

**ACC2015 Workshop:**  
**Stochastic Model Predictive Control**  
Tuesday, June 30, 2015 (8:30am -5:30pm)

**Organizers:** Stefan Streif (Technische Universität Ilmenau, Germany) and Ali Mesbah (UC Berkeley, USA)

**Additional Speakers:** Mark Cannon (University of Oxford, UK), Frauke Oldewurtel (UC Berkeley, USA), Roberto Tempo (CNR-IEIT, Politecnico di Torino, Italy)

**Overview:**

Stochastic MPC is an emerging stochastic optimal control approach that takes into account statistical descriptions of uncertainties, which can often be readily obtained during model development. Stochastic MPC approaches allow for systematically seeking tradeoffs between robustness (i.e. probabilistic constraint satisfaction) and control performance. In this workshop, several approaches to (linear and nonlinear) SMPC will be covered, including randomized and sampling based approaches, polynomial chaos, adaptive constraint tightening, and methods based on polytopic tubes. Different approaches will be demonstrated using various examples including energy building systems, wind turbine control, ecosystem-based management, manufacturing systems, and chemical and pharmaceutical processes.

**Outline:**

The workshop is designed for researchers with a basic knowledge of MPC who intend to get an overview of the main concepts, (potentially) promising approaches, and real-world applications of stochastic MPC. The first part of the workshop will provide a concise overview and introduction to stochastic (linear and nonlinear) MPC, and will highlight differences to deterministic robust MPC approaches. In the second part, a selection of well-established as well as promising new approaches to stochastic MPC will be presented. In the different talks, an introduction to each method as well as details and examples of specific real-life application of stochastic MPC will be given. The different pros and cons of the presented approaches will be actively discussed in the workshop, and open research problems will be pointed out. The outline of the workshop is as follows:

- Motivation for stochastic MPC (Ali Mesbah)
- Approaches to deal with chance constraints (Stefan Streif)
- Stochastic MPC with adaptive constraint tightening and applications to energy systems (Frauke Oldewurtel)
- Randomized techniques for analysis and design of uncertain systems, with applications to stochastic MPC (Roberto Tempo)
- Polynomial Chaos approach to stochastic MPC, with applications to chemical and pharmaceutical manufacturing processes (Ali Mesbah and Stefan Streif)
- Polytopic tubes and probabilistic set inclusions (Mark Cannon)

For additional details, please visit: [http://www.tu-ilmenau.de/at/events/SMPC\\_workshop\\_ACC15/](http://www.tu-ilmenau.de/at/events/SMPC_workshop_ACC15/)