:30		Coffe Break			
11:30 13:00		<b>Leveraging Systems and Data for Context-Aware and Emergent Behavior</b>	<b>Planning, Scheduling and Coordination</b>	<b>AI and Data-Based Methods</b>	<b>Automation in Construction</b>
13:00 14:00		Lunch Break	Conference Editorial Board Lunch		
14:00 15:30		<b>3D Reconstruction and Perception for Robotic Systems</b>	<b>Safe and Collaborative Manipulation of Autonomous Robots</b>	<b>AI-Based Methods</b>	<b>Autonomous Agents</b>
15:30 16:00		Coffe Break			
16:00 18:00		<b>Advanced Techniques in AI-Driven Optimization for Industrial and Manufacturing Processes</b>	<b>AI-Driven Control and Optimization</b>		
20:00 21:00		Welcome Reception			

# Friday, 30 of August

		Room T1	Room T2	Room T3	Room T4	Room T5
9:00 10:00	Registration Foyer	<b>Event-Based Reinforcement Learning for Cyber-Physical Energy Systems</b> <i>Plenary Room</i>				
10:00 11:00		<b>Safe and Secure Human-Machine Interaction: A SMCS Contribution I</b>	<b>Space Autonomy I</b>	<b>Innovations in Robotics and Automation for Enhanced Healthcare I</b>	<b>Emerging Data Science in Manufacturing I</b>	<b>Cognitive Manufacturing Systems I</b>
11:00 11:30		Coffe Break				
11:30 13:00		<b>Safe and Secure Human-Machine Interaction: A SMCS Contribution II</b>	<b>Space Autonomy II</b>	<b>Innovations in Robotics and Automation for Enhanced Healthcare II</b>	<b>Emerging Data Science in Manufacturing II</b>	<b>Cognitive Manufacturing Systems II</b>
13:00 14:00		Lunch Break		Woman in Engineering Luncheon		
14:00 15:00		Awards Sessions				<b>Industrial Foundation Models and Applications in Smart Manufacturing</b>
15:00 15:30						
15:30 16:30	<b>TASE Senior Editorial Board Meeting</b>	<b>Sightseeing Tour</b>				
16:30 17:30	<b>TASE Editorial Board Meeting</b>					
17:30 20:00						
20:00 21:00		Gala Dinner				

RAS IAB Startup/Mentor Office Hours

Friday, 30 of August - Continued

		Room T6	Room T7	Room T8	Room T9	Room T10		
9:00 10:00	Registration Foyer	<b>Event-Based Reinforcement Learning for Cyber-Physical Energy Systems</b> <i>Plenary Room</i>						RAS IAB Startup/Mentor Office Hours
10:00 11:00		<b>Advances in Intelligent Healthcare Management I</b>	<b>Assembly Lines in Circulation</b>	<b>Reinforcement Learning</b>	<b>Factory Automation</b>	<b>Discrete Event Dynamic Automation Systems</b>		
11:00 11:30		Coffe Break						
11:30 13:00		<b>Advances in Intelligent Healthcare Management II</b>	<b>Identification and Control of Complex Systems</b>	<b>Advanced Optimization Techniques</b>	<b>Advancements in Aerial Robotics</b>	<b>Collaborative Robots in Manufacturing</b>		
13:00 14:00		Lunch Break		Woman in Engineering Luncheon				
14:00 15:00		<b>Advances in Intelligent Healthcare Management III</b>	<b>Reinforcement Learning for Autonomous Driving and Robot Control</b>	<b>Control and Path Planning Strategies for Mobile Robot Systems</b>	<b>Characterization and Prediction of Printed Products</b>	<b>Predictive Control and Dynamic Modeling</b>		
15:00 15:30								
15:30 16:30	TASE Senior Editorial Board Meeting	<b>Sightseeing Tour</b>						
16:30 17:30	TASE Editorial Board Meeting							
17:30 20:00								
20:00 21:00							Gala Dinner	

Friday, 30 of August - Continued

		Room T11	Room T12	Virtual T1	Virtual T2	
9:00 10:00	Registration Foyer	<b>Event-Based Reinforcement Learning for Cyber-Physical Energy Systems</b> <i>Plenary Room</i>				RAS IAB Startup/Mentor Office Hours
10:00 11:00		<b>Innovative Design and Control Techniques in Robotics and Actuation Systems</b>	<b>Detection, Trust, and Adaptive Systems</b>			
11:00 11:30		Coffe Break				
11:30 13:00		<b>Machine Learning Applications in Robotics, Analytics, and Simulation</b>	<b>Neural Networks and Deep Network Physics</b>	<b>Computer Vision in Automation and Manufacturing</b>	<b>Machine Learning</b>	
13:00 14:00		Lunch Break	Woman in Engineering Luncheon			
14:00 15:00		<b>Learning and Coordination Strategies in Multi-Agent and Autonomous Systems</b>	<b>Robotics System for Teleoperation and Segmentation</b>	<b>Deep Learning in Robotics and Automation</b>	<b>Optimization and Optimal Control</b>	
15:00 15:30						
15:30 16:30	<b>TASE Senior Editorial Board Meeting</b>	Sightseeing Tour				
16:30 17:30	<b>TASE Editorial Board Meeting</b>					
17:30 20:00						
20:00 21:00		Gala Dinner				

## Saturday, 31 of August

		Room T1	Room T2	Room T3	Room T4	Room T5
9:00 10:00	Registration Foyer	<b>Machine Learning Methods for Real-Time Robot Control with Theoretical Guarantees</b> <i>Plenary Room</i>				
10:00 11:00			<b>Novel Planning and Control Approaches for Semiconductor Manufacturing I</b>	<b>Machine Learning for Optimization in Automation I</b>	<b>Autonomous Systems for Agriculture and Horticulture I</b>	<b>AI Enabled Discrete Event Dynamic Systems I</b>
11:00 11:30		Coffe Break				
11:30 13:00		<b>Energy Communities: Optimization and Control for Sustainability</b>	<b>Novel Planning and Control Approaches for Semiconductor Manufacturing II</b>	<b>Machine Learning for Optimization in Automation II</b>	<b>Autonomous Systems for Agriculture and Horticulture II</b>	<b>AI Enabled Discrete Event Dynamic Systems II</b>
13:00 14:00		Lunch Break	RAS SAC Lunch with Leaders		RAS TC Automation Cluster Lunch	
14:00 15:30		<b>Intelligent Operation, Maintenance, and Scheduling in Complex Systems</b>	<b>Diagnosis and Fault Detection</b>	<b>Machine Learning for Optimization in Automation III</b>	<b>Autonomous Systems for Agriculture and Horticulture III</b>	<b>Automated Sample Processing</b>
15:30 16:00		Coffe Break				
16:00 17:30		<b>Motion and Path Planning</b>	<b>Deep Learning Applications and Innovations in Robotics and Automation</b>	<b>Advanced Control and Modeling Techniques for Robotic Systems</b>	<b>Human-Robot Collaboration</b>	<b>Design and Control of Quadrotor UAVs</b>
19:30 20:00		CASE @20 / TASE @20				
20:00 21:00		Farewell Reception				
21:00	RAS SAC Social Hour					

Saturday, 31 of August - Continued

		Room T6	Room T7	Room T8	Room T9	Room T10
9:00 10:00	Registration Foyer	<b>Machine Learning Methods for Real-Time Robot Control with Theoretical Guarantees</b> <i>Plenary Room</i>				
10:00 11:00		<b>Cyber-Physical Manufacturing for Small Batch Customization I</b>	<b>Collaborative Robot-Enabled Advanced Manufacturing in the Context of Industry 5.0 I</b>	<b>Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing I</b>	<b>Smart and Sustainable Manufacturing I</b>	<b>Decision and Control Techniques for Autonomous Systems I</b>
11:00 11:30		Coffe Break				
11:30 13:00		<b>Cyber-Physical Manufacturing for Small Batch Customization II</b>	<b>Collaborative Robot-Enabled Advanced Manufacturing in the Context of Industry 5.0 II</b>	<b>Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing II</b>	<b>Smart and Sustainable Manufacturing II</b>	<b>Decision and Control Techniques for Autonomous Systems II</b>
13:00 14:00		Lunch Break	RAS SAC Lunch with Leaders		RAS TC Automation Cluster Lunch	
14:00 15:30		<b>Cyber-Physical Manufacturing for Small Batch Customization III</b>	<b>Collaborative Robots and Motion Control</b>	<b>Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing III</b>	<b>Smart and Sustainable Manufacturing III</b>	<b>Navigation, Manipulation, and Task Planning</b>
15:30 16:00		Coffe Break				
16:00 17:30		<b>Machine Learning in Robotics and Automation</b>	<b>Robotic Control and Motion Planning</b>	<b>Automation at Micro-Nano Scales</b>	<b>Human-Robot Interaction in Workplace and Mobility</b>	<b>Control and Safety Mechanisms for Construction</b>
19:30 20:00		CASE @20 / TASE @20				
20:00 21:00		Farewell Reception				
21:00	RAS SAC Social Hour					

Saturday, 31 of August - Continued

		Room T11	Room T12	Virtual T1	Virtual T2
9:30 10:00	Registration Foyer	<b>Machine Learning Methods for Real-Time Robot Control with Theoretical Guarantees</b>			
		<i>Plenary Room</i>			
10:00 11:00		Digital Twin in Smart Construction I	Human Gait Reconstruction		
11:00 11:30		Coffe Break			
11:30 13:00		Digital Twin in Smart Construction II	Dynamics, Control, and Security in Multi-Agent Systems	Planning, Scheduling and Coordination	Innovative Manufacturing and Automation
13:00 14:00		Lunch Break	RAS SAC Lunch with Leaders	RAS TC Automation Cluster Lunch	
14:00 15:30		Digital Twin in Intelligent Manufacturing	Innovative Visual and Gesture-Based Control Techniques	Factory Automation	Automation for Industrial Applications
15:30 16:00		Coffe Break			
16:00 18:00		Logistics and Intelligent Transportation	Defect Detection and Anomaly Detection in Deformable and Online Adaptive Products	Robotics	Motion Control
19:30 20:00			CASE @20 / TASE @20		
20:00 21:00		Farewell Reception			
21:00		RAS Social Hour			

# Sunday, 1 of September

		Room T1	Room T2	Room T3	Room T4
9:30 10:00	Registration Foyer	<b>Measuring and enhancing network resilience: metrics, learning, and defense strategies</b> <i>Plenary Room</i>			
10:00 11:00		<b>AURA - Acceptance and trUst of Robots in Automation 5.0 I</b>	<b>3rd International Conference on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding (VIPERC 2024) I</b>	<b>Control, Cooperation, and Resilience in Rural Energy Communities I</b>	<b>Human Movement Understanding, Whole-Body Control, and Human-Robot Interfaces in Manufacturing, Healthcare, and Underwater Exploration I</b>
11:00 11:30		Coffe Break			
11:30 13:00		<b>AURA - Acceptance and trUst of Robots in Automation 5.0 II</b>	<b>3rd International Conference on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding (VIPERC 2024) II</b>	<b>Control, Cooperation, and Resilience in Rural Energy Communities II</b>	<b>Human Movement Understanding, Whole-Body Control, and Human-Robot Interfaces in Manufacturing, Healthcare, and Underwater Exploration II</b>
13:00 14:00		Lunch Break			
14:00 15:30		<b>AURA - Acceptance and trUst of Robots in Automation 5.0 III</b>	<b>3rd International Conference on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding (VIPERC 2024) III</b>	<b>French-Italian Workshop on Robotics 4.0</b>	<b>Empowering the Future Workforce: Design Thinking Workshop with LEGO®</b>
15:30 16:00		Coffe Break			
16:00 18:00		<b>AURA - Acceptance and trUst of Robots in Automation 5.0 IV</b>	<b>3rd International Conference on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding (VIPERC 2024) IV</b>	<b>French-Italian Workshop on Robotics 4.0</b>	



		Room T5	Room T6	Room T7	Room T8
9:30 10:00	Registration Foyer	<b>Measuring and enhancing network resilience: metrics, learning, and defense strategies</b>			
		<i>Plenary Room</i>			
10:00 11:00		<b>Machine Learning for Automation I</b>	<b>Machine-learning (ML)-driven Digital Twin (DT) Construction for Advanced Manufacturing I</b>	<b>Industrial exoskeletons: market demands, open challenges and research opportunities I</b>	<b>Empowering Human-Robot Collaboration: shared autonomy, system transparency, and trustworthiness I</b>
11:00 11:30		Coffe Break			
11:30 13:00		<b>Machine Learning for Automation II</b>	<b>Machine-learning (ML)-driven Digital Twin (DT) Construction for Advanced Manufacturing II</b>	<b>Industrial exoskeletons: market demands, open challenges and research opportunities II</b>	<b>Empowering Human-Robot Collaboration: shared autonomy, system transparency, and trustworthiness II</b>
13:00 14:00		Lunch Break			
14:00 15:30		<b>Machine Learning for Automation III</b>		<b>Industrial exoskeletons: market demands, open challenges and research opportunities III</b>	
15:30 16:00		Coffe Break			
16:00 18:00	<b>Machine Learning for Automation IV</b>		<b>Industrial exoskeletons: market demands, open challenges and research opportunities IV</b>		

		Room T9	Room T10	Room T11	Room T12
9:30 10:00		<b>Measuring and enhancing network resilience: metrics, learning, and defense strategies</b> <i>Plenary Room</i>			
10:00 11:00		<b>Soft Robots and Wearables for flexible and interactive automation I</b>	<b>Constrained control of vehicle formations in industry and intelligent transportation systems: from model-based to data-driven solutions I</b>	<b>Translating Manufacturing Control and Automation Research to Practice: Examples, Challenges, and Opportunities I</b>	<b>Enhancing Human-Centered Automation: Mastering resilient Multi-Robot Systems with Dynamic Collaboration and Heterogeneity I</b>
11:00 11:30		Coffe Break			
11:30 13:00		<b>Soft Robots and Wearables for flexible and interactive automation II</b>	<b>Constrained control of vehicle formations in industry and intelligent transportation systems: from model-based to data-driven solutions II</b>	<b>Translating Manufacturing Control and Automation Research to Practice: Examples, Challenges, and Opportunities II</b>	<b>Enhancing Human-Centered Automation: Mastering resilient Multi-Robot Systems with Dynamic Collaboration and Heterogeneity II</b>
13:00 14:00		Lunch Break			
14:00 15:30			<b>Constrained control of vehicle formations in industry and intelligent transportation systems: from model-based to data-driven solutions III</b>		
15:30 16:00		Coffe Break			

# Keynote Presentations



## Ansgar Kriwet

*After studying mechanical engineering at the University of Aachen, Dr. Kriwet spent several years as research associate at The Institute for Machine Tools and Production Technology of the TU Berlin, followed by the Institute for Management and Technology IMT in Berlin. In 1995 Dr. Kriwet joined Festo and contributed significantly to the development of the new founded Cybernetic division. His mission here was the transformation of the component business of Festo to a solution business, creating customer advantages through ease of integration. In 2009 Dr. Kriwet was appointed to the Management Board of the Festo AG for Region and Sales Europe, followed by the responsibility for Global Sales in 2013. Since September 2022 Dr. Kriwet has been the Chief Technology Officer of Festo SE & Co. KG and is responsible for Global Research and Development in this area. He is driving the integration of electronic controls, sensors, communication, and Software with traditional mechanical motion components, enhancing customer value through data by reducing energy consumption.*

## Driving the biological transformation with automation

*Thursday, August 29th, 2024*

### **Abstract:**

Economists have been predicting the end of linear growth for some time. Further development towards a circular economy is the next big goal, as it offers new growth potential. And nature is an excellent role model in this regard because it knows no waste. For Festo, integrating biology as a basis for ongoing development in automation is particularly promising. It can be used to transform a biological cell into the smallest factory of the future.

To do this, we need to understand the biological processes and create optimal conditions to grow or manipulate different organisms. By using AI and quantum sensors to analyze the state of growth, we can then control and optimally monitor various parameters.

The aim of our work in this area is to create solutions that are real alternatives to today's established chemical processes, which often require a lot of heat and pressure and are mostly based on fossil raw materials.

Using the example of photobioreactors for the production of algae and the conversion of hydrogen into alternative energy sources, Festo shows how automation can contribute to a significant increase in efficiency in the future and thus to sustainable business.



## Qing-Shan Jia

*Qing-Shan Jia received his B.S. in automation in 2002 and Ph.D. in control science and engineering in 2006 from Tsinghua University, Beijing. He is a Full Professor and chair of the Institute of Systems Engineering at the Center for Intelligent and Networked Systems (CFINS), Department of Automation, Tsinghua University. He was vice dean of Tsinghua GIX (2016-2019) and vice chair of the Department of Automation (2015-2018). He completed a postdoc at Harvard University in 2006 and held visiting scholar positions at HKUST (2010) and MIT (2013). His research focuses on data-driven, statistical, and computational approaches for design and decision-making in manufacturing, energy, autonomous systems, and smart cities. He is the executive editor-in-chief of Results in Control and Optimization and an associate editor of Science China Information Sciences. Previously, he was an associate editor for several IEEE journals and served on various IEEE and IFAC committees. He is the founding chair of the IEEE RAS Technical Committee on Machine Learning for Automation (since 2023) and a member of the Chinese Automation Association's committees on Control Theory and Information Security of Industrial Systems.*

## Event-based reinforcement learning for cyber-physical energy systems, smart buildings, smart grids and smart cities

Friday, August 30th, 2024

### Abstract:

Cyber physical energy system (CPES) is where information and energy merges together to improve the overall system performance including economic, comfort, and safety aspects. Artificial intelligence which are enabled by internet of things (IoT), big data, and cloud computing, has a big role in the optimization of CPES.

In this talk, we focus on event-based reinforcement learning (eRL) which makes decisions according to events instead of states. This method provides a scalable solution for large-scale multi-stage decision making problem in which an accurate model may not be available. The performance of this method will be demonstrated by examples in smart buildings, smart micro-grid of buildings, and smart cities, and in particular on the problem of stochastic matching between the renewable power generation and the uncertain charging demand from the plug-in electric vehicles (PHEVs) in a city.

We will also discuss extensions of this method to distributed optimization. We hope this work sheds light to the optimization of CPES.



## Aude Billard

*Aude Billard is a full professor and head of the LASA laboratory at the School of Engineering, Swiss Institute of Technology Lausanne (EPFL). She is also the Associate Dean for Education at EPFL. Prof. Billard is President of the IEEE Robotics and Automation Society, director of the ELLIS Robot Learning Program, and co-director of the Robot Learning Foundation. She leads the Innovation Booster Robotics, funded by Innosuisse. She holds a BSc and MSc in Physics from EPFL and a PhD in Artificial Intelligence from the University of Edinburgh. Prof. Billard is an IEEE Fellow and has received numerous awards, including the Intel Corporation Teaching award, the Swiss National Science Foundation career award, and the IEEE RAS Distinguished Service Award. She has been a plenary speaker at major conferences and has served on organizing committees for numerous international robotics conferences. Her research focuses on machine learning and robotics, particularly on fast and reactive control and safe human-robot interaction. Her work has received several best conference paper awards, the King-Sun Fu Memorial Award for the best IEEE Transactions on Robotics paper, and has been featured in media outlets like BBC, IEEE Spectrum, and Wired.*

## Machine learning methods for real-time robot control with theoretical guarantees

*Saturday, August 31st , 2024*

### Abstract:

Deployment of robots in human-inhabited environments requires allowing robots to react rapidly, robustly and safely to changes in the environment. Recent advances in machine learning to analyze and model a variety of data offer powerful solutions for real-time control. For these techniques to be efficiently deployed and endorsed, they must be accompanied with explicit guarantees on the learned model.

This talk will give an overview of a variety of methods to endow robots with the necessary reactivity to adapt their path at time-critical situations. The learned control laws are accompanied by theoretical guarantees for stability and boundedness. Paucity of data is a reality in many robotics tasks.

I will present methods by which robots can learn control laws from only a handful of examples, while generalizing to the entire state space. I will present a variety of applications, from dynamic manipulation in interaction with humans to reactive navigation in crowded pedestrian environments.



## **Sonia Diaz Martinez**

*Sonia Martínez is a Full Professor and Jacobs Faculty Scholar at the Department of Mechanical and Aerospace Engineering, University of California, San Diego. She received her B.S. from Universidad de Zaragoza in 1997 and her Ph.D. in Engineering Mathematics from Universidad Carlos III de Madrid in 2002. She was a Visiting Assistant Professor at the Technical University of Catalonia and held postdoctoral positions at the University of Illinois, Urbana-Champaign, and the University of California, Santa Barbara. She joined UC San Diego in 2006, becoming an Associate Professor in 2010 and a Full Professor in 2014. Her research interests include networked control systems, multi-agent systems, and nonlinear control theory, with applications in robotics and cyber-physical systems. Prof. Martínez has received the Best Student Paper award at the 2002 IEEE Conference on Decision and Control, the NSF CAREER Award in 2007, and two Control Systems Magazine Outstanding Paper Awards (2008, 2021). She was named an IEEE Fellow in 2018 and is a Senior Editor of Automatica and Editor-in-Chief of the IEEE Open Journal of Control Systems.*

## **Measuring and enhancing network resilience: metrics, learning, and defense strategies**

*Sunday, September 1st , 2024*

### **Abstract:**

Resilience, understood as the ability of a network to carry out its goals under adversarial attacks and unexpected failures, is critical for autonomy. Despite important advances in the design of distributed coordination and decision-making algorithms, multi-agent networks have proven fragile to targeted attacks. Novel theories and tools are therefore needed to guarantee resiliency of these systems, being the development of notions and techniques that characterize network critical resilience.

However, obtaining such characterizations is difficult as resilience and performance are a complex function of the network's and adversary's capabilities, knowledge, resources, and the network interconnection structure. At the same time, we also need novel design methodologies that can protect multi-agent networks and adaptively manage their interconnection over time to achieve performance guarantees.

In this talk, we present our recent progress in these directions including algorithmic methods for metric computation, data-driven algorithms for multi-agent learning, and defense strategies.

## Advancements in Intelligent Transportation Systems: Modeling, Control, and Optimization

### Organizers

**Yin Tong**

*Southwest Jiaotong University*

**Silvia Siri**

*University of Genova*

**Simona Sacone**

*University of Genova*

In the rapidly evolving landscape of urbanization, the challenges associated with transportation become increasingly complex. Intelligent Transportation Systems (ITS) have emerged as a crucial solution to address these challenges, leveraging cutting-edge technologies to optimize various facets of urban mobility. The importance of ITS extends beyond mere convenience; it plays a pivotal role in mitigating traffic congestion, enhancing energy efficiency, and ensuring the safety of commuters. In particular, the development of artificial intelligence technology, sensing, and communication technologies has brought unprecedented innovation to the transportation system. Autonomous driving, the Internet of Vehicles, smart logistics, and more have occurred. Central to the evolution of ITS is the development of novel control and optimization techniques that enhance their functionality, effectiveness, and safety. This session serves to gather researchers and practitioners around the world to explore the advances in control and optimization methods of shaping the future of transportation in smart cities and to preview the next steps on the way.

## Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing

### Organizers

**Hyun-Jung Kim**

*Korea Advanced Institute of Science and Technology*

**Mengchu Zhou**

*New Jersey Institute of Technology*

Navigating the escalating demand for customized products while upholding stringent quality standards presents formidable challenges in the effective management of manufacturing systems. These challenges can be effectively met through the realization of autonomous manufacturing, minimizing human intervention. Autonomous manufacturing represents a transformative shift towards intelligent, self-governing production systems that leverage cutting-edge technologies to enhance efficiency, flexibility, and responsiveness within manufacturing processes. This necessitates the imperative adoption of advanced technologies such as reinforcement learning, deep learning, meta-learning, digital twin, and optimization methods. The urgency for autonomous manufacturing is particularly pronounced in industries like semiconductors, displays, batteries, and biopharmaceuticals, where production requirements encompass a myriad of complexities, ranging from time window constraints and limited buffers to sequence-dependent setup times, transport robots, and stringent quality control measures. To address these intricacies, this special session aims to bring together researchers, engineers, scientists, and managers actively involved in the research, development, and operation of manufacturing systems. The objective is to foster a collaborative effort to

tackle the diverse challenges associated with modeling, scheduling, operation, and control for the advancement of autonomous manufacturing.

## Advances in Intelligent Healthcare Management

### Organizers

**Zhibin Jiang**

*Shanghai Jiao Tong University*

**Xiaolan Xie**

*Ecole Des Mines De Saint Etienne*

**Liping Zhou**

*Shanghai Jiao Tong University*

The healthcare industry in many countries is facing significant challenges of rising costs, limited resources, increasing patient demand, and complex healthcare systems. Intelligent healthcare system integrating emerging technologies such as electronic health records, IoT devices, robotics and automation, AI, and telehealth and online healthcare might provide a promising solution. These technologies also raise challenges to healthcare management in terms of workflow adjustment, streamlining processes, data management, interoperability, ethics, privacy and security, medical quality, and cost and resource management that need to be addressed for effective implementation and utilization. In order for emerging technologies to better empower healthcare delivery systems, new methods and tools are being innovated to transform healthcare system by improving efficiency, decision-making, and patient care outcomes. This special session aims to explore the advancements in intelligent healthcare management by researchers, practitioners, and policymakers from different disciplines. In this session, we welcome all contributions that relate to using the modeling and algorithmic approaches and software tools in operations management, medical decision, AI, data analytics, and policy making with application to addressing intelligent health-

care management problems.

## AI Enabled Discrete Event Dynamic Systems

### Organizers

**Qianchuan Zhao**

*Tsinghua University*

**Kai Cai**

*Osaka Metropolitan University*

**Xiang Yin**

*Shanghai Jiao Tong Univ*

**Li Xia**

*Sun Yat-Sen University*

Discrete event dynamic systems (DEDS) aim at studying the man-made systems driven by events, such as the systems of manufacturing, transportation, computer, communication, energy, robots, etc. The foundation of DEDS is built on mathematical models, such as Markov models, Petri net, automata, queueing models, etc. The decision and control of DEDS is fundamental to improve the operation efficiency of those man-made systems, which involves the optimization theory such as Markov decision process (MDP), optimal control, supervisory control, etc. Recently, the remarkable successes of AI attract intensive attention on the study of data-driven learning and optimization. One of the main research streams of AI is to handle the dynamic decision-making problem with reinforcement learning, whose mathematical foundation is MDP. Therefore, with these facts, the research development of DEDS theory encounters a crossroad, combining the techniques of AI and enabling the study of DEDS in a manner of data-driven learning and optimization. This special session aims to bring together the international scholars and industry practitioners to discuss the recent progress of DEDS in the background of big development of AI techniques, while focusing on the field of automation science and engineering. The potential topics include but are not limited to the development of



DEDS theory such as Markov systems, Petri net, automata, the development of reinforcement learning & MDP decision theory, the AI enabled solution to dynamic games & multi-agent systems, and the application of above theories to solve engineering problems in the field of automation science and engineering.

## **Assembly Lines in Circulation: A Focus on Human-Centric, Sustainable, and Resilient Manufacturing**

### **Organizers**

**Hamidreza Rezaei**  
*IMT Atlantique*

**Simon Thevenin**  
*IMT Atlantique*

**Hashemi Petroodi S.Ehsan**  
*KEDGE Business School*

In the current era of intense global competition and rapid technological advances, manufacturers must frequently introduce new product variants. Each change in the product family requires the adaptation of manufacturing systems, and the frequent reconfiguration of production lines leads to sustainability challenges. Production resources are prematurely taken out of service, leading to scrapping or, at best, being sold for spare parts. In response to these challenges, the concepts of Industry 4.0 and Industry 5.0 have been introduced. Industry 4.0 represents significant improvements in production efficiency and flexibility through digitization and AI-driven technologies. Industry 5.0 takes these technological advances further, and it focuses on three fundamental principles: sustainability, human-centricity, and resilience. By emphasizing these pillars, Industry 5.0 seeks to address the environmental impact of manufacturing processes, improve the well-being of workers, and fortify systems against unforeseen disruptions. Despite its promising potential, the exploration of In-

dustry 5.0 is still in its early stages, with limited research and a lack of systematic understanding. In this context, this session welcomes original theoretical approaches and new applications that improve sustainability, resilience, and human centricity during the design, maintenance, operation, and decommissioning of assembly lines.

## **Autonomous Systems for Agriculture and Horticulture**

### **Organizers**

**David A. Anisi**  
*Abb*

**Shen Hin Lim**  
*University of Waikato*

**Mike Duke**  
*University of Waikato*

**Benjamin John McGuinness**  
*University of Waikato*

**Weria Khaksar**  
*Norwegian University of Life Sciences*

**Antonio Candea Leite**  
*Norwegian University of Life Sciences*

**Ibrahim A. Hameed**  
*NTNU I Ålesund*

Technology advancements, along with multiple significant issues such as lack of labour and general labour intensity in agriculture tasks, have sparked a rapid growth in agriculture and horticulture automation and robotics over the past 15 years. There are successful demonstrations in different aspects of agriculture and horticulture tasks such as crop and fruit harvesting, flower pollination and thinning, crop and fruit detection in different cycle phases and smart overall monitoring and management of weeds, crops, and fruits. However, it remains challenging for smart systems to achieve the dexterity, complexity, and speed of human motion in completing agriculture and horticulture tasks with full autonomy capability. In addressing these

challenges, this special session aims to reflect on current advancements in automation and robotics technology in agriculture and horticulture that will eventually allow commercial adoption and application in farms, orchards, and greenhouses. The topics include advancements in perception, monitoring and grasping of agriculture and horticulture tasks, fundamental advancements, and applications in enabling full autonomy of ground or aerial vehicles (localization, navigation and mapping) in agriculture and horticulture conditions, systems of systems approach integration, human-robot collaborative work, safety and smart human-assisted tools for agriculture and horticulture tasks.

## **Collaborative Robot-Enabled Advanced Manufacturing in the Context of Industry 5.0**

### **Organizers**

**Weitian Wang**

*Montclair State University*

**Xiwang Guo**

*Liaoning Petrochemical University*

**Mengchu Zhou**

*New Jersey Institute of Technology*

During the Industry 5.0 revolution, robotics has become increasingly significant in advancing manufacturing automation and intelligence. Different from traditional industrial robots, which are fenced off from human workers on production lines, collaborative robots make a tremendous shift to coexist and collaborate with human workers in open environments for manufacturing tasks. This makes robots capable of democratizing manufacturing industries with dynamic customer demands, high flexibility, and low cost. In the human-robot collaborative advanced manufacturing, humans have unmatched problem-solving skills and develop creative and unique solutions compared to robots, which can provide physical assistance, free human partners from dangerous tasks, and lower

the stress of human collaborators. Therefore, the cooperation and interaction between humans and robots for advanced manufacturing should create new potential opportunities and benefits to enhance safety, optimize production, boost efficiency, improve task quality, and increase worker productivity for industry sectors. In both academia and industries, new interdependent and cross-disciplinary research issues arise and need to be addressed to make human-robot teams more productive and ergonomic. This special session aims to bring researchers, engineers, scientists, and managers engaged in frontier research and technologies of robotics, automation, manufacturing, and cyber-physical systems to investigate and solve different open questions in the field of human-robot collaborative advanced manufacturing. Prospective authors are invited to share their state-of-the-art research findings to address the gaps in this area.

## **Decision and Control Techniques for Autonomous Systems**

### **Organizers**

**Laura Giarre**

*Università Di Modena E Reggio Emilia*

**Alberto Cavallo**

*Seconda Università Degli Studi Di Napoli*

**Federica Pascucci**

*Università Roma Tre*

**Raffaele Carli**

*Politecnico Di Bari*

One of the enabling technologies of the digital transition is Autonomous Systems, which are systems capable of automatically achieving a given goal without the intervention of a human operator. They are able to collect information about the environment in which they operate, process data from multiple sources, and determine and plan actions to be taken to

optimize performance, ensuring the safety of people and the proper functioning of devices. There is no doubt that they will assume a crucial role in society. The purpose of this Special Session is to propose new and innovative decision and control techniques for developing Autonomous Systems, thus enabling sustainable problem-solving in extremely diverse application fields, such as manufacturing processes, automotive, aerospace, defense, road and rail mobility, smart cities, home automation, energy networks, water networks, environmental monitoring, smart agriculture, logistics, telecommunications, biomedicine, green transition, etc. Original articles from both scholars and practitioners are welcome, reporting on concepts and approaches for Autonomous Systems and addressing system and control engineering topics that include but are not limited to i) design and develop autonomous engineering systems, with applications to smart manufacturing, autonomous vehicles, smart grids, robotics, and many more; ii) develop smart control algorithms (e.g., AI-enabled control, data-driven control, vision-based control) for smart environments such as smart cities, autonomous vehicles and mobile robots, smart grids, sustainable mobility systems, smart buildings, and smart homes, iii) develop testing platforms for emerging techniques to advance engineering autonomous system applications (e.g., cyber-physical systems, digital twin techniques).

