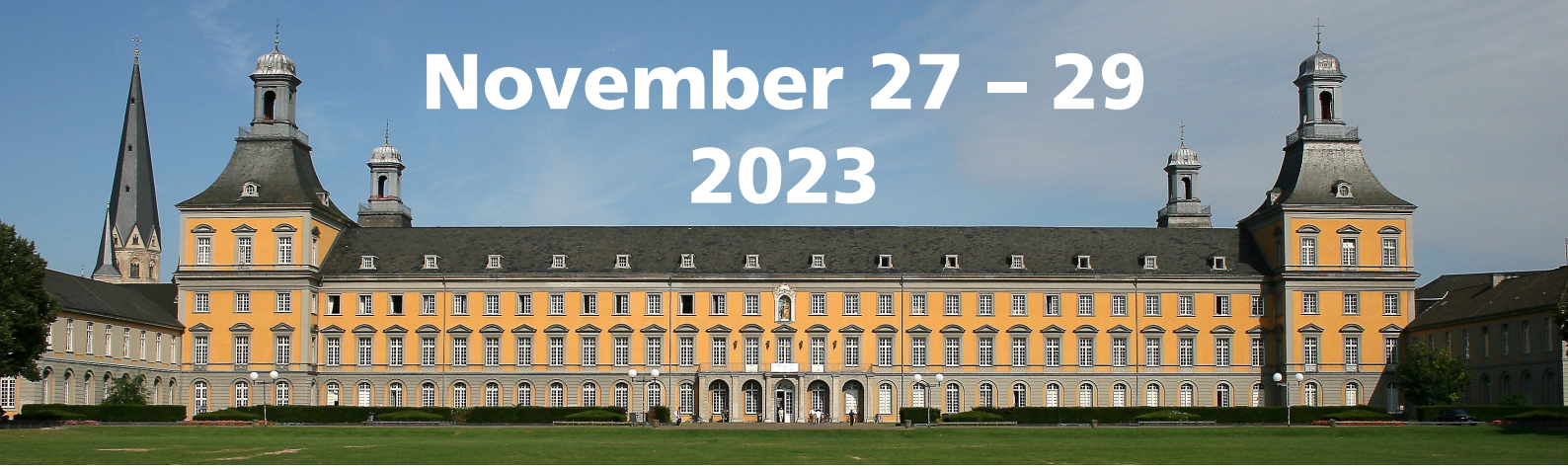

SDF mfi23 Bonn

Combined SDF and MFI Conference 2023

Technical Program

This year the combined IEEE 2023 Symposium Sensor Data Fusion and International Conference on Multisensor Fusion and Integration (SDF-MFI) will take place in Bonn, Germany. We are happy to announce the collaboration of two great conferences on robotics, data fusion, automation and intelligent systems in combined one-track conference. The Uniclub Bonn next to the Rhine river at the center of the former capital provides a great venue. This year's conference addresses numerous application aspects of sensor data fusion, as well as methodology oriented topics. Its 37 presentations are grouped into two tracks and in total 12 sessions. Particular emphasis is placed on advances in the field of robotics, theory of estimation and tracking, emitter localization, ground surveillance, resources management, and selected aspects of higher–level fusion. The contributions from industry, academia, and research institutions let us expect an exchange of ideas, lively discussions, and mutual cross–fertilization. For more detailed information see: `https://www.fkie.fraunhofer.de/en/events/sdf2023.html`.
Location: Universitätsclub Bonn e.V., Konviktstr. 9, 53113 Bonn, Germany. `www.uniclub-bonn.de`

Organisation

Executive Chairs:
Wolfgang Koch, Fraunhofer FKIE and University of Bonn, w.koch@ieee.org;
Uwe D. Hanebeck, Karlsruhe Institute of Technology KIT, uwe.hanebeck@kit.edu.
Technical Program Chairs:
Florian Pfaff, Karlsruhe Institute of Technology KIT, pfaff@kit.edu
Felix Govaers, Fraunhofer FKIE, Germany, felix.govaers@fkie.fraunhofer.de

