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# System Design, Planning and Control for Autonomous Driving



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### ABSTRACT:

The system design of an autonomous vehicle encompasses numerous different interconnected sensing and control algorithms that can be devised in several ways, and the system has to be extensively tested and verified before employed on roads. This talk gives an overview of the system design, implementation, and testing of the control stack in autonomous vehicles, based on our research over the last decade on guidance and control. We describe a modular approach, which allows to exploit different timescales, apply most suitable algorithm to each subproblem, and update the system without full redesign. However, a modular approach needs integration between different control layers. We discuss some of the key methods we have developed for supporting autonomous driving in this modular architecture and show some of our validations in experimental testbeds.

### BIOGRAPHY:

Karl Berntorp received the M.Sc. degree in engineering physics and the Ph.D. degree in automatic control from Lund University, Lund, Sweden, in 2009 and 2014, respectively. In 2008, he was a Visiting Researcher with Daimler AG, Sindelfingen, Germany. Since 2014, he has been with Mitsubishi Electric Research Laboratories, Cambridge, MA, USA. His work includes the design and implementation of estimation, constrained control, motion planning, and learning algorithms. He is the author of more than 75 papers in journals and conferences and has more than ten granted patents. His research interests include statistical signal processing, Bayesian inference, sensor fusion, and optimization-based control, with applications to automotive, transportation, navigation, satellite-based positioning, and communication systems. Dr. Berntorp is a Senior Member of IEEE and an Associate Editor and member of the IEEE Technology Conferences Editorial Board.