## **Digital Twin for Smart Engineering System Development, Operation and Optimization**

### **Organizers**

**Yan Lu**

*National Institute of Standards and Technology*

**Feng Ju**

*Arizona State University*

**Haw-Ching Yang**

*National Kaohsiung Univ. Of Sci. And Tech.*

**Min-Hsiung Hung**

*Chinese Culture University*

Digital twin, a concept integrating modeling and data analytics, has become increasingly more relevant to engineering system design, development and operation. Different from traditional model-based engineering, a Digital Twin includes a dynamic, virtual representation of a physical system or object managed through the lifecycle of the physical system to best support various engineering purposes. It continuously mirrors the real-world entity by incorporating real-time data and machine learning, employing multiple-level, multiple-fidelity models and simulations, and applying advanced reasoning and fusion for prediction and decision-making. Digital Twins can be applied in various engineering systems, including space vehicles, manufacturing, medical devices, and smart building and infrastructure. They are particularly useful for predicting performance, process control and optimization and maintaining assets like machines, energy networks or entire cities. This special session explores the frontier challenges and solutions associated with the design and application of digital twins for successfully engineering system development and operation.

## **Drivers and Tools for Efficiency Improvement in Industrial and Non-Industrial Processes**

### **Organizers**

**Silvia Maria Zanoli**

*Polytechnical University of Marche*

**Crescenzo Pepe**

*Università Politecnica Delle Marche*

Continuous efficiency improvement in industrial and non-industrial processes represents a crucial challenge in the current energy and digital transition and geopolitical situation. Efficiency can be associated to different processes, e.g.,

plants, machineries, and devices; efficiency can be referred to different points of view, e.g., energy and production. Ad hoc powerful drivers and tools are becoming crucial in this context; furthermore, suitable Key Performance Indicators (KPIs) are needed as metrics for evaluation and certification of efficiency. In this field, the impact of automation science and engineering is growing significantly. The fields of application are increasing also thanks to cross-fertilization between different areas: well-established technologies in a defined area can be extended and customized for other areas. Automation science and engineering systems could be located at different levels of the automation hierarchy; tailored drivers and tools can be detected and developed, while profiting from KPIs in order to evaluate and certify performance and benefits through an objective and unbiased paradigm. The present Special Session aims to collect contributions related to drivers and tools for efficiency improvement in industrial and non-industrial processes with a focus on the impact of automation science and engineering in this field. The Special Session would embrace emerging technologies and best practices. The Special Session will take into consideration research works on simulations in virtual environments and field applications. In addition, contributions on methodologies aimed at bridging the gap between simulations and field application are welcome, together with works on the transition from research to large-scale deployment.

## **Emerging Data Science in Manufacturing**

### **Organizers**

**Chia-Yen Lee**

*National Taiwan University*

**Chia-Yu Hsu**

*National Taiwan University of Science and Technology*

**Shu-Kai S. Fan**

*National Taipei University of Technology*

**Feng Ju**

*Arizona State University*

**Jakey Blue**

*National Taiwan University*

**Young Jae Jang**

*Korea Advanced Institute of Science and Technology*

**Anders Skoogh**

*Chalmers University of Technology*

**Giovanni Lugaresi**

*Laboratoire Génie Industriel*

Manufacturing is characterized by capital/labor-intensive, the short product life cycle, rapid technology migration, long production lead-time, and complex production networks. These characteristics bring more challenges and difficulties to the manufacturing management. This session focuses on how the data science or machine learning techniques support problem-solving and enhance the core competence in manufacturing industry. The special session focuses on data science and engineering in the broad area of manufacturing. Theoretical research or empirical study are all welcome. The topics in this session include defect classification, maintenance scheduling, predictive maintenance, and process parameter optimization, etc. This session would like to provide a platform that offers opportunities to discuss, debate, and exchange ideas, in particular, in a world-side view of manufacturing system. We invite all the researchers, scholars, and graduates when they would like to develop the mathematical/empirical models and benefit the automation and data science field.

## **Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing**

### **Organizers**

**Pai Zheng**

*The Hong Kong Polytechnic University*

**Tao Peng**

*Zhejiang University*

**Jinsong Bao**

*DongHua University*

**Shufei Li**

*The Hong Kong Polytechnic University*

**Wenjun Xu**

*Wuhan University of Technology*

**Xi Vincent Wang**

*KTH Royal Institute of Technology*

**George Q. Huang**

*The University of Hong Kong*

**Lihui Wang**

*KTH Royal Institute of Technology*

**Duc Truong Pham**

*University of Birmingham*

In line with the human-centric concerns of Industry 5.0, modern factories are striving for an ever-higher degree of flexible and resilient production, as conventional automation approach has reached its bottleneck considering mass personalization with increasing complicatedness and complexity. To achieve it, human-robot collaboration (HRC) becomes a prevailing strategy, which combines high accuracy, strength, and repeatability of industrial robots with high flexibility and adaptability of human operators to realise optimal overall productivity. Cutting-edge technologies, including robot learning and control, cognitive computing, mixed reality/metaverse, industrial IoT, and advanced data analytics create the potentials to bridge the gap of knowledge distilling and information sharing between onsite operators, robots and the manufacturing system with mutual cognitions. Therefore, this special session aims to bring together specialists in different fields of manufacturing systems, robotics, artificial intelligence, and other engineering domains to address the foreseeable HRC-empowered human-centric smart manufacturing paradigm characterized with high-level teamwork skills.

## **Industrial Foundation Models and Applications in Smart Manufacturing**

### **Organizers**

**Weiming Shen**

*Huazhong University of Science and Technology*

**Mengchu Zhou**

*New Jersey Institute of Technology*

**Giacomo Boracchi**

*Politecnico Di Milano*

**Kai Xu**

*National University of Defense Technology*

**Yunkang Cao**

*Huazhong University of Science and Technology*

Foundation models, characterized by extensive parameters and large-scale training data, stand as strong tools equipped with broad knowledge gleaned from training data. These foundation models showcase prowess in reasoning, abstraction, and interaction in common fields. Despite their versatile capabilities, existing foundation models face challenges in specific domains such as smart manufacturing, primarily due to the absence of domain-specific knowledge. In the domain of smart manufacturing, contemporary factories aspire to elevate flexibility, quality, and intelligence in their production processes. Conventional automation methods, constrained in interaction, flexibility, and decision-making, necessitate transformative solutions. Here, foundation models emerge as valuable solutions with their substantial advancements. This special session is dedicated to Industrial Foundation Models (IFMs), with the aim of enriching foundation models with more domain-specific knowledge tailored for industrial scenarios. The primary objective is to navigate the intricacies of IFM development, addressing challenges related to processing extensive industrial data and formulating innovative training schemes tailored to the unique demands of industrial

scenarios. These training schemes may include training IFMs from scratch, fine-tuning existing foundation models for specific industrial domains, new use of foundation models in the industry, and more. With a focus on smart manufacturing, this session explores the potential of IFMs in automating processes, enhancing capabilities for both humans and machines, with particular applications to product quality monitoring, prognostics and health management, and operations management.

## **Innovations in Robotics and Automation for Enhanced Healthcare**

### **Organizers**

**Dario Sanalidro**

*University of Catania*

**Enrico Ferrentino**

*University of Salerno*

**Loris Roveda**

*Supsi-Idsia*

**Alessandro Palleschi**

*Floating Robotics*

**Objectives:** This special session aims to explore recent advancements and challenges in integrating robotics and automation into healthcare practices. This session seeks to address the latest developments in diagnostic and therapeutic applications, minimally invasive surgery, rehabilitation, daily-life assistance, and efficient management of healthcare procedures. It provides a platform for interdisciplinary discussions among researchers. **Justifications:** The session is justified by the need to foster collaboration and share insights in the rapidly evolving field of robotics and automation applied to healthcare. Robotics and automation can significantly enhance patient care by providing precise and efficient medical procedures, reducing human error and complications, and enabling faster patient recovery times. In cases where

the availability of healthcare professionals is short, robotics and automation technologies can optimize workforce utilization, through e.g., telemedicine, faster surgical procedures, and shorter hospital stays. This session intends to provide a platform to discuss advancements, share the latest findings, and address the ethical and practical considerations associated with automation and robotics in healthcare. **Outcomes:** Participants will gain insights into research on robots operating in the human body, surgical robotics, rehabilitation robotics, daily-life and personal assistance devices, wearable technologies, and cognitive robotics. The session aims to inspire collaborative research initiatives and to accelerate the advancements of healthcare robotics.

## **Intelligent Operation, Maintenance, and Scheduling in Complex Systems**

### **Organizers**

**Ziyan Zhao**

*Northeastern University*

**Shixin Liu**

*Northeastern University*

**Kaixiang Peng**

*University of Science and Technology Beijing*

**Mengchu Zhou**

*New Jersey Institute of Technology*

**Kai Zhang**

*University of Science and Technology Beijing*

**Shuwei Zhu**

*Jiangnan University*

Operational optimization of complex systems is a multifaceted challenge that necessitates the infusion of intelligent approaches, like machine learning, reinforcement learning, evolutionary computation, and heuristic algorithms. Combining artificial intelligence technology with the characteristics of a specific complex system to solve its intelligent operation, maintenance, and

scheduling problems is a hot research field of academia and an important demand of practical application. Related research can improve operation efficiency, ensure safety and stability, reduce energy consumption, and save production costs. While existing research has made notable strides in tackling these complex issues, numerous related problems persistently remain open, necessitating further investigation and exploration. The research gaps of these challenges present exciting opportunities for researchers and practitioners to delve deeper into uncharted territories and contributing to the ongoing discourse on intelligent system optimization. This special session aims to delve into the intricate realm of intelligent operation, maintenance, and scheduling within complex systems and provide a platform to exchange research results, technical trends, and practical experience related to fault diagnosis, process control, operation research, applied mathematics, and management science. Besides, this session is expected to broaden the intelligent optimization community and promote the application of artificial intelligence in practical complex systems.

## **Novel Planning and Control Approaches for Semiconductor Manufacturing**

### **Organizers**

**Lars Moench**

*University of Hagen*

**Claude Yugma**

*Ecole Des Mines De Saint-Etienne*

Semiconductor manufacturing is one of the most complex manufacturing processes. Due to the increased use of new technologies, the global economy is significantly impacted by the semiconductor industry. Competition in the semiconductor sector is fierce. As a result, the semiconductor industry needs to continually reinvent itself and be resourceful at all decision

levels. Efficient design, analysis, and operation of semiconductor wafer manufacturing facilities and corresponding supply chains are essential. - Various factors can disrupt certain chains of the production networks. For example, the global supply chain has been disrupted by the Covid-19 pandemic which spreads around the world, resulting, for instance, in chip shortage. All this has an impact on the production (product quality, supply, etc.). Subsequently, effective decisions must be taken to conduct production operations at different levels of the supply chain links while addressing disruptions. -To ensure reliable results and reduced operational costs, highly automated manufacturing systems are used to carry out operations and make millions of decisions per day. This requires planning and scheduling methods in manufacturing execution systems (MES) and in logistics/supply chain management tools to support their automated operation. As new trends such as sustainable production, cloud computing, and Industry 4.0 emerge, they also need to be addressed. - The development and application of planning and scheduling methods for these high-cost systems and supply-chains are critical elements in improving their operations. The purpose of the proposed session is to highlight cutting-edge research on semiconductor manufacturing planning, scheduling, and supply-chain management.

### **Safe and Secure**

## **Human-Machine Interaction: A SMCS Contribution**

### **Organizers**

**Laura Giarrè**

*Università Di Modena E Reggio Emilia*

**Giancarlo Fortino**

*Università Della Calabria*

**Graziana Cavone**

*University Roma Tre*

**Giuseppe D'Aniello**

*University of Salerno*

Systems Man and Cybernetics and Robotics and Automation Societies both encourage interdisciplinary approaches in engineering that spread among various fields, such as computer science, control systems, electrical engineering, mathematics, mechanical engineering, system engineering, human systems, human organizational interactions, cybernetics, communication and control across humans and machines. This Special Session particularly focuses on human-machine interaction, for which it is of paramount importance to ensure safety of human beings and security of machines. In fact, improper control of machines might cause accidental harms to operators; and also safety breach can lead the machine to unsafe states and cause damage to the surrounding environment, including operators. The main aim of this session is to collect contributions on the most recent cross-disciplinary techniques to develop Safe and Secure Human-Machine Interaction. Thus, enabling the advancement of modelling, control, and information processing in various related application fields, such as manufacturing, logistics, smart mobility, aerospace, smart cities, networks, etc. In addition, this session is devoted also to the celebration of the Italian SMC Day 2024 by collecting some of the most significant and advanced research and contributions of SMCS and/or RAS Members on the topic. Original articles are welcome, reporting on theories and methods for Safe and Secure Human-Machine Interaction and addressing system and control engineering topics.

## **Smart and Sustainable Manufacturing**

### **Organizers**

**Qing Chang**

*University of Virginia*

**Congbo Li**

*Chongqing University*

**Wei Wu**

*Chongqing Univeristy*

**Feng Ju**

*Arizona State University*

**Nicla Frigerio**

*Politecnico Di Milano*

Smart manufacturing, in the era of Industry 4.0, leverages advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), data analytics, robotics, and cyber-physical systems. The objective is to create intelligent, interconnected, and automated manufacturing systems, thus leading to enhanced productivity, improved quality control, reduced downtime, and increased flexibility. Simultaneously, sustainable manufacturing has gained considerable attention as a means to address the environmental, social, and economic challenges associated with conventional manufacturing. Sustainable manufacturing focuses on minimizing resource consumption, reducing waste generation, optimizing energy usage, and adopting eco-friendly production processes. There is a growing inclination among customers and markets towards digital, customized, and flexible solutions with a reduced environmental impact. This inclination aligns with the central concept of Industry 5.0, which complements the Industry 4.0 approach by placing research at the forefront of the transition to a sustainable, human-centric, and resilient industry. The integration of smart and sustainable manufacturing is pivotal, holding the potential to revolutionize the environmental and economic impact of the manufacturing industry. This session will be an excellent opportunity for networking, collaboration, and knowledge exchange among industry experts, academics, and professionals who are passionate about advancing the field of manufacturing towards a more intelligent and sustainable future.



## **AURA: Acceptance and trUst of Robots in Automation 5.0**

### **Organizers**

**Silvia Proia**

*University of Modena  
and Reggio Emilia*

**Lorenzo Sabattini**

*University of Modena  
and Reggio Emilia*

**Valeria Villani**

*University of Modena  
and Reggio Emilia*

**Raffaele Carli**

*Polytechnic of Bari*

**Graziana Cavone**

*University Roma Tre*

Automation 5.0 represents the cutting-edge evolution of automation technologies within the framework of Industry 5.0, a revolution that further integrates humans into the automation chain. Central to the success of Automation 5.0 is the acceptance and trust of robots by humans. The social acceptance concept, defined as “an individual’s psychological state with regard to his or her voluntary or intended use of a particular technology” is crucial in Automation 5.0 for seamless robots’ integration into various domains, including manufacturing, healthcare, and transportation. Trust is another fundamental aspect of the HRC in Automation 5.0, enabling humans to rely on robots to perform tasks safely, accurately, and efficiently. Humans should feel confident that robots will operate within defined parameters and respond appropriately to unexpected situations. The aim of this workshop is to bridge roboticists from academia and industry to exchange insights and perspectives on fostering acceptance and trust of robots in Automation 5.0. In the discussion, particular attention will be devoted to the measurement of the key factors influencing human acceptance of robots in industrial settings, i.e., perceived occupational safety, physical ergonomics, cognitive ergonomics, efficiency, design, and privacy. In fact, certain metrics for these factors have already been established in existing literature, while others necessitate additional efforts for quantification and integration into robot design and control. Therefore, the perspectives of experts in this field will be presented aiming at delineating the path for the definition of appropriate functional and non-functional requirements for robots’ acceptance to be integrated into their architecture and design.

## **Constrained Control of Vehicle Formations in Industry and Intelligent Transportation Systems: from Model-based to Data-driven Solutions**

### **Organizers**

**Walter Lucia**

*Concordia University*

**MengChu Zhou**

*New Jersey Institute of Technology*

**Giancarlo Fortino**

*University of Calabria*

**Giuseppe Franzè**

*University of Calabria*

This workshop delves into the contemporary challenges of autonomous multi-vehicle systems, particularly focusing on formation control and collision avoidance for multi-agent configurations in the context of Smart Cities and Industry 5.0. The increasing attention to these issues arises from the successful deployment of Unmanned Vehicles (UVs) in Industry 5.0 and Intelligent Transportation Systems. Designing fully autonomous vehicle systems requires addressing key requirements such as precise signal tracking, goal attainment for each vehicle, coordination through formation control tools, and ensuring collision avoidance. However, existing approaches often lack efficiency when overlooking physical limitations in vehicle modelling, compromising their effectiveness in scenarios where geometrical constraints and saturation effects are crucial. The workshop aims to analyze recent advancements in constrained control for multi-vehicle systems, exploring how traditional constrained control techniques and data-driven approaches can be employed independently or in tandem to devise innovative and efficient hybrid control architectures for autonomous multi-vehicle systems moving in shared environments.

The greatest difficulty in implementing RECs is related to connecting the multidisciplinary nature of all the social elements with technological perspectives. These characteristics put in evidence the opportunity, presented by RECs, aimed at defining economic, social, and technical policies to determine changes in a macro sector by acting at a local level. The technical impact of a single REC makes the overall system globally smart while however each local community retain its independence. The starting point of any technical approaches for the construction of RECs must necessarily be linked to the characterization of the reference area, studying the possibility of creating independent or autonomous realities exploiting the territorial resources. The technological development must exploit all possible elements of a REC and all possible optimization and control architectures. The plant technology and energy conversion system must be characterized, on the basis of the available resource. Therefore, the impact of new technologies of RECs in the energy sector is indispensable since it is possible to reduce emissions and reach technological development and to solve energy congestion through incentives and the promotion of energy policies. RECs are also implementable in low energy efficiency contexts. Promoting innovative and replicable models of local and rural community management through hi-tech tools, new collaborations with local authorities and institutions is, therefore, necessary to step forward to a carbon-free society.

## **Control, Cooperation, and Resilience in Rural Energy Communities**

### **Organizers**

**Raffaele Carli**

*Polytechnic of Bari*

**Mariagrazia Dotoli**

*Polytechnic of Bari*

**Roberto Sacile**

*University of Genoa*

**Enrico Zero**

*University of Genoa*

## **Empowering Human-Robot Collaboration: Shared Autonomy, System Transparency, and Trustworthiness**

### **Organizers**

**Marco Faroni**

*Polytechnic University of Milan*

**Martina Lippi**

*Roma Tre University*

**Alessandro Umbrico**

*Institute of Cognitive Sciences and Technologies*

**Alessandro Marino**

*University of Cassino and Southern Lazio*

**Cesare Tonola**

*University of Brescia*

Regularly lifting heavy loads is considered one of the main factors contributing to work-related musculoskeletal disorders. Industrial exoskeletons have recently seen great developments, with dozens of devices literally invading the market. Robotic exoskeletons have the potential to protect the musculoskeletal system from injury and to reduce the occurrence of chronic musculoskeletal disorders. At the same time, we can observe that the adoption rate is still rather low, suggesting that despite the potential of occupational exoskeletons, there is still room for improvement. This workshop can be seen as a crossing point between the views of industry and academia in the development of exoskeleton technologies. The main objective of this workshop is to make academia aware of market demands and requirements and to make the industry aware of existing solutions and research opportunities. The workshop also includes live demonstrations from both industrial and academic sides, with the main objective of soliciting discussions.

The ultimate aspiration of collaborative robotics is to bring robots to a level where they can interact with people in a manner that mirrors human-human interaction. This involves establishing a paradigm of shared autonomy, where robots neither function independently nor act subserviently to humans. Instead, they actively collaborate with human operators and coexist seamlessly, complementing each other's strengths and capabilities to achieve common goals. In this shared autonomy framework, when humans can actively participate in robots' decisional processes and understand the causal relationships of actions, they are more likely to trust robots' autonomous behaviors and collaborate effectively. In turn, when robots leverage shared abstraction models of human reasoning and the context they are operating in, they can better adapt and act proactively to achieve complex objectives. As humans understand robots' actions, they can also provide feedback to refine the shared abstraction models, promoting continuous adaptation and improvement of the collaboration process. Establishing this interconnection is key to building a trustworthy collaboration and unlocking the full potential of human-robot synergy. This workshop aims to bring together different expertise and perspectives in designing, deploying, and evaluating shared autonomy and transparent collaboration to create a common ground for efficient and safe human-robot collaboration.

## **Industrial Exoskeletons: Market Demands, Open Challenges and Research Opportunities**

### **Organizers**

**Andrea Calanca**

*University of Verona*

**Mohamed Irfan Refai**

*University of Twente*

**Francesco Pascucci**

*University of Verona*

**Eldison Dimo**

*University of Verona*

# Empowering the Future Workforce: Design Thinking Workshop with LEGO®

## Organizers

**Pía Torres**  
*Di Tella University*

**Romina Fairbairn**  
*Di Tella University*

This workshop empowers engineers and scientists to thrive in the robotics and automation design revolution. Through hands-on activities with LEGO®s, you'll gain the skills to design innovative and impactful solutions.

### 1. Design Thinking:

- **User-Centric Design:** Develop empathy to users, understanding their needs and challenges.
- **Creative Problem-Solving:** Learn to brainstorm and explore solutions for real-world challenges.
- **Rapid Prototyping:** Craft physical prototypes to quickly test and refine your ideas.
- **Collaborative Innovation:** Master teamwork skills essential for successful development in multidisciplinary teams.

### 2. 21st Century Skills:

- **Critical Thinking & Problem-Solving:** Sharpen your ability to analyze complex challenges and develop innovative solutions.
- **Data-Driven Decisions:** Learn to leverage data to make informed choices for your designs.
- **Effective Communication:** Master communication and collaboration within diverse teams with varying technical backgrounds.

### 3. Human-Centered Development:

- **Designing with Purpose:** Explore the power of technology to address critical humanitarian challenges and improve lives.
- **Ethical Considerations:** Integrate ethical principles and social responsibility into your designs.
- **Building Sustainable Solutions:** Consider the environmental and social impact of your designs. Become a leader in the future of work. Design solutions that address real-world needs, aligning with United Nations Sustainable Development Goals and promoting positive humanitarian impact.

# Enhancing Human-Centered Automation: Mastering Resilient Multi-Robot Systems with Dynamic Collaboration and Heterogeneity

## Organizers

**Natalia Ogorelysheva**  
*Fraunhofer Institute for Material flow and Logistics*

**Julia Freytag**  
*Fraunhofer Institute for Material flow and Logistics*

Recent development and practice of Robotics 4.0 technologies are getting huge momentum to improve citizens quality of life and well-being and enhance society conditions. Latest advancements delve into the progression from traditional automation to collaborative and cognitive automation, emphasizing the importance of human-robot interaction and cooperation. In this context, the proposed workshop aims at exploring the evolution of robotics and automation across different human-centric technological domains, such as manufacturing, healthcare, transportation, and household tasks, while investing the effectiveness of new solutions for helping people, improving working conditions, transferring applications and economic enhancement of research.

The current utilization of multi-robot system (MRS) in industry and logistics has delineated a clear demarcation between tasks performed by humans and those by robots, often lacking efficient collaboration and adaptability. Despite their ability to perform numerous tasks, MRS are not sufficiently flexible, particularly in resilient and adaptive operations, which are crucial for dynamic industrial environments. As technology advances, the potential of MRS expands, yet the complexity and challenges within these systems also escalate. This underscores the need for a transformative approach in how these systems are integrated and managed to enhance not only their functionality but also their interaction within human-centric environments. One of the foremost challenges lies in developing systems that are not only resilient, adaptive, dynamic, and scalable but are also designed to transition from human support to automation in a modular fashion as technology and algorithms advance. This modular transition is designed to facilitate a seamless switch between robot and human operation. This includes using teleoperation as a method to bridge the gap when a situation demands human intervention or insight. The system should be equipped with decision-making capabilities to autonomously determine when it requires human assistance, depending on the complexity or unpredictability of the task at hand. Additionally, the system can learn from these human-led interventions, gradually incorporating human strategies and solutions into its algorithms to enhance future autonomous operations, thereby improving adaptability and resilience in dynamic environments. During the workshop, we will explore the potential to construct such systems through a smart orchestrating architecture. This architecture leverages various services in a modular manner, enhancing the flexibility of MRS and fostering a symbiotic relationship with human operators.

## French-Italian Workshop on Robotics 4.0

### Organizers

**Raffaele Carli**  
*Polytechnic of Bari*

**Mariagrazia Dotoli**  
*Polytechnic of Bari*

**Andrea Cherubini**  
*University of Montpellier*

## **Human Movement Understanding, Whole-Body Control, and Human-Robot Interfaces in Manufacturing, Healthcare, and Underwater Exploration**

### **Organizers**

**Emel Demircan**

*California State University Long Beach*

**Taizo Yoshikawa**

*Honda R&D (Japan)*

**Tadej Petric**

*Jozef Stefan Institute*

Robotics research has drawn much inspiration from humans as a system: in the design of the anthropomorphic aspects of manipulators, sensors, and actuators, approaches for coordinating full body motions, and the higher-level strategies for realizing complex tasks and interacting with the external environment and other humans. Today, robotics as a field has matured to the point where methodologies developed and used in robotics may be leveraged to address research questions in many other fields, ranging from neuroscience to computer animation. Together with the tools from biomechanics, robotics enables our efforts to explore natural human motion, leading to improvements in treatments for patients with neuro-musculoskeletal disorders, and facilitating development of human inspired robots. In recent years, expectations for remotely controlled robots have increased. Progress is being made in the development of technology that allows humans to perform tasks that were previously difficult to be done manually using remote-controlled robots. There are also high expectations for the use of remote-control technology for robots operating in various environments such as underwater and space. Interface technology for remote control using 5th generation mobile communication systems is attracting attention. The main objectives of the proposed TC are: 1) Achieving natural human behavior in remote operations and enabling more sophisticated strategies in complex tasks and interaction with the external environment; 2) Estimating and predicting human movement status and promoting applications in rehabilitation, prosthetic limbs, and exoskeleton design; and 3) Development of strategies to reconstruct human behavior on artificial anthropomorphic systems.

This workshop will explore the convergence of machine learning (ML) with digital twin (DT) technology as a cornerstone for innovation in advanced manufacturing. As manufacturing moves towards and beyond Industry 4.0, the DT concept has emerged as a transformative tool for optimizing manufacturing processes and product lifecycle management. The integration of ML enables predictive maintenance, real-time monitoring, and dynamic optimization. This workshop will focus on the significance of merging ML with DT in the manufacturing sector, driving towards smarter, more efficient, and autonomous systems.

## **Machine-learning-driven Digital Twin Construction for Advanced Manufacturing**

### **Organizers**

**Hyunwoong Ko**

*Arizona State University*

**Yan Lu**

*The National Institute of Standards and Technology*

## Machine Learning for Automation

### Organizers

**(Samuel) Qing-Shan Jia**  
*Tsinghua University*

**Bing Yan**  
*Rochester Institute of Technology*

**Aparna Varde**  
*Montclair State University*

**Bengt Lennartson**  
*Chalmers University of Technology*

**Maria Pia Fanti**  
*Polytechnic of Bari*

This workshop on Machine Learning for Automation (MLA) provides a unique opportunity to explore the cutting edge research and practice on how machine learning is transforming automation, and vice versa. How is ML transforming semiconductor manufacturing? Accelerating the design of next-generation batteries? Making buildings smarter? Achieving safe, green, and inclusive mobility in cities? Evolving automatic virtual metrology? And how to advance fundamental theories and algorithms in MLA practice, such as solving mixed-binary linear programming problems, combining constrained programming and satisfiability solvers, improving data efficiency and robustness, and making AI models explainable? What are the options in commercial software such as Matlab and Simulink for MLA? We provide 10 exciting talks from leading experts to address these questions. Beyond that, a poster session, a demo session, and a panel session would provide great hands-on experience and opportunities to interact with the experts in MLA. This will be a memorable full day workshop for the participants. This workshop is organized by the IEEE RAS TC on MLA, with support from TC on Logistics, TC on Semiconductor Manufacturing, TC on Smart Buildings, and TC on Digital Manufacturing and Human Machine Interaction.

This workshop unites researchers in Soft Robotics, Wearable technologies, and Automation to explore the potential of interactive, flexible soft robotic components. These components hold the key to transitioning hardware automation from structured manufacturing environments to dynamic, human-populated settings where the automation needs can continuously change. We'll discuss use cases ranging from soft grippers and exoskeletons to collaborative manipulators and robots designed for environmental interaction. AI technologies and their synergic use with flexible-reconfigurable hardware will also be covered.

## Soft Robots and Wearables for Flexible and Interactive Automation

### Organizers

**Vito Cacucciolo**  
*Politecnico di Bari*

**Francesco Giorgio-Serchi**  
*University of Edinburgh*

**Federico Renda**  
*Khalifa University*

**Shingo Maeda**  
*Tokyo Institute of Technology*

## **Translating Manufacturing Control and Automation Research to Practice: Examples, Challenges, and Opportunities**

### **Organizers**

**Efe Balta**

*inspire AG*

**Kira Barton**

*University of Michigan*

**Ilya Kovalenko**

*Pennsylvania State University*

**Wesley Oliviera**

*Instituto Tecnológico de Aeronáutica*

**Alisa Rupenyan**

*Zurich University for Applied Sciences*

**Dawn Tilbury**

*University of Michigan*

Partnerships and collaborations between academia and industry are imperative for addressing many of the challenges in creating Automation 5.0. The development of sustainable tools and methods, the implementation of new shop floor automation, and the creation of intelligent control tools will require input from both academic and industry researchers. In this workshop, we will explore challenges in developing manufacturing control and automation research in practice, focusing on initiatives, barriers, and collaboration opportunities. As part of this workshop, there will be speakers from both academia and industry who will share their experiences and perspectives on establishing academic-industry relationships. Speakers with global perspectives (USA, Brazil, Switzerland, etc.) will be featured as part of the workshop. In addition, we will have an interactive breakout session and a poster session that will engage attendees and allow them to discuss the 'best practices' and 'lessons learned' from their experiences, as well as provide opportunities to establish close academic and industry partnerships.



## Free visits at Polytechnic University of Bari

**Date:** August 28

**Time:** 09:30 – 12:00

**Location:** Campus “Ernesto Quagliariello”

**Cost:** Free

**Note:** Free transportation service is included.

## Guided technical tours at leading industrial companies

**Date:** August 28

**Time:** 12:00 – 18:00

**Participants:** Limited to 30

**Cost:** Fee includes transportation service and lunch.

### Companies

## MASMEC

Masmec is an Italian company that excels in precision engineering, particularly in the automotive and biomedical sectors. It is known for its advanced automation systems and commitment to innovation, ensuring high-quality, reliable products.



Magna is more than one of the world's largest suppliers in the automotive space. Magna is a mobility technology company built to innovate, with a global, entrepreneurial-minded team of over 179,000 employees across 343 manufacturing operations and 105 product development, engineering and sales centres spanning 28 countries. With 65+ years of expertise, their ecosystem of interconnected products combined with their complete vehicle expertise uniquely positions them to advance mobility in an expanded transportation landscape. For further information about Magna (NYSE:MGA; TSX:MG), please visit [www.magna.com](http://www.magna.com) or follow them on social.

# Events

## Welcome and Farewell Reception

Welcome: 29 August, 20:00 – 21:30

Farewell: 31 August, 20:00 – 21:00

*Included in the (in-person) full and student registration fees*

Join us for the Welcome and Farewell Ceremonies. You will enjoy nice moments while indulging in delicious typical Apulian foods. It's a perfect setting to connect with fellow participants.