Technical Program Committee

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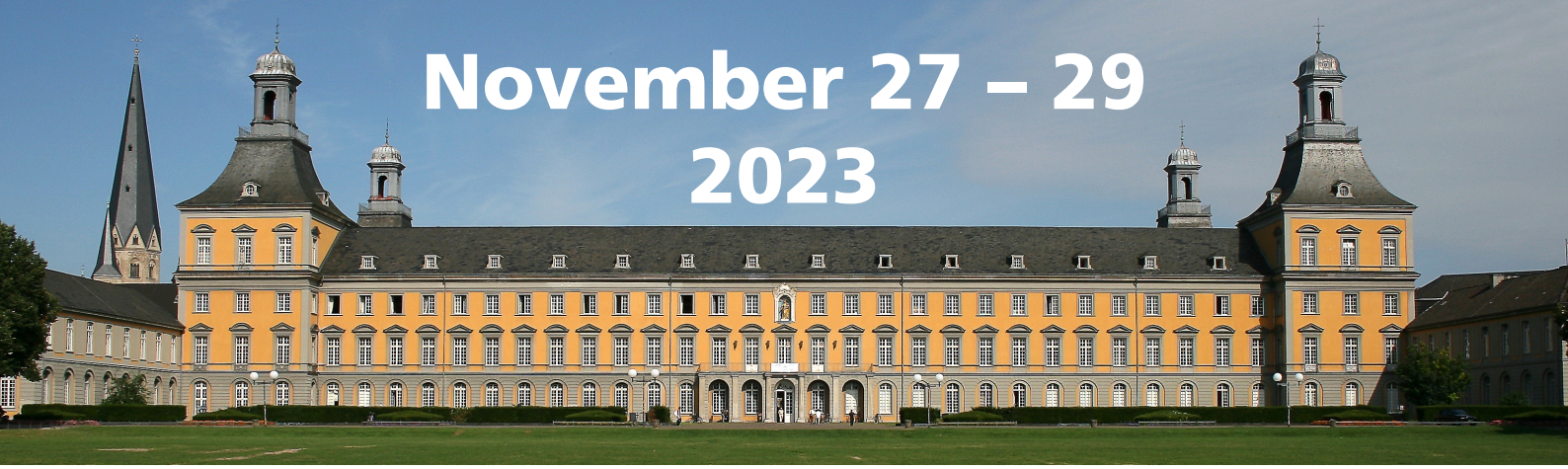

November 27 – 29 2023

SDF mfi23 Bonn

Day 1 – Monday November 27th

8:00 – 9:00	Registration

Morning session

09:00 – 12:00	**Tutorial 1:** *Bridging theory and applications with possibility theory* Jeremie Houssineau **Tutorial 4:** *Emerging trends in sensing capabilities and their integration with underwater robotics* Corina Barbalata, Katherine A. Skinner, Jinwei Ye **Tutorial 5:** *Multiple Extended Object Tracking for Automotive Applications* Marcus Baum, Jens Honer

Afternoon session

13:00 – 16:00	**Tutorial 3:** *Statistical and information-theoretic methods for multi-sensor multi-target estimation* Daniel Clark **Tutorial 6:** *Human-made Space Object Characterization over Large Distances* Carolin Frueh

Icebreaker (non-hosted)

18:00 –	Dinner at "John Barleycorn", Heerstraße 52, 53111 Bonn

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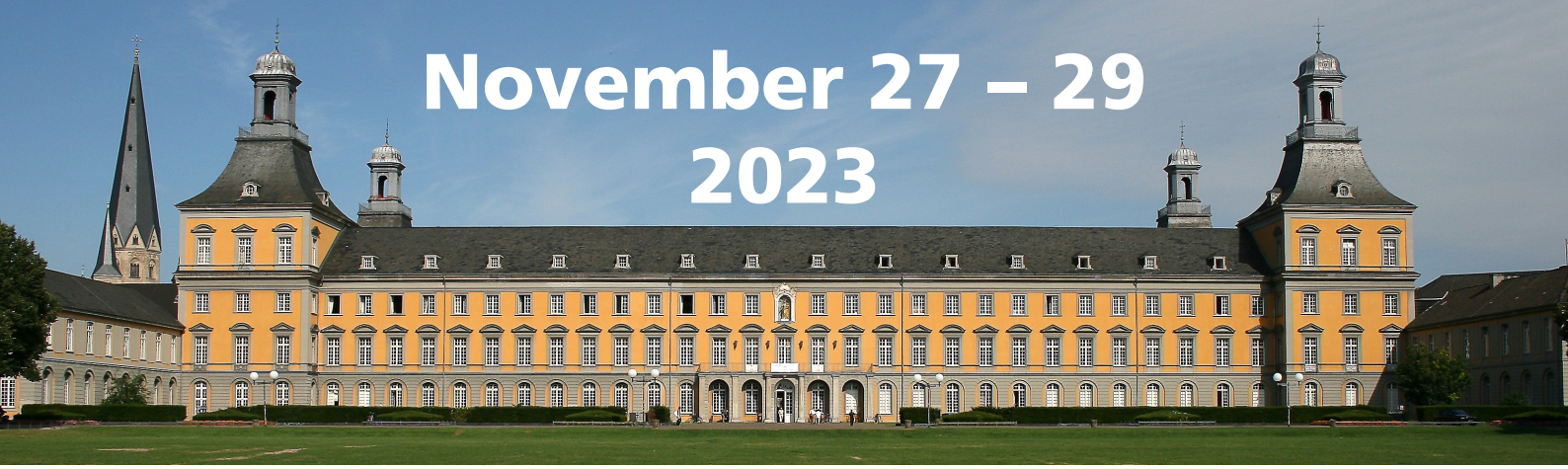

