ANTS 2026

15TH INTERNATIONAL CONFERENCE ON SWARM INTELLIGENCE

REACHING BEYOND — SWARM INTELLIGENCE ACROSS SYSTEMS, DISCIPLINES, AND COMMUNITIES

JUNE 8-10, 2026
DARMSTADT, GERMANY
CONFERENCE GUIDEBOOK

TECHNISCHE UNIVERSITÄT DARMSTADT

Robotics Institute Germany

PROGRAM AT A GLANCE

MONDAY, JUNE 8, 2026

08:00	Registration Opens
08:45	Opening Remarks
09:00	**Keynote** Jesús Gómez-Gardeñes *From Interaction Structure to Collective Dynamics*
10:00	Coffee Break
10:30	Oral Session 1
12:00	Lunch and Late-Breaking Result Posters
13:20	Oral Session 2
14:50	Coffee Break
15:20	**Perspective Talk** Meeyoung Cha *AI, Society, and Computing: Leveraging Global Data While Tackling Ethical Challenges*
15:50	Poster Teasers 1
16:00	Poster & Demo Session
17:00	End of Program
17:30	Art Tours of Mathildenhöhe and Haus Glückert

15TH INTERNATIONAL CONFERENCE
ON SWARM INTELLIGENCE

	TUESDAY, JUNE 9, 2026	WEDNESDAY, JUNE 10, 2026
08:00	Registration Opens	
09:00	**Keynote** Sharon Glotzer *Towards Colloidal Swarm Robots*	**Keynote** Guido de Croon *Swarms of Small, Autonomous Drones*
10:00	Coffee Break	
10:30	Oral Session 3	Oral Session 6
12:00	Lunch and Late-Breaking Result Posters	
13:20	Oral Session 4	Oral Session 7
14:50	Coffee Break and Group Photo	Coffee Break
15:20	**Perspective Talk** Thomas Watteyne *Swarm Robotics: A Low-Power Wireless Perspective*	**Perspective Talk** Liam Young *New Planetary Imageries*
15:50	Oral Session 5	Poster Teasers 3
16:00		Poster & Demo Session
16:15	Poster Teasers 2	
16:20	Announcing ANTS 2028 (moderated by Marco Dorigo)	
16:40	Poster & Demo Session	
17:00		Award Ceremony
17:30		Closing Remarks
17:40	End of Program	
19:00	Banquet at Restaurant Glasschrank	

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WELCOME

Roderich Groß, Prof.
ANTS 2026, General Chair
Technical University of Darmstadt, Germany

On behalf of the Organizing and Steering Committees, we welcome you to the 15th International Conference on Swarm Intelligence (ANTS 2026). This conference series began in 1998 and we are proud to promote our developing field in a building honouring a scientific discovery—the *darmstadtium*—here in Darmstadt, the “City of Science”.

The 2026 edition’s theme is “Reaching beyond—swarm intelligence across systems, disciplines, and communities”. We seek to encourage new perspectives, help bridge traditional boundaries and enable open debate on what could be ambitious, exploratory, and groundbreaking endeavors to embark on.

ANTS 2026 brings together swarm intelligence enthusiasts from 28+ countries to discuss the latest advances of their field. It features 6 invited talks (plenaries and perspectives), 52 contributed talks (including 10 lightning talks), and more than 100 poster presentations focused on self-organizing systems as found in robotics and across the sciences and the humanities.

The success of this year's conference will be the result of the joint work of our program committee, organizing committee and steering committee and the generous contributions from our sponsors. We would like to express our sincere gratitude for their support, as well as the contributions from all authors and the swarm intelligence community at large. We believe their efforts have generated an exciting academic and social program. We hope you will enjoy ANTS 2026.

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MONDAY, JUNE 8, 2026

KEYNOTE TALK 1

FROM INTERACTION STRUCTURE TO COLLECTIVE DYNAMICS

Jesús Gómez-Gardeñes, Prof.
University of Zaragoza, Spain

ABSTRACT

In systems composed of many interacting units, the emergence of collective behavior, ranging from epidemic spreading and social contagion to synchronization and cooperation, cannot be understood without explicitly accounting for the patterns of interaction among agents. In this talk, I will present a unifying perspective on how the structure of interactions shapes, constrains, and in some cases determines macroscopic collective dynamics. Starting from basic concepts in complex systems and network theory, I will show how structural properties such as heterogeneity, modularity, and multilayer organization critically affect spreading thresholds, diffusion of information and innovations, synchronization transitions, and the evolutionary dynamics of cooperation. Through these examples I will show common organizing principles underlying seemingly disparate phenomena and provides a coherent basis for addressing contemporary challenges in natural and artificial collective systems, from epidemic mitigation to the design of adaptive and resilient populations of interacting units.

BIOGRAPHY

Jesús Gómez-Gardeñes is Full Professor of Condensed Matter Physics at the University of Zaragoza and senior researcher at the Institute for Biocomputation and Physics of Complex Systems (BIFI), where he leads the Group of Theoretical and Applied Modeling (GoThAM Lab). His research is grounded in Statistical and Nonlinear Physics, with a central focus on Network Science and on how macroscopic collective phenomena emerge from microscopic interaction rules. Gómez-Gardeñes has made fundamental contributions to the understanding of the structure and dynamics of complex systems, particularly in congestion phenomena in traffic routing, synchronization transitions, multilayer network dynamics, and evolutionary game theory. A unifying theme of his work is the analysis of how structural organization constraints and shapes functional behavior. His research has received broad international recognition, especially for applications to real-world problems, including large-scale, data-driven modeling of epidemic spreading and the study of cooperation and cultural accumulation in real populations. Methodologically, his work combines analytical approaches, high-performance numerical simulations, and empirical data analysis, allowing him to connect theoretical models with operational tools for realistic scenarios. This integrative perspective is reflected in a prolific publication record in leading journals and a citation impact that positions him as a reference figure in the international complex systems community.

MONDAY, JUNE 8, 2026

PERSPECTIVE TALK 1

Meeyoung Cha, Prof.
Max Planck Institute for Security and Privacy, Germany; Korea Advanced Institute of Science and Technology, South Korea

AI, SOCIETY, AND COMPUTING: LEVERAGING GLOBAL DATA WHILE TACKLING ETHICAL CHALLENGES

ABSTRACT

AI agents powered by individuals' data are reshaping everyday interactions on social platforms and marketplaces. At a planetary scale, the aggregation of multi-modal data enables transformative applications such as poverty mapping, socioeconomic predictions, and disaster assessments. However, these advancements also bring systemic risks, including biases, misinformation, and threats to democratic institutions. This talk explores how thoughtful design in database systems and AI can mitigate these challenges, foster sustainable development, and uphold human-centered values. It further advocates for the vigilant oversight of societal-scale AI applications to prevent dual-use and other ethical concerns and instead promote the benefit for humanity. I will also discuss my journey through my research on misinformation, as well as my life as a data scientist, based on my experiences collaborating with world-class scientists at Meta, AT&T Research, and Microsoft, as well as NGOs such as the United Nations Pulse Lab and the World Customs Organization.