## Gala Dinner

30 August, Corte di Torrelonga, 20:00 – 23:30

*Included in the (in-person) full and student registration fees*

Indulge in an evening of elegance at an old Italian Villa — delight in fine dining, entertainment, and camaraderie within the historic walls of this enchanting venue. Transportation service is included.

## Sightseeing tour of Bari

30 August, 15:30 – 20:00

*Included in the (in-person) full and student registration fees*

Explore the charm of Bari's old town with a guided sightseeing tour. Transportation service is included.

## RAS SAC Events

### Lunch with Leaders

31 August, 13:00 – 14:00 @ Rooftop

**Organizer:** Nicola Mignoni

**Leaders:** Aude Billard, Bengt Lennartson, Carla Seatzu, Dawn Tilbury, Fan-Tien Cheng, Feng Ju, Laura Giarrè, Maria Pia Fanti, Mengchu Zhou, Michael Yu Wang, Qianchuan Zhao, Weiming Shen, Yu Sun

*This event is reserved for students and Young Professionals*

This free luncheon is open to students and young professional attendees offering the chance to meet and interact with Leaders of RAS and/or Industry. The event will feature informal roundtable discussions over lunch in an exclusive location, which allows participants to receive career advice, gain insight into the future, or simply engage in general conversation to get to know pioneers in the field. Don't miss out on this chance to elevate your networking experience and make meaningful connections with figures in the world of robotics and automation.

### Social Hour

31 August, 21:00 – 22:00 @ Rooftop

Join the RAS Student Activities Committee's Social Hour to meet fellow student attendees, grab a snack and beverage and make networking easier at the conference. Attending a conference as a student can be overwhelming, particularly if you are without an advisor, lab mates, or colleagues. Attending the SAC Social Hour will give you the opportunity to connect with others, which makes it easier to engage in thoughtful conversations on the future of robotics and automation during the remainder of the conference.

## RAS WIE Events

### WIE Lunch: Automation 5.0 and Engineering for Diversity and Inclusion

August 30, 13:00 - 14:00

**Organizers:** Graziana Cavone, Hyun-Jung Kim, Georgia Chalvatzaki, Nadia Figueroa

**Moderators:** Nadia Figueroa, Valeria Bonagura

This event focuses on the role of Automation 5.0 in fostering diversity and inclusion in engineering. It features a panel discussion followed by round-table discussions and a buffet lunch, providing ample opportunities for networking and knowledge sharing.



*Patrizia Lamberti – Associate Professor of Electrotechnics at University of Salerno, Italy / Chair of the Italian WIE Affinity Group*



*Calogero Maria Oddo – Associate Professor of Industrial Bioengineering at University Sant'Anna of Pisa, Italy*

## RAS IAB Event

The RAS Industrial Activities Board (IAB) is dedicated to fostering the growth of the industrial community within the IEEE Robotics and Automation Society. Our mission is to enhance collaboration between industry and academia by encouraging industrial participation in current activities and initiating new actions beneficial to this community.

### Startup/Mentor Office Hours

August 30, 2024 10:00 – 17:00 @ RAS Corner in the Exposition Area

Connect with IAB experts and mentors to gain insights and advice on your startup ventures. This is a unique opportunity to discuss your ideas, receive valuable feedback, and network with professionals in the field.

### Coffee Break

August 29, 15:30 – 16:00 @ Coffee Break Area  
Join us for a relaxing coffee break where you can meet and interact with fellow conference attendees. This informal setting provides a great opportunity to network and discuss potential collaborations.

### Industrial Panel

August 29, 16:00 – 17:00 @ Plenary Room

Gain insights into the latest trends and advancements in the industrial sector from leading experts. This panel will feature discussions on cutting-edge technologies and their applications in manufacturing and robotics.

**Moderator:** Andra Keay

**Manufacturing 5.0 @ Magna**



Alex Zak – Global Director, Corporate R&D, Advanced Manufacturing & Robotics of Magna International Inc.

**Enabling Industry 5.0: Automation Solutions for Automotive @ Masmec**



Vito Lazazzera – Innovation Director – Automotive Division, MASMEC S.p.A., Italy.

**Bi-manual Collaborative and Advanced Path Planning in Humanoid Robot RoBee**



Fabio Puglia – President and co-founder of Oversonic, Besana, Italy.

**Medium Voltage Smart Grids: Automation for Evolved Operations**



Pasquale Massimiliano Girardi – Head of Territorial Unit Barletta-Andria-Trani, Electricity Distribution and Measurement, e-distribuzione S.p.A., Italy.

**Session on the Process and Importance of IEEE Standardization for Automation**

August 29, 17:00 – 18:00 @ Plenary Room

Introducing the opportunity to propose and to work on IEEE standards. The aim is to inform researchers why, when and how to work on such a standard and the processes required.

**Session on the Process and Importance of IEEE Standardization for Automation**

August 29, 17:00 – 18:00 @ Plenary Room

Introducing the opportunity to propose and to work on IEEE standards. The aim is to inform researchers why, when and how to work on such a standard and the processes required. Standards are crucial not only for success of open automation or interfacing networked control systems as discussed in the last Automation Cluster Forum at ICRA 2024 and 2023.

**Anchor:** Birgit Vogel-Heuser

**IEEE Robotics and Automation Standards: Introduction and Opportunities**



Paulo Jorge Sequeira Gonçalves – Professor at Instituto Politécnico de Castelo Branco | Senior Researcher at IDMEC, Instituto Superior Técnico, Universidade de Lisboa

The IEEE Robotics and Automation Society (RAS) has been developing standards since 2011 to formally adopt and confirm best practices in robotics and automation as standards. Its main objectives are to promote: common measures and definitions in robotics and automation; measurability and comparability of robotics and automation technology; integrity, portability, and reusability of robotics and automation technology. The talk will start to briefly introduce the IEEE Standards Association process to develop standards, and presents well-known success stories. The second part of the talk is dedicated to the past, present, and future of the IEEE RAS standards activities. Ranging from the first ever ontological standard for robotics and automation (2015) covering core concepts in this domain, to the most recent on Robot Task Representation (2024), encompassing standards for Map Data Representation and Autonomous Robotics. Current and future efforts will also be introduced in the areas of Human Robot Interaction, Multiple Robots, and Humanoid Robots.

***From open source to your research project: Why standards matter***



*Stefan Scherzinger – Expert Robotic Ecosystems and Software Integration, Software & Electronics, Research & Development, SCHUNK SE & Co. KG, Brackenheim-Hausen*

Researchers in the robotics and automation fields often rely on open-source software for a variety of devices and systems as part of their scientific projects. However, this software is typically developed and maintained by small communities or individuals, which

poses challenges as the number of products and ecosystem interfaces continues to grow. In this talk, we will explore SCHUNK's current challenges in developing open-source gripper drivers for robotic ecosystems and motivate the use of standards to address this dilemma.

***Standardized data provision through digital twins (Asset Administration Shell)***



*Ansgar Kriwet – Festo SE & Co. KG, Executive Board Research and Development, Esslingen*

Interoperable and standardized data is critical to shortening time-to-market for machine manufacturers. Automated and error-free access to information across company boundaries enables data quality and simplifies machine development and factory operations. Aspects discussed are; how the optimal component and machine design can already be identified in a networked virtual environment; and how Digital Twins enable a well-understood international digital language between networked companies. Important working groups for standardized descriptions, data structures and data are for the digital twins will be mentioned.

# Awards

**Chair:** Michael Yu WANG

## Best Conference Paper Award

**Chair:** Dezhen Song

**Members:** Birgit Vogel-Heuser, Jingang Yi

This award is given annually to the author(s) of a paper presented at the IEEE International Conference on Automation Science and Engineering (CASE) that contributed to the notable advancement in automation research: abstractions, algorithms, theory, methodologies, and models that improve efficiency, productivity, quality, and reliability of machines and systems operating in structured environments over extended periods, or that improve the explicit structuring of environments where machines and systems operate.

**Finalists:**

Accelerating Virtual Fixture Estimation for Robot Manipulation Using Reinforcement Learning and Human Demonstrations

*Diego Fernandez Prado, Konstantinos Larintzakis, Jan Irsperger, Eckehard Steinbach*

Semantic Behaviour Tree Learning through Kinesthetic Demonstrations for Position-Force Controlled Robotic Applications

*Lorenzo Fratini, Niccolò Lucci, Matteo Malavenda, Andrea Maria Zanchettin, Paolo Rocco*

Hierarchical Reinforcement Learning Based on Planning Operators

*Jing Zhang, Emmanuel Dean, Karinne Ramirez-Amaro*

## Best Application Paper Award

**Chair:** Lars Mönch

**Members:** Feng Ju, Hyun-Jung Kim

This award is given to the author(s) of a paper

presented at the IEEE International Conference on Automation Science and Engineering (CASE), recognizing outstanding applications in the field of automation.

**Finalists:**

Multi-Agent Path Planning for Finite Horizon Tasks with Counting Time Temporal Logics

*Peng Lv, Shaoyuan Li, Xiang Yin*

Chattering-Free Sliding Mode Control for Position and Attitude Tracking of a Quadrotor with a Cable-Suspended Load

*Sara Gomiero, Karl von Ellenrieder*

A Geometry Aware Diffusion Model for 3D Point Cloud Generation

*Ao Zhang, Zhen Shen, Qihang Fang, Jian Jian Yang, Gang Xiong, Xisong Dong*

## Best Student Paper Award

**Chair:** Raffaele Carli

**Members:** Qing-Shan Jia, Michela Robba

This award recognizes the best paper authored primarily by a student and presented by the student at the IEEE International Conference on Automation Science and Engineering (CASE). The award is supported by his academic family to honor Professor Yu-Chi (Larry) Ho, a Past President of the IEEE Robotics and Automation Council, which later became the IEEE Robotics and Automation Society.

**Finalists:** A Feature Extraction Framework with Entropy on Graphs for Cross-Dataset Building Fault Detection

*Jiajing Huang, Abhidnya Patharkar, Teresa Wu, Jin Wen, Zheng O'Neill, Kasim Candan*

Adaptive Responses of Cancer Cells to Tumor Microenvironment Changes: An Evolutionary Model Perspective

*Chiara Romano, Alessandro Borri, Maria Domenica Di Benedetto*

Development of a Novel Multipurpose Robotic End Effector for Fruitlet Thinning and Fruit Harvesting of Apples

*Rahul Jangali, Benjamin John McGuinness, Shen Hin Lim, Henry Williams, Ans Qureshi, David Anthony James Smith, Bruce MacDonald, Mike Duke*

## Peter Luh Memorial Best Paper Award for Young Researcher

**Chair:** Raffaele Carli

**Members:** Qing-Shan Jia, Michela Robba

This award recognizes the best paper co-authored by a young leading researcher and presented by the researcher at the IEEE International Conference on Automation Science and Engineering (CASE). The award is established in honor of Professor Peter Luh's dedicated service to raising the profile of Automation and supporting young researchers early in their career. Peter Luh was a co-founder of CASE and the founding Editor in Chief of the automation journal, *Transactions on Automation Science and Engineering (T-ASE)*. He was also noted by many of the Robotics and Automation Society volunteers as the first person to reach out to them early in their careers and encourage them to become volunteers. For this reason, this award is specifically dedicated to young researchers holding a PhD degree not older than five years on the last day of the month when the conference is held.

### **Finalists:**

An efficient parallel single surrogate objective optimization method for multi-objective black-box problem and its application in processor design

*Xiaoliang Lv, Qiaozhu Zhai, Yuhang Zhu, Jianchen Hu, Yuzhou Zhou, Xiaohong Guan*

Helical Trajectory Control of Quadrotor UAVs Using Fractional Order Proportional-Integral-Derivative (FOPID) Controller

*Ghulam E Mustafa Abro, Ayman M Abdallah, Mohssen E. Elshaar*

A Distributed Algorithm for Coordination in Energy Communities

*Riccardo Brumali, Guido Carnevale, Ruggero Carli,*

*Giuseppe Notarstefano*

## Best Short Paper Award

**Chair:** Dezhen Song

**Members:** Birgit Vogel-Heuser, Jingang Yi

The award is given to the author(s) of a presentation-only paper or abstract presented at the IEEE International Conference on Automation Science and Engineering (CASE).

### **Finalists:**

Measuring Healthcare Accessibility in Metropolitan Cities in China

*Qing Wang, Leqi Weng, Fanyuan Ma, Jingshan Li*

Data-Driven Methods for Virtual Metrology of Sheet Resistance in Physical Vapor Deposition (PVD) Process

*Chia-Yu Hsu, You-Wei Cheng, Ming-Yu Lee*

Designing Deep Reinforcement Learning-Based Dynamic Machine Allocation with Case Study of a Semiconductor Tool Group

*Hsin-Tzu Hsu, Shi-Chung Chang*

## Best Application Video Award

**Chair:** Lars Mönch

**Members:** Feng Ju, Hyun-Jung Kim

This award is given to the author(s) of a paper presented with outstanding application videos at the IEEE International Conference on Automation Science and Engineering (CASE).

### **Finalists:**

Adaptive Incremental Hybrid Impedance Control for Robotic Garment Manipulation

*Yukuan Zhang, Dayuan Chen, Alberto Elías Petrilli-Barceló, Jose Victorio Salazar Luces, Yasuhisa Hirata*

Strongly-Connected Minimal-Cost Radio-Networks among Fixed Terminals Using Mobile Relays and Avoiding No-Transmission Zones

*Francesco Bernardini, Daniel Biediger, Ileana Pineda, Linda Kleist, Aaron Becker*

Concentric-Tube-Eccentric-Rod: A Continuum Actua-

tor for Macro-/Micro-Scale Translational Actuation  
*Lingyun Zeng, S.M.Hadi Sadati, Mirroyal Ismayilov, Lukas  
Lindenroth, Christos Bergeles*

## **Best Healthcare Automation Paper Award**

**Chair:** Mauro Gaggero

**Members:** Angelo Alessandri, Patrizia Bagnerni  
ini

This award is given annually to the author(s) of a paper presented at the IEEE International Conference on Automation Science and Engineering (CASE) that contributed to the notable advancement in Best Healthcare Automation. The award is sponsored by Pinetree Health Technologies Co., Ltd.

### **Finalists:**

**Fiducial Marker Based Patient-To-Robot Registration and Target Tracking for Automatic Extra-Body Ultrasound Imaging**

*Yixuan Zheng, Weizhao Wang, Hamza Ferhusoglu, Tharun Subramaniyam, Zhouyang Xu, Kawal Rhode, Richard James Housden*

**Accelerating Laboratory Automation through Robot Skill Learning for Sample Scraping**

*Gabriella Pizzuto, Hetong Wang, Hatem Fakhroldeen, Bei Peng, Kevin Sebastian Luck, Andrew Ian Cooper*

**Automating 3D Surgical Suture Planning**

*Viraj Ramakrishnan, Julia Isaac, Harshika Jalan, Harsha Polavaram, Aviv Adler, Hansoul Kim, Danyal Fer, Ken Goldberg*



## CASE24 Summer School on Autonomous Systems for Smart Cities

Autonomous systems are increasingly becoming integral to the development of smart cities, encompassing a wide range of applications beyond just vehicles. These systems include drones for surveillance, robots for maintenance, and AI-driven software for managing city infrastructure. Research in this field aims to enhance urban safety, reduce environmental impact, improve public services, and ensure sustainable urban development.

Our Summer School intends to showcase the latest advancements in autonomous systems research relevant to smart cities, providing insights to students, academic researchers, and industrial practitioners. The goal is to explore the integration of autonomous systems into various smart city scenarios, including traffic management, public safety, waste management, and energy efficiency.

The summer school will be supported by the RAS TC Automation Cluster and the following RAS Technical Committees: Automation in Logistics, Agricultural Robotics and Automation, Digital Manufacturing and Human-Centered Automation, Performance Evaluation & Benchmarking of Robotic and Automation Systems.

### Organizers

**Maria Pia Fanti**

*Polytechnic University of Bari*

**Angela Faragasso**

*University of Tokyo*

**Birgit Vogel-Heuser**

*Technical University of Munich*

**Fabio Bonsignorio**

*University of Zagreb*

### Program

**Date:** August 28th, 2024

**Time:** 8:30 – 17:00

# 3rd International Conference on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding (VIPERC 2024)

The VIPERC 2024 on Visual Pattern Extraction and Recognition for Cultural Heritage Understanding aims to be a satellite event of IEEE CASE 2024, presenting academic and industry papers on big data, data mining and knowledge discovery, machine learning and deep learning, 3D modeling and simulation (structural, thermal, functional and acoustic analysis), software engineering, and, more generally, aspects related to digital transition for visual pattern extraction, analysis, and recognition to preserve cultural heritage.

VIPERC 2024 welcomes contributions from various research areas related to the digitization of cultural heritage, building recovery, conservation, and maintenance, leveraging current technologies and the support of robotics and automation. It also favours the participation of young research scholars who want to present their early-stage in-progress academic work.

## Organizing committee

### General Chairs

**Alessia AMELIO**

*University of Chieti-Pescara*

**Drahomira CUPAR**

*University of Zadar*

**Valentino SANGIORGIO**

*University of Chieti-Pescara*

### Program Chairs

**Marijana TOMIĆ**

*University of Zadar*

**David RAMÌREZ SOLANA**

*Polytechnic University of Bari*

**Sergio MONTELPARE**

*University of Chieti-Pescara*

**Luca VIRGILI**

*Marche Polytechnic University*

**Alex MIRCOLI**

*Marche Polytechnic University*

# Useful Information

## The Nicolaus Hotel

The Nicolaus Hotel is an elegant hotel and conference center a few steps away from Bari city center.

The hotel offers a welcoming atmosphere and an immediate sense of belonging. The interiors are full of light, with functional and technological spaces combined with art and creativity. It has 174 comfortable and elegant rooms, 15 modular

and technical meeting rooms, a cozy and private wellness area, and 5 exclusive dining locations.

In addition, the Nicolaus Hotel has a large Congress Centre divided into 15 modular and technical conference rooms seating up to 1000 and qualified professional staff to support the conference's activities.



## How to Reach the Nicolaus Hotel

If you stay at Nicolaus Hotel, you can benefit of the *free bus shuttle service* from/to the Bari Airport. The service is upon availability at scheduled times, and it needs to be booked at least 24 hours before your arrival (and departure). For further information contact the [Nicolaus Hotel](#).

If you do not stay at Nicolaus Hotel, from the Airport of Bari (*Aeroporto*, in Italian) you can easily reach the Main Railway Station (Bari Centrale) by *train*, *bus*, and *taxi service* (see below). From there, take a *city-bus* operated by AMTAB to the Nicolaus Hotel.



### By train

A 20-minute *train*, operated by [Ferrotramviaria](#), connects Bari Airport to/from Bari Centrale (the Main Railway Station, or FS Station). The entrance of the “Ferrotramviaria Railway Station” is located on the right side of the main entrance of the Airport. There are on average two trains per hour and a single ticket costs € 5.00. Ticket can be purchased at the *box office* of the station, or at the automatic *ticket-machines*, or online through the *Ferrotramviaria App* (download by scanning the QR Code).



### By bus shuttle

A 30-minute *public bus shuttle* to/from Bari Airport and Bari Centrale operated by [Tempesta Autolinee](#) (stops and timetables shown here can change, always check on the website). The bus stops in front of the arrivals and departures exit (at the Airport) and in “Aldo Moro” square (at the Main Railway Station). You can purchase a single ticket for € 4.00 directly on the bus before departure.

AIRPORT Karol Wojtyła	KAROL WOJTYŁA AIRPORT BARI-PALESE	FFSS STATION BARI CENTRAL	FS STATION Aldo Moro Square
	Departures	Departures	
STOP ON REQUEST Piazza Garibaldi, 50 AmTAB Bus Stop  STOP ON REQUEST Via Quintino Sella at number 113/112  FS STATION Aldo Moro Square	07.30	05.10	STOP ON REQUEST Via Andrea from Bari (imp. via Garibaldi)  STOP ON REQUEST Via Niccolò Piccinni (in front of almost number 4)  STOP ON REQUEST Garibaldi Square (in front of almost number 4)  Airport Karol Wojtyła
	08.30	06.30	
	09.25	07.30	
	10.15am	08.30	
	11.30	09.20	
	12.30	10.15am	
	1.15pm	11.15am	
	2.30pm	12.20	
	3.30pm	1.20pm	
	4.40pm	2.30pm	
	5.30pm	3.20pm	
	6.40pm	4.30pm	
	7.45pm	5.30pm	
	8.45pm	6.30pm	
	9.30pm	7.30pm	
	10.10pm	8.30pm	
11.10pm			
24.10			

Alternatively, you can take directly a city-bus (*line 16*) from Bari Airport to the Main Railway Station for € 1.50 (on board). The travel duration is around 40 minutes. Further information on stops and timetables on the [AMTAB](#) website.

### By taxi

A taxi to the city center costs approximately € 25.00 – 30.00. Further information at <https://bari.airports.aeroportidipuglia.it/da-e-per-gli-aeroporti/type/taxi/>

## Discover Bari

Bari is the capital city of Apulia Region (or Puglia, as it is known to the locals). While keeping strong ties with its own traditions, it represents a modern city, as well an important economic center, in the whole Southern Italy. Bari is a highly multifaceted city, and you really need to discover every single aspect to understand its true core.

Known as the *Gateway to the East* due to its long tradition of trade, this capital of Apulia is rich in history. Exploring the historic city center allows us to discover its most authentic character, with signs of its past scattered through the local alleyways and endless examples of age-old traditions passed from generation to generation. Then, the famous Bari promenade offers one of the most beautiful view in Italy, overlooking the

clear sea and the unique charm of Bari.

Bari is composed of four urban sections. In the northern city area, there is the Old Town (also called *Bari Vecchia*) between two modern harbours, with the *Basilica of San Nicola* (Saint Nicholas), the *Cathedral of San Sabino*, and the *Hohenstaufen Castle of Frederick II*, which is now also a major nightlife district. In the southern district, the *Murat quarter* (erected by Joachim Murat), the modern heart of the city, is laid out on a rectangular grid-plan with a promenade on the sea and the major shopping district.

Today, this dynamic city, nestled in the heart of the countryside, punctuated by white dry-stone walls, still holds dear the memory of its seafaring exploits of the Middle Ages, as well as its precious monuments and striking churches.



## Getting around Bari

To reach the most suggestive areas of Bari there is no better service than that offered by the public [AMTAB](#) urban transport network, with several city-buses.

A ticket costs €1 (€1.50 if bought on board). Further information on lines, stops, and timetables on the AMTAB website, or check

out the travel planner dashboard. You can instead download the [MUVT App](#), which allows you to consult the timetables of the rides, create travel itineraries and buy tickets directly from your smartphone.

As an alternative, you can always take a taxi in Bari Centrale.

## Top Suggested Tourist Attractions in Bari

A perfect city for those who love the sea, but also for avid explorers: what to see in Bari? We have shortlisted some *popular sites* that you must absolutely visit.

### Bari Vecchia

A tour of *Bari Vecchia* is perfect to get stuck into the heart of this Apulian capital. The San Nicola district spans between the two ports of Bari, the old and the new, overlooking the seafront of Bari. The historical centre of the city, dating back to the Middle Ages, is encircled by walls. While exploring the narrow streets, take a moment to admire the women making traditional Apulian *orecchiette* pasta by hand.



### Basilica of San Nicola

The *Basilica of San Nicola* is an important Romanesque church located in the heart of the old town. Built between 1087 and 1197, the basilica houses the relics of Saint Nicholas, Bishop of Myra, making it a place of pilgrimage for Christians around the world. Its imposing facade and majestic interior, with frescoes, columns and the famous ciborium, testify to the historical and spiritual richness of this site.

### The Swabian Castle by Frederick II

The *Norman-Swabian Castle of Bari* is a majestic medieval fortress located in the heart of the city. Built in the 12th century by the Normans and later enlarged by the Swabians, the castle is a significant example of military architecture. With its imposing towers, the mighty walls and the impressive moat, the castle tells the story of the successive dominations in Puglia. Today it hosts exhibitions and cultural events, offering visitors a fascinating journey into the past.





### Cathedral of San Sabino

The *Cathedral of San Sabino* is a masterpiece of Apulian Romanesque architecture, located in the historic center of Bari. Built in the twelfth century, it is dedicated to San Sabino, bishop of Canosa. The Cathedral is renowned for its austere facade and intricate interior decorations. Inside, visitors can admire the precious mosaic floor and the crypt that houses the relics of the saint.

### Bari Promenade

Bari Promenade, also known as *Lungomare Nazario Sauro*, stretches for several kilometers along the coast, offering a breathtaking view of the Adriatic Sea. Built in the 1920s, the promenade features elegant street lamps, benches and palm trees, creating a relaxing atmosphere for walking, jogging and cycling. It is a great place to watch the sunset and enjoy the sea breeze, with numerous bars and restaurants offering local specialities along the way.



### Orecchiette's Street

Another must-visit destination for food enthusiasts is the *Strada delle orecchiette* (Orecchiette's Street) in Bari Vecchia (the Old Town). Here, amidst the narrow streets, local women showcase their artisanal skills by handcrafting the famous orecchiette pasta right outside their homes. Visitors can witness the meticulous process of pasta-making and even sample these freshly made delicacies.



## Find out more about Puglia

In recent years, Puglia has gradually built a reputation as a bridge between West and East, that mirrors an increasingly multi-cultural, open, tolerant and friendly community, connecting people, individuals and businesses, from *different countries and cultures*.

### Puglia's Gastronomy

The region's cuisine is based on typical products found within the surrounding region of Apulia: *wheat, olive oil, seafood and wine*. Local flour is used in homemade bread and pasta production including, most notably, the famous *orecchiette* ear-shaped pasta.

Homemade dough and olive oils are also used to bake fried *panzerotti* with mozzarella, and *focaccia alla barese* with tomatoes. Perhaps, Bari's most famous dish is the oven-baked *Patate, riso e cozze* (potatoes with rices and mussels). The whole Apulian region have a range of wines, including the classical *Primitivo, Castel del Monte, Muscat*, and several *rosé wines*.

While attending the conference, take some time to explore the region's rich culinary her-

itage. Known for its delicious seafood dishes and traditional Pugliese cuisine, Bari offers a gastronomic experience like no other. Be sure to visit local trattorias and osterias to experience the region's authentic flavors.

The Baresi are also very fond of vegetables, especially *chicory* and *fava beans* they combine in a wonderful hearty dish. We also recommend a pasta dish unique to the region –*spaghetti all'assassina*–, which is dried pasta cooked only in a heady sauce of tomato and wine and then topped with cool ricotta. The pasta stays firm, much more so than mere al dente, and has a delightful chewiness to it. The “assassin” reference is to the chili peppers that make this a fiery killer of a dish, said to be created in Bari in the 1970s.



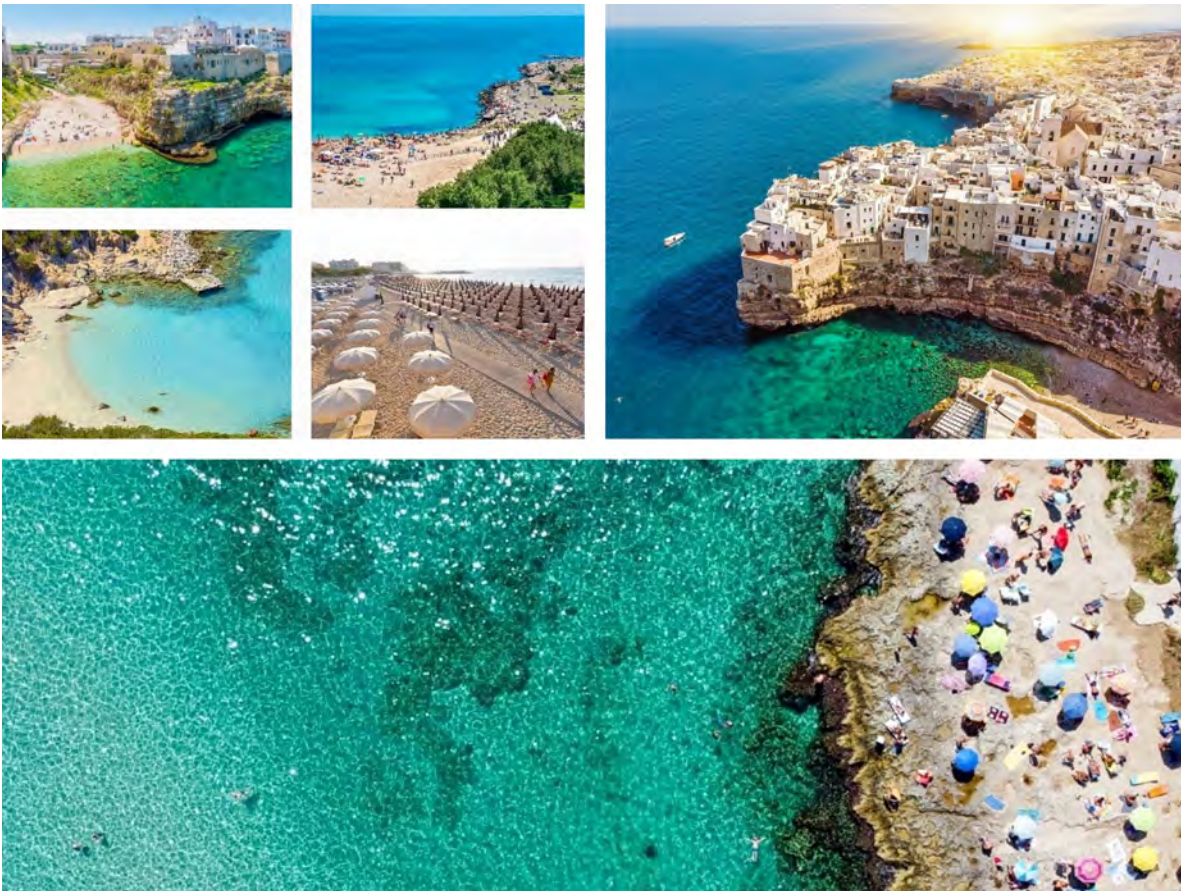


## Beaches and Nature in Puglia

Bari is the ideal setting for a refreshing swim along the captivating Italian coastline. Discover the *white high cliffs*, the *sandy beaches* with *crystalline waters*, and the charming towns along the coast. Plan your visit to experience the scenic wonders Puglia has to offer on our website.

Nature around in Puglia is magnificent. The white high cliffs of *Mattinata* and *Vieste*, the long sandy beaches with crystalline water,

the *grottoes of Castellana Grotte*, the second European biggest *Canyon of the Gravina di Laterza*, the *bauxite quarry in Otranto*, the beautiful little towns on the sea like *Polignano*, *Monopoli*, and *Gallipoli*, the little cities surrounded by acres of olive groves like *Martina Franca*, the *white city of Ostuni*, and many other special places make the Apulia region an incredible land to be discovered step by step.



## History and Culture in Puglia

A vacation in Puglia means also history and culture, thanks to the many museums and archaeological sites across the area. Like that of so many parts of southern Italy, Puglia's history is a tangled web indeed!

Its strategic position and its fertile soil made it an attractive proposition. In the 8th century BC, it became a Greek colony and was

part of Magna Graecia. *Taranto* was one of the most flourishing cities during this period. In 272 BC, the Romans conquered the region, leaving behind a wealth of archaeological sites. In the Middle Ages, Puglia was ruled by *Goths*, *Lombards*, *Arabs*, *Normans*, and *Byzantines*, each leaving their mark on the region's culture and architecture.

The cultural and historical heritage in Puglia is witnessed by many landmarks: *St. Nicholas' Basilica*, the *Swabian Castle by Frederick II*, the *Margherita Theatre* and the *Petruzzelli Theatre* (in the town of Bari). *Castel del Monte* octagonal castle by Frederick II (in the town

of Andria), the *Trulli* stone huts in the Unesco World Heritage Site of Alberobello (in the province of Bari), the *Lecce Baroque* (in the town of Lecce), and many more. You can plan your trip with the Puglia official tourism portal [Puglia turismo](#).



## Top Suggested Tourist Attractions in Puglia

Bari is situated in the center of Apulia, making it simple reaching a lot of interesting and fascinating tourist attractions all around the region. We suggest *some location* that you cannot absolutely miss.