November 27 – 29 2023

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Day 2 – Tuesday November 28th

8:00 – 9:15	Registration
9:15 – 9:30	Opening remarks

Keynote Talk

09:30 – 10:30

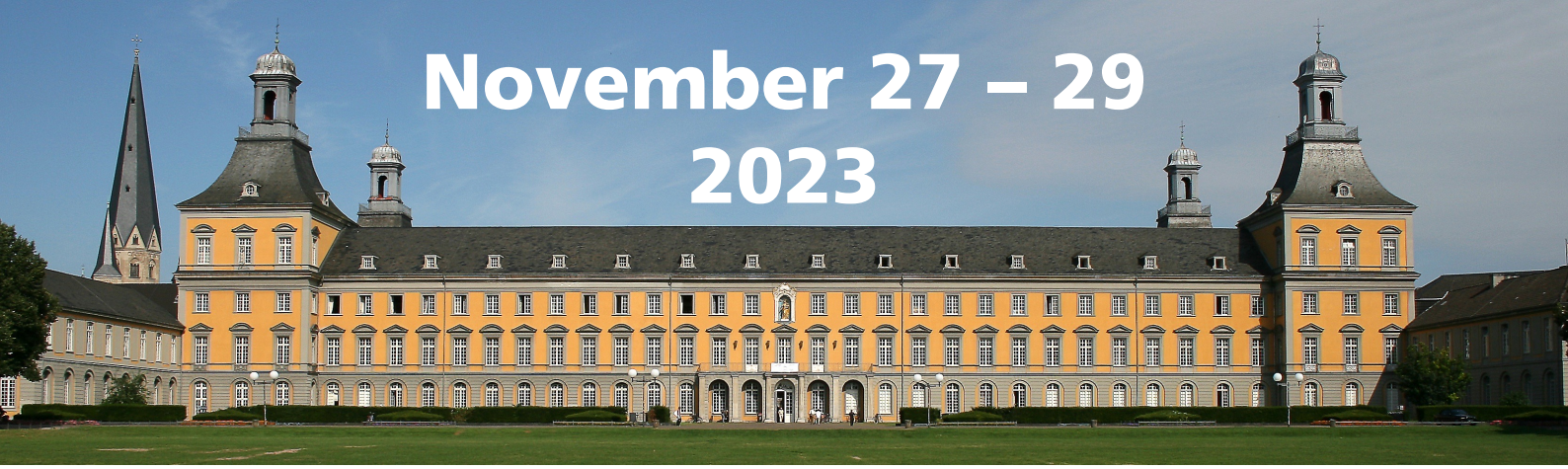
Henk Blom

Title: Machine Learning and AI in Future Air Transportation Design – Early Identification of Safety Issues and Feedback to Design

Abstract: Commercial air transport makes use of a complex socio-technical system, which involves dynamic interactions under uncertainties between distributed human decision makers, dynamical systems and infrastructure. Machine Learning and AI (artificial intelligence) developments hold great potential for the design and implementation of significant changes in this socio- technical system. Due to dynamic interactions between distributed system entities, such changes may trigger unforeseen and rare emergent behavior. From a safety perspective, this asks for early identification, and feedback to design, of such behavior. Established safety methods, currently in use in aviation and air transportation, fall short in identifying novel emergent behavior. This talk will explain the use of methods from complexity science in advanced safety analysis of future air transport designs.