BIOGRAPHY

Meeyoung (Mia) Cha is a pioneering researcher at the intersection of AI, data science, and computational social science. As a Scientific Director at the Max Planck Institute for Security and Privacy (MPI-SP) and Professor at KAIST, she has established a global benchmark for applying computational rigor to humanitarian challenges. Her research spans from the field's earliest million-scale rumor propagation models to the deployment of high-resolution satellite imagery for global poverty mapping and anti-corruption. These transformative frameworks are utilized by international bodies like UNICEF and the World Customs Organization to ensure economic transparency. An ACM Distinguished Member and recipient of multiple Test-of-Time Awards, Prof. Cha is a frequent contributor to global policy forums, including UNODC, APEC, and the AI Action Summit. Her career exemplifies a profound commitment to engineering human-centric technology that secures the ethical and social future of global society.

TUESDAY, JUNE 9, 2026

KEYNOTE TALK 2

Sharon Glotzer, Prof.
University of Michigan, USA

TOWARDS COLLOIDAL SWARM ROBOTS

ABSTRACT

The growing ability to synthesize colloidal nanoparticles of arbitrary shape and interaction anisotropy creates the potential for realizing active complex particle systems with emergent swarm-like behavior that mimics that of microrobotic assemblies and biological systems such as unicellular organisms and tissues. In this talk, we discuss the rise of colloidal robotics and present a complex particle system we call “flexicles” – deformable, artificial cellular superstructures composed of active particles encapsulated by a flexible membrane. We investigate the behavior of single-, multi- and many-flexicle systems, demonstrating how shape deformability of model flexicles gives rise to a diversity of swarming behavior. We show how flexicles are able to navigate through complex environments, accomplish simple tasks, and more. Our findings demonstrate a new, experimentally realizable class of complex particle systems capable of emergent swarm-like behaviors and robotic function.

BIOGRAPHY

Sharon C. Glotzer is the John Werner Cahn Distinguished University Professor of Engineering and the Stuart Churchill Collegiate Professor of Chemical Engineering at the University of Michigan, Ann Arbor. She also holds faculty appointments in Materials Science & Engineering, Physics, Applied Physics, and Macromolecular Science and Engineering, and is an elected member of the U.S. National Academy of Sciences, U.S. National Academy of Engineering, American Academy of Arts & Sciences, and the Royal Society of Chemistry in the UK. Her research on computational assembly science and engineering aims toward the predictive design of colloidal and soft matter, with emphasis on complex particles and particle systems. Using simulation, geometrical concepts, and statistical mechanics, her research group seeks to understand the complex behavior emerging from simple rules and forces and to use that knowledge to design new classes of materials. Her work includes control of spatiotemporal organization in soft matter, discovery of one-dimensional dynamical structures in dense atomic, molecular and particulate fluids, and the discovery of high entropy colloidal crystals and quasicrystals for which she introduced the notion of entropic bonding. Glotzer’s “patchy particle” framework for designing and rationalizing assemblies of nanoparticles has been guiding experiments for two decades. Recently, her group introduced the “flexicle” as a conceptual platform for colloidal robotics. Glotzer’s group also develops and disseminates powerful open-source software, including the particle simulation toolkit HOOMD-blue.

TUESDAY, JUNE 9, 2026

PERSPECTIVE TALK 2

SWARM ROBOTICS: A LOW-POWER WIRELESS PERSPECTIVE

Thomas Watteyne, Dr. (with Geovane Fedrecheski, Dr.)
Analog Devices, USA

ABSTRACT

Communication between robots is the heart of swarm robotics. It is communication that enables robots to carry out a task jointly, coordinate their movement, and share the status of the expedition. My background is in low-power wireless communications and while I have been working mostly on applications with static networks, I've been looking at swarm robotics since 2022. I believe communication is the next frontier for swarm robotics research and development. I organize my remarks in two parts. First, I will survey the state of the art in low-power wireless, and networking in swarm robotics. Communication solutions such as WiFi or simple optical communication, used in swarm testbed setups, don't translate well in real-world scenarios in which robots are far apart, and where there is no infrastructure. I will survey different networking paradigms, including mesh networking and time synchronized channel hopping. Together, we will define an architecture and possible avenues for future swarm networking solutions. Second, I will focus on the need for hands-on swarm experimentation platforms with a focus on wireless. Together with collaborators from Horizon Europe OpenSwarm consortium, Analog Devices and Inria have been designing, building and installing a testbed of 1,000 swarm robots called "DotBots". Two DotBot testbed are running: at Analog Devices in Ireland, and at Inria in France. We will delve into the platform's multi-gateway wireless orchestration infrastructure that uses a novel Time Synchronized Channel Hopping network over BLE, and offers roaming, scalability to 1,000 nodes, and 250 ms round-trip latency. Throughout the talk, we will be driving robots in the room, allow you to program them, and we will connect remotely to the testbeds in France and Ireland. So bring your laptop and be ready for an interactive and hands-on session!

BIOGRAPHY

Thomas Watteyne is an insatiable enthusiast of embedded technologies. He is a Principal Engineer at Analog Devices, in Boston. He is currently on a sabbatical from a Senior Research Director position at Inria in Paris in the AIO research team, working on robotic swarms and low-power wireless. In 2023-2024, Thomas served as the scientific coordinator of the Horizon Europe OpenSwarm project. Between 2013 and 2022, Thomas cochaired the IETF 6TiSCH working group to standardize how to use IEEE802.15.4e TSCH in IPv6-enabled mesh networks. He was a postdoctoral research lead in Prof. Kristofer Pister's team at the University of California, Berkeley. Between 2005 and 2008, he was a research engineer at France Telecom, Orange Labs. He holds a PhD in Computer Science (2008), an MSc in Networking (2005) and an MEng in Telecommunications (2005) from INSA Lyon, France. He is a Senior member of IEEE. He is fluent in 4 languages.

Geovane Fedrecheski is a research engineer at the AIO team of the French National Institute for Research in Digital Science and Technology (Inria) in Paris. He holds a Bachelor's degree in Computer Science (UNICENTRO) and a PhD in Electrical Engineering (USP), and was a visitor scholar at UC Berkeley. He has developed mobile, web, and IoT systems, worked at LG Electronics, and taught MOOCs. He contributes to global IoT security standards at IETF and developed the Micro-robot Access Radio Infrastructure (Mari). At Inria, he currently leads the development of the OpenSwarm Testbed, an open and scalable platform for swarm robotics research and education.

WEDNESDAY, JUNE 10, 2026

KEYNOTE TALK 3

SWARMS OF SMALL, AUTONOMOUS DRONES

Guido de Croon, Prof.
Delft University of Technology, Netherlands

ABSTRACT

Swarms of small drones are promising for many applications, such as search-and-rescue, greenhouse monitoring, or keeping track of stock in warehouses. Since they are small, they can fly in narrow areas. Moreover, their light weight makes them very safe for flight around humans. However, making such tiny drones fly completely by themselves is an enormous challenge. Most approaches to Artificial Intelligence for robotics have been designed with self-driving cars or other large robots in mind – and these are able to carry many sensors and ample processing. In my talk, I will argue that a different approach is necessary for achieving autonomous flight with tiny drones. In particular, I will discuss how we can draw inspiration from flying insects, and endow our drones with similar intelligence. Examples include the fully autonomous “DelFly Explorer”, a 20-gram flapping wing drone, and swarms of CrazyFlie quadrotors of 30 grams able to explore unknown environments and finding gas leaks. Moreover, I will discuss the promises of novel neuromorphic sensing and processing technologies, illustrating this with recent experiments from our lab.