### The majestic Cathedral of Trani

The *Cathedral of San Nicola Pellegrino in Trani* has a typical Apulian Romanesque style, built during Norman rule, features light pink limestone tuff. The 58-meter high bell tower, constructed between the 13th and 14th centuries, offers breathtaking views from the top. The complex includes the Upper Church dedicated to San Nicola Pellegrino, the Lower Crypt housing his relics, and the Hypogeum of San Leucio, accessible via a staircase from the left nave.



#### How to reach it?

- *By train:* from Bari Centrale (the Main railway station), take a regional train to Trani. The journey takes about 30-40 minutes. There are numerous trains operated by [Trenitalia](#) throughout the day. For prices and timetables check at Trenitalia website.



### The spectacular cliffs of Polignano a Mare

*Polignano a Mare* is a stunning Apulian town overlooking the Adriatic. It was named the most welcoming resort in the world for 2023 by Booking.com's Traveller Review Awards. The ranking, based on 240 million verified reviews, highlights the town's natural and cultural heritage, food and wine, local traditions, and exceptional tourist facilities and services.

#### How to reach it?

- *By train:* from Bari Centrale (the Main railway station), take a regional train to Polignano a Mare. The journey takes about 30-40 minutes. There are numerous trains operated by [Trenitalia](#) throughout the day. For prices and timetables check at Trenitalia website.
- *By coach:* from "Largo Ciaia" (Ciaia Square), take a coach to Polignano a Mare. The journey takes about 45 minutes. There are numerous trains operated by [Ferrovie del Sud-Est](#) (FSE) throughout the day. For prices and timetables check at FSE website.

### The famous Stones of Matera

Matera is a very fascinating city of Basilicata region, also known as "the second Bethlehem" for its historical and picturesque charm. Everyone remembers Mel Gibson's famous film "The Passion of Christ", but probably few know that it was shot here. Its famous Sassi, ancient cave dwellings, were inhabited until the 1950s and are now a UNESCO World Heritage site.



### How to reach it?

- **By train:** from Bari Centrale FAL railway station ("Aldo Moro" Square, close to the Main station), take a regional train to Matera. The journey takes about 1 hour and half. There are numerous trains operated by [Ferrovie Appulo Lucane](#) (FAL). For prices and timetables check at FAL website.
- **By coach:** from Bari Centrale Bus Station (Capruzzi street), take a coach to Matera. The journey takes about 1-1:20 hour. There are numerous journeys operated by [Flixbus](#), [Marinobus](#), and [Bus Miccolis](#). For prices and timetables check at companies websites.



### Monopoli: the City of 100 Lands

The city owes this name to its *numerous districts*, each with unique features like beaches, countryside, farms, and historic centers. Its *Cathedral* is a Baroque masterpiece, while the coastline boasts hidden coves and sandy beaches. The surrounding countryside is rich with diverse crops such as olives, almonds, and fruits.

### How to reach it?

- **By train:** from Bari Centrale (the Main railway station), take a regional train to Monopoli. The journey takes about 30-40 minutes. There are numerous trains operated by [Trenitalia](#) throughout the day. For prices and timetables check at Trenitalia website.

### The octagonal castel of "Castel del Monte"

Placed in Andria, it is known for its *octagonal structure*, unique in the world, which made it one of the most important examples of medieval architecture in Italy, as well a *UNESCO World Heritage Site*. All rooms of the castle have an octagonal shape. There are 8 rooms both on the ground and first floor. The building is surrounded by 8 towers that have octagonal plans and are arranged on the eight edges of the plant.



### How to reach it?

- **By train + coach:** from Bari Centrale (the Main railway station), take a regional train operated by [Trenitalia](#) to Trani (the journey takes about 30-40 minutes). Then, from Trani railway station take a coach operated by [COTRAP](#) to Andria-Castel del Monte (the journey takes about 1 hour). For prices and timetables check at Trenitalia and COTRAP websites.



### Ostuni: the white city

Known as *the White City*, Ostuni is a really pretty town in the land of Salento. It is famous for its historic center characterized by buildings and houses of white lime. The custom of using lime for construction is very old and it seems that it derived also because in the Middle Ages it was thought to be a natural disinfectant against the plague.

#### How to reach it?

- **By train + bus:** from Bari Centrale (the Main railway station), take a regional train, operated by [Trenitalia](#), to Ostuni (the journey takes about 50 minutes). Then, from Ostuni Trenitalia railway station, take a local bus, operated by [S.T.P. Brindisi s.p.a.](#) (a COTRAP company) to Ostuni Centro Storico to reach the city center (the journey takes about 15 minutes). For prices and timetables check at Trenitalia and COTRAP websites.

#### How to reach it?

- **By train:** from Bari Centrale (the Main railway station), take a regional train to Putignano (the journey takes about 50 minutes). Then, from Putignano take another regional train to Alberobello (the journey takes about 30 minutes). There are numerous trains operated both by [Trenitalia](#) and [Ferrovie del Sud-Est](#) (FSE) throughout the day. For prices and timetables check at Trenitalia and FSE websites.
- **By coach:** from "Largo Sorrentino" (Sorrentino Square), take a coach to Alberobello. The journey takes about 1 hour. There are numerous journeys operated by [Ferrovie del Sud-Est](#) (FSE) throughout the day. For prices and timetables check at FSE website.



### Castellana's Caves

Rightly called *Meraviglia di Puglia*, the Grottoes of Castellana represents a complex of underground cavities of karst origin, located in the Municipality of Castellana Grotte, in the south-eastern Murge of the Apulian region. Their extraordinary beauty and geological importance makes these caves one of the most spectacular speleological attractions in Italy, with stalactite and stalagmite formations, large caves and fascinating underground passages.

#### How to reach it?

- **By coach:** from "Largo Sorrentino" (Sorrentino Square), take a coach to Castellana Grotte (the journey takes about 1:20 hour). There are numerous journeys operated by [Ferrovie del Sud-Est](#) (FSE) throughout the day. For prices and timetables check at FSE website.

## Phrasebook

Although officially recognized as Italian, the language spoken in Bari is heavily influenced by various linguistic elements, leading to the conclusion that the *Barese dialect* can be considered a distinct language.

We have shortlisted here some funny common expressions in the Bari dialect to assist you in navigating the area. These unique expressions offer you a glimpse into the rich cultural tapestry of this charming coastal city. Whether you're wandering the ancient streets or enjoying the local cuisine, mastering a few phrases in Barese will enhance your experience and endear you to the locals.

### **Aivògghiie** → *Sure*

It means Sure, but it mostly means a "yeah I've done it a while ago, don't worry". You would use it in the context of someone asking you if you've finished studying for a test, and you've done all you needed to do.

### **Assàje** → *A lot*

Used to indicate a large quantity, e.g., "Mi piace assàje" means "I like it a lot".

### **Cannéstr** → *Basket*

Used for shopping or carrying items, e.g., "Prendi il cannéstr per la frutta" means "Take the basket for the fruit".

### **Cazzaròle** → *Cooking pots*

This term refers to pots and pans in the kitchen, e.g., "Metti l'acqua nelle cazzaròle" means "Put the water in the pots".

### **Ce st'á fètt?** → *What's wrong with you?*

It is used humorously when someone is acting strangely, like "Uagliò, c' se' fètt?", which means "What's causing you to feel unwell?".

### **Ch' la fèscia?** → *What are you doing?*

This expression is often used in a playful manner to ask someone what they're up to, like "Ehi, ch' la fèscia?".

### **Che scamàgne!** → *What a mess!*

Used when something is chaotic or disorganized, e.g., "La tua stanza è un scamàgne!".

### **Chiùne** → *To snore*

Used to describe someone snoring loudly. If you share a room and your roommate snores, you might say, "Uà, chiùne come 'nu trattore!", which means "Wow, he snores like a tractor!".

### **Dambònde** → *Over there*

Dambònde means that it's right over there. So, if you're looking for the bathroom and you're in a restaurant in Bari you'll probably hear the waiter tell you "Dambònde", as in it's down there.

### **Fèsse** → *Idiot*

A mildly derogatory term used to call someone an idiot or a fool. It's often used among friends in a teasing manner, like "Ah, uagliò, si proprie 'nu fèsse!" meaning "Ah, dude, you're such an idiot!".

### **M'ha fatt' muri** → *You've killed me (with laughter)!*

This expression literally means "You've killed me". It is used when someone makes you laugh a lot, like "M'ha fatt' muri con quella battuta!", meaning "You made me laugh a lot".

### **Mannile** → *Towel*

So, you're down south and you want to go to the beach but you don't know how to ask for one? Go with "Asciugamano" first (the towel), but they might answer with "aaaaaah un mannile?".

**Mbrugghià** → *To cheat*

Often used in the context of games or relationships, e.g., "Non mbrugghià", which means "Please don't cheat, play fair".

**Mò** → *Now*

It literally means "now". For example, when you ask someone "When do I have to do this thing?", and he/she answer you "right now", he/she could say "Mò!".

**Moh** → *Wow!/Incredible!*

Moh, which is not to be confused with Mò, is used as an inter-layer for any expression of surprise (positive or negative).

**Non tene cè ffà!** → *Someone who has nothing to do*

You got one of those lazy friends that needs a little pep talk, go in straight-faced, and start shouting in Barese to them. Drop-in a "Non tene cè ffà!", so you'll scare him straight into being less lazy.

**Nuje** → *We/Us*

This is a colloquial way to say "we" or "us" in Bari, as well all around Puglia. For example, "Nuje amma sci' a mare" means *We are going to the beach*.

**Nz'è manghiàte** → *He/She didn't eat*

This phrase is used when someone hasn't eaten. For example, if you're concerned about a friend, you might say, "Nz'è manghiàte tutta la giornata!".

**Sbrindulèt** → *Clumsy person*

A playful term for someone who is always clumsy. It's used to tease a friend or family member who is accident-prone. For example, if your friend keeps knocking over their drink, you could say, "Sei un vero sbrindulèt!" meaning "You're such a clumsy person!".

**Scè** → *Come on*

It is an expression of encouragement or disbelief, e.g., "Scè, non ci credo!" literally means "Come on, I don't believe it!".

**Sciatà** → *To rest*

This expression is perfect for those lazy afternoons. After a very heavy lunch, you can say "Dopo pranzo mi voglio sciatà" which means "After lunch, I want to rest".

**Sciuscià** → *To stroll around*

This term means to take a leisurely walk, often without a specific destination. It's perfect for describing a relaxed evening walk along the seafront.

**Stràcquate** → *Exhausted*

When you're extremely tired (maybe after a hard walking), you can say "Sono stràcquate" meaning "I'm very exhausted after this walk".

**Uagnèdde** → *Young girl*

It represents an affectionate term for a young girl: "Quidde uagnèdde è proprio simpatica!" means "That young girl is really nice!".

**Uagliò** → *Dude/Bro*

This is a term of endearment or casual address for a friend, similar to "dude" or "bro" in English. You might hear it among friends at a café or bar.

**Uè mà!** → *Hey, buddy!*

This is a friendly greeting among friends, similar to "Hey, man!", "Uè mà, tutto appòste?".

**Vattinne và!** → *Come oon!/Suuure!/Get out of here!*

This one is pretty much universal in southern Italy. You'll hear this when someone says some tall tale that is in no way real. It literally means "get out of here", but it's to be interpreted as the Sopranos style "Geeet out a'heeeere!".

**Vamm'bràje!** → *Leave me alone!*

This expression is used when you want someone to stop bothering you. For instance, if a street vendor keeps pestering you to buy something, you can say, "Vamm'bràje!".

# List of Contributions

**Thursday, August 29**

## **Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing I**

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Generic Human-Centered Human-Machine Interface Modeling and Design for Human-Machine Interaction in Industry 5.0

*Felicien Barhebwa Mushamuka, Germain Marcel Gaston Christophe Clavier*

Towards Global Awareness in Human-Robot-Collaborative Multi-Cell Assembly System

*Khansa Rekik, José Grimaldo Da Silva Filho, Attique Bashir, Rainer Müller*

A Robot Obstacle Avoidance Motion Planning Method for Tightly Coupled Human-Robot Collaboration Space

*Yuanfa Dong, Hongbo Xiao, Ye Yuan, Wenrong Liu, Bin Zhou, Wei Peng, Youjun An*

An HCPS-Based Inspection Method for Bearing Assembly Quality of Coarse Pointing Mechanism

*Bingtao Hu, Xupeng Li, Yixiong Feng, Dinghao Cheng, Zetian Zhao, Yong Wang, Jianrong Tan*

Vision-Language Model-Driven Scene Understanding and Robotic Object Manipulation

*Sichao Liu, Jianjing Zhang, Robert Gao, Xi Vincent Wang, Lihui Wang*

Split-Hand Assembly Action Recognition Enhanced with Knowledge-Driven Sequence Reasoning

*Regina Lee, Hao Zheng, Dazzle Johnson, Minas Liarokapis, Yuqian Lu*

## **Energy and Environment-aware Automation**

*Room T10 @ 11:30-13:00*

Frequency-Division Control for Parallel Hybrid Electric Vehicles

*Davide Tebaldi*

A Techno-Economic Modelling and Component Sizing in Renewable Energy Communities: The Perspective of Technical Facilitators

*Vishal Kachhad, Amit Joshi, Valerio Mariani, Vincenzo Raffa, Luigi Glielmo*

Optimizing the Design of Combined Alkaline and Proton Exchange Membrane Electrolyzers to Fully Utilize Fluctuating Renewable Energy

*Jinhui Liu, Xinrui Bao, Yadong Zhou, Zhanbo Xu, Jiang Wu, Wangyi Guo, Xiaohong Guan*

Dayahead Energy Storage Operation Scheduling with Demand Response in Photovoltaic Array Integrated Electric Vehicle Charging Station

*Na Li, Tao Fang, Si Chen*

Contract-Based Demand Response Mechanism for Commercial and Industrial Customers

*Sajad Parvizi, Mina Montazeri, Hamed Kebriaei*

Probabilistic Forecasting Framework Oriented to Distribution Networks and Microgrids

*Antonio Parejo, Sebastián García, Enrique Personal, Juan Ignacio Guerrero, Alejandro Carrasco, Carlos Leon De Mora*

## **Leveraging Systems and Data for Context-Aware and Emergent Behavior**

*Room T11 @ 11:30-13:00*

Dynamic Feature Extraction and Prediction for High Dimensional Time Series with Seasonality

*Bingyuan Li, Yang Wang, Yang Zhao, Lishuai Li, Yining Dong*

Multi-Agent Modeling of Human Traffic Dynamics for Rapid Response to Public Emergency in Spatial Networks

*Xiaoru Shi, Hankang Lee, Hui Yang*

Context-Aware Cognitive Assembly Assistive System Based on Online Human Action Recognition

*Huachang Liang, Hao Zheng, Yuqian Lu*

Coupon Personalization: Leveraging Click Data with Deep Learning for Behavioral Insights

*Ruotong Sun, Chen Wang*

Heterogeneous Risk Management Using a Multi-Agent Framework for Supply Chain Disruption Response



Mingjie Bi, Juan-Alberto Estrada-Garcia, Dawn Tilbury, Siqian Shen, Kira Barton

## **Planning, Scheduling and Coordination**

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### **Managing Just-In-Sequence Micro-Logistics with Multi-Agent-Path-Finding**

Matevž Bošnjak, Andrej Zdesar, Rok Vrabič, Gregor Klančar

### **Temporal-Logic-Based Exploration and Execution of Markov Decision Processes Using Recursive Gaussian Processes**

Shumpei Tokuda, Masaki Yamakita, Hiroyuki Oyama, Rin Takano

### **CAD-Informed Uncertainty-Aware Sequence and Motion Planning for Robotic Assembly**

Takuya Kiyokawa, Ismael Valentin Rodriguez Brena, Korbinian Nottensteiner, Peter Lehner, Thomas Eiband, Maximo A. Roa, Kensuke Harada

### **Resilience-Based Workforce Routing and Scheduling Problem in Substation System Emergency Operation**

Tianbao Liang, Yaping Liu, Zhanbo Xu, Jiang Wu, Haoming Zhao, Xiaohong Guan

### **Active Connection and Motion Planning of a Multi-Module Pipeline Robot**

Cheng Liu, Yongzhan Sun, Wei Wei, Qingdong Yan, Meng Guo

### **NUMA-Aware Virtual Machine Placement: New MMMK Model and Column Generation-Based Decomposition Approach**

Xunhang Sun, Xiaoyu Cao, Qiaozhu Zhai, Haisheng Tan, Jianchen Hu, Lei Zhu, Li Su, Wenli Zhou, Feng Gao, Xiaohong Guan

## **Drivers and tools for efficiency improvement in industrial and non-industrial processes**

Room T2 @ 11:30-13:00

### **A Meta-Heuristic Approach for Capacitated Vehicle Routing Problem in Fuel Distribution**

Enrico Zero, Alberto Daniele, Alessandro Bozzi, Simone Graffione, Alessandra Elisa Sindi Morando

### **Towards energy-efficient shrink tunnels by means of Economic Model Predictive Control**

Leandro Pitturelli, Davide Previtali, Antonio Ferramosca, Fabio Previdi

### **Optimizing Tomato Production through IoT-Based**

### **Smart Data Collection and Analysis**

Giulia Oddi, Laura Belli, Luca Davoli, Martina Galaverni, Iliaria Marchioni, Margherita Rodolfi, Deborah Beghè, Federico Solari, Giuseppe Vignali, Tommaso Ganino, Gianluigi Ferrari

### **Operational Optimisation of Pharmaceutical Lyophilizers through Leak Detection Data Analysis**

Daniele Antonucci, Davide Bonanni, Luca Consolini, Gianluigi Ferrari

### **Further Developments in State Estimation and Parameter Identification for Efficiency Optimization of Induction Motor Operations**

Angelo Accetta, Marcello Pucci, Stefano Bifaretti, Patrizio Tomei, Cristiano M. Verrelli

### **Digital Twin Modeling Method for Complex Equipment Maintenance Management**

Qiqi Chen, George Q. Huang

## **In-field Digital technologies, Robotics and AI for Sustainable Agriculture I**

Room T3 @ 11:30-13:00

### **Unsupervised Dust Removal Method for Tillage Quality Monitoring in Challenging Agricultural Conditions**

Peter Buckel, Thomas Dietmüller, Timo Oksanen

### **Self-Supervised Data Generation for Precision Agriculture: Blending Simulated Environments with Real Imagery**

Leonardo Saraceni, Ionut Marian Motoi, Daniele Nardi, Thomas Alessandro Ciarfuglia

### **Enhancing Precision Agriculture through Human-In-The-Loop Planning and Control**

Shankar Deka, Sujeet Phodapol, Andreu Matoses Gimenez, Victor Nan Fernandez-Ayala, Rufus Cheuk Yin Wong, Pian Yu, Xiao Tan, Dimos V. Dimarogonas

### **A Framework Based on Control Barrier Functions for Time-Varying Connectivity Maintenance**

Andrea Miele, Martina Lippi, Andrea Gasparri

### **Smart Visual Sensors for Real Time Weather and Ground Conditions Recognition for Agricultural Robotics**

Diego Gagnaniello, Antonio Greco, Carlo Sansone, Bruno Vento

### **Non-Linear Model Predictive Control for Multi-Task GPS-Free Autonomous Navigation in Vineyards**

Matteo Sperti, Marco Ambrosio, Mauro Martini, Alessandro Navone, Andrea Ostuni, Marcello Chiaberge

## **Advancements in Intelligent Transportation Systems: Modeling, Control, and Optimization I**

Room T4 @ 11:30-13:00

Adaptive Equivalent Consumption Minimization Strategy with Battery Aging Considerations for Parallel Hybrid Electric Vehicle

*Bin Zhou, Daihui Wang, Zhifeng Yang, Yuanfa Dong, Youjun An, Wei Peng*

Deep Reinforcement Learning Platooning Control of Non-Cooperative Autonomous Vehicles in a Mixed Traffic Environment

*Danilo Menegatti, Andrea Wrona, Antonio Di Paola, Simone Gentile, Alessandro Giuseppe*

A Direct Data-Driven Control Design for Autonomous Bicycles

*Niklas Persson, Mojtaba Kaheni, Alessandro Vittorio Papadopoulous*

Cyber-Physical Threat Analysis of Composite Scenario of CTCS-3 Based on STPA

*Saifei Li, Chunyun Zeng, Jianbin Ye, Lijie Zhang*

Optimization for Track Utilization at Urban Rail Transit Rolling-Stock Base Based on Maintenance and Operation Plans

*Yang Liu, Liang Ma, Yang Yang*

Research on Dynamic Calculation of Passenger Flow in Urban Rail Network Based on the Coupling Model of Passenger Flow and Train Operation

*Wenqi Ying, Liang Ma, Xi Li*

## **Digital Twin for Smart Engineering System Development, Operation and Optimization I**

Room T5 @ 11:30-13:00

Digital Twin System for Automated Container Terminal and a Case Study

*Xiangyu Bao, Funing Jia, Jingshu Zhong, Lei Zhang, Changhui Liu, Liang Chen, Yu Zheng*

Short-Term Electricity Load Forecasting for Foundry Based on Parallel Temporal Convolutional Network Models

*Min-Sin Liu, Shyh-Leh Chen, Ping-Huan Kuo*

A Novel Digital Twin Efficient Development Scheme for Manufacturing

*Min-Hsiung Hung, Ming-Jun Shi, Yu-Chuan Lin, Yao-Xun Chang, Chao-Chun Chen, Yung-Chou Kao, Fan-Tien Cheng*

Control-Oriented Multiphysics Model for Thermal Runaway Prediction in Lithium-Ion Battery under Operational and Abuse Conditions

*Jun-Hyeong Kim, Eunji Kwak, Jinho Jeong, Ki-Yong Oh*

Predicting Thermal Runaway in a Lithium-Ion Battery Using Multiphysics-Informed DeepONet with Encoders

*Jinho Jeong, Eunji Kwak, Jun-Hyeong Kim, Ki-Yong Oh*

Denosing Diffusion Modeling Based Causal Data Fusion for Predictive Additive Manufacturing Digital Twins

*Fatemeh Elhambakhsh, Hyunwoong Ko, Zhuo Yang, Yan Lu*

## **Innovative Applications of AI and Automation in Industrial Scenarios**

Room T6 @ 11:30-13:00

Behavior Trees in Industrial Applications: A Case Study in Underground Explosive Charging

*Mattias Hallén, Matteo Iovino, Shiva Sander-Tavallaey, Claes Christian Smith*

Visualizing High-Dimensional Configuration Spaces: A Comprehensive Analytical Approach

*Jorge Ocampo Jimenez, Wael Suleiman*

Graph-based Deep Reinforcement Learning for Crane Scheduling with Temporal Constraints

*Woo-Jin Shin, Hyun-Jung Kim*

Practical Heuristics for Victim Tagging During a Mass Casualty Incident Emergency Medical Response

*Maria Cardei, Afsaneh Doryab*

Automatic Robot Path Planning for Active Visual Inspection on Free-Form Surfaces

*Osama Tasneem, Roel S. Pieters*

DL-DRL: A Double-Level Deep Reinforcement Learning Approach for Large-Scale Task Scheduling of Multi-UAV

*Xiao Mao, Guohua Wu, Mingfeng Fan, Zhiguang Cao, Witold Pedrycz*

## **Optimized UAV Systems**

Room T7 @ 11:30-13:00

A CAD Model-Based Navigation Method for UAVs Around Transmission Tower

*Varun Burde, Jiří Souček, Alexandr Lazarov, Pavel Burget*

Computationally Efficient Multi-Agent Optimization Framework for Online Routing of UAV-UGV System  
*Subramanian Ramasamy, Mohammad Safwan Mondal, Pranav Bhounsule*

Cables Tension Modeling for Multi-UAV Payload Transportation  
*Andrea Delbene, Marco Baglietto*

Deconstructing for Superiority: Aristotelian Modularization in UAV Systems  
*Luca Santoro, Alessandro Assirelli, Erik Mischiatti, Marco Perini, Matteo Nardello, Daniele Fontanelli, Davide Brunelli*

A Tailsitter UAV with a Passive Joint Able to Turn Acutely with a Flip Motion  
*Takumi Ito, Riku Funada, Mitsuji Sampei*

On the Robustness and Real-Time Adaptation of UAV-Based Crowd Localization in Complex and High-Density Scenes  
*Ahmed Elhagry, Wail Gueaieb, Abdulmotaleb El Saddik, Giulia De Masi, Fakhri Karray*

## Big-Data and Data Mining Applications

Room T8 @ 11:30-13:00

A Positive-Unlabeled Learning Approach for Detecting Malicious In-App Purchases on the App Store  
*Bowen Hu, Ziyi Yu, Yadong Zhou, Sizhe He, Yang Liu, Ting Liu, Xiaohong Guan*

Utilising Explainable Techniques for Quality Prediction in a Complex Textiles Manufacturing Use Case  
*Briony Forsberg, Henry Williams, Bruce Macdonald, Reza Hamzeh, Tracy Chen, Kirstine Hulse*

A Virtual Primary Key Generation Scheme Based on Dimensionality Reduction and Encoding for Digital Fingerprinting  
*Weiwei Tan, Bowen Hu, Yadong Zhou, Sizhe He, Yang Liu, Ting Liu, Xiaohong Guan*

Industrial Time Series Data-Driven Causal Delay Relationship Analysis for Complex Industrial Processes  
*Haibo Qiao, Yan-Ning Sun, Lilan Liu, Zeng-Gui Gao, Yong Yang, Hongwei Xu*

Long-Term Water Quality Prediction Based on Intelligent Optimization and Seasonal-Trend Decomposition  
*Ziqi Wang, Xiangxi Wu, Jing Bi, Haitao Yuan, Jia Zhang, Mengchu Zhou*

WaterTS: Integrating Enhanced Transformer, Sliding

Block, and Channel Independence for Long-Term Water Quality Prediction  
*Jing Bi, Lifeng Xu, Ziqi Wang, Haitao Yuan, Shichao Chen, Mu Gu, Mengchu Zhou*

## Optimization and Automation in Logistics

Room T9 @ 11:30-13:00

Grid-Based Bayesian Bootstrap Approach for Real-Time Detection of Abnormal Vessel Behaviors from AIS Data in Maritime Logistics  
*Yongkyung Oh, Sungil Kim*

Logistics Resource Allocation Problem for Aircraft Final Assembly Distribution System Considering Learning Effect  
*Yulong Dong, Lu Chen, Zhongkai Bao*

Three Approaches to the Automation of Laser System Alignment and Their Resource Implications: A Case Study  
*David A. Robb, Donald Risbridger, Ben Mills, Ildar Rakhmatulin, Xianwen Kong, Mustafa Suphi Erden, M. J. Daniel Esser, Richard Carter, Michael J. Chantler*

Stability Enhancement of Aircraft Ground Handling Qualities Via Model Predictive Control Allocation  
*José Joaquín Mendoza Lopetegui, Giulio Loiacono, Lorenzo Desiderato, Mara Tanelli*

Ontology Versioning for Managing Inconsistencies in Engineering Models Arising from Model Changes in the Design of Intralogistics Systems  
*Fan Ji, Birgit Vogel-Heuser, Rafael Schypula, Maximilian Wünnenberg, Michael Goedicke, Johannes Fottner*

## AI and Data-based Methods

Virtual T1 @ 11:30-13:00

Towards Online Anomalous Trajectory Detection and Classification  
*Jingwei Wang, Tianle Ni, Yukai Zhao, Qilin Huang, Yunlong Ma, Min Liu, Weiming Shen*

Enhancing Fault Troubleshooting through Human-Machine Collaboration: A Multi-Stage Reasoning Approach  
*Sijie Wen, Yongming Chen, Xinyu Pan, Weibin Zhuang, Xinyu Li*

A Risk-Sensitive Automatic Stock Trading Strategy Based on Deep Reinforcement Learning and Transformer  
*Linyu Li, Qi Liu, Yanjie Li, Yongjin Mou, Zheng Zhang*

**Real-Time Interactive Capabilities of Dual-Arm Systems for Humanoid Robots in Unstructured Environments**

*Wei Jia, Alex Rameriz-Serrano, Yuan Liu*

**Lyapunov Stable Neural Controllers in UAVs for Precision Monitoring**

*Paolo Arena, Damiano Gravina, Giulio Lecci, Alessia Li Noce, Luca Patanè*

## **Automation in Construction**

*Virtual T2 @ 11:30-13:00*

**Shakebot: A Low-Cost, Open-Source Robotic Shake Table for Earthquake Research and Education**

*Zhiang Chen, Devin Keating, Yash Dinesh Shethwala, Aravind Adhith Pandian Saravanakumaran, Ramon Arrow-smith, Albert Kottke, Christine Wittich, Jnaneshwar Das*

**Real-Time Prediction of Human-Generated Reference Signals for Advanced Digging Control**

*Leonardo Cecchin, Adrian Trachte, Lorenzo Fagiano, Moritz Diehl*

**An exploratory study of the data quality of BIM models for Spanish public procurement**

*Ana Pérez-García, Norena Martín-Dorta, José Ángel Aranda*

**Smart Drill: An Autonomous Drilling End-Effector with Embedded Sensing and Intelligence for Mobile and Collaborative Robots**

*Edoardo Del Bianco, Federico Rollo, Marco Roveri, Nikos Tsagarakis*

## **Human-Robot Collaboration for Futuristic Human-Centric Smart Manufacturing II**

*Room T1 @ 14:00-15:30*

**A Spatial-Temporal Graph Neural Network with Hawkes Process for Temporal Hypergraph Reasoning towards Robotic Decision-Making in Proactive Human-Robot Collaboration**

*Pengfei Ding, Jie Zhang, Peng Zhang, Youlong Lv*

**Optimal Heterogeneous Assembly Worker Integration Via Multi-Mode Human-Robot Collaboration: An Adaptive Co-Evolutionary Approach**

*Bo Tian, Himanshu Kaul, Mukund Janardhanan*

**DuHa: A Dual-Hand Action Segmentation Method for Human-Robot Collaborative Assembly**

*Hao Zheng, Regina Lee, Yuqian Lu, Xun Xu*

**Peg-Hole Robotic Disassembly Compliant Strategy**

**Based on Soft Actor-Critic Algorithm**

*Xiaolong Zhang, Jiayi Liu, Lei Qi, Wenjun Xu, Xianxu Peng, Tianshu Wu*

**Human Grasping Behavior Analysis in Human-Robot Collaboration Based on Markerless Motion Capture**

*Yuguang Xiang, Bitao Yao, Mengyuan Ba, Wenjun Xu, Yi Tang, Link Lee*

**Large Language Model for Humanoid Cognition in Proactive Human-Robot Collaboration**

*Shufei Li, Zuoxu Wang, Zhijie Yan, Yiping Gao, Han Jiang, Pai Zheng*

## **Robust Point Cloud Estimation**

*Room T10 @ 14:00-15:30*

**6D Assembly Pose Estimation by Point Cloud Registration for Robotic Manipulation**

*Kulunu Samarawickrama, Gaurang Sharma, Alexandre Angleraud, Roel S. Pieters*

**An Approach for Precise Robotic Sanding Applications of Uneven Surfaces Based on Improved Point Cloud Registration Methods**

*Xiaomei Xu, Marco Schneider, Attique Bashir, Rainer Müller*

**Sparse Color-Code Net: Real-Time RGB-Based 6D Object Pose Estimation on Edge Devices**

*Xingjian Yang, Zhitao Yu, Ashis Banerjee*

**KeyMatchNet: Zero-Shot Pose Estimation in 3D Point Clouds by Generalized Keypoint Matching**

*Frederik Hagelskjær, Rasmus Laurvig Haugaard*

**Planning of Collision-Free Trajectories for Robotic Manipulation and Management of DOFs for Positional Targets**

*Paolo Lino, Riccardo Raimondi, Nicola Longo, Antonio Venezia, Simone Panicucci*

## **3D Reconstruction and Perception for Robotic Systems**

*Room T11 @ 14:00-15:30*

**Mask Generation of Inpainting Model for Moire Pattern Based 3D Reconstruction**

*Taejung Kim, Minh Ha, Saba Arshad, Tae-Hyoung Park*

**Low-Cost Stereo Vision: A Single-Camera Approach for Precise Robotic Perception**

*Stefan Marx, Daniel Gusenburger, Attique Bashir, Rainer Müller*

FIT3D: Real-Time Flatness Inspection Algorithm for Ceramic Tiles Using the Structured Light 3D Scanner  
*Yukun Xie, Juan Du, Fugee Tsung, Peng Wan, Guanghua Xu*