Chair: Wolfgang Koch

10:30 – 11:00	Coffee



November 27 – 29 2023

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Session 1a: *Estimation I*

Chair: TBD

11:00 – 11:30	**Daniel Frisch, Uwe Hanebeck** *Deterministic Von Mises-Fisher Sampling on the Sphere Using Fibonacci Lattices*
11:30 – 12:00	**Jiri Ajgl, Ondrej Straka** *On Visualisation of Linear Estimation and Fusion: From Equations to Ellipses*
12:00 – 12:30	**Dominik Prossel** *Progressive Particle Filtering Using Projected Cumulative Distributions*

Session 1b: *Data fusion for cameras*

Chair: TBD

11:00 – 11:30	**Je Sean Tan, Sutthiphong Srigrarom** *Air-to-ground Targets Re-identification from Non-aligned and Partially Overlapped Cameras by Homograhy Transfer and Iterative Closest Point with Huber Loss Function*
11:30 – 12:00	**Jeong Min Kang, Zoran Sjanic, Gustaf Hendeby** *Optical Flow Revisited: how good is dense deep learning based optical flow?*
12:00 – 12:30	**Maxime Roedelé, Tor Arne Johansen, Kjetil Vasstein** *GNSS-Independent Maritime Navigation Using Monocular Camera Images with Digital Elevation Map*
12:30 – 13:30	Lunch

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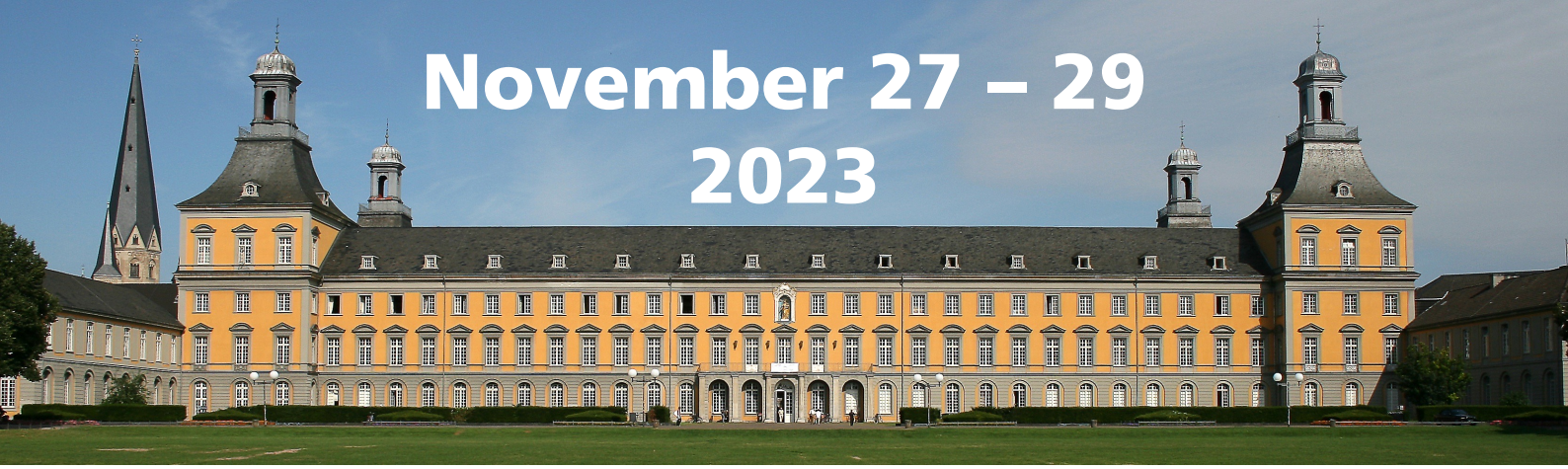

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Session 2a: *Estimation II*

Chair: TBD

13:30 – 14:00	**Jindrich Dunik, Ondrej Straka, Benjamin Noack** *Classification of Uncertainty Sources for Reliable Bayesian Estimation*
14:00 – 14:30	**Felix Govaers** *On Statistics based Prediction of Decomposed Tensor Probability Density Functions*
14:30 – 15:00	**Eva Schmitt, Benjamin Noack** *Event-based Colored-Noise Kalman Filtering for Improved Resource Effiency*

Session 2b: *Automotive applications*

Chair: TBD

13:30 – 14:00	**Björn Volkmann, Karl-Philipp Kortmann** *Friction and Road Condition Estimation using Dynamic Bayesian Networks*
14:00 – 14:30	**Philipp Hafemann, Markus Lienkamp, Simon Hahn** *Optimizing Autonomous Vehicle Sensor Setups: A Framework for Coverage Analysis*
14:30 – 15:00	**Christian Hofmann, Franca Taliercio, Jonas Walter, Jörg Franke, Sebastian Reitelshöfer** *Towards Adaptive Environment Perception and Understanding for Autonomous Mobile Robots*