BIOGRAPHY

Guido de Croon received his M.Sc. and Ph.D. in the field of Artificial Intelligence (AI) at Maastricht University, the Netherlands. Currently, he is Full Professor at the Micro Air Vehicle lab (MAVLab) of Delft University of Technology. Furthermore, he is editor-in-chief of the Nature portfolio journal of Robotics. His research interest lies with computationally efficient, bio-inspired algorithms for autonomous, light-weight flying robots, with an emphasis on computer vision. His work has included fully autonomous flight of the 20-gram flapping wing drone “DelFly Explorer” and a swarm of tiny, 30-gram nano-copters able to explore unknown environments and localize gas leaks. Moreover, his group has made several advances in energy-efficient, low-latency neuromorphic sensing and processing for autonomous drones. Finally, his work has generated various new hypotheses on biological intelligence, including how honeybees actively evaluate distances with optical flow and how flying insects can estimate their flight attitude without using accelerometers.

WEDNESDAY, JUNE 10, 2026

PERSPECTIVE TALK 3

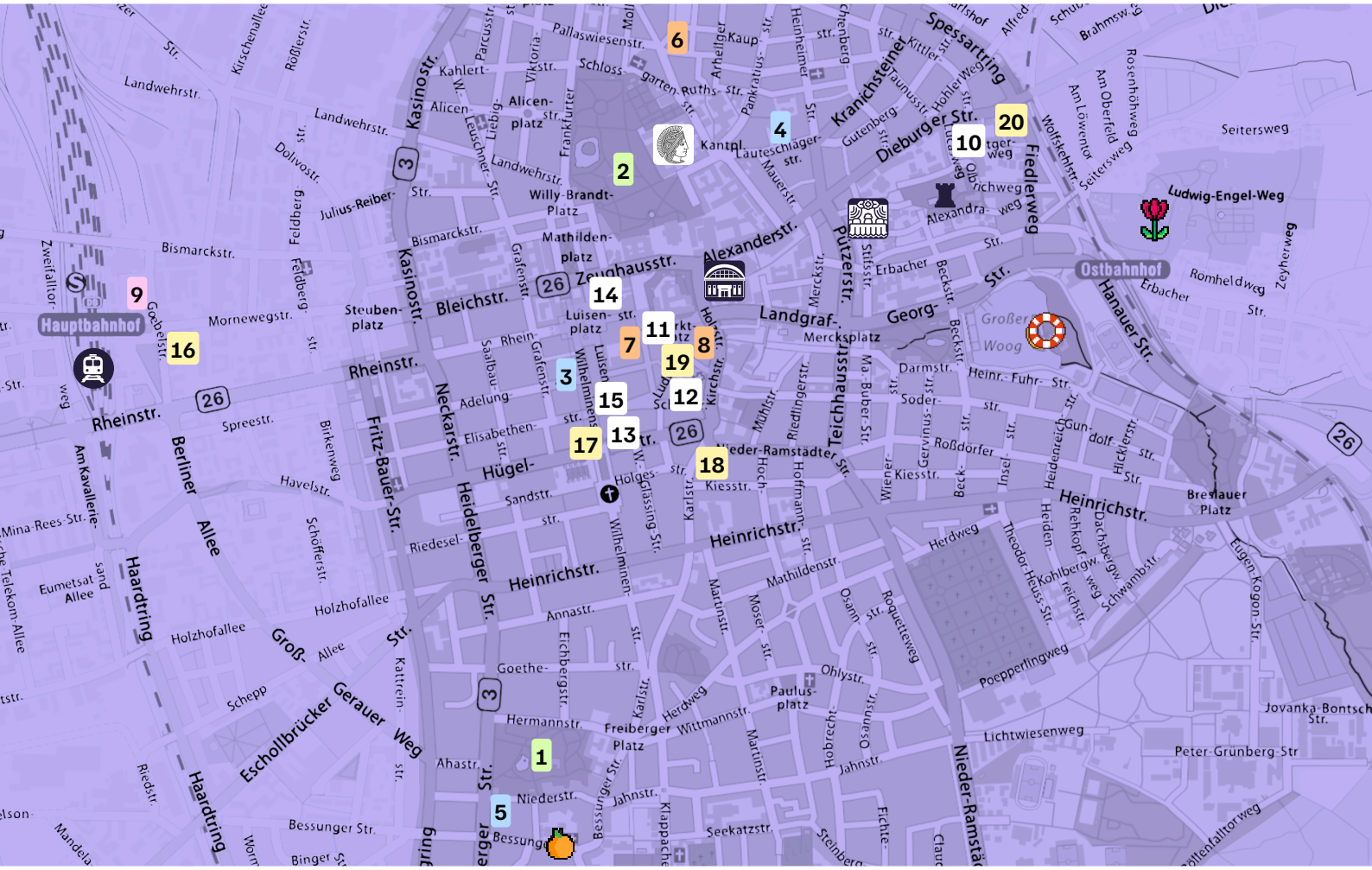
Liam Young
SCI Arc, USA

NEW PLANETARY IMAGERIES

ABSTRACT
Following centuries of colonisation, globalisation, and never-ending economic extraction, we have remade the world from the scale of the cell to the tectonic plate. The dystopias of science fiction that previously read as speculative cautionary tales are now the stage sets of the everyday as many of us live out our lives in a disaster film playing in real-time. In this seemingly futureless moment, the storytelling performance 'Planetary Imaginaries' will take us on a sci-fi safari through a screenscape of alternative and hopeful worlds. Slipping between fiction and documentary, the journey will be both an extraordinary image of tomorrow and an urgent illumination of the environmental questions that are facing us today.

BIOGRAPHY
Liam Young is a designer, director and BAFTA nominated producer renowned for his innovative work at the intersection of design, fiction, and futures. Described by the BBC as ‘the man designing our futures’, his visionary films and speculative worlds are both extraordinary images of tomorrow and urgent examinations of the environmental questions facing us today. As a worldbuilder he visualizes the cities, spaces and props of our imaginary futures for the film and television industry and with his own films he has premiered with platforms ranging from Channel 4, Apple+, SxSW, Tribeca, the New York Metropolitan Museum, The Royal Academy, Venice Biennale, the BBC and the Guardian. His films have been collected internationally by museums such as MoMA New York, the Art Institute of Chicago, SF MoMA, The Smithsonian, the Victoria and Albert Museum, the National Gallery of Victoria and M Plus Hong Kong and has been acclaimed in both mainstream and design media including features with TED, Wired, New Scientist, Arte, Canal+, Time magazine and many more. His film work is informed by his academic research and has held guest professorships at Princeton University, MIT, and Cambridge and now runs the ground breaking Masters in Fiction and Entertainment at SCI Arc in Los Angeles. He has published several books including the recent Machine Landscapes: Architectures of the Post Anthropocene and Planet City, a story of a fictional city for the entire population of the earth.

