

Invitation: BIMoS Days January 2023

The Berlin International Graduate School in Model and Simulation based Research cordially invites you and your research group to the next BIMoS Days:

Berlin International Graduate
School in Model and
Simulation based Research
(BIMoS)

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Monday, 9th January at 2 pm

Topic: “Decision making in optimal control of complex dynamical systems”
by
Prof. Falk M. Hante,
Humboldt-Universität zu Berlin
Lehrstuhl für Angewandte Mathematik mit Schwerpunkt
Optimierung komplexer Systeme

AND

Monday, 16th January at 2 pm

Topic: “Numerical Methods in Control and Optimization of Dynamical Systems”
by
Jun. Prof. Jan Heiland
Max-Planck-Institut für
Dynamik komplexer technischer Systeme, Magdeburg
Computational Methods in Systems and Control Theory

[Zoom-link for the online-events and abstracts can be found on the next pages.](#)

Zoom-Meeting link:

<https://zoom.us/j/91335069503?pwd=ejgyeS9KeWNqZnJXWnY2cXFwKytMZz09>

Meeting-ID: 913 3506 9503
Kenncode: 826193

BIMoS Days are devoted to a particular mathematical methodology and its applications. They typically consist of several talks by the research group.

Abstracts:

Title

**“Decision making in optimal control of complex dynamical systems”
by Prof. Falk M. Hante**

Date: Monday, 9th January at 2 pm

Abstract:

In the age of globalization and digitalization the simulation-based optimization of systems with real and virtually linked components, with elements of discrete logic and adaptive models with hierarchies up to partial differential equations gain increasing importance. These challenges occur for instance in the operation of sustainable energy networks, in coordinating autonomous traffic or in the control of cell dynamics in human neural networks. A broad class of such heterogeneous systems can be considered within the framework of mixed-integer optimal control problems. Decomposition approaches combining mixed-integer programming techniques and methods from optimal control can be used to solve such problems efficiently. The main ideas of the underlying theory and examples will be presented.

Title: “Numerical Methods in Control and Optimization of Dynamical Systems” by Jun. Prof. Jan Heiland

Date: Monday, 16th January at 2 pm

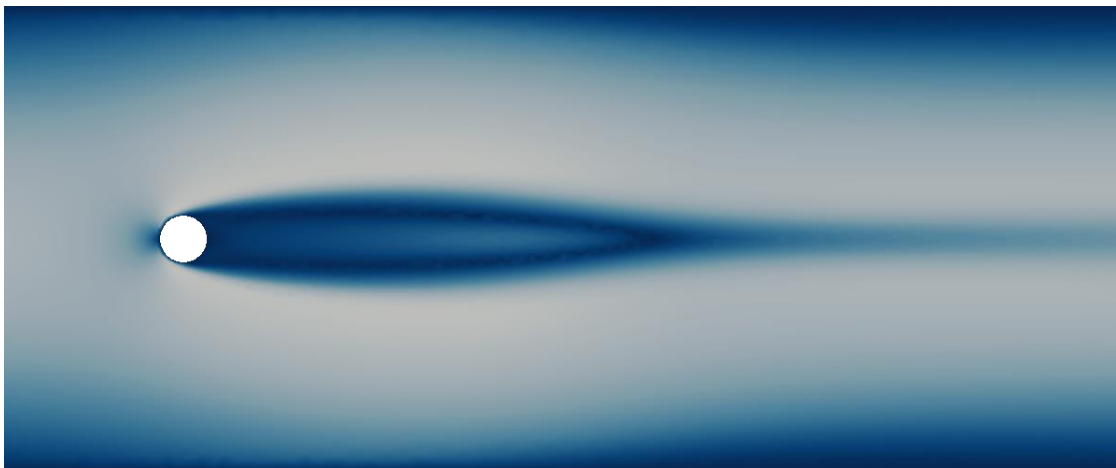
Abstract:

The underlying topic of this lecture is the development, analysis, and implementation of numerical algorithms for robust control and stabilization of (partial) differential equations. A particular focus lies on large-scale descriptor systems that play a role in the control of flows.

Within the vast research field of numerical methods for control systems, we pursue the so-called H-infinity controller design that is designed to work even if the model is faulty.

After an introduction into the basic notions and principles of dynamical systems and control, I will address the challenges that come with high-dimensional (or even infinite-dimensional) nonlinear systems and show some recent theoretical and numerical approaches to their solution. The findings and concepts are illustrated by applications to the Navier-Stokes model equations and to a real-world triple pendulum.

If time suffices, I will address data-driven approaches that use data and possibly techniques from Machine Learning to enhance the models in terms of accuracy or faster evaluation times.



Steady but unstable state of a flow that – without control – will not persist over time



The transition towards the natural periodic regime