15:00 – 15:30 Coffee

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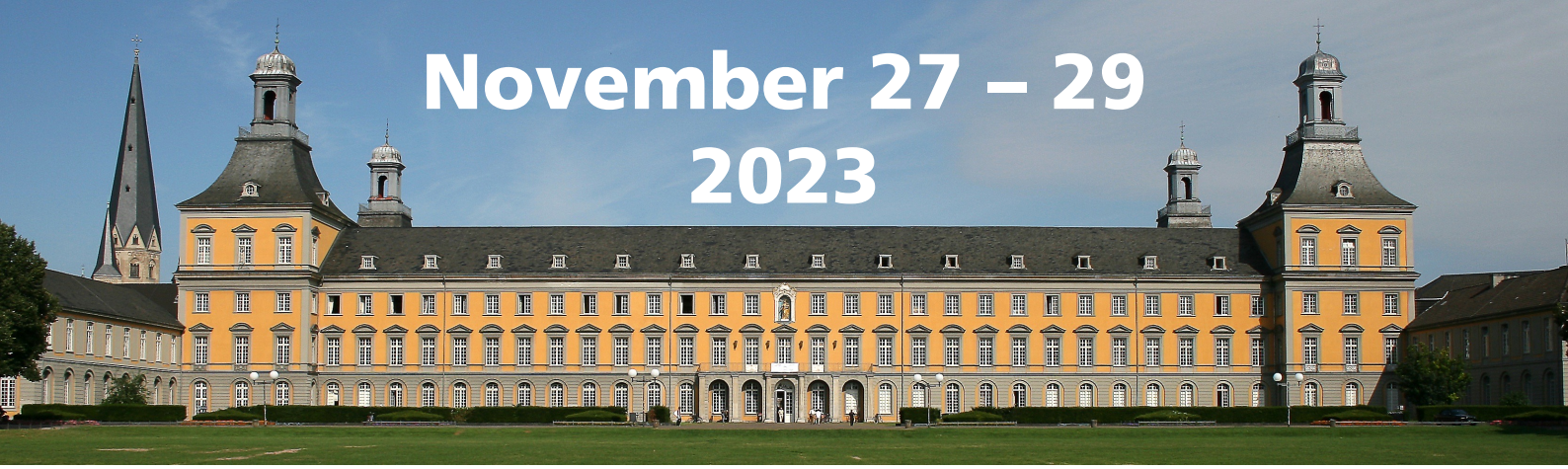

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Session 3a: *Estimation III*

Chair: TBD

15:30 – 16:00	**Serkan Zobar, Mehmet Ciydem, Ozgul Salor, Charles Toth, Alper Yilmaz** *2D-HASAP: Two-Dimensional Heading-Aided Single-Anchor Positioning via Hidden Markov Model Map-Matching*
16:00 – 16:30	**Kouji Murakami** *Estimation of connector insertion state based on phase spectrum of waves transmitted between robot fingers*
16:30 – 17:00	**Simon Steuernagel, Aaron Kurda, Marcus Baum** *Point Cloud Registration based on Normal Distribution Sets and the Gaussian Wasserstein Distance*

Session 3b: *Odometry*

Chair: TBD

15:30 – 16:00	**Martin Michaelis, Philipp Berthold, Thorsten Luettel, Hans-Joachim Wuensche** *Generating Odometry Measurements from Automotive Radar Doppler Measurements*
16:00 – 16:30	**Jacob M. Hartzer, Srikanth Saripalli** *Online Multi-IMU Calibration Using Visual-Inertial Odometry*
16:30 – 17:00	**Kolja Thormann, Marcus Baum** *Single-Frame Radar Odometry Incorporating Bearing Uncertainty*

17:45 – 18:00	Best Paper Awards
18:00 – 19:00	Piano recital from Julia Rinderle
19:00 –	Gala dinner