SOCIAL EVENTS & LOCAL ATTRACTIONS



- Darmstadtium, Schlossgraben 1 *Conference venue*
- Glasschrank, Pützerstr. 6 *Banquet dinner*
- TU Darmstadt Stadtmitte
- Train station

LOCAL ATTRACTIONS

- Mathildenhöhe, Darmstadt-Ost
- Orangeriegarten, Bessunger Str.
- Rosenhöhe, Darmstadt-Ost
- Woog Badesee, Darmstadt-Ost

PARKS

1. Prince Emil Garden, Niederstr. 27
2. Herrngarten, Schloßgartenstr.

CAFES

3. Café Miss Moonlight, Wilhelminenstr. 17a
4. bluebee cafe, Lauteschlägerstr. 28
5. buna, Heidelberger Str. 72

ICE CREAM

6. Thildas Eis, Schuknechtstr. 1
7. Eis Venezia, Ernst-Ludwig-Str. 7
8. Coccola, Schustergasse 7

APERITIF

9. Vinocentral, Platz d. Deutschen Einheit 21

RESTAURANTS

10. Shiraz, Dieburger Str. 73
11. Obendrüber vom Henschel, Marktpl. 2
12. das krü, Ludwigstr. 8
13. Woodrich, Wilhelminenstr. 10
14. Luis Seafood, Schleiermacherstr. 2 cash only
15. Slap Pizza, Wilhelminenstr. 4

BRAUHAUS

16. Braustüb'l, Goebelstr. 7
17. City Braustüb'l, Wilhelminenstr. 31
18. Grohe Brauhaus, Nieder-Ramstädter Str. 3
19. Ratskeller, Marktpl. 8
20. Biergarten Darmstadt, Dieburger Str. 97

MONDAY, JUNE 8, 2026
TECHNICAL PROGRAM

09:00 - 10:00	**Keynote Talk 1** Jesús Gómez-Gardeñes *From Interaction Structure to Collective Dynamics*
10:30 - 12:00	**Oral Session 1 [Mo1]** Session chairs: Mary Katherine Heinrich (Université libre de Bruxelles) and Yara Khaluf (Vrije Universiteit Amsterdam)
Mo1-1 10:30 - 10:48	ROS-2-ARGoS Bridge: Scalable Simulations of Swarms of 1000 and More Robots *Sindiso Mkhatshwa, Tianfu Zhang, Paolo Leopardi, Heiko Hamann, and Andreagiovanni Reina*
Mo1-2 10:48 - 11:06	Bigraphical Model Checking for Coordinated Drone Landings on Vertiports *Dominik Grzelak, Tianxiong Zhang, and Uwe Aßmann*
Mo1-3 11:06 - 11:24	Mitigating Latency and Partitioning Through Size Regulation in Blockchain-Enabled Robot Swarms *Raina Zakir, Marco Dorigo, and Volker Strobel*
Mo1-4 11:24 - 11:42	A Fast Distributed Algorithm for Breakage Detection in Modular Robots *Ikrame Yazidi, Lucas Berthome, Morvan Ouisse, and Benoit Piranda*
Mo1-5 11:42 - 12:00	Lightning talks Leadership Emergence in a Drum Circle Setting *Sara Delplanque, Seyed Ehsan, Marjani Bajestani, Giovanni Beltrame, Simone Dalla Bella, Floris van Vugt, Caroline Traube, and Nicholas Foster* How Social Contagions Shape Collective Consensus *Mohammad Savari, Nikolaj Horsevad, Robert E. Kooij, Mohammadreza Chamanbaz, Didier Wernli, and Roland Bouffanais* Psychological Needs Shape Human Social Cooperation *Chen Chen, Liang Li, Fadong Chen, Mohammad Salahshour, and Xiangyi Li Richter* Magnetically Controlled Collective Motion in Compliant Butterfly Structures *Muhammad Bilal Khan, Kilian Schäfer, Florian Hofmann, Matthias Lutzi, Eduardo Sergio Oliveros-Mata, Oleksandr Pylypovskyi, Denys Makarov, and Oliver Gutfleisch*
12:00 - 13:20	**Late-Breaking Results Posters**

13:20 - 14:50	**Oral Session 2 [Mo2]** Session chairs: Heiko Hamann (University of Konstanz) and Yating Zheng (Humboldt University of Berlin)
Mo2-1 13:20 - 13:38	Emergent In-group Bias: Sociality and Individuation in Robotic Swarms *Roman Miletitch and Limor Raviv*
Mo2-2 13:38 - 13:56	Decoding Spatial and Temporal Influence in Collective Behavior Using Information Theory *Udoy S. Basak, Sulimon Sattari, Iacopo Hachen, Iain D. Couzin, and Liang Li*
Mo2-3 13:56 - 14:14	AID: Agent Intent from Diffusion for Multi-agent Informative Path Planning *Jeric Lew, Yuhong Cao, Derek Ming Siang Tan, and Guillaume Sartoretti*
Mo2-4 14:14 - 14:20	Re-solving the Shepherding Problem: Lead When Possible, Herd When Necessary *Daniel Strömbom, Julianna Hoitt, and Cameron Cloud*
Mo2-5 14:20 - 14:26	From Pheromones to Policies: Reinforcement Learning for Engineered Biological Swarm *Aymeric Vellinger, Nemanja Antonic, and Elio Tuci*
Mo2-6 14:26 - 14:32	GMM-PACO: Gaussian Mixture Models and Pareto-Based Ant Colony Optimization for Multi-objective Feature Selection *Anna Krysta, Inès Alaya, and Tristan Cazenave*
Mo2-7 14:32 - 14:38	FDA Flocking: Future Direction-Aware Flocking via Velocity Prediction *Hossein B. Jond and Martin Saska*
Mo2-8 14:38 - 14:44	Distributed Analytic Center Selection for Resilient Control of Multi-robot Systems with Imperfect Communication Channels *Gennaro Notomista*
Mo2-9 14:44 - 14:50	Escaping the Trap: Benchmarking Swarm Gradient-Following in Geometrically Constrained Environments *Kian Andrew Busico, Lilly Schwarzenbach, Fares Abu-Dakka, and Eliseo Ferrante*
15:20 - 15:50	**Perspective Talk 1** Meeyoung Cha *AI, Society, and Computing: Leveraging Global Data While Tackling Ethical Challenges*

15:50 - 16:00 **Poster Teasers 1**

Swarm vs. Swarm Behaviour via Multi-objective Multi-agent Reinforcement Learning
Sune S. Nielsen, Negin Mohammadi, Tanaz Ghahremani, and Grégoire Danoy

Environmental Perception in a Swarm of Conversational Agents
Absera Yihunie, Lilly Schwarzenbach, Hanan Salam, and Eliseo Ferrante