Dynamic Intrinsic Parameter Rectification Network for Cameras with Optical Image Stabilization in Desktop Augmented Reality Applications  
*Shuangyu Xie, Di Wang, Shu-Hao Yeh, Wei Yan, Dezhen Song*

Tracking Branched Deformable Linear Objects Using Particle Filtering on Depth Images  
*Yuxuan Yang, Johannes A. Stork, Todor Stoyanov*

Towards Robust Perception for Assistive Robotics: An RGB-Event-LiDAR Dataset and Multi-Modal Detection Pipeline  
*Adam Scicluna, Cedric Le Gentil, Sheila Sutjipto, Gavin Paul*

### **Safe and Collaborative Manipulation of Autonomous Robots**

Room T12 @ 14:00-15:30

Electromagnetic Field & ToF Sensor Fusion for Advanced Perceptual Capability of Robots  
*Hongsik Yim, Hyunchang Kang, Tien Dat Nguyen, Hyouk Ryeol Choi*

CO2 Laser Welding of Low-Density Polyethylene for Soft Linear Eversion Robot Fabrication  
*Brandon Saldarriaga, Carlo Alberto Seneci, S.M.Hadi Sadati, Zicong Wu, Kawal Rhode, Christos Bergeles*

Manipulation and Handover Planning for Dual-Arm Robots  
*Matteo Colombo, Luca Beretta, Andrea Maria Zanchettin, Paolo Rocco*

Serving Time: Real-Time, Safe Motion Planning and Control for Manipulation of Unsecured Objects  
*Zachary Brei, Jonathan Michaux, Bohao Zhang, Patrick Holmes, Ram Vasudevan*

A Hierarchical Manipulation Planning Framework Combining Striking, Pushing and Pick & Place Motion Primitives  
*Priyansh Sinha, Prakrut Kotecha, Nagamanikandan Govindan*

### **Optimization and distributed control in System of Systems Engineering**

Room T2 @ 14:00-15:30

Cooperative Roundabout Navigation: Distributed Predictive Control with Virtual Platooning in Mixed Traffic  
*Alessandro Bozzi, Simone Graffione, Roberto Sacile, Enrico Zero*

Strategic Path Control to Balance Risks between Competing Teams in Graph Network  
*Matteo Aicardi, Roberto Sacile, Enrico Zero*

Recovery Techniques for a Multi-UAV System Transporting a Payload  
*Andrea Delbene, Marco Baglietto*

Neural Network-Based Prediction of Import Container Outflows Via Trucks: A System-Of-Systems Analysis in Port Terminals  
*Rexhina Hoxha, Alessio Olmo, Cecilia Caterina Pasquale, Roberto Sacile, Simona Sacone, Enrico Zero*

Efficient Multi-Robot Task Allocation with Nonsmooth Objective Functions for Persistent Monitoring in Large Dispersed Areas  
*Muhamad Rausyan Fikri, Made Widhi Surya Atman, Yury Nikulin, Azwirman Gusrialdi*

Concurrent Design Optimization of Shared Powertrain Modules in a Family of Electric Vehicles  
*Maurizio Clemente, Mauro Salazar, Theo Hofman*

### **In-field Digital technologies, Robotics and AI for Sustainable Agriculture II**

Room T3 @ 14:00-15:30

Tackling Environmental Variability: Few Shot Segmentation for Domain-Adaptive Weed Segmentation in Agricultural Robotics  
*Nico Catalano, Monica Leone, Matteo Matteucci*

A Distributed Multi-Agent Control Strategy for Agricultural Row Following  
*Arianna Rana, Annalisa Milella, Antonio Petitti*

GMOS Based Multi-Gas Sensing System for Fruit Environment  
*Adir Krayden, Hanin Ashkar, Moshe Avraham, Dan Aronin, Tanya Blank, Sara Stolyarova, Dima Shlenkevitch, Yael Nemirovsky,*

Enhancing Small Object Detection in the YOLOv8 Model: A Comprehensive Analysis of the Optimized Model Head Adaptations  
*Firozeh Solimani, Angelo Cardellicchio, Giovanni Dimauro, Alba Mininni, Maria Calabritto, Roberto Di Biase, Angelo Petrozza, Stephan Summerer, Francesco Cellini, Vito Renò*

**Multi-UAV Active Sensing for Precision Agriculture Via Bayesian Fusion**

*Luca Pierdicca, Dimitri Ognibene, Vito Trianni*

**In Search of Compositional Multi-Task Deep Architectures for Information Theoretic Field Exploration**

*Emanuele Masiero, Sathya Bursic, Vito Trianni, Giuseppe Vizzari, Dimitri Ognibene*

**Advancements in Intelligent Transportation Systems: Modeling, Control, and Optimization II**

*Room T4 @ 14:00-15:30*

**A Comprehensive Optimization Model for Iron Transportation Scheduling under the Large Cycle Mode**

*Yajun Zhang, Liang Ma*

**AGV Traffic Management in Automated Industrial Plants: An Enhanced Lifelong Multi-Agent Path Finding Approach**

*Alessandro Bonetti, Silvia Proia, Simone Guidetti, Lorenzo Sabattini*

**A Planning Algorithm for Dispatching and Smart Charging Operations of Autonomous Delivery Robots in Pedestrian Areas**

*Virgilio Bachi, Simone Graffione, Cecilia Caterina Pasquale, Silvia Siri*

**An Optimization Model of Wagon-Flow Allocation Considering Pick-Up and Delivery Operations at the Railway Technical Station**

*Shumei Tao, Liang Ma, Wentao Guo*

**Safe Optimal Train Formation Control in Virtual Coupling Using Control Barrier Functions**

*Yike Li, Yin Tong, Alessandro Giua*

**Singularity-Free Lagrange-Poincaré Equations on Lie Groups for Vehicle-Manipulator Systems**

*Borna Monazzah Moghaddam, Robin Chhabra*

**Digital Twin for Smart Engineering System Development, Operation and Optimization II**

*Room T5 @ 14:00-15:30*

**Knowledge Constrained Deep Clustering for Melt Pool Anomaly Detection in Laser Powder Bed Fusion**

*Erfan Ziad, Zhuo Yang, Yan Lu, Feng Ju*

**An Overarching Quality Evaluation Framework for Additive Manufacturing Digital Twin**

*Yan Lu, Jiarui Xie, Mutahar Safdar, Zhuo Yang, Hyunwoong*

*Ko, Li Shengyen, Fatemeh Elhambakhsh, Yaoyao Fiona Zhao*

**High Fidelity Multiphysics Finite Element Model of an Induction Motor for Generating Virtual Fault Data in Bearings**

*Dayeon Jeong, Seho Son, Kyung Ho Sun, Byeong Chan Jeon, Seung Hwan Lee, Ki-Yong Oh*

**Real-time Service Capacity Allocation with Advance Arrival Information and Instantaneous Services**

*Meng Li, Yu He, Lili Guo, Feifan Wang*

**Investigation on Domain Adaptation of Additive Manufacturing Monitoring Systems to Enhance Digital Twin Reusability**

*Jiarui Xie, Zhuo Yang, Chun-Chun Hu, Haw-Ching Yang, Yan Lu, Yaoyao Fiona Zhao*

**A Distributed AM Architecture with Digital Twin for L-PBF Cluster**

*Chun-Chun Hu, Haw-Ching Yang, Yan Lu, Yung-Chou Kao, Fan-Tien Cheng*

**Safety in Autonomous Systems: from Fault Detection to Fault Prognosis**

*Room T6 @ 14:00-15:30*

**Digital Twin for Electric Vehicle Monitoring**

*Luca Cavanini, Pawel Majecki, Mike J. Grimble, Alan Devine, Curt Hillier*

**Battery State-Of-Charge Estimator Design Based on the Least-Squares Support Vector Machine**

*Luca Cavanini, Pawel Majecki, Mike J. Grimble, Gerrit Van Der Molen*

**Adaptive Control of Quadrotor under Actuator Loss and Unknown State-Dependent Dynamics**

*Saksham Gupta, Amitabh Sharma, Aditya Mulgundkar, Rishabh Dev Yadav, Spandan Roy*

**Runtime Anomaly Monitoring of Human Perception Models for Robotic Systems**

*Hariharan Arunachalam, Zhuoling Huang, Marc Hanheide, Leonardo Guevara*

**Fault Detection and Isolation for a Standard Quadrotor Using a Deep Neural Network Trained on a Momentum-Based Estimator**

*Vincenzo Scognamiglio, Jonathan Cacace, Fabio Ruggiero, Vincenzo Lippiello*

**Observer-Based Residual Generator for Fault Detection and Isolation of Convex Sets**

Alessandro Baldini, Riccardo Felicetti, Alessandro Freddi, Sauro Longhi, Andrea Monteriù

## Advanced Sensing and Control Techniques

Room T7 @ 14:00-15:30

Design of an H2 Gain Scheduling State Derivative Feedback Controller for Linear Parameter-Varying Systems

Edvaldo Assuncao, Marcelo C. M. Teixeira, Marco Antonio Leite Beteto

Design of Observer Schemes for One-Sided Lipschitz Noisy Nonlinear Systems

Juan Pablo Arango Restrepo, Lucien Etienne, Vicenç Puig, Eric Duviella, Pablo Segovia, Kokou Languéh

Detection and Tracking of Underwater Pipes Using a Magnetic Camera

Javier Garcia Gonzalez, Ryan Lewis, Mohammadreza Shahsavari, Aaron Becker, Leclerc Julien

Visual Servoing Based Dynamic Groove Following with an Industrial Robot

Gorka Sarabia, Alberto Izaguirre, Xabier Elkorobarrutia, Virginia Ruiz Garate, Fares Abu-Dakka, Imanol Andonegui

Fingertip Contact Force Direction Control Using Tactile Feedback

Dounia Kitouni, Elie Chelly, Mahdi Khoramshahi, Véronique Perdereau

RIV-SLAM: Radar-Inertial-Velocity Optimization Based Graph SLAM

Dong Wang, Stefan May, Andreas Nuechter

## Advancements in Autonomous Systems

Room T8 @ 14:00-15:30

Transfer Learning-Based Lane Line Detection System for Visual Path Following Control

Allan S. Almeida, Tiago Trindade Ribeiro, Andre Gustavo Scolari Conceicao

Multilayer Graph Partitioning to Enable a Decentralized Path Planning for Large and Heterogeneous AGV Fleets

Thomas Peitscher, Dennis Luensch, Peter Detzner

Towards Precision in Motion: Investigating the Influences of Curriculum Learning Based on a Multi-Purpose Performance Metric for Vision-Based Forklift Navigation

Simon Hadwiger, David Kube, Vladimir Dr. Lavrik, Tobias

Meisen

Enhancing Logistics Automation: Integrating Capacitive Proximity and Tactile Sensors for Trolley Pose and Center of Mass Estimation

Yucheng Tang, Ilshat Mamaev, Björn Hein

A Co-Simulation Framework for Autonomous Mobility in Urban Mixed Traffic Context

Michele Roccotelli, Gaetano Volpe, Maria Pia Fanti, Agostino Marcello Mangini

Online Image Pre-Processing Using Bayesian Optimization for Visual-Inertial Odometry

Suyong Lee, Hanyeol Lee, Chan Gook Park

## Predictive Process Engineering for the Construction Industry

Room T9 @ 14:00-15:30

Testing Autonomous Underwater Vehicle Compatibility with Bidirectional Acoustic Tags for Biotelemetry

Gerard Batet, David Sarria, Marta Real, Spartacus Castro, Joaquin Del Rio Fernandez, Narcis Palomeras, Ivan Masmitja

Design, Implementation and Testing of an EtherCAT-Based Network for Multi-Modal Distributed Sensing Architectures

Francesco Giovinazzo, Alessandro Perri, Marco Staiano, Francesco Grella, Marco Sartore, Manuela Adami, Riccardo Galletti, Giorgio Cannata

Multi-Objective Heuristics for Network Construction in an Obstacle-Dense Environment

Francesco Bernardini, Aaron Becker

## AI-Based Methods

Virtual T1 @ 14:00-15:30

Comparison of Evolutionary Algorithms: A Case Study on the Multi-Objective Carbon-Aware Mine Planning

Nurul Asyikeen Binte Azhar, Aldy Gunawan, Shih-Fen Cheng, Erwin Leonardi

Scheduling Reconfigurable Poly-Robots for Warehouse Transport Operations

Mari Chaikovskaia, Jean-Philippe Gayon

SEARCHD - Advanced Retrieval with Text Generation Using Large Language Models and Cross Encoding Re-Ranking

Pradumn Mishra, Aditya Mahakali, Prasanna Shrinivas Venkataraman

Assembly Procedure Generation for Reconfigurable Robot Cells Considering Operation Concurrency and Geometrical Constraints

*Marc Ungen, Elias Huber, David Kampert, Oliver Riedel*

Research on Spindle Dynamic Performance Prediction by CGAN Model Based on LSTM and Attention Mechanism

*Siyi Ding, Jia Lin, Wenbo Zhou, Xinhua Mao, Jie Zhang*

Few-Shot RUL Prediction with a Hypernetwork Structure Incorporating Uncertainty Quantification and Calibration

*Ying Wang, Fangyu Li, Di Wang*

### **Autonomous Agents**

*Virtual T2 @ 14:00-15:30*

Online Multi-Robot Coverage Path Planning in Dynamic Environments Through Pheromone-Based Reinforcement Learning

*Kale Champagne, Chen Boli, Farshad Arvin, Junyan Hu*

Lifelong MAPF for Shipment Preparation in Stochastic Warehouses

*Abderraouf Maoudj, Mekid Samir Nadir, Anders Lyhne Christensen*

Indirect Vessel Velocity Control to Reduce the Impact of Underwater Noise at Cetacean Locations

*Mahassen Ardhaoui, Martin Otis, Salick Diagne*

Tram Warning for Automated Shuttle

*Mikko Tarkiainen, Kimmo Kauvo, Elina Aittoniemi*

Look Further Ahead: Testing the Limits of GPT-4 in Path Planning

*Mohamed Aghzal, Erion Plaku, Ziyu Yao*

Improving Generalization in Aerial and Terrestrial Mobile Robots Control through Delayed Policy Learning

*Ricardo Grando, Raul Steinmetz, Victor Augusto Kich, Alison Henrique Kolling, Pablo Ezequiel Moraes Furik, Junior Costa De Jesus, Bruna De Vargas Guterres, Daniel Fernando Tello Gamarra, Rodrigo Da Silva Guerra, Paulo Drews-Jr*

### **Optimization and Optimal Control**

*Room T10 @ 16:00-18:00*

Automated Drill and Blast Design Using Data from Autonomous Drills

*Ozan Perincek, Ryan Loxton, Sarang Kulkarni, Daniel Terence John Arthur*

Self-Adaptive Optimization Techniques for Matrix Production Systems

*Alexandre Sawczuk Da Silva, Tim Knissel, Gereon Weiss*

Parameter Estimation of a Dynamic Growth Model for Lettuce in an Adaptive Vertical Farm

*Echrak Chnib, Patrizia Bagnerini, Mauro Gaggero, Ali Zermouche*

An Optimal Sensor Placement Strategy for Continuous Petri Nets

*Cristian Mahulea*

Distributed Feedback Optimization for Multi-Robot Target Encirclement and Patrolling

*Lorenzo Pichierri, Guido Carnevale, Giuseppe Notarstefano*

**Advanced Techniques in AI-Driven Optimization for Industrial and Manufacturing Processes**

*Room T11 @ 16:00-18:00*

Clothoid-Based CAD Model Compensation for Precise Welding in Manufacturing Processes

*Edoardo Fiorini, Riccardo Muradore, Francesco Visentin*

Lumped-Parameter Modeling and Control for Robotic High-Viscosity Fluid Deposition

*William Van Den Bogert, James Lorenz, Xili Yi, Albert J. Shih, Nima Fazeli*

Life Cycle Economic Policy for Multi-Level Imperfect Maintenance and Repairman Assignment

*Shunkang Zhao, Youjun An, Xiaohui Chen, Yuanfa Dong, Ziye Zhao, Bin Zhou*

Reinforcement Learning for the Supply Chain Dynamics Problem with Production Capacity Constraints and Non-Stationary Demand

*Valeria Fichera, Leonardo Longo, Roberto Rosario Corsini, Sergio Fichera, Antonio Costa*

Investigating the Adaptability of Alarm Root-Cause Analysis Methods for Discrete Process Types

*Bjarne Lahrsen, Birgit Vogel-Heuser, Jan Wilch, Victoria Hankemeier, Matthias Wander, Christoph Kögel*

A Novel Spindle Speed and Angle Estimation Strategy in Multi-material Robotic Drilling

*Bin Chen, Chaoyue Niu, Erica Dale Smith, Robert Bramley, Pete Crawforth, Mahdi Mahfouf, Visakan Kadiramanathan*



## AI-Driven Control and Optimization

Room T12 @ 16:00-18:00

Enhancing Predictability in Deep Reinforcement Learning for Building Temperature Control

*Luca Ferrarini, Alberto Valentini*

Novel Rail Deployment Method for Monorail Vehicle Manipulator for Fusion Reactor Maintenance

*Yuto Noguchi, Tomoyuki Ito, Takuya Iwamoto, Junji Ohmori, Nobukazu Takeda*

Energy-Efficient Placement Optimization of the HVAC System for 5G Base Station with Redundant Configuration

*Yaping Liu, Jiang Wu, Yuanjun Shen, Tianbao Liang, Zhanbo Xu, Xiaohong Guan, Yadong Zhou*

Fault-Tolerant Sensor Reconciliation in Wireless Sensor Networks for Traffic Flow Monitoring

*Gianfranco Gagliardi, Franco Angelo Torchiario, Vincenzo D'Angelo, Francesco Tedesco, Alessandro Casavola*

Design and Maneuver of a Tool-Changer Using Switchable Magnet for a Tool Hung by a Cable

*Dongkyung Cheong, Hyeongkyun Park*

## Emerging Technologies in Robotics and Data Integration

Room T7 @ 16:00-18:00

Emergent Social Behaviors in Congestion Games with Reinforcement Learning

*Jiajun Chen, Jiayi Zeng, Ning Zhu, Qiao-Chu He*

An Ontology-Based Multi-Source Heterogeneous Data Integration Framework for Cutting Tool Life-cycle Management

*Mingyuan Xia, Xianwen Zhao, Xiaofeng Hu*

Human Following in Mobile Platforms with Person Re-Identification

*Mario Srouji, Yao-Hung Tsai, Hugues Thomas, Jian Zhang*

Enhancing Model-Based System Architecting through Formalized Decision Management

*Josua Höfgen, Birgit Vogel-Heuser, Alejandra Vicaria, François Pouzol, Christian Kurzhals*

Using Machine Learning to Support Prostate Cancer Detection without a Dedicated Biomarker

*Salem Hadrien, Brouqsault Marc, Slim Hammadi, Ben Othman Sarah*

## Formal Methods in Robotics and Automation

Room T8 @ 16:00-18:00

AirNeRF: 3D Reconstruction of Human with Drone and NeRF for Future Communication Systems

*Alexey Kotcov, Maria Dronova, Vladislav Cheremnykh, Sausar Karaf, Dzmitry Tsetserukou*

Computationally Efficient IMU-Based Endpoint Position Estimation of a Flexible Manipulator with Transverse and Torsional Displacement Effects

*Seyedmohammad Tahamipourzarandi, Sadeq Yaqubi, Jouni Mattila*

Contact Consistent Disturbance Estimation for Quadruped Robots

*Hasan Can Ozden, Emre Tanfener, Hasan Eftun Orhon, Ömer Tarık Banuş, Uluc Saranlı, Mustafa Mert Ankaralı, Ali Emre Turgut*

Modeling and Analysis of Multi-Line Orders in Multi-Tote Storage and Retrieval Autonomous Mobile Robot Systems

*Xiaotao Shan, Yichao Jin, Peizheng Li, Koichi Kondo*

Robust Parameter Identification for Robot Manipulators Using Haar Wavelets

*Woraphrut Kornmaneesang*

Valve-Free Operation of the Lift Cylinder in Mobile Machines with an Electrohydraulic Actuation System

*Timofei Komarov, Daniil Zadorozhniuk, Heikki Handroos, Juha Pyrhönen*

## Solutions for Sustainable and Resilient Systems

Room T9 @ 16:00-18:00

Problem Formulation and Solution Methodology of Energy Consumption Optimization for Two-Machine Geometric Serial Lines

*Chao-Bo Yan, Lingchen Liu*

Multi-Stage Robust Implicit Decision Rule for Optimal Control Problem of Energy Storage System

*Jiexing Zhao, Qiaozhu Zhai, Yuzhou Zhou, Xiaoyu Cao, Jianchen Hu, Fei Xue, Xutao Li*

Dynamic and Sustainable Flexible Job Shop Scheduling Problem under Worker Unavailability Risk

*Candice Destouet, Houda Tlahig, Belgacem Bettayeb, Bélahcène Mazari*

Resilient and Privacy-Preserving Multi-Agent Optimization and Control of a Network of Battery Energy Storage Systems under Attack

*Mojtaba Kaheni, Elio Usai, Mauro Franceschelli*

**Development of a Simulation-Based Solution Concept for AI-Driven Clustering / Combination of Pick and Stow Operations to Improve Logistics Performance in SMEs**

*Timo Schroth, Hummel Dr. Hummel, Konrad Von Leipzig, Jan Schuhmacher*

**A Solution Based on Hub Selection and Robot Routing Optimization for Last-Mile Delivery**

*María Asuncion Del Cacho Estil-Les, Wasim Ali, Mario Binetti, Agostino Marcello Mangini, Maria Pia Fanti*

## **Friday, August 30**

**Safe and Secure Human-Machine Interaction: a SMCS Contribution I**

*Room T1 @ 10:00-11:00*

**A Multi-Tiered Control Framework Designed for Managing the Logistical Activities of Self-Driving Vehicles within Manufacturing Environments**

*Domenico Famularo, Giuseppe Franzè, Francesco Giannini, Francesco Pupo, Giancarlo Fortino, Francesco Tedesco*

**Feedback Control in Multi-Agent Markovian Networks**

*Elisa Gaetan, Laura Giarrè, Paolo Falcone*

**A Denial of Service Game for Age of Incorrect Information in Cyber-Physical System**

*Valeria Bonagura, Leonardo Badia, Federica Pascucci, Stefano Panzieri*

**Discrete Event Dynamic Automation Systems**

*Room T10 @ 10:00-11:00*

**Validation of Supervisory Control Synthesis Tool CIF Using Model Checker MCRL2**

*Michel Reniers, Jeroen J. A. Keiren*

**Learning normal and delayed behavior of max-plus linear systems from input and output event data**

*Ibis Velasquez, Yannick Pencolé, Euriell Le Corronc*

**Opacity Enforcement in Discrete Event Systems Using Modification Functions**

*Xiaoyan Li, Christoforos Hadjicostis, Zhiwu Li*

**A Cryptographic System Based on Automata for Networked Automation Systems Abstracted As Discrete-**

**Event Systems**

*Marcos Vicente Moreira, Publio M. M. Lima, Lilian Kawakami Carvalho, Felipe Gomes Cabral*

**Innovative Design and Control Techniques in Robotics and Actuation Systems**

*Room T11 @ 10:00-11:00*

**Paper-Based Bistable Origami Gripper to Make Quadcopters Multi-Functional**

*Shuta Okamoto, Yuki Fukatsu, Chinthaka Premachandra, Hiroki Shigemune*

**Design of a Multiple Cilia Inspired Active Entanglement Soft Gripper for Adaptable and Stable Grasping**

*Yukang Yan, Zichen Xu, Xianli Wang, Qingsong Xu*

**Online Motion Modification for Mobile Manipulators Based on Sequential Quadratic Programming**

*Kimitoshi Yamazaki, Takuya Iwasaki, Yutaka Takase, Solvi Arnold, Keisuke Takeshita*

**Detection, Trust, and Adaptive Systems**

*Room T12 @ 10:00-11:00*

**Container Detection from Gantry Cranes Exploiting an Auto-Prompting SAM**

*Yunjian Feng, Jun Li*

**Trustworthy Dual-Scale Defect Detection Network for Diversified Electronic Products**

*Xinting Liao, Jie Zhang, Junliang Wang*

**Conquering the Robotic Software Development Cycle at Scale: Using KubeROS from Simulation to Real-World Deployment**

*Yongzhou Zhang, Frederik Pasch, Florian Mirus, Kay-Ulrich Scholl, Christian Wurl, Björn Hein*

**APFC: Adaptive Particle Filter for Change Point Detection of Profile Data in Manufacturing Systems**

*Yukun Xie, Juan Du, Jianguo Wu*

**Space Autonomy I**

*Room T2 @ 10:00-11:00*

**Coopetitive Lunar Mapping: A Distributed Non-Proprietary Multi-Robot Coordination Using Blockchain-Based Cost Optimisation**

*Loïck Chovet, Renan Lima Baima, Abhishek Bera, Miguel A. Olivares-Mendez, Gilbert Fridgen*

**Structure from Motion-Based Motion Estimation and 3D Reconstruction of Unknown Shaped Space Debris**

*Kentaro Uno, Takehiro Matsuoka, Akiyoshi Uchida, Kazuya Yoshida*

### **Impact Behaviour Analysis of a Passive Compliant Unit for Active Space Debris Removal**

*Maxime Hubert Delisle, Xiao Li, Baris Yalcin, Miguel A. Olivares-Mendez, Carol Martinez*

### **Innovations in Robotics and Automation for Enhanced Healthcare I**

*Room T3 @ 10:00-11:00*

#### **Improving SEA Joint Torque Sensing for Enhanced Torque Estimation in Human-Machine Interaction**

*Giulia Bodo, Christian Vassallo, Luca De Guglielmo, Matteo Laffranchi*

#### **Over Three Decades of Upper-Limb Robotic Neurorehabilitation: Drawing Conclusions and Future Work**

*Adriano Scibilia, Alessio Prini, Tito Dinon, Nicola Pedrocchi, Marco Caimmi*

#### **Cooperative Control Solutions for FES-Motorized Robotic Systems: A Narrative Review**

*Tommaso Del Grossi, Dell'Eva Francesca, Viola Camerini, Marta Gandolla, Alessandra Pedrocchi, Emilia Ambrosini*

#### **Optimization and Evaluation of the Control Framework for Brain-Machine Interfaces**

*Paolo Forin, Gloria Beraldo, Stefano Tortora, Emanuele Menegatti, Luca Tonin*

### **Emerging Data Science in Manufacturing I**

*Room T4 @ 10:00-11:00*

#### **Open Stamped Parts Dataset**

*Sarah Antiles, Sachin Talathi*

#### **Real Options for Maintenance Scheduling with Bearing Degradation in Panel Manufacturer**

*Yenwen Chen, Pin-Chi Chu, Chia-Yen Lee*

#### **Spatio-Temporal Transformer for Temperature Profiles Prediction in Large Format Additive Manufacturing**

*Haoyang Xie, Dylan Hoskins, Kyle Rowe, Feng Ju*

### **Cognitive Manufacturing Systems I**

*Room T5 @ 10:00-11:00*

#### **Position-Aware Transformer-Based One-Stage Torpedo Can Connecting Device Camouflage Object Detection Algorithm**

*Tianjie Fu, Peiyu Li*

#### **Cognitive Programming Interface : From Task Level Programming to Coherent Task Level Programming**

*Paul-Edouard Raphaël Gerin, Julie Dumora, Olivier David, Baptiste Gradoussoff*

#### **Autonomy in Cognitive Development of Robots: Embracing Emergent and Predefined Knowledge and Behavior**

*Satoru Isaka*

#### **Unveiling Designers' Cognitive States in Early Engineering Design Stages: An Autoencoder-DNN Approach based on EEG Data**

*Mingrui Li, Zuoxu Wang, Fan Li, Jihong Liu*

### **Advances in Intelligent Healthcare Management I**

*Room T6 @ 10:00-11:00*

#### **Joint Optimization of Subsidy and Location for Healthcare Network Redesign Considering Patient Choice Behavior**

*Yewen Deng, Liping Zhou, Zhibin Jiang*

#### **An Analytical Threshold-Based Classification Technique for Post-Incident Fall Detection**

*Joe Dibble, Michael Bazzocchi*

#### **Deep Reinforcement Learning-based Scheduling of Healthcare Provider Network Considering Patients Preference**

*Xuanzhu Fan, Jiafu Tang*

#### **Real-Time Early Prediction of Sepsis in the ICU Utilizing Deep Learning Networks**

*Kaibo Zhu, Na Geng*

### **Assembly Lines in Circulation: A Focus on Human-Centric, Sustainable, and Resilient Manufacturing**

*Room T7 @ 10:00-11:00*

#### **Reinforcement Learning Methods for Preventive Maintenance and Machine Replacement Problem with Second-Hand Equipments**

*Chen Xiong, Simon Thevenin, Guillaume Massonnet*

#### **A Mathematical Model Integrating Line Balancing, Equipment Selection, and Workforce Management**

*Hamidreza Rezaei, Simon Thevenin, Cerqueus Audrey*

#### **Exploration of Socio-Technical Systems in the Context of Reuse of Assembly Lines**

*Philipp Url, Maximilian Johannes Orgler, Wolfgang Vorraber*

Assembly Lines in Circulation towards a Holistic Framework to Enable the Reuse of Assembly Resources

*German Bluvstein, Sebastian Kurscheid, Nora Reinbold, Wolfgang Vorraber, Philipp Url, Shiva Noori, Emad Yaghmaei, Rie Brammer Larsen, Simon Thevenin, Hamidreza Rezaei, Rüdiger Daub*

### **Reinforcement Learning**

Room T8 @ 10:00-11:00

Multi-Agent Reinforcement Learning with Decentralized Distribution Correction

*Kuo Li, Qing-Shan Jia*

An OCBA-Based Method for Efficient Sample Collection in Reinforcement Learning

*Kuo Li, Xinze Jin, Qing-Shan Jia, Dongchun Ren, Huaxia Xia*

Reinforcement Learning for Aligning Laser Optics with Kinematic Mounts

*Ildar Rakhmatulin, Donald Risbridger, Richard Carter, M. J. Daniel Esser, Mustafa Suphi Erden*

Investigating Integral Reinforcement Learning to Achieve Asymptotic Stability in Underactuated Mechanical Systems

*Babak Salamat, Daniel Bencic, Gerhard Elsbacher, Christian Seidel, Andrea Andrea M. Tonello*

### **Factory Automation**

Room T9 @ 10:00-11:00

An Intelligent Factory Automation System with Multivariate Time Series Algorithm for Chip Probing Process

*Yu-Ming Hsieh, Chin-Yi Lin, Jan Wilch, Birgit Vogel-Heuser, Yu Chen Lin, Yu-Chuan Lin, Min-Hsiung Hung, Fan-Tien Cheng*

A Realistic Industrial Car Factory Digital Twin Simulation for Virtual Reality Applications and Robotic Training

*Florian Spiess, Swarnabha Roy, Mattias Hollmann, Christopher Cosway, Stavros Kalafatis*

Unwind While Unwinding - Solving Complex Automation Problems with Machine Learning

*Niklas Körwer, Martin Bischoff, Rik W. De Doncker*

Practical Q-Learning-Based Route-Guidance and Assignment for Large-Scale Mobile Robots in Manufacturing Factory

*Sangpyo Hong, Illhoe Hwang, Seol Hwang, Young Jae*

*Jang*

### **Safe and Secure Human-Machine Interaction: a SMCS Contribution II**

Room T1 @ 11:30-13:00

A Data-Driven Approach for Context Definition in Situation-Aware Wearable Computing Systems

*Giuseppe D'Aniello, Giancarlo Fortino, Matteo Gaeta, Zia Ur Rehman*

Security-by-Design of Smart Water Supply Systems: A Switching Output Automaton-Based Approach

*Tianyu Liu, Carla Seatzu, Federica Pascucci, Graziana Cavone, Alessandro Giua*

Security System for STEM Laboratories

*Silvia Arambula, Godoy Ruben, Javier Arambula, Jose Arambula*

### **Collaborative Robots in Manufacturing**

Room T10 @ 11:30-13:00

Virtual Reality As a Robot Programming Tool and a Comparison of Its Effectiveness in Common Tasks