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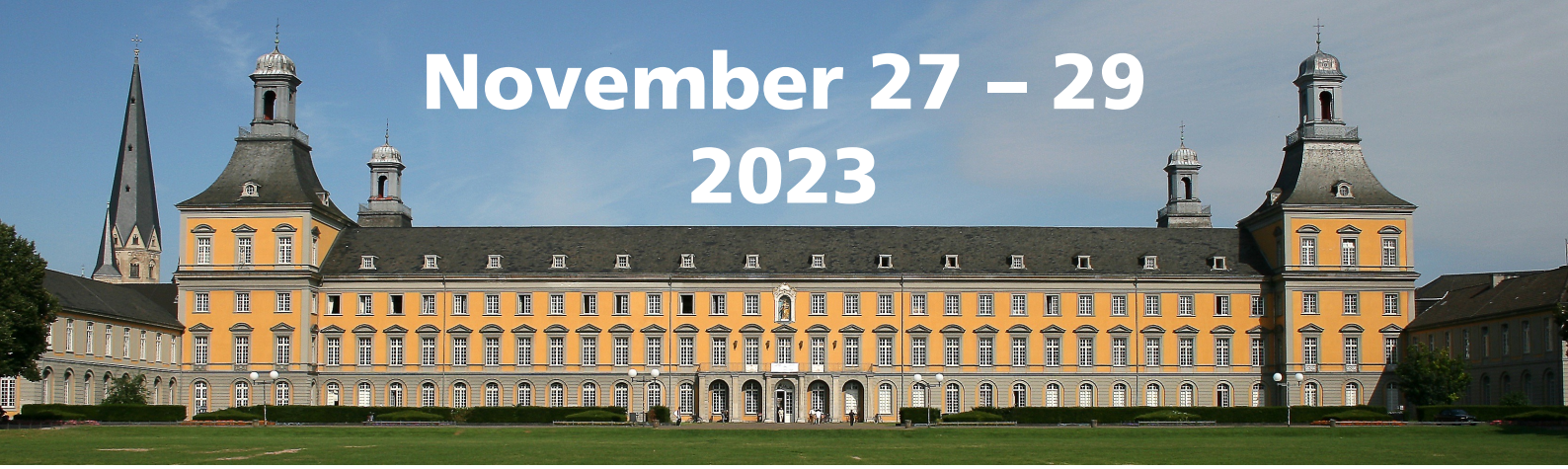

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Day 3 – Wednesday November 29th

Keynote Talk

Jörg Stückler

Title: From Visual SLAM to Embodied AI: Self-Supervised Learning of Action-Conditional Dynamics Models

09:00 – 10:00

Abstract: Beyond localization and mapping, intelligent robots require the ability to learn their action capabilities in the environment. In this talk, I will present my recent research on learning action-conditional models of robot and environment dynamics. I will detail self-supervised and physics-informed approaches that learn the action-conditional dynamics of objects and the robot and approaches that adapt online with state estimation. I will report on experimental results which demonstrate that such action-conditional dynamics models can be useful for action planning and also improve state estimation. *Chair:* Uwe Hanebeck

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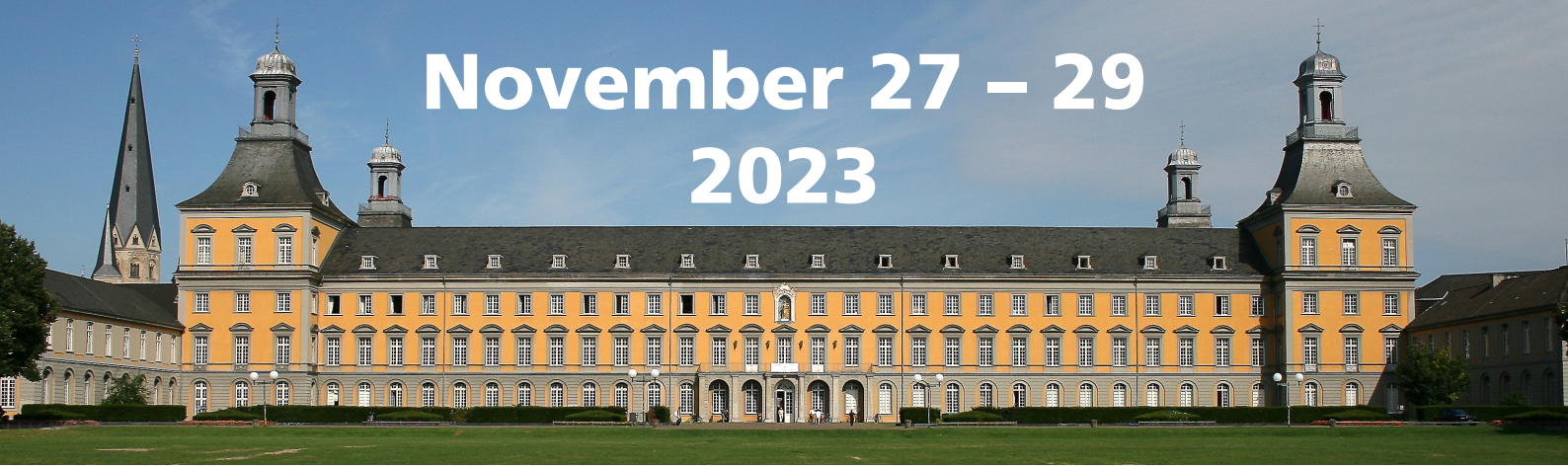
10:00 – 10:30 Coffee