A Gaussian Bounded Confidence Model for Resisting Misinformation in Swarm Robotics
Yuxuan Yuan, Paul O'Dowd, and Jonathan Lawry

Minimizing Uncertainty as a Principle for Task Allocation in Robot Swarms
Yannick Wesseloh, Paolo Leopardi, Jonas Kuckling, and Heiko Hamann

Experimentally Validated Distributional Modelling and Control for Passive Swarm Robots
Seth Lim, Yuanbo Nie, Mohamed S. Talamali, Roderich Groß, and Visakan Kadirkamanathan

16:00 - 17:00 **Poster & Demo Session**

TUESDAY, JUNE 9, 2026
TECHNICAL PROGRAM

09:00 - 10:00	**Keynote Talk 2** Sharon Glotzer *Towards Colloidal Swarm Robots*
10:30 - 12:00	**Oral Session 3 [Tu1]** Session chairs: Inès Alaya (Université Paris Dauphine - PSL) and Guillaume Sartoretti (National University of Singapore)
Tu1-1 10:30 - 10:48	Convergence and Running Time of Time-Dependent Ant Colony Algorithms *Bodo Manthey, Jesse van Rhijn, Ashkan Safari, and Tjark Vredeveld*
Tu1-2 10:48 - 11:06	Tumblenauts: Towards a Bacteria-Inspired Robot Swarm for Intra-vehicular Space Inspection *Sneha Ramshanker, Merihan Alhafnawi, Yushra Guffer, and Radhika Nagpal*
Tu1-3 11:06 - 11:24	Closing the Loop Between BEECLUST and Honeybee Thermotaxis *Martin Stefanec, Alexander Herlitz, Daniel Reisinger, Johannes Diebold, Daniel Nicolas Hofstadler, Anna Reichenpfader, Laurenz Alexander Fedotoff, Farshad Arvin, Ronald Thenius, and Thomas Schmickl*
Tu1-4 11:24 - 11:42	Multi-agent Reinforcement Learning of a Fault-Robust Controller in an Intralogistics Robot Swarm *Youssef Alboraei, Sabine Hauert, and Suet Lee*
Tu1-5 11:42 - 12:00	Lightning talks SWARMUSE: Operationalizing Embodied Music Pedagogy Through Swarm Intelligence *Luc Nijs* Swarm Organization: A Framework for Implementing Multi-agent Systems *Lena Fahry* From Individual Balance Control to Collective Dynamics in Ultra-dense Crowds *Antoine Tordeux, Thomas Chatagnon, and Mohcine Chraibi*
12:00 - 13:20	**Late-Breaking Results Posters**

13:20 - 14:50	**Oral Session 4 [Tu2]** Session chairs: Rosario Aragues (Universidad de Zaragoza) and Andrew Vardy (Memorial University of Newfoundland)
Tu2-1 13:20 - 13:38	Distributed Multi-coverage for Robot Swarms *Mariem Guitouni and Aaron T. Becker*
Tu2-2 13:38 - 13:56	Marine Surface Vehicle Formations in Confined Environments *Chanaka Thushitha Bandara and Herbert G. Tanner*
Tu2-3 13:56 - 14:14	Ten Years of the Collective Perception Benchmark in Swarm Robotics: Achievements and Challenges *Heiko Hamann and Andreagiovanni Reina*
Tu2-4 14:14 - 14:20	User-Centred Design of Multi-UAV Swarm Interfaces for Firefighting UAVs *Alexander McConville, Georgios Tzoumas, Lucio R. Salinas, Marcela Munera, and Sabine Hauert*
Tu2-5 14:20 - 14:26	When Small Differences Matter: How Small Differences Create Leaders in Flocking Swarms *Yara Khaluf*
Tu2-6 14:26 - 14:32	Modeling Information Propagation in Robot Swarms Through Epidemiological Models *Giuseppe A. Patarino, Volker Strobel, Himank Gupta, and Marco Dorigo*
Tu2-7 14:32 - 14:38	Online Self-calibration of Robotic Swarm Motility Phases via Social Learning with Fast Transmission *Leo Cazenille, Salman Houdaibi, and Nicolas Bredeche*
Tu2-8 14:38 - 14:44	How Swarms Differ: Challenges in Collective Behaviour Comparison *André Fialho Jesus and Jonas Kuckling*
15:20 - 15:50	**Perspective Talk 2** Thomas Watteyne (with Geovane Fedrecheski) *Swarm Robotics: A Low-Power Wireless Perspective*

15:50 - 16:15	**Oral Session 5 [Tu3]** Session chairs: Aaron T. Becker (University of Houston) and Thomas Schmickl (University of Graz)
Tu3-1 15:50 - 15:56	Decentralized Multi-robot Coverage of Hemispherical Surfaces via Fortune-Based Partitioning *Mehdi Belal, Tiziano Manoni, Dario Albani, and Lorenzo Sabattini*
Tu3-2 15:56 - 16:02	FORMICA: Decision-Focused Learning for Communication-Free Multi-Robot Task Allocation *Antonio Lopez, Jack Muirhead, and Carlo Pinciroli*
Tu3-3 16:02 - 16:08	Adaptive Multi-robot Herding via Dynamic Risk-Aware Angular Repositioning *Leyre Remartinez, Alejandro Perez-Yus, and Rosario Aragues*
Tu3-4 16:08 - 16:14	Split Over *n* Resource Sharing Problem: Are Fewer Capable Agents Better Than Many Simpler Ones? *Karthik Soma, Mohamed S. Talamali, Genki Miyauchi, Giovanni Beltrame, Heiko Hamann, and Roderich Groß*
16:15 - 16:20	**Poster Teasers 2**
	MagBotSim: Physics-Based Simulation and Reinforcement Learning Environments for Magnetic Robotics *Lara Bergmann, Cedric Grothues, and Klaus Neumann* Development of an Integrated Swarm Robotics Platform with Real-Time Human-Based Guidance *Rugved Upaddhye, Akshat Singh, Swadhin Agrawal, and Sujit P.B.* Fission-Fusion Processes for Regulation of Group Size and Number in Multi-agent Systems *Tianfu Zhang, Suet Lee, and Heiko Hamann*
16:40 - 17:40	**Poster & Demo Session**

