



网络通信与安全紫金山实验室数理基础研究中心论坛 暨第62届东南大学复杂系统与网络科学研究中心论坛

The 62st Workshop of Research Center for Complex Systems and
Network Science of Southeast University(SEU)

Special Section from Technical University of Munich(TUM)

程序册

论坛资助：国家自然科学基金委、
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主办：东南大学复杂系统与网络科学研究中心
江苏省网络群体智能重点实验室 江苏国家应用数学中心 数学学院
复杂工程系统测量与控制教育部重点实验室 自动化学院
复杂网络应用与安全研究中心 网络空间安全学院
数理基础研究中心 网络通信与安全紫金山实验室

Program

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**Sponsors: ¹Complex System and Network Science Research Center of Southeast
University,**

²Key Lab of Network Swarm Intelligence of Jiangsu Province,

³School of Mathematics, Southeast University,

⁴School of Cyber Science and Engineering, Southeast University,

⁵School of Automation, Southeast University,

**Inviters: Simone Baldi (SEU & TUDelft), Wenwu Yu (SEU),
Junjie Jiao (TUM & EPFL), Di Liu (TUM & EPFL)**

4:30pm-6:30pm (Beijing), 9:30am-11:30am (Germany)

Friday, November 11, 2022

Zoom: 674 8045 8036 Passcode: 764394



Online Learning Control with Robust Performance guarantees



Prof. Sandra Hirche

Abstract:

The control design allowing complex systems to operate in unstructured only partially known and potentially changing environments is one of the great challenges in systems and control. Application domains include robotics in healthcare, autonomous surveillance and rescue, service, and logistics. Apart from adaptability, robust performance guarantees including safety represent critical concerns.

In this talk we will present recent results on learning-based control with performance and safety guarantees for highly uncertain systems. In order to achieve high sample efficiency as well as transparency of the system, we will consider a data-augmented model-based approach combining known dynamic models with Gaussian Processes. Epistemic uncertainty due to limited training data will explicitly taken into account in the control design in order to achieve robust behavior of the closed loop system. Online learning as well as realtime capabilities in the presence of resource constraints are further important aspects for which novel approaches will be presented.

Prof. Sandra Hirche holds the TUM Liesel Beckmann Distinguished Professorship and heads the Chair of Information-oriented Control in the Faculty of Electrical and Computer Engineering at Technical University of Munich (TUM), Germany (since 2013). She received the diploma engineer degree in Aeronautical and Aerospace Engineering in 2002 from the Technical University Berlin, Germany, and the Doctor of Engineering degree in Electrical and Computer Engineering in 2005 from the Technische Universität München, Munich, Germany. From 2005-2007 she has been a PostDoc Fellow of the Japanese Society for the Promotion of Science at the Fujita Laboratory at Tokyo Institute of Technology, Japan. Prior to her present appointment she has been an Associate Professor at TUM.

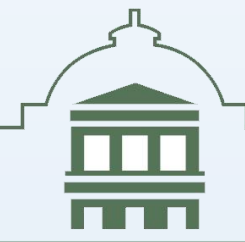
Her main research interests include learning, cooperative, and networked control with applications in human-robot interaction, multi-robot systems, and general robotics. She has published more than 200 papers in international journals, books and refereed conferences. She has received multiple awards such as the Rohde & Schwarz Award for her PhD thesis, the IFAC World Congress Best Poster Award in 2005 and – together with students – Best Paper Awards of IEEE Worldhaptics and IFAC Conference of Manoeuvring and Control of Marine Craft in 2009 and the Outstanding Student Paper Award of the IEEE Conference on Decision and Control 2018. In 2013 she has been awarded with an ERC Starting Grant on the “Control based on Human Models” and in 2019 with the ERC Consolidator Grant on “Safe data-driven control for human-centric systems”.

Prof. Sandra Hirche is Fellow of the IEEE and received the IEEE Control System Society Distinguished Member Award. She has served as IEEE Control System Society (CSS) Vice-President for Member Activities (2014/15), as Chair for Student Activities in the IEEE CSS (2009-2014), as Chair of the CSS Awards Subcommittee on “CDC Best Student-Paper Award” (2010-2014), and has been elected member of the Board of Governors of IEEE CSS (2010-2013). She has been Co-Chair of the IFAC TC 1.5 “Networked Control Systems” (2010-2017) and the Co-IPC for the 2020 IFAC World Congress.

November 11th, Friday, 2022
9:30am ~ 10:30am (Germany)
16:30pm ~ 17:30pm (Beijing)

Zoom Meeting: 674 8045 8036
Passcode: 764394

<https://tum-conf.zoom.us/j/67480458036>



Search, Identification and Collection of Marine Litter with Autonomous Robots



Stefan Sosnowski

Abstract:

SEACLEAR — short for SEArch, identificAtion and Collection of marine Litter with Autonomous Robots — is a Horizon 2020 funded EU project aiming at creating a sustainable approach to the increasing problem of ocean pollution. As part of this project, our international mixed research-industry team is developing a collaborative robotic solution consisting of unmanned underwater, surface and aerial vehicles, that autonomously searches and collects waste from the seabed. This will result in new applications and methods in the mapping, automated classification and collection of marine debris.

In this talk, we will present an overview of the system and focus specifically at the control challenges that arise from operating under water. Uncertainties and variability in operation conditions originating from different demonstration sites require adaptability and robust performance of the closed-loop system. In order to achieve this, we will highlight how a data-augmented model-based control approach can combine known dynamic models of underwater systems with Gaussian processes to capture the unmodeled residuals of the underlying full system dynamics through online learning. Furthermore, we will combine control strategies for the different phases of an exemplary pick-up task from the seabed and provide an outlook on novel approaches to take into account the inherent nonlinearities of (underwater) systems.

Stefan Sosnowski is a lecturer at the Technical University of Munich with the Chair of Information-oriented Control, where he leads the underwater robotics group since 2014. He received the Dipl.-Ing. degree and Dr.-Ing. degree (PhD) summa cum laude in electrical engineering from the Technical University of Munich (TUM), Munich, Germany, in 2007 and 2014, respectively. He has authored and coauthored more than 40 journal papers, refereed conference papers, and book chapters on bioinspired and underwater robotics as well as nonlinear control, distributed dynamical systems and multi-agent systems. He received awards such as the Best Paper Award of the IFAC Conference of Manoeuvring and Control of Marine Craft in 2009, Finalist Best Paper Award of the International Conference on Social Robotics in 2010, the most innovative video award of the IJCAI-2009 AI Video Competition and Finalist Best Video Award of the International Conference on Robotics and Automation in 2008.

**November 11th, Friday, 2022
10:30am ~ 11:30am (Germany)
17:30pm ~ 18:30pm (Beijing)**

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