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Session 4a: *Target Tracking I*

Chair: TBD

10:30 – 11:00	**Tim Baur, Johannes Reuter, Uwe Hanebeck** *On Runtime Reduction in 3D Extended Object Tracking by Measurement Downsampling*
11:00 – 11:30	**Masaki Yoneda, Karl-Magnus Dahlén, Takashi Ogawa** *Extended Object Tracking with Doppler velocity-based Point Registration*
11:30 – 12:00	**Jens Honer, Hauke Kaulbersch** *First-Order Approximation of the Random Set Cluster Process for Extended Target Tracking*

Session 4b: *Distributed estimation*

Chair: TBD

10:30 – 11:00	**Jonas Rockbach, Isabel Schlangen, Bennewitz Maren** *Self-organising, Hierarchical, and Extending Distributed Sensor Fusion for Swarm Control*
11:00 – 11:30	**Igor Tchouchenkov, Florian Segor** *Groups of heterogeneous autonomous systems in area reconnaissance*
11:30 – 12:00	**Amelia Samandari, Andreas Willig** *Distributed Time Slot Allocation For Transmission of Sensor Data in UAV Formations*
12:00 – 12:30	**Conor Rosato, Alessandro Varsi, Joshua Murphy, Simon Maskell** *An $\mathcal{O}(\log_2 N)$ SMC^2 Algorithm on Distributed Memory with an Approx. Optimal L-Kernel*
12:30 – 13:30	Lunch

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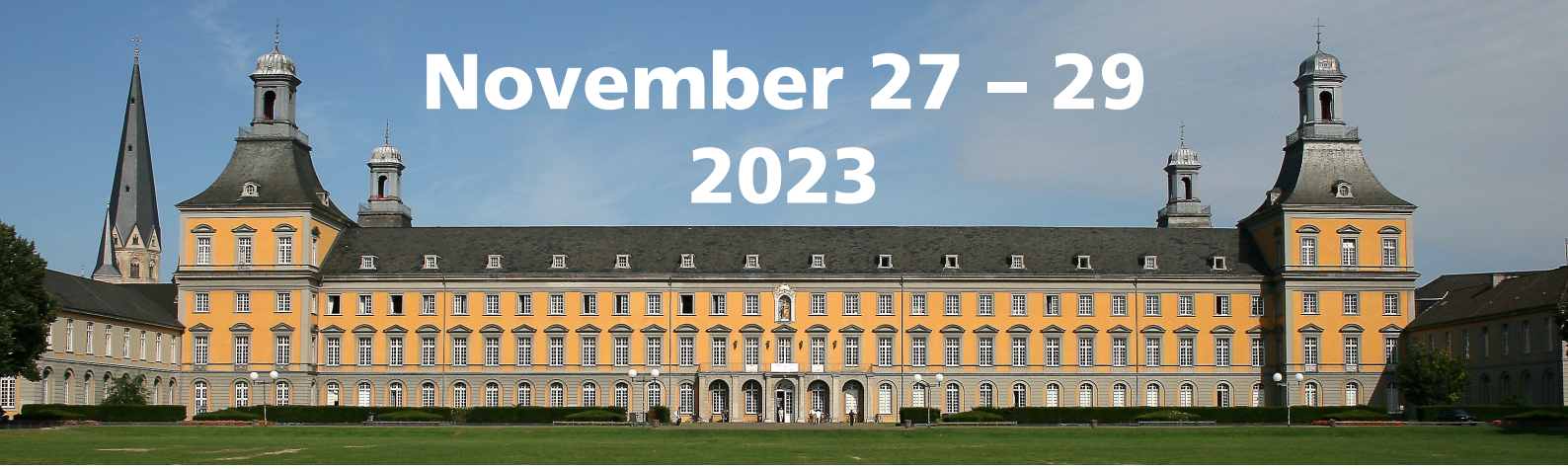

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Session 5a: *Target Tracking II*