WEDNESDAY, JUNE 10, 2026
TECHNICAL PROGRAM

09:00 - 10:00	**Keynote Talk 2** Guido de Croon *Swarms of Small, Autonomous Drones*
10:30 - 12:00	**Oral Session 6 [We1]** Session chairs: Giovanni Beltrame (Polytechnique Montréal) and Raina Zakir (Université libre de Bruxelles)
We1-1 10:30 - 10:48	Energy-Efficient Flocking in Self-organized Robot Swarms *Sina Mahdavi, Dushyant Singh, Peter Klapwijk, Georges Jetti, Michael Khayyat, Francesco Braghin, and Eliseo Ferrante*
We1-2 10:48 - 11:06	A Social Interaction Model for Forager Task Allocation in Honey Bees *Atakan Botasun, Babür Erdem, Elvin Gültekinoğlu, Ali Emre Turgut, and Erol Şahin*
We1-3 11:06 - 11:24	Plyo: AI-Assisted Lightning-Fast Communication for Robot Swarms *Martina Balbi, Lance Doherty, and Thomas Watteyne*
We1-4 11:24 - 11:42	Distributed MPC for Connectivity-Constrained Fixed-Wing Aerial Swarms *Yacine Derder, Augustin Desombre, İzzet Kağan Erünsal, and Alcherio Martinoli*
We1-5 11:42 - 12:00	Lightning talks A Mechanical Route for Cooperative Transport in Autonomous Robotic Swarms *Eden Arbel, Luco Buise, Charlotte van Waes, Naomi Oppenheimer, Yoav Lahini, and Matan Yah Ben Zion* SwarmMAP: Decentralized Cell Type Annotation in Single Cell Sequencing Data *Oliver Lester Saldanha, Vivien Goepp, Kevin Pfeiffer, Hyojin Kim, Rafael Kramann, Sikander Hayat, and Jakob Nikolas Kather* Fluid Fleets: Applying Swarm Intelligence to Public Transit *Lindsay Burke, Maxfield Comstock, Jason Graham, Petras Swissler, and Simon Garnier*
12:00 - 13:20	**Late-Breaking Results Posters**

13:20 - 14:50	**Oral Session 7 [We2]** Session chairs: Suet Lee (Technical University of Darmstadt) and P. Baliyarsimhuni Sujit (Indian Institute of Science and Research Bhopal)
We2-1 13:20 - 13:38	A Micro-Macro Model of Encounter-Driven Information Diffusion in Robot Swarms *Davis S. Catherman and Carlo Pinciroli*
We2-2 13:38 - 13:56	Warmth and Competence in the Swarm: Designing Effective Human-Robot Teams *Genki Miyauchi, Roderich Groß, and Chaona Chen*
We2-3 13:56 - 14:14	Multi-tobot Visibility-Based Connected Exploration *Chetan Gadidesi, Sean Klink, and Aaron T. Becker*
We2-4 14:14 - 14:20	Scalable Foraging: A Paired Body Design and Controller for Foraging Robots *Andrew Vardy and Marius Seidl*
We2-5 14:20 - 14:26	Heterogeneous Visco-Elastic Cyber-Physical Swarm Exploration Algorithm in an Unknown Environment *Fatemeh Rekabi Bana, Mazen Bahaidarah, and Farshad Arvin*
We2-6 14:26 - 14:32	Active Elastic Matter: 3D Collective Motion for Swarms *Ersin Keskin, Ali Emre Turgut, and Erol Şahin*
We2-7 14:32 - 14:38	Swarming from Vision Data Only: A Comparative Study of Imitation and Reinforcement Learning *Yu Zhou, Jo Plested, Kathryn Kasmarik, and Matt Garratt*
We2-8 14:38 - 14:44	On the Cost of Evolving Task Specialization in Multi-robot Systems *Paolo Leopardi, Heiko Hamann, Jonas Kuckling, and Tanja Katharina Kaiser*
We2-9 14:44 - 14:50	Knowledge Distillation-Driven Federated Learning as a Service for Resource-Constrained Edge Intelligence *Filippo Vannella, Tianyue Chu, David Solans Noguero, and Sotirios Spantideas*
15:20 - 15:50	**Perspective Talk 3** Liam Young *New Planetary Imageries*

15:50 - 16:00 **Poster Teasers 3**

SonoRo: A Swarm Robotics Platform to Study Acoustically-Driven Collective Behaviour
Alberto Doimo, Heiko Hamann, Andreagiovanni Reina, and Thejasvi Beleyur

Knowledge Distillation for Developing Versatile Controllers of Robotic Swarms
Asad Razzaq and Toshiyuki Yasuda

Trust and Perception of Robot Swarm Motion in Remote Contexts
Yue Cao, Razanne Abu-Aisheh, Shyamli Suneesh, and Sabine Hauert

Grid-Based Complete Resource Foraging for Robot Swarms
Arturo Gonzalez and Qi Lu

Cooperative Energy-Replenishment in Robot Swarms with Optimal Performance and Efficiency
Julian Rau, Mohamed S. Talamali, Genki Miyauchi, Usama Ali, Mengyao Liu, Danny Hughes, Thomas Watteyne, and Roderich Groß

16:00 - 17:00 **Poster & Demo Session**

LATE BREAKING RESULTS & FRESH PERSPECTIVES

MONDAY, JUNE 8, 2026

Leadership emergence in a drum circle setting - Sara Delplanque, Seyed Ehsan, Marjani Bajestani, Giovanni Beltrame, Simone Dalla Bella, Floris van Vugt, Caroline Traube, Nicholas Foster
How social contagions shape collective consensus - Mohammad Savari, Nikolaj Horsevad, Robert E. Kooij, Mohammadreza Chamanbaz, Didier Wernli, Roland Bouffanais
Psychological needs shape human social cooperation - Chen Chen, Liang Li, Fadong Chen, Mohammad Salahshour, Xiangyi Li Richter
Magnetically controlled collective motion in compliant butterfly structures - Muhammad Bilal Khan, Kilian Schäfer, Florian Hofmann, Matthias Lutzi, Eduardo Sergio Oliveros-Mata, Oleksandr Pylypovskyi, Denys Makarov, Oliver Gutfleisch

Air-to-air interception via "Go"-inspired metrics and reinforcement learning - Ye Kai, Wu Zihan, Wu Yifei, Qian Hao, Shao Wen Woo, Sutthiphong Srigrarom
Centroid estimation via distributed dynamic consensus - Sergio Pardina, Rosario Aragues, Gonzalo Lopez-Nicolas
Consensus-based swarm cooperation for meta-heuristic optimization - Alessandro Nitti, Marco Donato, Giuseppe Carbone
Cooperative primed probabilistic search of people in industrial outdoor environments using a heterogeneous robot team - Markus Kramer, Jonathan Lichtenfeld, Kevin Daun, Oskar von Stryk
Decision-making for decentralized vision based geo-localization of a swarm - Gal Sajko, Jan Babič
Downwash-aware configuration optimization for modular aerial systems - Mengguang Li, Heinz Koeppl
Gesture-based human swarm interaction using LLMs - Alessandro Nazzari, Nathan Cerisara, Dorian Tonnis, Marco Dorigo, Mary Katherine Heinrich
LLM-based specification design for multi-robot supervisory control - Ecem Işıldar, Genki Miyauchi, Roderich Groß
Multi-robot-systems for project cargo transportation - Martin Sliwinski, Noel Blunder, Hendrik Rose, Johann Bergmann, Jan-Christian Wieck, Jana Jost
Scalable multi-agent navigation in maze-like environments - Julian Rau, Jahir Argote-Gerald, Grace McFassel, Genki Miyauchi, Paul Trodden, Roderich Groß
Social learning dynamics in a swarm of robots - Keivan Amini, Jérémy Fersula, Johann Asnacios, Nicolas Bredeche, Olivier Dauchot
SwarmEye: A swarm-intelligence framework for instance-specific image processing - Khalil Alrahman Youssefi, Melanie Schranz
When robots stop swarming: Rethinking collective behavior beyond swarm - Khulud Alharthi