*Jonathan Boutin, Guillaume Dupoirion, Jean-Philippe Roberge*

Design and Experiment of Hydraulic Driven Wheel-Bipedal Robot

*Xu Li, Haoyang Yu, Zhenguo Taozhenguo, Haibo Feng, Songyuan Zhang, Yili Fu*

Adaptable Recovery Behaviors in Robotics: A Behavior Trees and Motion Generators(BTMG) Approach for Failure Management

*Faseeh Ahmad, Matthias Mayr, Sulthan Suresh Fazeela, Volker Krueger*

Using Multi-Channel 3D Lidar for Safe Human-Robot Interaction

*Sarthak Arora, Subramanian Karthik, Odysseus Adamides, Ferat Sahin*

Investigation and Validation of Pipeline Robot Wall Pressure Control Strategy

*Cheng Liu, Tian Zhe, Wei Wei, Qingdong Yan, Meng Guo*

### **Machine Learning Applications in Robotics, Analytics, and Simulation**

Room T11 @ 11:30-13:00

Visual Deformation Detection Using Soft Material

### Simulation for Pre-Training of Condition Assessment Models

Joel Sol, Amir Mehdi Soufi Enayati, Homayoun Najjarian

### Investigating Low Data, Confidence Aware Image Prediction on Smooth Repetitive Videos Using Gaussian Processes

Nikhil Shinde, Xiao Liang, Florian Richter, Sylvia Herbert, Michael C. Yip

### Equipment Health Monitoring for Industrial Robotic Arms

James Moore, Daniela Sawyer

### Comprehensive Framework for Facilitating the Deployment of Distributed On-Premise Analytics Applications in Resource-Constraint Environments

Nicolai Schoch, Pascal Becker, Virendra Ashiwal, Andrew Habib

### Comparative Analysis of Uncertainty Quantification Models in Active Learning for Efficient System Identification of Dynamical Systems

Hans Mertens, Frances Zhu

### Environment Classification Method Using Autoencoder to Select Appropriate Crowd Model for Robot Simulation

Saki Nakazawa, Yuka Kato

### Neural Networks and Deep Network Physics

Room T12 @ 11:30-13:00

### Solving Differential Equations Using Physics-Informed Deep Equilibrium Models

Bruno Machado Pacheco, Eduardo Camponogara

### Transferability of Machine Learning Models for Energy Consumption Prediction of In-Vehicle Low-Voltage Equipment: A Case Study

Julian Mueller, Xuanheng Liu, Jonas Maier, Georg Frey

### In-Situ 3D Printing Monitoring in Dynamic Environments Via Self-Supervised Deep Neural Network Adaptation

Fang Wang, Gang Xiong, Qihang Fang, Zhen Shen, Di Wang, Li Wan, Xisong Dong, Feiyue Wang

### Recurrent Neural Network Based Reinforcement Learning for Inventory Control with Agent-Based Supply Chain Simulator

Atsuki Kiuchi

### MPC of Uncertain Nonlinear Systems with Meta-Learning for Fast Adaptation of Neural Predictive

### Models

Jiaqi Yan, Ankush Chakrabarty, Alisa Rupenyan, John Lygeros

### Neural networks to approximate capacity consumption in lot-sizing models

David Tremblet, Simon Thevenin, Alexandre Dolgui

### Space Autonomy II

Room T2 @ 11:30-13:00

### Integration of Slip Detection and Grip Force Control in an Autonomous Robot Assembly Task for Space Applications

Ishrath I, S Barat, Gustavo Hernan Diaz Huenupan, Shreya Santra, Kazuya Yoshida, Harish Palanhandalam-Madapusi

### Collaborative Load Transportation in Microgravity Environments: Centralized and Decentralized Predictive Controllers

Sujet Phodapol, Pedro Roque, Dimos V. Dimarogonas

### Improving Soft-Capture Phase Success in Space Debris Removal Missions: Leveraging Deep Reinforcement Learning and Tactile Feedback

Bahador Beigomi, Zhenghong (George) Zhu

### Communication-Constrained Path Planning for Multi-Rover Exploration on the Lunar Surface

Shreya Santra, Emanuel Staudinger, Kazuya Yoshida

### Optimal Control-Based Target Tracking for Cognitive Spaceborne Radars

Matteo Sartoni, Andrea Testa, Andrea Pietropaolo, Carlo Ciancarelli, Giuseppe Notarstefano

### Innovations in Robotics and Automation for Enhanced Healthcare II

Room T3 @ 11:30-13:00

### Safe haptic teleoperations of admittance controlled robots with virtualization of the force feedback

Lorenzo Pagliara, Enrico Ferrentino, Andrea Chiacchio, Giovanni Russo

### Using Marker-Less Pose Estimation for the Detection and Classification of FES-Induced Tremor

Anna Polato, Natalia Paredes-Acuña, Nicolas Berberich, Emanuele Menegatti, Luca Tonin, Gordon Cheng

### Development and Preliminary Validation of a Novel Handheld Sensing Device for Remote Palpation

Tommaso Lisini Baldi, Nicole D'Aurizio, Leonardo Franco, Domenico Prattichizzo

Robot-Assisted Superficial Hyperthermia Treatments: The ROBHOT System  
*Marco Ferro, Pierfrancesco Pavoni, Marilena Venditelli*

Heat and Moisture Transferable Fabric Actuator  
*Tetsuyou Watanabe, Nozomu Arai, Shun Matsuda*

Toward Robust 2D Control Using a 4-Class Brain-Computer Interface Based on Motor Imagination  
*Luca Zanchi, Luca Tonin, Stefano Tortora, Emanuele Menegatti*

## Emerging Data Science in Manufacturing II

Room T4 @ 11:30-13:00

Short-Term Travel Time Prediction Model for OHT Systems in Semiconductor Fabs  
*Jaeho Lee, Young Jae Jang*

Robust Ensemble Forecasting and Deep Reinforcement Learning for Energy Management of Islanded Microgrids  
*Yun-Chia Hsu, Chia-Yen Lee*

Stochastic Capacity Planning with Most Productive Scale Size and Eco-Efficiency  
*Wei Kang, Chia-Yen Lee*

High-Speed Interpretable Representation Learning of Melt Pool Signatures in Metal Additive Manufacturing  
*Mathieu Vandecasteele, Dries Verhees, Wilfried Philips, Abdellatif Bey-Temsamani, Brian Booth*

Reinforcement Learning Genetic Algorithm for Surface Mount Technology Scheduling Problem in Semiconductor Package Supply Chain  
*Hung-Kai Wang, Chia-Le Wu*

Bottleneck Mining: A Data-Driven Bottleneck Identification Method Via Process Mining in Manufacturing Systems  
*Zonghang Fang, Chunlong Yu*

## Cognitive Manufacturing Systems II

Room T5 @ 11:30-13:00

ManufVisSGG: A Vision-Language-Model Approach for Cognitive Scene Graph Generation in Manufacturing Systems  
*Zhijie Yan, Zuoxu Wang, Shufei Li, Mingrui Li, Xinxin Liang, Jihong Liu*

A self-training-based approach for aluminum alloy

casting quality prediction  
*Haonan Wang, Jun Wu, Quanzhi Sun, Weipeng Liu, Tao Peng, Renzhong Tang*

Physically-Based Data Augmentation for Deep Learning-Enabled Automated Visual Inspection of Scratches  
*Peng Wang, Wenhui Wang, Yuanbin Wang*

Generalizing Knowledge Enabled Fast-Adaptive Optimization for Advanced Machining Systems  
*Qinge Xiao, Chengke Wu, Zhile Yang, Yuanjun Guo, Hanping Guo*

Developing Cognitive Digital Twin for Smart Manufacturing: Methodology and Case Study  
*Tang Ji, Jan Polzer, Xun Xu*

Knowledge Graph Learning Enabled Automatic Work Packaging in Modular Construction Manufacturing  
*Zisheng Liu, Xiao Li, Chengke Wu, Qinge Xiao, Yue Teng, Zhile Yang*

## Advances in Intelligent Healthcare Management II

Room T6 @ 11:30-13:00

A Two-Stage Matheuristic for the Home Healthcare Routing and Scheduling Problem with Perishable Products  
*Aldy Gunawan, Nabila Yuraisyah Salsabila, Minh Pham Kien Nguyen, Vincent F. Yu*

An Efficient Algorithm for Workflow Analysis in a Day Surgery Center  
*Hanyi Zheng, Qing Wang, Jingshan Li*

Next-Day Surgery Scheduling: A Preference-Based Data-Driven Approach  
*Zhaoyang Liu, Qing Wang, Jingshan Li*

Detection and Manipulation of Test Tubes in the Pre-Analytical Phase of the Laboratory Sector  
*Matheus Santana De Jesus, Jefferson Medeiros Norberto, Marcondes Da Silva Júnior, Adrien Durand-Petiteville*

Automated Computation of Cutting Paths for Unit-Dose Repackaging of Pharmaceutical Blister Packs  
*Aline Assaka Tani, Jefferson Medeiros Norberto, Marcondes Da Silva Júnior, Adrien Durand-Petiteville*

Enhancing Medical Training: A Genetic Algorithm and PID Control Approach to Colonoscopy Simulations  
*Hang-Ling Wu, Scarlett Miller, Jason Moore*

## Identification and Control of Complex Systems

Room T7 @ 11:30-13:00

On the Design of Digital Event-Based Controllers for a Class of Nonlinear Systems: An Application to Unmanned Aerial Vehicles

*Mario Di Ferdinando, Alessandro Modesti, Nicola Epicoco, Stefano Di Gennaro, Pierdomenico Pepe*

Modelling Sensors Degradation for Water Quality Monitoring: A Data-Driven Approach

*Marino Pavone, Nicola Epicoco, Giordano Pola, Andrea Manno*

IIOT Cyberattacks in Industrial Field Control Systems: PID Attack and Hardware Trojan Effects

*Alessandro Massaro, Nicola Epicoco, Giuseppe Loseto, Carmelo Antonio Ardito*

Performance Evaluation of Over-The-Air Computation for State Feedback Control Systems

*Alberto Gianfrancesco, Vittorio De Luliis, Piergiuseppe Di Marco, Pangun Park*

An Evaluation of Methods for Assessing Robot Kinematic Model Accuracy in the Presence of Noise

*Mitchell Woodside, Philip Olubodun, Patrick Bazzoli, J. Adam Nisbett, Guixiu Qiao, Douglas Bristow*

## Advanced Optimization Techniques

Room T8 @ 11:30-13:00

Simulated Hill Climbing Search for the Solutions of  $k$ -Vertex Cut Problems

*Yangming Zhou, Zhibin Jiang, Mengchu Zhou*

Fixture Layout Optimization for the Curved Shell Plate in the Shipbuilding Industry

*Ge Hong, Shuo Gao, Guojin Si, Tangbin Xia, Ershun Pan, Lifeng Xi*

A Markowitz Optimization Approach for Automating the Italian Research Quality Monitoring and Evaluation

*Nicola Mignoni, Paolo Scarabaggio, Raffaele Carli, Mariagrazia Dotoli*

Distributed  $\ell_0$  Sparse Aggregative Optimization

*Alireza Olama, Guido Carnevale, Giuseppe Notarstefano, Eduardo Camponogara*

Design Analysis of a Novel Belt-Driven Manipulator for Fast Movements

*Christoph Stoeffler, Janne Janzen, Adriano Del Río, Heiner Peters*

## Advancements in Aerial Robotics

Room T9 @ 11:30-13:00

Time-Optimal Handover Trajectory Planning for Aerial Manipulators Based on Discrete Mechanics and Complementarity Constraints

*Wei Luo, Jingshan Chen, Henrik Ebel, Peter Eberhard*

Sparse Gaussian Process Regression for Residual Dynamics Learning in Multi-Rotor Aerial Vehicles Control

*Geesara Kulathunga, Marc Hanheide, Alexandr Klimchik*

Precise Multi-Target Detection and Geolocalization Using Unmanned Aerial Vehicles Supporting Surveillance Operations

*Jonathan Cacace, Bartomeu Rubí, Javier Rodriguez, Julian Cayero*

Enhancing Wildfire Propagation Estimation with an Autonomous Aerial Agent

*Constantinos Heracleous, Panayiotis Kolios, Christos Panayiotou*

Star-Shaped Tilted Hexarotor Maneuverability: Analysis of the Role of the Tilt Cant Angles

*Marco Perin, Massimiliano Bertoni, Nicolas Viezzer, Giulia Michieletto, Angelo Cenedese*

Informative Sensor Planning for a Single-Axis Gimbaled Camera on a Fixed-Wing UAV

*Aditya Parandekar, Brady Moon, Nayana Suvarna, Sebastian Scherer*

## Computer Vision in Automation and Manufacturing

Virtual T1 @ 11:30-13:00

Mixed-Test Method for Performance Evaluation of Intelligent Collaborative Robotic Systems

*Miguel Da Silva, Maria Makarov, Remi Regnier, Didier Dumur*

MaskVal: Simple but Effective Uncertainty Quantification for 6D Pose Estimation

*Philipp Quentin, Daniel Goehring*

Object recognition with human-in-the-loop assistance using error information

*Jie Hu, Nobutaka Kimura, Takaharu Matsui*

GN: Geometric-Net for Geometric-Level Pose and Size Estimation without CAD Templates

*Zihao Wan, Jianhua Hu, Haojian Zhang, Yunkuan Wang*

Memory-Based Error Label Suppression for Embodied Self-Improving Object Detection

Jieren Deng, Haojian Zhang, Jianhua Hu, Yunkuan Wang

Few-Shot Traversability Segmentation of Indoor Robotic Navigation with Contrastive Logits Align

Qiyuan An, Christos Sevastopoulos, Farnaz Farahanipad, Fillia Makedon

**Machine Learning**

Virtual T2 @ 11:30-13:00

Calibration of Deep Learning Classification Models in fNIRS

Zhihao Cao, Zizhou Luo

Simple but Effective: Rethinking the Ability of Deep Learning in fNIRS to Exclude Abnormal Input

Zhihao Cao

ARIBIC: Artificial Intelligence Based Indoor Cartography

Dennis Schüthe, Hao Pang, Maximilian Gilles, Sven Dierfeld, Edwin G. Ng, Johannes Hinckeldeyn, Julien Stanguenec

Reinforcement Learning with Large Language Model for Hybrid Disassembly Lines in Remanufacturing Contexts

Peng Ji, Xiwang Guo, Jiacun Wang, Weitian Wang, Shujin Qin, Ying Tang, Qi Kang

Regularized Optical Flow for Detecting Moving Foreground from Videos Taken by Steady-Moving Cameras

Yinwei Zhang, Shenghao Xia, Biao Zhang, Jian Liu

Enhancing Robotic Grasp Failure Prediction Using a Pre-Hoc Explainability Framework

Cagla Acun, Ali Ashary, Dan Popa, Olfa Nasraoui

**Predictive Control and Dynamic Modeling**

Room T10 @ 14:00-15:30

Robust Real-Time Predictive Control Using Inertial Motion Prediction, Bisection, and Self-Tuning

Takashi Nammoto, Toshisada Mariyama

Optimal Integrated Scheduling of Observation and Download Tasks for Multiple Satellites with Memory Constraints

Chaehyeon Kim, Sung Jun Kim, Han-Lim Choi

Sparse Nonlinear Dynamic Identification of a Single-

Phase Flow System

Luis Kin Miyatake, Eduardo Camponogara, Laio Oriol Seaman

Hybrid Dynamic Modelling Using FeedForward and Temporal Convolutional Networks (FNN+TCN) and Robust Control Scheme for Aerial Manipulators

Abolfazl Eskandarpour, Mohammad Soltanshah, Kamal Gupta, Mehran Mehrandezh

Enhancing Mobile Robot Navigation Safety and Efficiency through NMPC with Relaxed CBF in Dynamic Environments

Minh Nhat Nguyen, Stephen McIlvanna, Yuzhu Sun, Yan Jin, Mien Van

A MPC Performance Degradation Diagnosis Method Based on Receding Feature Horizon

Wenhua Jiao, Taotao Zou, Zhangcheng Xie, Shipin Yang, Yining Dong, Lijuan Li

**Learning and Coordination Strategies in Multi-Agent and Autonomous Systems**

Room T11 @ 14:00-15:30

Multi-Agent Vulnerability Discovery for Autonomous Driving Policy by Finding AV-Responsible Scenarios

Ye Mu, Weilin Liu, Chao Yu, Xuefei Ning, Zhong Cao, Zelai Xu, Shuang Liang, Huazhong Yang, Yu Wang

A Hybrid Algorithm for Optimized Task Allocation and Coordination among Multiple Specialized Robots

Alfa Budiman, Pierre Payeur, Eric Lanteigne, Luis Eduardo Garza-Castañon

Robotic Learning of Haptic Skills from Expert Demonstration for Contact-Rich Manufacturing Tasks

Çağatay Basdoğan, Sara Hamdan, Erhan Oztop, Yusuf Aydin

Multi-Volume Potential Fields for Effective Learning from Demonstration

Victor Hernandez Moreno, Louis Ferdinand Nicodemus Fernandez, Marc Carmichael, Jochen Deuse

Learning Robot Skills from Demonstration for Multi-Agent Planning

Maximilian Diehl, Isacco Zappa, Andrea Maria Zanchettin, Karinne Ramirez-Amaro

**Robotics System for Teleoperation and Segmentation**

Room T12 @ 14:00-15:30

TeleFMG: A Wearable Force-Myography Device for



Natural Teleoperation of Multi-Finger Robotic Hands  
*Alon Mizrahi, Avishai Sintov*

Development of a Manipulation-Aimed Teleoperation System for an Articulated Aerial Robot  
*Kotaro Kaneko, Junichiro Sugihara, Kazuki Sugihara, Haruki Kozuka, Jinjie Li, Yunong Li, Takuzumi Nishio, Keisuke Nagato, Masayuki Nakao, Moju Zhao*

Towards Optimal Human-Robot Interface Design Applied to Underwater Robotics Teleoperation  
*Paulo Padrao, Jose Fuentes, Tero Heikki Kaarlela, Alfredo Bayuelo, Leonardo Bobadilla*

A Stable Guidance Method for Teleoperation-Based Robot Learning from Demonstration  
*Weiyong Si, Zhehao Jin, Zhenyu Lu, Ning Wang, Chenguang Yang*

A Novel Bilateral Control of Leader Follower Robots Based on Virtual Impedance Method  
*Kiyoshi Nagai, Nana Ishigami*

Development of Human-In-The-Loop Based Robot Environment Awareness and Control Framework for Underwater Robot Operation  
*Daegil Park, Yeongjun Lee, Jong-Boo Han, Tae-Kyeong Yeu*

**Industrial Foundation Models and Applications in Smart Manufacturing**  
*Room T5 @ 14:00-15:30*

RAD: A Comprehensive Dataset for Benchmarking the Robustness of Image Anomaly Detection  
*Yuqi Cheng, Yunkang Cao, Chen Rui, Weiming Shen*

A New Deep Learning Model for Semi-supervised Soft-sensing of an Industrial Production Process  
*Xudong Shi, Chenyu Tian, Qi Kang, Mengchu Zhou, Hanqiu Bao, Jing An*

Attention Fusion Reverse Distillation for Multi-Lighting Image Anomaly Detection  
*Yiheng Zhang, Yunkang Cao, Tianhang Zhang, Weiming Shen*

Modeling and Analysis of Time Dependent Petri Nets  
*Shu Zhang, Yufeng Chen, Ruotian Liu, Xuya Cong, Maria Pia Fanti*

Iterative Auto-Labeling of High-Frequency Induction Brazing through a SSOD and Score Filtering  
*Min-Gwan Kim, Joonhyeok Moon, Ok Hyun Kang, Heejong Lee, Ki-Yong Oh*

**Advances in Intelligent Healthcare Management III**  
*Room T6 @ 14:00-15:30*

Feasibility Study on Powered Hip Skeleton for Optimization of Walking Assist  
*Kiyoshi Nagai, Ranka Hane, Makoto Okado, Toshihito Ohashi, Taketoshi Ichihara*

Optimal Treatment Selection for Patients with Stomach and Gastroesophageal Junction Adenocarcinoma  
*Michela Prunella, Paolo Scarabaggio*

Real-Time Patient Flow Prediction in Otolaryngology Department  
*Qing Wang, Taojun Wang, Jingshan Li*

Optimization for Regional Examination Centers Design Considering Multiservice Collaboration  
*Tianjiao Sun, Yewen Deng, Liping Zhou*

Advance Scheduling for Inpatient Admission with Stochastic Arrivals and Lengths of Stay and a Moving Booking Window  
*Jiajun Dai, Na Geng, Xiaolan Xie*

Visual Feedback BCI for UAV Control Using Error Related Negativity  
*Dario Sanalitro, Seyed Yahya Shirazi, Maide Bucolo*

**Reinforcement Learning for Autonomous Driving and Robot Control**  
*Room T7 @ 14:00-15:30*

Influence of Visual Observations Dimensionality Reduction on a Deep Reinforcement Learning Controlled Terrestrial Robot  
*Luiz Afonso Marão, Luís Eduardo De Souza Cintra, Glauco Augusto De Paula Caurin*

An Examination of Offline-Trained Encoders in Vision-Based Deep Reinforcement Learning for Autonomous Driving  
*Shawan Mohammed, Alp Argun, Nicolas Bonnotte, Gerd Ascheid*

An Application of Model-Free Reinforcement Learning to the Control of Aerial Vehicles with Slung Payloads  
*Eleni Sabourin, Eric Lanteigne*

RaCIL: Ray Tracing Based Multi-UAV Obstacle Avoidance through Composite Imitation Learning  
*Harsh Bansal, Vyom Goyal, Bhaskar Joshi, Akhil Gupta,*

Harikumar Kandath

Non-Prehensile Aerial Manipulation Using Model-Based Deep Reinforcement Learning  
Cora Dimmig, Marin Kobilarov

### **Control and Path Planning Strategies for Mobile Robot Systems**

Room T8 @ 14:00-15:30

Generalization of a Stateful Graph Search Algorithm Applied to Heterogeneous Mobile Robot Path Planning  
Fabian Menebröker, Dennis Luensch, Marc Hantzsch, Utku Pazarci

Finite-Time Convergence of Multi-robot Segregation using MPC with Aperiodic Motion Smoothing  
Richa Dubey, Shreyash Gupta, Saurabh Chaudhary, Niladri Sekhar Tripathy, Suril Vijaykumar Shah

Novel Approach for Trajectory Planning in Laser Material Processing: Constrained Dual-Stage System Using Model Predictive and Sliding Mode Control  
Lucas De Andrade Both, Christian Matthias Sinn, Leon Gorißen, Philipp Walderich, Thomas Kaster, Jan-Niklas Schneider, Felix Lange

A Multi-Agent Path Planning Strategy with Reconfigurable Topology in Unknown Environments  
Hao Sun, Junyan Hu, Li Dai, Chen Boli

Motion Generation for Mobile Manipulators to Assist in Putting on a Jacket While Walking  
Yusuke Kuribayashi, Yutaka Takase, Kimitoshi Yamazaki

Global Trajectory Optimization for Autonomous Driving Using Nonlinear Programming with Topology Classes  
Maryam Nezami, Ngoc Thinh Nguyen, Georg Schilb

### **Characterization and Prediction of Printed Products**

Room T9 @ 14:00-15:30

Steady Conformal Support Structures for 3D Printing  
Dong Wang, Zhen Shen, Qihang Fang, Dong-Ming Yan, Weixing Wang, Qing Wang, Gang Xiong

Improving the Strength of Fused Filament Fabrication Parts by Non-Planar Alignment of Material Extrusion with Stress Vectors  
Rhys Edwards, Lee Clemon

Surface Quality Characterization and Modeling for Printed 2D Products Using Printing Primitives  
Minghao Gu, Cesar Ruiz, Qiang Huang

Data-Driven Extrusion Force Control Tuning for 3D Printing  
Xavier Guidetti, Ankita Mukne, Marvin Rueppel, Yannick Nagel, Efe Balta, John Lygeros

Deposition Width Prediction in Extrusion-Based Bioprinting Using Deep Learning with Thermal Imager Temperature Series  
Chao-Yaug Liao, Ting Wei Hsueh

A Small 3D Printed Robotic Arm for Teaching Industry 4.0 and Robotic Engineering  
Pavel Surynek

### **Deep Learning in Robotics and Automation**

Virtual T1 @ 14:00-15:30

DMG6D: A Depth-Based Multi-Flow Global Feature Fusion Network for 6D Pose Estimation  
Zihang Wang, Qiang Zhang, Xueying Sun, Jianwei Zhu, Hao Wei

Enhancing Cooperative Visual SLAM with a Self-Supervised Deep Learning Model for Efficient Keypoint-Based Inter-Map Loop Closure Detection  
Zakaria Chekakta, Abdelhafid Zenati, Nabil Aouf

Omnidrone-Det: Omnidirectional 3D Drone Detection in Flight  
Phumrapee Pisutsin, Jiaping Xiao, Mir Feroskhan

To Cooperate or Not: Multi-Agent Reinforcement Learning-Based On-Ramp Merging Strategies for Autonomous Vehicles  
Dan Wang, Gangyan Xu, Zhizhou Wu

End-To-End Visuomotor Learning from Virtual Environment to Real Robot  
Kei Higuchi, Constantin Uhde, Gordon Cheng, Ixchel Georgina Ramirez-Alpizar, Gentiane Venture, Natsuki Yamano

Neural Human Intent Estimator for an Adaptive Robotic Nursing Assistant  
Christopher Trombley, Madan Mohan Rayguru, Payman Sharafian Ardakani, Irina Kondaurova, Nancy Zhang, Moath Alqatamin, Sumit Kumar Das, Dan Popa

### **Optimization and Optimal Control**

Virtual T2 @ 14:00-15:30

### Strategic Sensor Deployment in Traffic Networks for Enhanced Traffic Flow and Pollution Analysis through Global Search Optimization

Marco Lupia, Gianni Cario, Gianfranco Gagliardi, Vincenzo Gallelli

### Safe Value Functions: Learned Critics As Hard Safety Constraints

Daniel Chee Hian Tan, Fernando Acero, Robert Mccarthy, Andromachi Maria Delfaki, Zhibin (Alex) Li, Dimitrios Kanoulas

### To Test or Not: Incentivizing Individuals in a Population to Achieve Socially Optimal Testing in Epidemics

Amal Roy, Chandramani Singh, Narahari Yadati

### A Dynamic and Prospective Model to Predict and Prevent Errors in Production Processes

Gerarda Fattoruso, Squillante Massimo, Antonio Violi

### Payload Delivery through Acrobatic Quadrotor Flip-And-Throw Maneuver Using Model Predictive Control

Saransh Jain, Yash Dinesh Shethwala, Swaraj Akurathi, Jnaneshwar Das

### Modeling and Control of an Eel-Inspired Soft Robot for Design Optimization

Zhangjingyi Jiang, Mark Campbell

## Saturday, August 31

### Decision and Control Techniques for Autonomous Systems I

Room T10 @ 10:00-11:00

#### Early Design Phase: Solar HAPS UAV

Anisha Bhattacharya, Lakshmi Manasa C N, Sreevalli Seetharamu

#### Exploiting Interlaced Kalman Filter for Anomaly Detection

Valeria Bonagura, Foglietta Chiara, Federica Pascucci, Stefano Panzieri

#### Polynomial Approximation of Regions of Attraction Via Occupation Measures: An Application to a Biological Autonomous System

Pierluigi Francesco De Paola, Alessandro Borri, Alessia Paglialonga, Pasquale Palumbo, Fabrizio Dabbene

#### Security and Localization of Cyber Attacks in Finite State Machines

Bushra Bushra, Elena De Santis, Giordano Pola

### Integrating Occupancy Grid with Semantic Road Information for Autonomous Navigation in Urban Scenarios: A Benchmark Study

Simone Felicioni, Elena Burani, Mirko Leomanni, Mario Luca Fravolini, Paolo Valigi, Gabriele Costante

### Digital Twin in Smart Construction I

Room T11 @ 10:00-11:00

#### Digital Twin-Driven Automatic Response Analysis for Demolition Safety

Zhengxu Zhu, Shuxuan Zhao, Xinyue Guo, Ray Y. Zhong

#### DT-PoseFormer: A Digital Twin-Enabled Transformer Network for Precise Pose Estimation of MiC Modules

Yujie Han, Jingda Xie, Jiyuchen Ding, Zhiheng Zhao, George Q. Huang

#### Design and Development of a Shape Measurement System for 3D Construction Printing with a Manipulator

Reina Nakanishi, Hiroki Ogura, Shinya Yamamoto, Hiroyuki Abe, Ryu Kikuchi

#### Real-Time Locating System-Enabled Digital Twin for Crane Operation Safety Monitoring on Construction Sites

Peisen Li, Jingda Xie, Jiyuchen Ding, Zhiheng Zhao, Wei Wu, George Q. Huang

### Human Gait Reconstruction

Room T12 @ 10:00-11:00

#### Knee Exoskeleton-Enabled Balance Control of Human Walking Gait with Unexpected Foot Slip

Chunchu Zhu, Jingang Yi

#### Multi-Sensor and Deep Learning Based Ankle Joint Motion Intention Prediction under Diverse Gait Speed Conditions

Jumin Gong, Dunwen Wei, Tao Gao, Zekun Liu

#### Standing to Sitting Assistance - Control Strategy for an Assistive Robotic Chair Based on Human Motion Prediction

Elena Basei, Jun-Ichiro Furukawa, Takahide Ito, Qi An, Jun Morimoto

#### An Adaptive Gait Planner for a Lower-Limb Exoskeleton Ascending Staircases of Unknown Geometry

Marina Raineri, Corrado Guarino Lo Bianco

### Novel Planning and Control Approaches for

## **Semiconductor Manufacturing I**

Room T2 @ 10:00-11:00

Data-Driven Strategies for Optimizing Lot Priority Allocation to Reduce Cycle Times in Semiconductor Manufacturing

*Adrien Wartelle, Stephane Dauzere-Peres, Claude Yugma, Quentin Christ, Renaud Roussel*

Comparing Dispatching Rules for Minimizing the Total Weighted Tardiness in the Cleaning-Diffusion Manufacturing Stage

*Roberto Rosario Corsini, Antonio Costa, Giuseppe Oriti, Sergio Fichera, Daniele Vinciguerra, Marco Stefano Scroppo, Daniele Pagano*

## **Machine Learning for Optimization in Automation I**

Room T3 @ 10:00-11:00

A Survey of Reinforcement Learning for Optimization in Automation

*Ahmad Farooq, Kamran Iqbal*

Offline Contextual Learning with Correlated Bayesian Beliefs

*Fan Zhang, Siyang Gao, Jie Song*

MILP Models for Flexible Job Shop Scheduling with Spatial Constraints and Sequence Flexibility

*Yunjun Han, Shaoming Peng, Zhen Shen, Zhikun Tao, Gang Xiong*

Optimization of Embedded System with Edge Computing and Sleep Modes for Balance between Energy Consumption and Cache Occupancy

*Chen Hou*

## **Autonomous Systems for Agriculture and Horticulture I**

Room T4 @ 10:00-11:00

Safety Assurance of Autonomous Agricultural Robots: From Offline Model-Checking to Runtime Verification

*Mustafa Adam, Elias Hartmark, Tage Andersen, David A. Anisi, Ana Cavalcanti*

Robot-Assisted Fruit Harvesting: A real-world usability study

*Leonardo Guevara, Prabuddhi Wariyapperuma, Hariharan Arunachalam, Juan Vasconez, Marc Hanheide, Elizabeth I. Sklar*

DAVIS-Ag: A Synthetic Plant Dataset for Prototyping

Domain-Inspired Active Vision in Agricultural Robots

*Taeyoung Choi, Dario Guevara, Zifei Cheng, Grisha Bhandodkar, Chonghan Wang, Brian Bailey, J. Mason Earles, Xin Liu*

AGRIDS: An Advanced Multi-Modal Mapping Architecture for Robotics and Agriculture

*Jonathan Cox, Marc Hanheide, Riccardo Polvara*

## **AI enabled Discrete Event Dynamic Systems I**

Room T5 @ 10:00-11:00

Marking Diagnosability Enforcement of Labeled Petri Nets in the Presence of Sensor Attacks