Chair: TBD

13:30 – 14:00	**Patrick Hoher, Johannes Reuter, Felix Govaers, Wolfgang Koch** *Extended Object Tracking and Shape Classification using Random Matrices and Virtual Measurement Models*
14:00 – 14:30	**Alexander Scheible, Thomas Griebel, Martin Herrmann, Charlotte Hermann, Michael Buchholz** *Track Classification for Random Finite Set Based Multi-Sensor Multi-Object Tracking*
14:30 – 15:00	**Philipp Berthold, Bianca Forkel, Martin Michaelis, Hans-Joachim Wuensche** *Joint Multi Extended Object Tracking by Optimizing the Global Coherence*

Session 5b: *Machine learning for data fusion I*

Chair: TBD

13:30 – 14:00	**Thomas Henderson** *Geolocating and Grading Crosswalks using Deep Learning*
14:00 – 14:30	**Yan Wang** *Localization and classification of partial occluded deformable objects with application on the downs and feathers*
14:30 – 15:00	**Joshua Gehlen, Felix Govaers, Martin Ulmke, André Fischer** *Architecture and design of AI based air situation assessment*

15:00 – 15:30	Coffee

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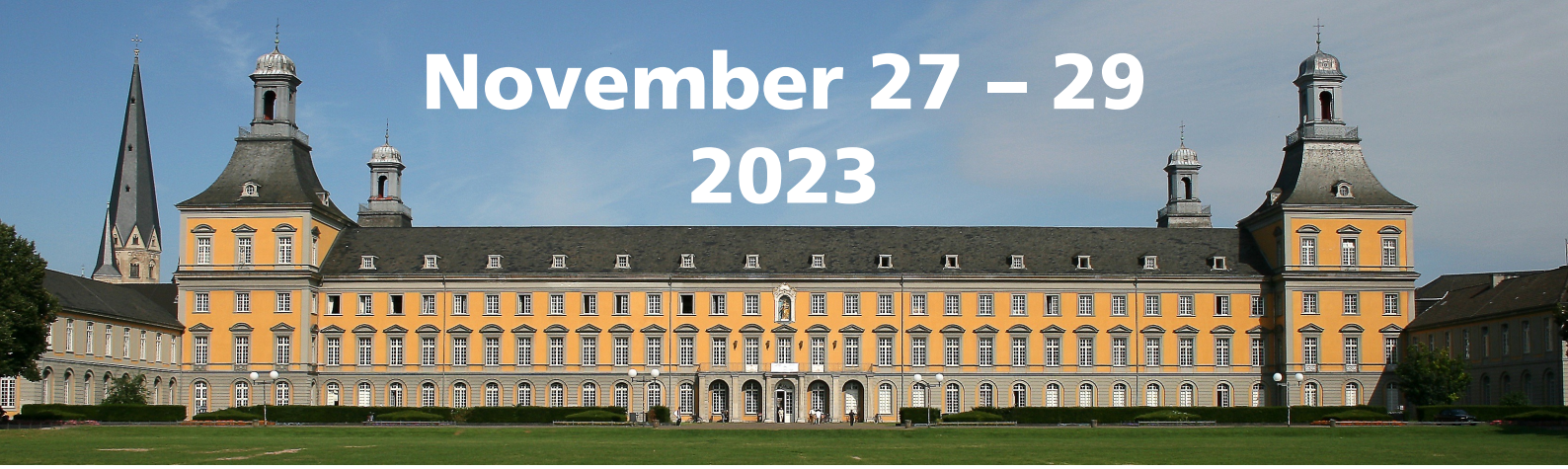

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Session 6a: *Data fusion with range / direction of arrival measurements*

Chair: TBD

15:30 – 16:00	**Alberto Ortiz** *UWB Nodes Auto-Calibration through a Bias-Aware Two-Stage Methodology*
16:00 – 16:30	**Jannik Springer, Marc Oispuu, Wolfgang Koch, Peter Knott** *Joint Emitter Localization and Calibration for Moving Array Sensors*
16:30 – 17:00	**Macarena Varela, Wulf-Dieter Wirth, Marc Oispuu** *Wideband Direction-Of-Arrival Estimation Using Microphone-Arrays*

Session 6b: *Machine learning for data fusion II*

Chair: TBD

15:30 – 16:00	**Elizabeth P. de Benedictis, Florian Drews, Florian Faion, Claudius Glaeser** *Improving object detection for truck-related classes by removing label inconsistencies*
16:00 – 16:30	**Markus Walker, Uwe Hanebeck, Marcel Reith-Braun** *Identifying Trust Regions of Bayesian Neural Networks*
16:30 – 17:00	**Robert Logiewa, Folker Hoffmann, Felix Govaers, Wolfgang Koch** *Dynamic Pursuit-Evasion Scenarios With a Varying Number of Pursuers Using Deep Sets*

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