TUESDAY, JUNE 9, 2026

SWARMUSE: Operationalizing embodied music pedagogy through swarm intelligence - Luc Nijs
Swarm organization: A framework for implementing multi-agent systems - Lena Fahry
From individual balance control to collective dynamics in ultra-dense crowds - Antoine Tordeux, Thomas Chatagnon, Mohcine Chraibi

Criticality and collective responsiveness in bio-inspired drone swarms - Matthieu Verdoucq, Dari Trendafilov, Ramón Escobedo, Guy Theraulaz, Gautier Hattenberger
Distributed and decentralized task allocation for heterogeneous swarms - Yigal Koifman, Ariel Barel, Alfred M. Bruckstein
EHS situational awareness through swarm intelligence for industrial environments - Jochen Nickles, José Quevedo, Markus Sauer

TUESDAY, JUNE 9, 2026

Emergent cooperation in decentralized MARL for shepherding non-cohesive agents - Stefano Covone, Cinzia Tomaselli, Francesco De Lellis, Andreagiovanni Reina, Mario di Bernardo
Finite-size scaling of ant colony optimization on distributed knowledge graphs - Alexander Chepizhko, Melanie Schranz
Industrial self-composing systems for increased flexibility and resilience - José Quevedo, Jochen Nickles, Markus Sauer
Maze-solving with density-driven intelligent swarms - Esther María Zamora Sánchez, Sébastien Billès, Nicolas Bredèche, Raphaël Candelier
Navigation of robotic swarmalators with dynamics and constraints - Xinyue Xu, Wei Xiao, Steven Ceron
Silicone ethernet (SEth): A nervous system for robotic touch - Mengyao Liu, Dag Malstaf, Jonathan Oostvogels, Sam Michiels, Alexander Badri-Spöwitz, Danny Hughes
The QUPA troopas: Reproducible, beginner-friendly robots for swarm robotics - Gabriel Madroñero Pachajoa, David Torres Torres, Andrés Tutivén Gálvez, José Santos Terán, Jhonatan Diaz, Bryan Puruncajas, Christian Tutivén Gálvez, Carlos Saldarriaga, David Garzón Ramos
Throughput comparison between an AMR-based sorting system and a loop sorter - Moritz Roidl
Visual-based collective shepherding in swarm robotics - Yating Zheng, Haowei Ji, Heiko Hamann, Pawel Romanczuk

WEDNESDAY, JUNE 10, 2026

A mechanical route for cooperative transport in autonomous robotic swarms - Eden Arbel, Luco Buise, Charlotte van Waes, Naomi Oppenheimer, Yoav Lahini, Matan Yah Ben Zion
SwarmMAP: Decentralized cell type annotation in single cell sequencing data - Oliver Lester Saldanha, Vivien Goepp, Kevin Pfeiffer, Hyojin Kim, Rafael Kramann, Sikander Hayat, Jakob Nikolas Kather
Fluid fleets: Applying swarm intelligence to public transit - Lindsay Burke, Maxfield Comstock, Jason Graham, Petras Swissle, Simon Garnier

Automatic deployment of a supervisory control generators to the Leo rover - Grasiela da Silva Ferreira, Ecem Işıldar, Roderich Groß, Yuri Kaszubowski Lopes
Co-evolution of agent policies and space: Emergent warehouse layout optimization - Tenta Suzuki, Sota Eguchi, Yuta Tobe, Tomohiro Harada, Kiyohiko Hattori
Consensus-based swarm cooperation for meta-heuristic optimization - Alessandro Nitti, Marco Donato de Tullio, Giuseppe Carbone
Echo state machine - Suet Lee, Grace McFassel, Usama Ali, Khulud Alharthi, Avgi Stavrou
Evolving behaviours for supervisory control of robot swarms - Ana Paula Chiarelli de Souza, Maria Eduarda Silva de Macedo, Roberto Silvio Ubertino Rosso Jr., Yuri Kaszubowski Lopes
Group-based acoustic localization in communication-constrained robot swarms - Felix Matzdorf, Jannis Bauer, Roderich Groß
Hovernauts: A low-cost stochastic robotic swarm testbed for space inspection - Yushra Guffer, Sneha Ramshanker, Radhika Nagpal
Learning feasibility-aware collective decisions in robot swarms - Usama Ali, Julian Rau, Roderich Groß
Nested co-design of maritime search-and-rescue system-of-systems - Gang Chen, Anton van Beek, Zhenjun Ming
Spatial-structured cohesion from extremal alignment in topological active matter - Julian Giraldo-Barreto, Viktor Holubec
Stigmergy-based information sharing in multi-agent navigation via pheromone maps - Yuta Tobe, Tenta Suzuki, Tomohiro Harada, Kiyohiko Hattori
The hive mind is a single reinforcement learning agent - Karthik Soma, Yann Bouteiller, Heiko Hamann, Giovanni Beltrame

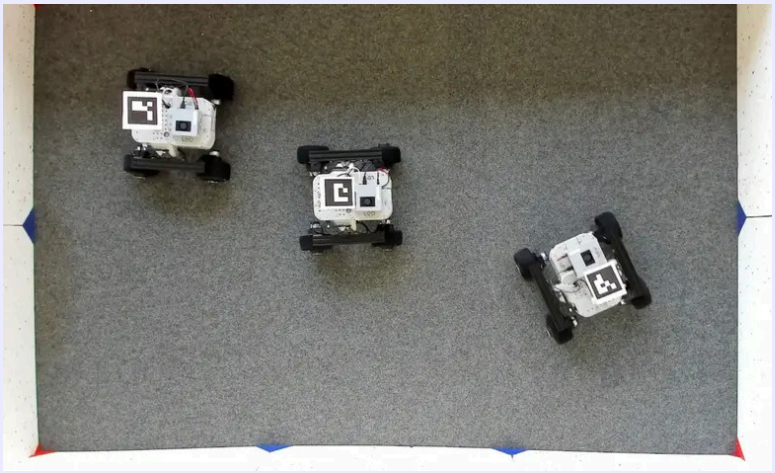
ROBOT DEMOS

Schedule for demos at the robot demo arena. More demos can be found at posters.

MONDAY 12:00 - 13:20PM

LLM-BASED SPECIFICATION DESIGN FOR MULTI-ROBOT SUPERVISORY CONTROL

Ecem Işıldar, Genki Miyauchi, Roderich Groß



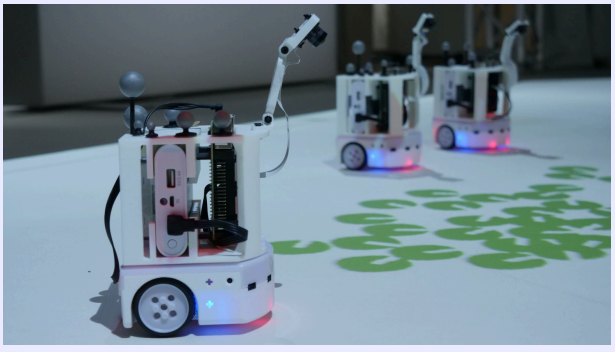
An interactive multi-robot system with Leo Rover robots equipped with depth cameras, enabling manual or autonomous exploration. The system uses Supervisory Control Theory with LLM-generated specifications to create formally verifiable controllers.