*Zhenhua Yu, Yinyin Qi, Xuya Cong*

Activation Control of Multiple Piecewise Linear Neural Networks

*Chen Hou*

Self-Triggered Model Predictive Control for Signal Temporal Logic Tasks

*Junyue Huang, Chuwei Wang, Xinyi Yu, Xiang Yin*

## **Cyber-Physical Manufacturing for Small Batch Customization: Challenges, Enabling technologies, and Methodologies I**

Room T6 @ 10:00-11:00

Protocol Model and Execution Protocols for Networked MRO Intralogistics

*Qiqi Chen, Zhiheng Zhao, George Q. Huang*

Automated Printing Primitive Extraction and Learning for Complexity Reduction in Additive Manufacturing Operations

*Weizhi Lin, Yuanxiang Wang, Qiang Huang*

Multi-Model based Additive Manufacturing: A framework for automated large-scale 3D concrete printing with industrial robots

*Lukas Lachmayer, Annika Raatz, Tobias Recker*

Digital Twin-Based Synchronized Decision-Making and Control Method for Kitchen Waste Collection and Transportation System

*Ming Wan, Ting Qu, Manna Huang, Xiaoguang Sun, Mingxing Li, George Q. Huang*

## **Collaborative Robot-Enabled Advanced Manufacturing in the Context of Industry 5.0 I**

Room T7 @ 10:00-11:00

Design of Wire-Driven Modular Robot Hand to Han-

### dle Daily Objects

*Jeongdo Ahn, Joonho Lee, Jongwoo Park, Dongil Park, Chanhun Park*

### Enhancing Human-Robot Collaborative Assembly in Manufacturing Systems Using Large Language Models

*Jonghan Lim, Sujani Patel, Alexander Evans, John Pimley, Yifei Li, Ilya Kovalenko*

### A Control Architecture for Safe Trajectory Generation in Human-Robot Collaborative Settings

*Jozsef Palmieri, Paolo Di Lillo, Martina Lippi, Stefano Chiverini, Alessandro Marino*

### A Passivity-Based Variable Impedance Controller for Incremental Learning of Periodic Interactive Tasks

*Matteo Dalle Vedove, Edoardo Lamon, Daniele Fontanelli, Luigi Palopoli, Matteo Saveriano*

### Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing I

*Room T8 @ 10:00-11:00*

### Unlocking the Potential of Robot Manipulators: Seamless Integration Framework

*Mikel Bueno Viso, Irene Bernardino, Seemal Asif, Philip Webb*

### Solving an Integrated Order Batching, Picker Allocation and Batch Sequencing Problem Via Autoencoder-Embedded Iterated Local Search

*Xinsai Lv, Chengran Lin*

### A Visual Object Detection and Counting System for Intelligent Casting Foundry Automation

*Yu-Teng Hsu, Che-Wei Chou*

### Data-Mechanism-Driven Product Performance Optimization with Multiple Parameters under Uncertainties in Manufacturing Automation Systems

*Kaiyue Cui, Zhaoxi Hong, Xiuju Song, Mengchu Zhou, Zhiwu Li, Yixiong Feng, Jianrong Tan*

### Smart and Sustainable Manufacturing I

*Room T9 @ 10:00-11:00*

### A Systematic Literature Review on EV Battery Cell Stacking Process

*Sen Bai, Nicla Frigerio, Andrea Matta*

### Robot Learning from Demonstration Based on Human-In-The-Loop Reinforcement Learning

*Chen Li, Tian Yu, Qing Chang*

### Bottleneck Analysis of a Li-Ion Battery Cell Manufacturing System

*Heng Dong, Zhenghao Fan, Qing Wang, Wei Zhou, Yanbin Yu, Ling Fu, Jingshan Li*

### Production and Changeover Control of Textile and PET Recycling

*Elias El Achkar, Nicla Frigerio*

### Energy Communities: optimization and control for sustainability

*Room T1 @ 11:30-13:00*

### Energy Community Optimal Management: A Bilevel Approach

*Virginia Casella, Giulio Ferro, Luca Parodi, Michela Robba*

### Optimal Coordination of Photovoltaic/Thermal Collectors and Ground-Source Heat Pumps in Integrated Energy Systems

*Shuobin Wang, Zhanbo Xu, Xiyuan Jian, Kun Liu, Huibiao Yang, Hongqiang Li*

### Noncooperative Control of Energy Communities through Learning-Based Response Dynamics

*Saba Askari Noghani, Paolo Scarabaggio, Raffaele Carli, Mariagrazia Dotoli*

### Online Coordination of BESS and Thermostatically Control Loads for Shared Energy Optimization in Energy Communities

*Jerónimo José Moré, Diego Deplano, Alessandro Pilloni, Alessandro Pisano, Mauro Franceschelli*

### Distributed Optimization for Networks of Battery Energy Storage Systems in Energy Communities with Shared Energy Incentives

*Mohamed A.Elouamin Messilem, Diego Deplano, Mauro Franceschelli, Elio Usai, Ruggero Carli*

### Decision and Control Techniques for Autonomous Systems II

*Room T10 @ 11:30-13:00*

### Resilient Networks for Multi-Agent Systems Based on Graph Self-Organization into Random Approximate Regular Graphs

*Wenjie Zhao, Diego Deplano, Zhiwu Li, Alessandro Giua, Mauro Franceschelli*

### Sensor Fusion-Based Autonomous Flight Method for Drone Inspection of Power Facilities

*Munsu Jeon, Joonhyeok Moon, Jeong Siheon, Ki-Yong Oh*

### Embodied Runtime Monitoring of Learning-Enabled Robot Perception Components

*Deebul Sivarajan Nair, Sathwik Panchangam, Miguel A. Olivares-Mendez, Nico Hochgeschwender*

### Drone as a Service in Logistics: a Review of Optimization and Control Techniques

*Mojtaba Porghoveh, Raffaele Carli, Mariagrazia Dotoli*

### Adaptive Robust Controller for Handling Unknown Uncertainty of Robotic Manipulators

*Mohamed Mahmoud Abdelwahab Mohamed, Giulio Giacomuzzo, Alberto Dalla Libera, Ruggero Carli*

### An Automatic Sleep Staging Method Based on Spatio-Temporal JK-ViT Architecture

*Yu An, Yikun Feng, Zhihong Li, Xi Zhang*

## Digital Twin in Smart Construction II

Room T11 @ 11:30-13:00

### Digital-Twins-As-A-Service in Construction Engineering

*Philipp Zech, Claudio Nardin, Sashko Ristov, Matthias Flora, Ruth Breu*

### Deep Reinforcement Learning Enabled Model for Green Last-Mile Delivery in MiC Construction

*Wennan Zhang, Chenglin Yu, Ying Yu, Li Yin, Ray Y. Zhong*

### Digital Twin Enabled Construction Site Monitoring (CSM) Method with Edge-Cloud Collaboration

*Shuxuan Zhao, Kai Kang, Chuqiao Xu, Xinyue Guo, Ray Y. Zhong*

### Digital Twin Enabled Collision Early Warning for Smart Site Safety System (SSSS)

*Shuxuan Zhao, Chenglin Yu, Xinye Qu, Zhengxu Zhu, Junjie Lei, Ray Y. Zhong*

### Spatial-Temporal Traceability and Relativity of Cyber Physical Internet in Modular Integrated Construction Logistics

*Zhiheng Zhao, Didi Zhou, Hengzhi Liu, Mengdi Zhang, George Q. Huang*

### Segmenting and Classifying Repetitive Construction Process Time Series Using Small Amount of Labeled Data

*Mingxi Zhang, Birgit Vogel-Heuser, Dorothea Pantfoerder, Marius Krüger, Matthias Semel, Hans Regler, Alejandra Vicaria*

## Dynamics, Control, and Security in Multi-Agent

## Systems

Room T12 @ 11:30-13:00

### Dynamics and Control of Soft Robots with Implicit Strain Parametrization

*Federico Renda, Anup Teejo Mathew, Daniel Feliu*

### An Investigation of Denial of Service Attacks on Autonomous Driving Software and Hardware in Operation

*Tillmann Stübler, Andrea Amodei, Domenico Capriglione, Giuseppe Tomasso, Nicolas Bonnotte, Shawan Mohammed*

### A Preliminary Study about Multi-Robot Task Allocation with Energy Constraints

*Chaima Baccouche, Imen Iben Ammar, Dimitri Lefebvre, Achraf Jabeur Telmoudi*

### Online Conflict-Free Scheduling of Fleets of Autonomous Mobile Robots

*Francesco Popolizio, Martina Vinetti, Alvin Combrink, Sabino Francesco Roselli, Maria Pia Fanti, Martin Fabian*

### Study of a Condition Monitoring Method Based on the Concept of Complex Fuzzy Sets

*Wesley Rodrigues De Oliveira*

### A Multi-Robot System for the Study of Face-To-Face Interaction Dynamics

*Cinzia Tomaselli, Dario Calogero Guastella, Giovanni Muscato, Mattia Frasca, Lucia Valentina Gambuzza*

## Novel Planning and Control Approaches for Semiconductor Manufacturing II

Room T2 @ 11:30-13:00

### Tree-Based Dispatcher for Job Shop Scheduling

*Lee Je-Hun, Jimin Park, Hyun-Jung Kim*

### Discovering Priority Indices for an Energy-Aware Flexible Flow-Shop Batch Scheduling Problem

*Daniel Schorn, Lars Moench*

### Minimizing Total Weighted Completion Time in a Two-Stage Permutation Flowshop with Multiple Orders Per Job

*Rohan Korde, John Fowler, Lars Moench*

### Decentralized Resource Allocation for Product Rollover Execution in the Presence of Uncertainty

*Carlos Leca Carlos A Leca Perez, Karl Kempf Karl Kempf, Reha Uzsoy*

## Capacity Modeling of Parallel Unrelated Machine Sets for Production Planning

*Reha Uzsoy, Lars Moench*

## Machine Learning for Optimization in Automation II

Room T3 @ 11:30-13:00

### A Coordinated Energy Management Method for 5G Base Station Using Multi-Agent Deep Deterministic Policy Gradient

*Yuanjun Shen, Jiang Wu, Yaping Liu, Di Wang, Haoming Zhao, Zhanbo Xu, Yadong Zhou, Xiaohong Guan*

### On Efficient Sampling for Reinforcement Learning with Multiple Constraints

*Qing-Shan Jia, Qi Guo*

### Integrating End-To-End Prediction-With-Optimization for Distributed Hydrogen Energy System Scheduling

*Wangyi Guo, Zhanbo Xu, Zhequn Zhou, Jinhui Liu, Jiang Wu, Haoming Zhao, Xiaohong Guan*

### Large-Scale Data Center Cooling Control Via Sample-Efficient Reinforcement Learning

*Ni Mu, Xiao Hu, Qing-Shan Jia, Xu Zhu, Xiao He*

### Uniform Transformation: Refining Latent Representation in Variational Autoencoders

*Ye Shi, C. S. George Lee*

## Autonomous Systems for Agriculture and Horticulture II

Room T4 @ 11:30-13:00

### Hyperspectral Imaging and Machine Learning to Identify Epicuticular Wax Loss in Masena Blueberries for Post-Harvest Freshness

*Jonathan Pearse, Yaminn Thawdar, Alicia Sim, Melanie Po-Leen Ooi, Benjamin John Mcguinness, Peter Michael Reutemann, Dale Fletcher, Mike Duke*

### Quality Assessment of an Outdoor 3D Scanning System for Grapevines Using a Feature Consistency Metric

*Trevor Gee, Henry Williams, David Anthony James Smith, Bruce Macdonald*

### Remote Point Irrigation Monitoring System

*Silvia Arambula, Alan Alberto Gonzalez, Javier Arambula*

### Synthetic Data-Based Training of Instance Segmentation: A Robotic Bin-Picking Pipeline for Chicken

## Fillets

*Marissa Jonker, Wesley Roozing, Nicola Strisciuglio*

### Evaluation of a Low-Cost Selective Shaking Device and Soft Surface Catchment for Fresh Market Blueberry Harvesting

*Alicia Sim, Jonathan Pearse, Benjamin John Mcguinness, Henry Williams, Mike Duke*

## AI enabled Discrete Event Dynamic Systems II

Room T5 @ 11:30-13:00

### Synthesis of Free-Labeled Petri Nets with Inhibitor Arcs

*Wei Cheng, Lulai Zhu, Andrea Matta*

### Property-Based Transparency: A New Utility Definition

*Patricia Monica Campos Mayer Vicente, Felipe Gomes Cabral, Publio M. M. Lima, Marcos Vicente Moreira, Audine Subias, Yannick Pencolé*

### CoDRMA: Collaborative Depth Refinement Via Dual-Mask and Dual-Attention for Birds Eye View Collaborative 3D Object Detection

*Kang Yang, Yongcai Wang, Yunjun Han, Qing-Shan Jia*

### Economical and Reliable Energy Management for Networked Microgrids in a Multi-Agent Collaborative Manner

*Junkai Hu, Li Xia, Jianqiang Hu, Haoran Wu*

### Prioritize Team Actions: Multi-Agent Temporal Logic Task Planning with Ordering Constraints

*Bowen Ye, Jianing Zhao, Shaoyuan Li, Xiang Yin*

### State Entropy Optimization in Markov Decision Processes

*Shuai Ma, Li Xia, Qianchuan Zhao*

## Cyber-Physical Manufacturing for Small Batch Customization: Challenges, Enabling technologies, and Methodologies II

Room T6 @ 11:30-13:00

### A Carbon-Aware Routing Protocol for Optimizing Carbon Emissions in Modular Construction Logistics

*Chung-Lam Ng, Hang Wu, Ming Li, Ray Y. Zhong, Xinye Qu, George Q. Huang*

### Cyber-Physical Internet Driven Delivery for Small-Batch Production

*Xinye Qu, Shuxuan Zhao, George Q. Huang, Ming Li, Chung-Lam Ng*

Cutting Tool Surface Defect Detection Based on Chaos Difference Method in Manufacturing Process  
*Ziqing Wu, Weilong Niu, Xiaoguang Sun, Li Chen*

Cyber Physical Systems-Based Control Structure and Decision-Making Method for Processing-Distribution System  
*Yanghua Pan Pan, Zhi Tang, Ting Qu, Ray Y. Zhong, George Q. Huang*

A Privacy-Preserving Trajectory Data Publishing Approach for Protocol Transport Unit Tracking and Tracing in Cyber-Physical Internet  
*Yuhui Su, Ming Li, George Q. Huang*

Methods for Situation Awareness and Knowledge Modeling of Social Manufacturing Resources  
*Xiaoguang Sun, Wenfeng Luo, Weilong Niu, Ming Wan, Wanshan Li, Ting Qu*

**Collaborative Robot-Enabled Advanced Manufacturing in the Context of Industry 5.0 II**  
*Room T7 @ 11:30-13:00*

Plan It Safe: A Risk-Driven Motion Planning Framework for Collaborative Robots  
*Elena Stracca, Alessandro Palleschi, Lucia Pallottino, Paolo Salaris*

Human-Robot Adaptive Collaboration through Eye-Tracking  
*Matteo Manzardo, Davide Ciaghi, Luca Gualtieri, Sofia Morandini, Federico Fraboni, Luca Pietrantoni, Renato Vidoni*

A Multifaceted User Study for the Teaching-Learning-Prediction-Collaboration Framework in Human-Robot Collaborative Tasks  
*Omar Obidat, Garrett Modery, Weitian Wang, Xiwang Guo, Mengchu Zhou*

Characterization of Human Trust in Robot through Multimodal Physical and Physiological Biometrics in Human-Robot Partnerships  
*Jesse Parron, Rui Li, Weitian Wang, Mengchu Zhou*

Human-Robot Interactive Disassembly Planning under Uncertain Quality of EOL Products  
*Gao Yicong, Chen Xu, Xiaolei Ye, Shanhe Lou, Jianrong Tan*

Hybrid Disassembly Line Balancing for Human-Robot Collaborative Remanufacturing  
*Feng Guo, Xiwang Guo, Mengchu Zhou, Weitian Wang, Shujin Qin, Qi Kang*

**Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing II**  
*Room T8 @ 11:30-13:00*

A Q-Learning-Based Meta-Heuristic Algorithm for Open Shop Scheduling Considering Group and Transportation Activities  
*Yifeng Wang, Mengyao Ji, Yaping Fu, Hongfeng Wang, Kaizhou Gao*

Multi-Agent Scheduler for the Continuous Dynamic Flexible Job Shop Scheduling Problem  
*Dazzle Johnson, Gang Chen, Yuqian Lu*

Block Relocation Problem with Deep Reinforcement Learning  
*Ji-Kwang Jung, Sang-Hyun Cho, Woo-Jin Shin, Hyun-Jung Kim*

Analysis and Control of Time Delays in a Cluster Tool for a Cyclic Schedule  
*Min-Chan Kim, Hyun-Jung Kim*

Noncyclic Scheduling of Single-Armed Cluster Tools with Multiple Wafer Types and Wafer Residency Time Constraints Using Deep Reinforcement Learning  
*Duyeon Kim, Min-Chan Kim, Hyun-Jung Kim*

Analysis of Backward Sequence in Lot Switching Periods for Single-Armed Cluster Tools  
*Jeongsun Ahn, Hyun-Jung Kim*

**Smart and Sustainable Manufacturing II**  
*Room T9 @ 11:30-13:00*

Production Planning and Allocation of Re-Entrance Flows with Stochastic Quality  
*Xiaoxiao Shen, Nicla Frigerio, Shichang Du, Andrea Matta*

Efficient Job Shop Scheduling Via Graph Based Deep Reinforcement Learning with Adaptive Multi-Action Selection  
*Jeongwon Park, Yutong Su, Feng Ju*

Mechanical Design Parameter Optimization through Graph-Based Bayesian Optimization and Pseudo Labeling  
*Guoyan Li, Xiaoning Jin*

Modeling and Analysis for Inherent Energy Efficiency of Two-Machine Bernoulli Serial Lines  
*Xu Longyao, Peiji Liu, Xu Wang, Fangyuan Yu, Chao Liu*



## Data-Driven Ergonomic Risk Assessment of Complex Hand-Intensive Manufacturing Processes

Anand Krishnan, Xingjian Yang, Utsav Seth, Jonathan M. Jeyachandran, Jonathan Y. Ahn, Richard J. Gardner, Samuel Pedigo, Agnes Blom-Schieber, Ashis Banerjee, Krithika Manohar

## A Sample Path-based Method for the Digital Twin Prediction Update Synchronization Problem of Unreliable Production Lines

Yi-Xing Gou, Andrea Matta, Barış Tan

## Planning, Scheduling and Coordination

Virtual T1 @ 11:30-13:00

## Long Short Term Memory Autoencoder-Aided Evolutionary Algorithm to Solve an Energy-Minimized Task Scheduling Problem

Zhiwen Miao, Chengran Lin

## Low-Carbon Disassembly Sequence Planning with Improved Moth-Flame Optimizer by Considering Non-Homogeneous Information in Industry 5.0

Yixiong Feng, Kaiyue Cui, Zhaoxi Hong, Weiyu Yan, Xiuju Song, Jianrong Tan

## A Computationally Efficient Approach to Account for Stochastic Delays in Multi-Robot Task Allocation in a Proactive Manner

Shengqiang Chen, Quan Nguyen, Satyandra K. Gupta

## Preference Elicitation and Incorporation for Human-Robot Task Scheduling

Neel Dhanaraj, Minseok Jeon, Jeon Ho Kang, Stefanos Nikolaidis, Satyandra K. Gupta

## A Large-Scale Charging Approach for Electric Vehicles Considering Multi-Station Collaboration and Task Optimization

Richard Mao, Ziru Su, Defu Li, Zexu Zhao

## Innovative Manufacturing and Automation

Virtual T2 @ 11:30-13:00

## Contact Force Guidance Assembly towards Unknown-Shaped Dual Peg-In-Hole

Ninglong Jin, Wei Du, Jianhua Wu, Zhenhua Xiong

## Estimation of External Force Acting on Underwater Robots

Srinivasan Lakshminarayanan, Daniel Andre Duecker, Andriy Sarabakha, Amartya Ganguly, Leila Takayama, Sami Haddadin

## Automated Plan Refinement for Improving Efficiency

## of Robotic Layup of Composite Sheets

Rutvik Rakeshbhai Patel, Alec Kanyuck, Zachary McNulty, Zeren Yu, Lisa Carlson, Vann Heng, Brice Johnson, Satyandra K. Gupta

## Co-Evolution DTs: Achieving Value-Added Cognitive Digital Twins across the Entire Lifecycle

Xiaodong Tong, Jinsong Bao, Liu Tianyuan

## Measuring Object Rotation Via Visuo-Tactile Segmentation of Grasping Region

Julio Castaño-Amorós, Pablo Gil

## Mining User Requirement Scenarios and Generating Design Solutions for Rehabilitation Aids Based on Large Language Models

Xinyu Pan, Jie Gong, Sijie Wen, Weibin Zhuang, Xinyu Li

## Intelligent operation, maintenance, and scheduling in complex systems

Room T1 @ 14:00-15:30

## Improved discrete JAYA algorithms for hot rolling scheduling considering equipment performance degradation

Peitang Zhong, Kun Zou, Ziyang Zhao, Shixin Liu

## Topology Mapping and Connectivity Detection for Autonomous Mobile Robot Systems

Jingfu Hou, Ziyang Zhao, Shixin Liu, Dawei Yang

## A Distributed Online Heuristic for a Large-Scale Workforce Task Assignment and Multi-Vehicle Routing Problem

Diego Deplano, Carla Seatzu, Mauro Franceschelli

## Multi-Modal Double Row Layout Problem

Xingquan Zuo

## Solving the Food-Energy-Water Nexus Problem Via Intelligent Optimization Algorithms

Qi Deng, Zheng Fan, Zhi Li, Xinna Pan, Qi Kang, Mengchu Zhou

## Optimization of Scheduling for Parallel Die-Casting Production Systems

Zhenghao Fan, Kwok On Siu

## Navigation, Manipulation, and Task Planning

Room T10 @ 14:00-15:30

## Convergent Navigation of Mobile Manipulator by Tri-linear Interpolated Artificial Potential Function

Gregor Klančar, Jakob Baumgartner

A Comparative Analysis of Different Semi-Rigid Formation Geometries Regarding Multi-Robot Cooperative Object Transport for Large-Scale Objects  
*Tobias Recker, Henrik Lurz, Lukas Lachmayer, Annika Raatz*

Task Planning for Robot Manipulator Using Natural Language Task Input with Large Language Models  
*Tomoya Kawabe, Tatsushi Nishi, Ziang Liu, Tomofumi Fujiwara*

Scenario Convex Programs for Dexterous Manipulation under Modeling Uncertainties  
*Berk Altiner, Adnane Saoud, Alex Caldas, Maria Makarov*

On-Manifold Strategies for Reactive Dynamical System Modulation with Non-Convex Obstacles  
*Christopher K Fourie, Nadia Figueroa, Julie A. Shah*

Autonomous Visual Navigation for Quadruped Robot in Farm Operation  
*Yiyu Chen, Zishen Wei, Stavros Vougioukas, Satyandra K. Gupta, Quan Nguyen*

### **Digital Twin in Intelligent Manufacturing** Room T11 @ 14:00-15:30

Automatic Fuzzing of Asset Administration Shells As Digital Twins for Industrie 4.0  
*Nico Braunisch, Marko Ristin, Björn Otto, Phillip Schanely, Hans Wernher Van De Venn, Wollschlaeger Martin, Tobias Kleinert*

Combining Digital Twins and Mixed Reality – How Can the Process Industry Benefit?  
*Dorothea Pantfoerder, Joseph Alterbaum, Linda Rudolph, Fabrizio Palmas, Birgit Vogel-Heuser*

A Match Made in Semantics: Physics-Infused Digital Twins for Smart Building Automation  
*Ganesh Ramanathan, Simon Mayer*

Edge Computing Empowered Digital Twin: An End-To-End Computing Task Scheduling Approach  
*Ruirui Zhong, Yixiong Feng, Xiuju Song, Bingtao Hu, Yong Wang, Puyan Li, Jianrong Tan*

### **Innovative Visual and Gesture-Based Control Techniques** Room T12 @ 14:00-15:30

Intuitive Gesture-Based Control System for AR Drone  
*Chia-Hsuan Lee, Cheng-Yu Tsai, Yan-Jie Wang, Yen-Lun Chen*

Keypoint Detection Technique for Image-Based Visual Servoing of Manipulators  
*Niloufar Amiri, Guanghui Wang, Farrokh Janabi-Sharifi*

Endoscopic Stereo Vision for Robotic 3D Detection of Thin Wire Features  
*Tanzeel Ahmad Fazal, Gianluca Laudante, Michele Mirto, Olga Pennacchio, Salvatore Pirozzi*

Region of Interest Loss for Anonymizing Learned Image Compression  
*Christoph Liebender, Ranulfo Bezerra, Kazunori Ohno, Satoshi Tadokoro*

Learning Embeddings with Centroid Triplet Loss for Object Identification in Robotic Grasping  
*Anas Gouda, Max Schwarz, Christopher Reining, Sven Behnke, Alice Kirchheim*

Effect of Sparse Training Images on Classification Accuracy of Segmentation for Visual Navigation  
*Marin Wada, Yuriko Ueda, Miho Adachi, Ryusuke Miyamoto*

### **Diagnosis and Fault Detection** Room T2 @ 14:00-15:30

Synthetic Data Generation with Reinforcement Learning for Fault Diagnosis of Rolling Bearings  
*Tenta Komatsu, Kyaw Myo Htun, Zhiqi Liu, Muhammad Usman, Faye Juliano*

Open-Set Fault Diagnosis Based on Prototype Learning with Dual Category-Classifiers  
*Shenqiang Ke, Liang Gao, Xinyu Li, Yiping Gao*

An Early Fault Detection Framework for Wind Turbines Using Vibration Signals  
*José Luis Conradi Hoffmann, Mateus Martínez De Lucena, Gustavo Medeiros De Araujo, Antônio Augusto Fröhlich*

Condition Monitoring with Incomplete Data: An Integrated Variational Autoencoder and Distance Metric Framework  
*Maryam Ahang, Mostafa Abbasi, Todd Charter, Homayoun Najjaran*

Benchmarking Sensor Modalities with Few-Shot Domain Adaptation for Cross-Domain Fault Diagnosis  
*Muhammad Usman, Tenta Komatsu, Kyaw Myo Htun, Zhiqi Liu, Aryel Beck*

Data-Driven Approach for Satellite SADA System Health Monitoring with Limited Data  
*Xinting Zhu, Lishuai Li, Yanfang Mo, Yining Dong, Xuejin Shen, Xiaoyu Chen, S. Joe Qin*

### **Machine Learning for Optimization in Automation III**

Room T3 @ 14:00-15:30

A Multi-Layer Weather Classification-Based Regression Model for PV Power Prediction

*Zeina Bahij, Bing Yan*

A Tightened Formulation for Job Shop Scheduling with Mobile Robots

*Najmus Sahar, Anthony Basile, Bing Yan*

Accurately Predicting Probabilities of Safety-Critical Rare Events for Intelligent Systems

*Ruoxuan Bai, Jingxuan Yang, Weiduo Gong, Yi Zhang, Qijiang Lu, Shuo Feng*

Non-Invasive Spatial Registration Using Customized Dental Bracket and Improved Genetic Algorithms

*Angen Ye, Yujia Song, Jiangfeng Su, Dapeng Zhang*

Deep Reinforcement Learning-Based Symbolic Regression for PDE Discovery Using Spatio-Temporal Rewards

*Xizhe Wang, Hongbo Zhao, Qianchuan Zhao, Benben Jiang*

Double Deep Q-Learning Based on Personalized Thermal Comfort Model for HVAC Optimization

*Hanchen Zhou, Di Wang, Zhanbo Xu, Qing-Shan Jia*

### **Autonomous Systems for Agriculture and Horticulture III**

Room T4 @ 14:00-15:30

Non-Destructive Biomass Estimation Based on 3D Reconstruction from a Handheld Camera

*Jaspreet Singh, Grzegorz Cielniak*

How about Them Apples: 3D Pose and Cluster Estimation of Apple Fruitlets in a Commercial Orchard

*Ans Qureshi, David Anthony James Smith, Trevor Gee, Ho Seok Ahn, Benjamin John Mcguinness, Catherine Downes, Rahul Jangali, Kale Black, Shen Hin Lim, Mike Duke, Bruce Macdonald, Henry Williams*

Mass Estimation of Soft Fruit Via Oscillatory Plant Dynamics

*Nikolaus Wagner, Grzegorz Cielniak*

Multi-Objective Dispatching for Shared Harvesters

*Yi-Jia Wang*

The Barracuda: A Novel Cutting Mechanism for Pruning Canes Wrapped Around Wires

*Henry Williams, Scott Harvey, Benjamin John Mcguinness, David Anthony James Smith, Shen Hin Lim, Mike Duke*

Lightweight and Efficient Attention-Based CNN Models for In-Field Strawberry Instance Segmentation

*Ziang Zhao, Yulia Hicks, Xianfang Sun, Benjamin John Mcguinness, Shen Hin Lim*

### **Automated Sample Processing**

Room T5 @ 14:00-15:30

Automated Sample Transportation and Handling for Determination of Trace Metals in Cell Growth Media Using ICP-MS

*Heidi Fleischer, Mohamed Ali Tlili, Thomas Roddelkopf, Kerstin Thurow*

Vaulting Detection with the Multi-Model Unscented Kalman Filter

*Jesse Peter Macht, Joshua Taylor, Fae Azhari*

Robot Based Automated Sample Processing

*Mohamed Ali Tlili, Kerstin Thurow, Thomas Roddelkopf*

Flexible Automation System for Parameter Screening and Small Scale Protein Purification Applied to Colostrum Samples

*Anna Bach, Julia Palent, Tim Zastrow, Christa Kupke, Thomas Roddelkopf, Mohamed Ali Tlili, Heidi Fleischer, Kerstin Thurow*

Automatic Label-Free Classification of Viable Cell On-A-Chip

*Emanuela Cutuli, Giovanna Stella, Josephine Migliore, Giulia Valenti, Francesca Guarino, Dario Sanalidro, Maide Bucolo*

### **Cyber-Physical Manufacturing for Small Batch Customization: Challenges, Enabling technologies, and Methodologies III**

Room T6 @ 14:00-15:30

Out-Of-Order Architecture for Real-Time Data-Driven Resilient Planning and Scheduling of Cyber-Physical Manufacturing Systems

*Mingxing Li, Ting Qu, Mian Yan, Ming Li, Zhen He, George Q. Huang*

Limited Data-Driven Router Bandwidth Configuration for Cyber Physical Internet

*Yi You, Ming Li*

IoT-Based MRO Intralogistics Labor Productivity Monitoring and Measurement System: A Case Study

in Hong Kong

*Fan Yang, Ming Li, Mingxing Li*

Solving Size-Agnostic Job Shop Scheduling Problems Like GPT Speaks

*Zhaolin Yuan, Jiyuchen Ding, Ming Li, George Q. Huang, Zhiheng Zhao*

Optimization of Dynamic Scheduling in Additive Manufacturing with Deep Reinforcement Learning

*Mingyue Sun, Jiyuchen Ding, Jian Chen, Zhiheng Zhao, George Q. Huang*

## **Collaborative Robots and Motion Control**

Room T7 @ 14:00-15:30

Enhancing Robot Collaboration by Improving Human Motion Prediction Through Fine-Tuning

*Marco Casarin, Michael Vanuzzo, Mattia Guidolin, Monica Reggiani, Stefano Michieletto*

Obstacle Avoidance for a Robotic Manipulator with Linear-Quadratic Model Predictive Control

*Gonzalo Jesus Meza Perez, Kristoffer Fink Løwenstein, Lorenzo Fagiano*

GraspTrack: Object and Grasp Pose Tracking for Arbitrary Objects

*Benedict Stephan, Söhnke Benedikt Fishedick, Daniel Seichter, Dustin Aganian, Horst-Michael Gross*

Adaptive Toolpath Generation for Wire Geometric Elements in Cyber-Physical System for Cobotic Finishing

*Ramy Meziane, Julien-Mathieu Audet, Amir Hajzargarbashi*

A MPC-Based Approach for Motion Planning on Redundant Manipulators in Human Robot Collaboration

*Chen Cai, Michael Schröder, Steven Liu*

Estimation of Human Compliance Parameters During Robot Kinesthetic Teaching by Compensation of the Dynamics of the Force-Torque Sensor

*Emil Lykke Diget, Iñigo Iturrate, Christoffer Sloth*

## **Advancements in Modeling, Scheduling, and Control for Autonomous Manufacturing III**

Room T8 @ 14:00-15:30

Robust Liveness Controllers for Time Petri Nets with Unreliable Resources

*Xiaobin Zhang, Yonglai Wang, Biaohua Xu, Gaiyun Liu*

Optimization of Machine Leasing Operation Strategy for Welfare Enterprises

*Chunfeng Liu, Qiqi Shi, Jufeng Wang*

A Fast and Efficient Collision Checking Method for Redundant Robotic Arms

*Fabio Mastromarino, Paolo Scarabaggio, Raffaele Carli, Mariagrazia Dotoli*

Variable Neighborhood Search with Reinforcement Learning for Parallel Machine Batching Scheduling

*Jimin Park, Sang-Wook Lee, Sohyun Jeong, Hyun-Jung Kim, Jeonil Li, Sang-In Mun*

Cyclic Scheduling of Single-Arm Cluster Tools with Equipment Front-End Module and One-In-One-Out Loadlocks

*Baoying Huang, Naiqi Wu, Yan Qiao, Siwei Zhang*

Disturbance Rejection-Guarded Learning for Vibration Suppression of Two-Inertia Systems

*Fan Zhang, Jinfeng Chen, Yu Hu, Zhiqiang Gao, Ge Lv, Qin Lin*

## **Smart and Sustainable Manufacturing III**

Room T9 @ 14:00-15:30

Construction of a Semi-Automated Machine for Roasting Coffee Beans

*Leonardo Gabriel Rocha Armas, Luis Fernando Subieta Lara*

Numerical Comparison of the Polarization Curve Contributions and Simulation of Proton Exchange Membrane Fuel Cells

*Giovanni Azzone, Milad Alizadehtir, Davide Tebaldi, Roberto Zanasi*

I4.2-GiM: A Novel Green Intelligent Manufacturing Framework for Net Zero

*Hao Tieng, Ting-Chia Ou, Tsung-Han Tsai, Yu-Yong Li, Min-Hsiung Hung, Fan-Tien Cheng*

Energy Consumption Optimization for Two-Machine Bernoulli Serial Lines Producing Perishable Products

*Sheng Zhang, Lingchen Liu, Chao-Bo Yan*

Carbon Emissions Prediction Method for Gear Hobbing Based on Federated Learning with Multi-Source Data Cooperative

*Yan Xu, Qian Yi, Kai Yi, Congbo Li, Shuping Yi*

Performance Evaluation of Two-Machine Bernoulli Lines with Conveyor Buffers

*Yishu Bai, Tianyu Zhu, Liang Zhang*

## Factory Automation

Virtual T1 @ 14:00-15:30

Evaluating the Robustness of an Edge-Cloud Controller to Network Delay through the Quadratic Boundedness Framework

*Marco Giani, Raffaele Romagnoli*

A Laser-Based Volumetric Measurement Approach for Industrial Settings

*Jérôme Rutinowski, Niklas Schrötler, Simon Klüttermann, Moritz Roidl, Christian Janiesch*

Automated Vision-Based Bolt Sorting by Manipulator for Industrial Applications

*Surya Prakash S.K, Amit Shukla, Naisarg Pandya, Shirish Shekhar Jha*

Dynamic Grasping with a Learned Meta-Controller

*Yinsen Jia, Jingxi Xu, Dinesh Jayaraman, Shuran Song*

Optimization of Storage Allocation for a Robotic Mobile Fulfillment System Considering Multiple Workstations

*Zhenqi Xu, Zhenhao Ding, Wei Weng, Meimei Zheng*

How Stable Is a Pallet? A Framework for Analyzing the Dynamic Stability of Stacked Pallets

*Dibyendu Roy, Pranjal Vyas, Jim Cherian*

## Automation for Industrial Applications

Virtual T2 @ 14:00-15:30

MNSSA: Meso-Level Network Security Situation Awareness for ICS Via Graph Evolution Analysis

*Shilong Zhang, Hui Zhang, Guo Chen, He Luo, Meiqi Wu, Hongxiang Chen, Zehua Ren, Zijun Wang, Yang Liu*

Rural Distribution Network Fault Restoration Strategy Considering Rice Yield Loss Due to Flooding

*Yujin Ding, Lu Zhang, Wei Tang*

Energy Efficiency Evaluation of Five-axis Machine Tools with Different Configurations based on Workspace Stiffness and Machining Energy Consumption

*Xiaojian Liu, Hanqi Yang, Langning Xing, Wang Yang, Qiu Lemiao, Shuyou Zhang*

Large-Scale Path Planning and Time Window Allocation in UAV-Assisted Wireless Sensor Networks with Variational Multi-Dimensional Optimization

*Boyuan Zhang, Rui Lai, Guanghong Gong, Haitao Yuan, Jinhong Yang, Jia Zhang, Mengchu Zhou*

Design and Analysis of Hybrid Robots for Powerline Inspection

*Zhishuo Li, Yunong Tian, Guodong Yang, Yanfeng Zhang, En Li, Zize Liang*

## Motion and Path Planning

Room T1 @ 16:00-17:30

Exposure Conscious Path Planning for Equal Exposure Corridors

*Eugene Hamzezadeh, John G. Rogers Iii, Neil Dantam, Andrew J. Petruska*

Welding Sequence and Robot Path Optimization for Spot Welding Robots to Prevent Deformation of Sheet Metal Parts

*Hiroki Takeda, Kaoru Kitajima, Daiki Kajita, Takahiro Nakano*

Effective Searching for the Honeybee Queen in a Living Colony

*Jan Blaha, Jan Mikula, Tomas Vitr, Jiří Janota, Í, Jiri Ulrich, Tomáš Rouček, Fatemeh Rekabi Bana, Laurenz Alexander Fedotoff, Martin Stefanec, Thomas Schmickl, Farshad Arvin, Miroslav Kulich, Tomas Krajník*

On Improving the Settling Time for Highly-Accurate Pick-And-Place Processes with Experimental Validation

*Thomas Auer, Frank Woittennek*

Learning from Local Experience: Informed Sampling Distributions for Efficient Motion Planning

*Keita Kobashi, Changhao Wang, Yu Zhao, Hsien-Chung Lin, Masayoshi Tomizuka*

A Dynamic Programming Framework for Optimal Planning of Redundant Robots Along Prescribed Paths with Kineto-Dynamic Constraints

*Enrico Ferrentino, Heitor J Savino, Antonio Franchi, Pasquale Chiacchio*

## Control and Safety Mechanisms for Construction

Room T10 @ 16:00-17:30

A Position Controller for Hydraulic Excavators with Deadtime and Regenerative Pipelines

*Yuki Yamamoto, Jinjun Qiu, Takayuki Doi, Takao Nanjo, Koji Yamashita, Ryo Kikuuwe*

Actuator Placement for Damping of Wind-Induced Oscillations of Adaptive High-Rise Buildings

*Amelie Zeller, Michael Böhm, Oliver Sawodny*

Safe Operation for Autonomous Wheel Loader Using Control Barrier Functions under Unknown Disturbances and Input Delay

*Chengyandan Shen, Christoffer Sloth*

Concept of a Highly Automated Tower Crane

*Alexander Schock-Schmidtke, Tim Bernhard, Johannes Fottner*

A Fault-Tolerant Collision Avoidance Architecture for Autonomous Excavators Using Digital Twin-Based Predictive and Real-Time Detection

*Mineto Satoh, Tatsuya Yoshimoto*

DUFOMap: Efficient Dynamic Awareness Mapping

*Daniel Duberg, Qingwen Zhang, Mingkai Jia, Patric Jensfelt*

## **Logistics and Intelligent Transportation**

Room T11 @ 16:00-17:30

Enhancing Robotics Online 3D Bin Packing: A Comparative Study of Conventional Heuristic and Deep Reinforcement Learning Approaches

*Heng Xiong, Kai Ding, Wan Ding, Xuchong Qiu, Klaus Janschek, Jianfeng Xu*

LogisticsBenchmark: A Tool for Benchmarking AGV Roadmaps

*Tena Žužek, Alessandro Bonetti, Martina Benko Loknar, Lorenzo Sabbatini, Rok Vrabič*

Enhancing Autonomous Robot Safety through Localization Performance Analysis

*Ulas Sureyya Bingöl, Mustafa Mert Ankarali, Akif Hacineci-poglu*

MCTS Based Dispatch of Autonomous Vehicles under Operational Constraints for Continuous Transportation

*Milan Tomy, Konstantin M Seiler, Andrew John Hill*

A Traffic Model Integrating Long Short-Term Memory Networks with Multi-Class Macroscopic Equations

*Kleona Binjaku, Cecilia Caterina Pasquale, Simona Sacone, Elinda Kajo Mece*

Distributionally Robust Facility Location and Transportation Problem with Drones under Disruption and Demand Uncertainty

*Chenxu Lou, Hanghang Zhu, Yong Chen, Zhi Pei*

## **Defect Detection and Anomaly Detection in Deformable and Online Adaptive Products**

Room T12 @ 16:00-17:30

Explainable Online Unsupervised Anomaly Detection for Cyber-Physical Systems Via Causal Discovery from Time Series

*Daniele Meli*

Online-Adaptive Anomaly Detection for Defect Identification in Aircraft Assembly

*Siddhant Shete, Dennis Mronga, Ankita Jadhav, Frank Kirchner*

Supervised Domain Adaptation for Surface Defect Detection Leveraging Partial Data Availability

*Immanuel Heider, Jan Baumgärtner, Patrick Bartz, Alexander Puchta, Jürgen Fleischer*

DoG-PaDiM: Anomaly Detection Based on Bandpass Filtering for Arbitrary Size Defect Extraction

*Naoto Hiramatsu, Naoki Murakami, Hiroki Kobayashi, Shuichi Akizuki, Manabu Hashimoto*

Automating Deformable Gasket Assembly

*Simeon Oluwafunmilore Adebola, Tara Sadjadpour, Karim El-Refai, William Panitch, Zehan Ma, Roy Lin, Tianshuang Qiu, Shreya Ganti, Charlotte Le, Jaimyn Drake, Ken Goldberg*

## **Deep Learning Applications and Innovations in Robotics and Automation**

Room T2 @ 16:00-17:30

PIPE: Process Informed Parameter Estimation, a learning based approach to task generalized system identification

*Constantin Schempp, Christian Friedrich*

Semi-Supervised Novelty Detection for Precise Ultra-Wideband Error Signal Prediction

*Umberto Albertin, Alessandro Navone, Mauro Martini, Marcello Chiaberge*

Attacking Automation Systems Via the PLC Backplane Bus

*Song Son Ha, Florian Förster, Henry Beuster, Thomas Doebbert, Dominik Merli, Gerd Scholl*

A Domain-Specific Language Framework for Specification and Generalization of Robot Motion

*Anahide Silahli, Aljaz Kramberger, Thiago Rocha Silva*

Distributed Learning for Autonomous Vehicles in Communication-Constrained Environments

*Nicole Cruz, Jose Fuentes, Leonardo Bobadilla*

Attention Meets UAVs: A Comprehensive Evaluation of DDoS Detection in Low-Cost UAVs

Ashish Sharma, Svsn Surya Suhas Vaddhiparthy, Sai Usha Goparaju, Deepak Gangadharan, Harikumar Kandath

## Advanced Control and Modeling Techniques for Robotic Systems

Room T3 @ 16:00-17:30

Frontal Target Approaching and Height Control of Micro Air Vehicles Using Multi-Perspective Optical Flow Observables

Hann Woei Ho, Ye Zhou

Adaptive Stiffness Control of Series Elastic Actuator Manipulators Based on Dynamic System

Kunlin Guo, Chao Zeng, Weiyong Si, Ning Wang, Chenguang Yang

Hybrid PI-Neural Network Control for Fluid-Driven Origami-Inspired Artificial Muscle

Nonthaphat Prakongpak, Teeranoot Chanthasopeephan

3D Feedback Motion Planning of Unmanned Underwater Vehicles Using Sparsity Enhanced Random Sequential Composition

Emre Ege, Eminalp Koyuncu, Mustafa Mert Ankarali

Open-Source CFD Simulation of Magnetic Rotating Swimmers with Experimental Validation

Yitong Lu, Jocelyn Ramos, Deeksha Sarda, Dipan J. Shah, Aaron Becker, Leclerc Julien

Modeling of a Six-Bar Tensegrity Robot Using the Port-Hamiltonian Framework and Experimental Validation

Songyuan Liu, Qingkai Yang, Jingshuo Lv, Hao Fang

## Human-Robot Collaboration

Room T4 @ 16:00-17:30

Towards Safe Human-Machine Collaboration: Intuitive Configuration and Management of Safety Zones in Augmented Reality Environments

Mohammad-Ehsan Matour, Christian Thormann, Alexander Winkler

User-Centered Human-Robot Coworking: A Novel Approach Transforming Manual Tasks

Christian Bergner, Ronald Schmidt-Vollus, Klaus Bengler

Optimal Robot Motion Planning for Human-Robot Collaboration Considering Power and Force Limiting

Florian Stuhlenmiller, Arne Wahrburg, Debora Clever, Nima Enayati, Federico Benzi

Siamese Network for Assembly Step Recognition and Quality Assessment for Human-Robot Collaboration

Martina Pelosi, Letizia Repizzi, Andrea Maria Zanchettin, Paolo Rocco

The Role of Automation and User Experience in Multi Robot Systems

Kouta Suzuki, Miaohui Shi, Vitvasin Vimolmongkolporn, Yukiko Iwasaki, Iwata Hiroyasu

## Design and Control of Quadrotor UAVs

Room T5 @ 16:00-17:30

Design and Experimental Results of a Robust Attitude Controller for a UAV Quadrotor

Ahmed Allam, Elhaouari Kobzili, Fethi Demim

Multi-Model Predictive Attitude Control of Quadrotors

Mohammadreza Izadi, Zeinab Shayan, Reza Faieghi

DeepCovPG: Deep-Learning-Based Dynamic Covariance Prediction in Pose Graphs for Ultra-Wideband-Aided UAV Positioning

Zahra Arjmandi, Jungwon Kang, Gunho Sohn, Costas Armenakis, Mozhdeh Shahbazi

Autonomous Quadrotor Landing on Inclined Surfaces Using an Actuated Skids System Guided by a Multi-Zone ToF Sensor

Massimiliano Bertoni, Riccardo Antonello, Angelo Cenedese, Giulia Michieletto

Cooperative Indoor Exploration Leveraging a Mixed-Size UAV Team with Heterogeneous Sensors

Michaela Cihlarova, Vaclav Pritzl, Martin Saska

## Machine Learning in Robotics and Automation

Room T6 @ 16:00-17:30

Industrial Internet of Things (IIoT)-Enabled Decentralized Computation Offloading in Smart Factory

Xinyue Guo, Shuxuan Zhao, Zhengxu Zhu, Ray Y. Zhong

Directionality-Aware Mixture Model Parallel Sampling for Efficient Linear Parameter Varying Dynamical System Learning

Sunan Sun, Haihui Gao, Tianyu Li, Nadia Figueroa

Visual Imitation Learning of Non-Prehensile Manipulation Tasks with Dynamics-Supervised Models

Abdullah Mustafa, Ryo Hanai, Ixchel Georgina Ramirez-Alpizar, Floris Marc Arden Erich, Ryoichi Nakajo, Yukiyasu Domae, Tetsuya Ogata

**Enhanced Intrusion Detection in Robot Operating Systems Via Grid Search Based Multi-Head Attention Stacked Convolutional Network**

*Muhammad Hamza Zafar, Even Falkenberg Langås, Muhammad Faisal Aftab, Filippo Sanfilippo*

**W-RIZZ: A Weakly-Supervised Framework for Relative Traversability Estimation in Mobile Robotics**

*Andre Schreiber, Arun Narenthiran Sivakumar, Peter Du, Mateus Valverde Gasparino, Girish Chowdhary, Katherine Driggs-Campbell*

**Robotic Control and Motion Planning**

Room T7 @ 16:00-17:30

**Terrain Compensation for Off-Road Vehicles Using Inertial Measurements in a Multi-Body System**

*Kai Döring, Ruben Hefele, Michael Maier, Timo Oksanen*

**Design, Control, and Motion-Planning for a Root-Perching Rotor-Distributed Manipulator**

*Takuzumi Nishio, Moju Zhao, Kei Okada, Masayuki Inaba*

**A New Trajectory Planning Approach with Motion Duration Control for Kinematic Constrained Systems**

*Lucas De Andrade Both, Felix Lange*

**Disassembly of Rectangle Peg-Hole Structures through Compliance Strategy and Reinforcement Learning**

*Farzaneh Goli, Yongjing Wang, Mozafar Saadat*

**Enhancing Manipulator Flexibility: Real-Time Positional Control for Variable Assembly Environments Using AprilTag Markers and Edge Detection**

*Kamogelo Teddy Theodore Moyo, Jose Victorio Salazar Luces, Ankit A. Ravankar, Yasuhisa Hirata, Shota Morozumi*

**Large Language Model-Enabled Multi-Agent Manufacturing Systems**

*Jonghan Lim, Birgit Vogel-Heuser, Ilya Kovalenko*

**Automation at Micro-Nano Scales**

Room T8 @ 16:00-17:30

**Frequency Domain Optimization Design of the Dual-Loop Controller for Piezoelectric Tube Scanners with Compound Dynamics**

*Yixuan Meng, Xiangyuan Wang, Limin Zhu*

**Large Language Model for Intuitive Control of Robots in Micro-Assembly**

*Rolf Wiemann, Niklas Terei, Annika Raatz*

**Accelerating Micro-Assembly Process Implementation by a CAD-Based Control Interface**

*Niklas Terei, Rolf Wiemann, Annika Raatz*

**Comparative Study of Keypoint Detection and ArUco Marker Methods for Optical 6D Pose Estimation in Electronics Packaging**

*Lucas Janisch, Daniel Schulz, Alexander Schmidt, Raven Thomas Reisch, Tobias Kamps, Jörg Franke*

**Slippage Prediction in Microrobotic Fiber Characterization**

*Ali Zarei, Dhanesh Kattipparambil Rajan, Pasi Johannes Kallio*

**A High-Gain Loop-Shaping Method for Precision Motion Control**

*Yixuan Meng, Xiangyuan Wang, Limin Zhu*

**Human-Robot Interaction in Workplace and Mobility**

Room T9 @ 16:00-17:30

**Vision-Based Postural Risk Auto-Assessment Method for Sit-Stand Office Working Using REBA**

*Qiqi He, Xiangying Zhang, Dai Li, Tao Peng, Renzhong Tang*

**Enhancing Driver Maneuver Intention Recognition: A Framework Integrating Driver Facial Motion and Driving Scene Understanding**

*Gege Cui, Hailong Huang*

**The Effects of Framing and Apology in HRI in Manufacturing**

*Emilia Theresa Jeanne Seigneur Pietras, Anna-Sophie Ulfert-Blank, Guglielmo Borzone, Aljaz Kramberger, Norbert Krüger, Leon Bodenhausen*

**A Cross-Domain, Computational Robot Design Flow from Morphology to Fabrication**

*Anwasha Chatteraj, Richard Lin, David Martinez, Ankur Mehta*

**Learning Scooping Deformable Plastic Objects Using Tactile Sensors**

*Yuto Kageyama, Masashi Hamaya, Kazutoshi Tanaka, Atsushi Hashimoto, Hideo Saito*

**Norm-Oriented Robotic Navigation System Applying the IEEE 7007-2021 Standard**

*Caroline Santos Dos Reis, Edson Prestes, Michael Houghaling*



## **Robotics**

*Virtual T1 @ 16:00-17:30*

**Automated Robot Recovery from Assumption Violations of High-Level Specifications**

*Qian Meng, Hadas Kress-Gazit*

**BREATH: Breathing Robot for Enhancing Athletic Training and Health**

*Matthew Sawchuk, Sabir Saheel, Jack Quigley, Arshia Khan*

**Multimodal Human Detection Using RGB, Thermal and LiDAR Modalities for Robotic Perception**

*Kennedy O. S. Mota, Luis Carlos Garrote, Cristiano Preme-bida*

**Combining Binocular Camera and Infrared Beacon: Enhancing Trajectory Planning and Motion Error Elimination for Floor Grinding Robots**

*Guangzhen Lin, Chang Siwei, Haoqian Liu, Nan Wang*

## **Motion Control**

*Virtual T2 @ 16:00-17:30*

**Force-Controlled Movement on Irregular Curved Surfaces for Constant-Pressure Contour-Following in Rubber Tapping Applications**

*Kai Döring, Samuel Brodie, Timo Oksanen*

**Development of a Simple and Novel Digital Twin Framework for Industrial Robots in Intelligent Robotics Manufacturing**

*Tianyi Xiang, Borui Li, Xiaonan Pan, Quan Zhang*

**Memory-Enhanced Bidirectional Potential-Guided RRT with Resampling-Based Iterative Optimization for Efficient Path Planning**

*Bowen Lin, Junhu Wei*

**A Half FitzHugh-Nagumo Neuron Circuit Embedded into a Motor for a New Intelligent Actuator**

*Paolo Arena, Carlo Famoso, Alessia Li Noce, Alberto Motta, Igor Galati, Luca Patanè*

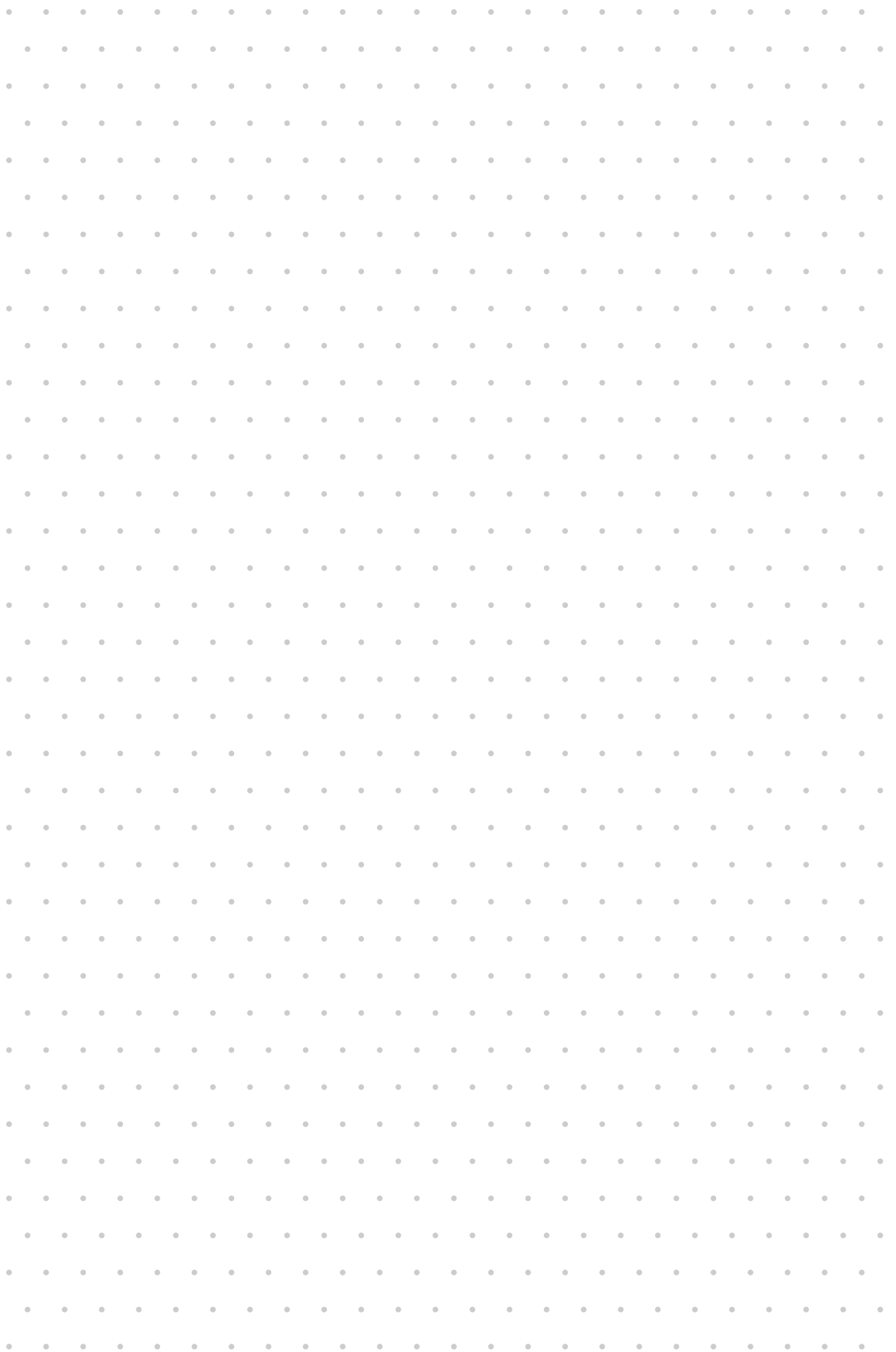
**Design and HIL Testing of Enhanced MRAC Algorithms to Improve Tracking Performance of LQ-Strategies for Quadrotor UAVs**

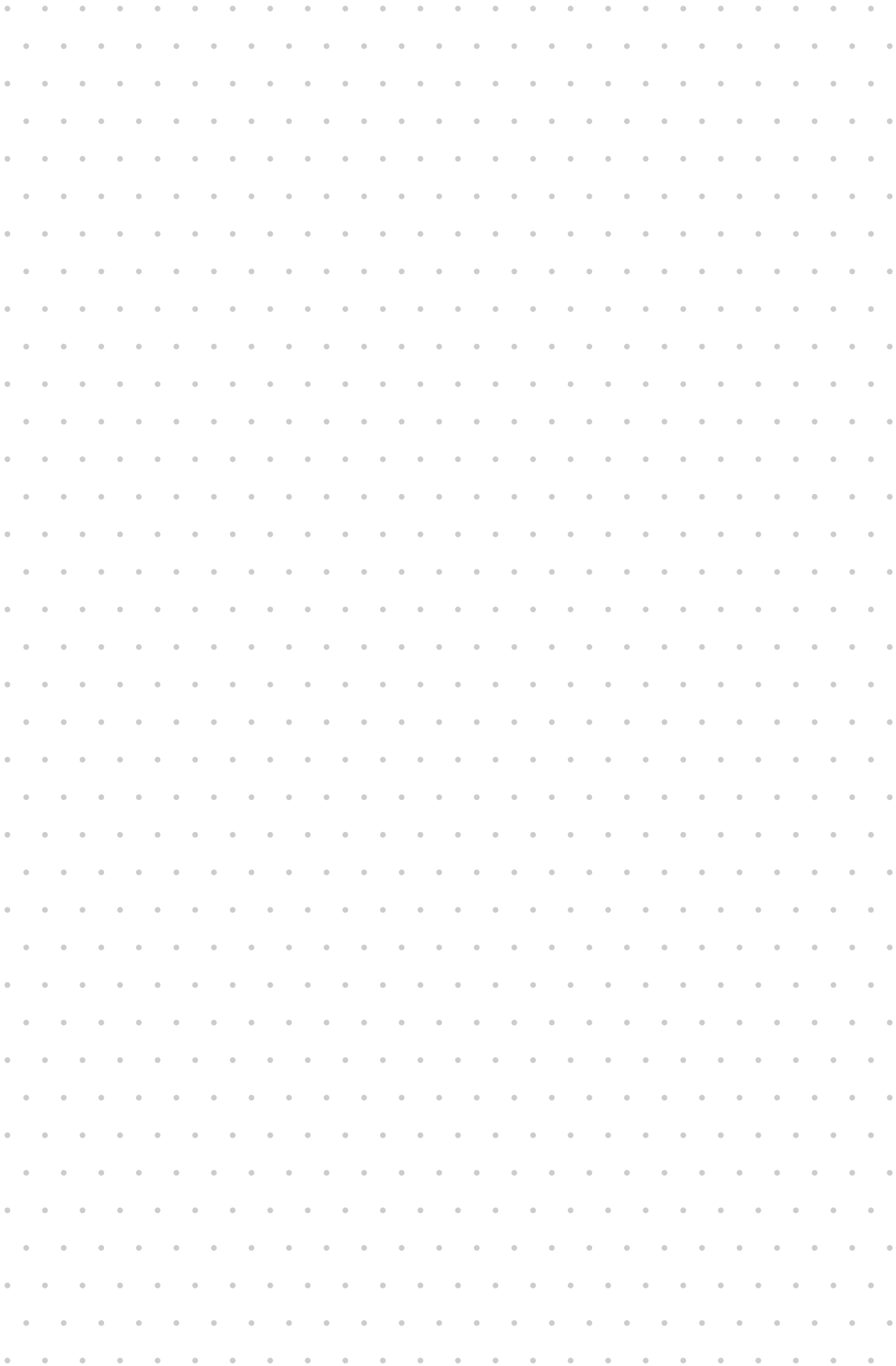
*Simone Martini, Salvatore Matteo Mennea, Mario Mikhailov, Alessandro Rizzo, Kimon Valavanis, Aldo Sorniotti, Umberto Montanaro*



# Notes









## Call for Papers

The 2025 IEEE 20th International Conference on Automation Science and Engineering (CASE 2025) is one of the three flagship conferences of the IEEE Robotics & Automation Society and provides a primary forum for cross-industry multidisciplinary research in automation.

CASE 2025 will be held on August 18 – August 21, 2025, in Los Angeles, California, USA. The conference will focus on **Secured and Trustworthy Automation**: Automation systems such as collaborative robotics, self-operating systems and vehicles, smart manufacturing, healthcare, farming, transportation & logistics, and smart cities, increasingly rely on secured and trustworthy automation. Research is needed to overcome vulnerability and bias due to imperfect system design, data collection, machine learning, or control.

The conference will cover a wide range of topics on Systems, Automation, Autonomous Systems, Discrete Event Systems, Smart Cities, Robotics, Building Automation, Automation in Meso, Micro and Nano-scale, Big Data, Machine Learning, Information and Communication Technologies, etc.

CONFERENCE WEBSITE: <https://2025.ieeeecase.org/>

## Organizing Committee

**General chair** Qiang Huang, USC

**General co-chair** Satyandra K. Gupta, USC

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**Award committee chairs** Bengt Lennartsson (chair) (Chalmers University of Technology), Jingshan Li (Tsinghua University), additional members will be selected by Bengt

**Diversity and inclusion chairs** Giulia Pedrielli (Arizona State University), Karinne Ramirez Amaro (Chalmers University of Technology), Heeyoung Kim (KAIST)

**Local committee** USC: Ali Abbas (Chair), Paul Bogdan, John Carlson, Yong Chen, Maged Dessouky, Yan Jin, Bhaskar Krishnamachari

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**Publication chair** Liang Zhang (University of Connecticut)

**Publicity chairs** Fugee Tsung (Hong Kong Univ. Sci & Tec Guangzhou), Yuqian Lu (The University of Auckland), Feng Ju (Arizona State University)

## Key dates and deadlines

**February 8, 2025**

- Special session proposal submission

**March 1, 2025**

- Regular and special session full paper submission

**April 1, 2025**

- Workshop/tutorial proposal submission Industry paper and work-in-progress paper submission

**April 30, 2025**

- RA-L, T-RO, RAM, T-ASE presentation-only submission

**May 17, 2025**

- Paper acceptance notification

**June 14, 2025**

- Final paper submission Early registration

**July 15, 2025**

- Final program

**August 18, 2025**

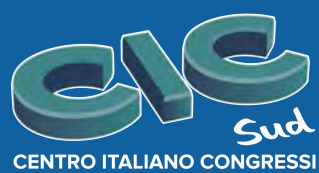
- Conference starts

## Contributing

IEEE CASE 2025 invites special session and workshop/tutorial proposals, regular papers, industry papers and presentation-only papers related to the conference topics, which include but are not limited to:

- Foundation of Automation
- Human-centered automation
- Automation in life science and healthcare
- Sustainability and green automation
- Automation in agriculture and horticulture
- Automation in meso, micro and nano-scale
- Smart building and construction
- Knowledge-based automation
- Manufacturing automation
- Cloud-based automation
- Big data, data mining and machine learning
- Privacy and security in automation





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