MONDAY 16:00 - 17:00PM

COLLECTIVE SHEPHERDING WITH HUMAN-ROBOT INTERACTION

Yating Zheng, Haowei Ji, Heiko Hamann, Pawel Romanczuk

We study a collective shepherding task where multiple robots herd virtual sheep agents projected onto the floor. For the demo, delegates can interact with the shepherding system by controlling the positions of printed disks representing the virtual sheep.

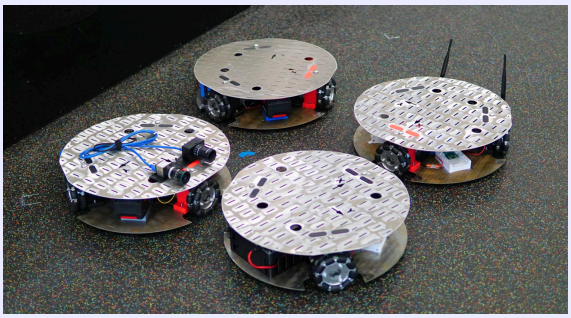


TUESDAY 12:00 - 13:20PM

ROBOCHIEF: A LOW-COST MOBILE ROBOT PLATFORM FOR DYNAMIC MULTI-ROBOT APPLICATIONS

Karol Rösner, Aaron Xavier, Moritz Roidl

RoboChief is a compact, affordable mobile robot platform designed for multi-robot research. Built from standard components and 3D-printed parts, it supports agile omnidirectional motion, payloads of up to 50 kg, and high-speed experiments that help bridge the gap between laboratory research and industrial applications.



TUESDAY 16:40 - 17:40PM

THE 1,000 DOTBOT SWARM TESTBED

Thomas Watteyne and Geovane Fedrecheski

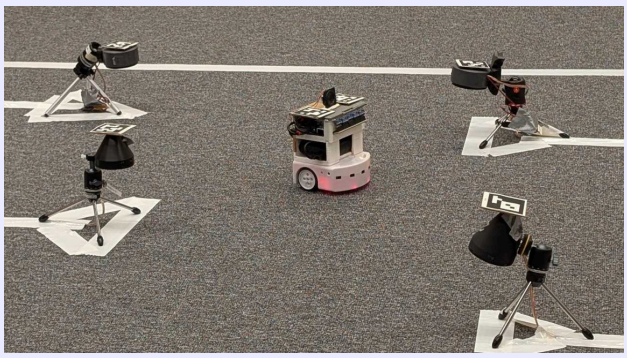
We have built a public testbed of 1,000 ground robots called “DotBots” which you can use to develop swarm intelligence algorithms, including localization, communication and navigation, and also for teaching. We will bring as many as we can to ANTS and let you play with them.

WEDNESDAY 12:00 - 13:20PM

SONORO: A SWARM ROBOTICS PLATFORM TO STUDY ACOUSTICALLY-DRIVEN COLLECTIVE BEHAVIOUR

Alberto Doimo, Heiko Hamann,
Andreagiovanni Reina, and Thejasvi Beleyur

The SonoRo robots will demonstrate environmental awareness, localization, and coordination through collision avoidance, aggregation, and dispersion tasks.



AWARD FINALISTS

The following papers have been nominated for the Best Paper Award by the Program Committee.

ROS-2-ARGoS Bridge: Scalable Simulations of Swarms of 1000 and More Robots

[Mo1-1]

Sindiso Mkhatshwa[1,2], Tianfu Zhang[2], Paolo Leopardi[1,2], Heiko Hamann[1,2], and Andreagiovanni Reina[1,2,3]

[1]Centre for the Advanced Study of Collective Behaviour, Universität Konstanz, Konstanz, Germany
[2]Department of Computer and Information Science, Universität Konstanz, Konstanz, Germany
[3]Department of Collective Behaviour, Max Planck Institute of Animal Behavior, Konstanz, Germany

Emergent In-group Bias: Sociality and Individuation in Robotic Swarms

[Mo2-1]

Roman Miletitch[1] and Limor Raviv[1,2]

[1]Language Evolution and Adaptation in Diverse Situations (LEADS) group, Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands
[2]Donders Center for Cognition, Radboud University, Nijmegen, The Netherlands

Decoding Spatial and Temporal Influence in Collective Behavior Using Information Theory

[Mo2-2]

Udoy S. Basak[1,2,3], Sulimon Sattari[4], Iacopo Hachen[1,2], Iain D. Couzin[1,2], and Liang Li[1,2]

[1]Max Planck Institute of Animal Behavior, Konstanz, Germany
[2]Department of Biology, University of Konstanz, Konstanz, Germany
[3]Department of Mathematics, Pabna University of Science and Technology, Pabna, Bangladesh
[4]Research Institute for Electronic Science, Hokkaido University, Sapporo, Japan

Marine Surface Vehicle Formations in Confined Environments
[Tu2-2]
Chanaka Thushitha Bandara and Herbert G. Tanner
Center for Autonomous and Robotic Systems (CARS), University of Delaware, Newark, USA

Energy-Efficient Flocking in Self-organized Robot Swarms
[We1-1]
Sina Mahdavi[1], Dushyant Singh[1], Peter Klapwijk[1], Georges Jetti[1], Michael Khayyat[1], Francesco Braghin[1], and Eliseo Ferrante[2,3]
[1]*Politecnico di Milano, Milan, Italy*
[2]*New York University Abu Dhabi, Abu Dhabi, United Arab Emirates*
[3]*Vrije Universiteit Amsterdam, Amsterdam, The Netherlands*

The Awards for Best Paper, Best Videos and Best Posters will be announced in the Award Ceremony, Wednesday June 10.

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Resilience for Digital Cities

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How can the functionality of cities with digitally networked infrastructure be ensured in extreme situations, crises, and disasters?

At the LOEWE Center emergenCITY, we work interdisciplinarily on the resilience of cities and their digital infrastructure, including during times of crisis. By resilience, we mean the ability of a system to avert a crisis, recover quickly from a crisis, or achieve a new level of functionality through change. Resilient systems learn from crises to become better and more sustainable.

Program Areas

City and Society (SG)

We investigate the chances and needs of a digital society regarding resilient information and communications technology.

Information (INF)

We focus on data analysis, data visualization and data utilization to optimize crisis detection and recovery.

Communication (KOM)

We work on maintaining and supporting communication between citizens even if central communication systems fail.

Cyber-Physical Systems (CPS)

We explore the potential of autonomous systems to support humans with emergency response and recovery.

Current Missions

eHUB

We seek to mitigate the impact of crises utilizing resilient infrastructure and smart appliances.

Serious Games

We develop games as interactive learning environments for crisis prevention.

Knowledge Base

We aim to combine and share data about the city to speed up and improve emergency reactions.

Digital Heinerblock

We investigate resilience of urban spaces on district level.

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