

IWR Colloquium

Winter Semester 2024 / 2025

January 29, 2025 • 16:15

Mathematikon • Conference Room / 5th Floor

Speaker:

Prof. Stefan Volkwein

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Title:

“Adjoint-based calibration of nonlinear stochastic differential equations”

Abstract:

To study the nonlinear properties of complex natural phenomena, the evolution of the quantity of interest can be often represented by systems of coupled nonlinear stochastic differential equations (SDEs). These SDEs typically contain several parameters which have to be chosen carefully to match the experimental data and to validate the effectiveness of the model. In the present paper the calibration of these parameters is described by nonlinear SDE-constrained optimization problems. In the optimize-before-discretize setting a rigorous analysis is carried out to ensure the existence of optimal solutions and to derive necessary first-order optimality conditions. For the numerical solution a Monte-Carlo method is applied using parallelization strategies to compensate for the high computational time. In the numerical examples an Ornstein-Uhlenbeck and a stochastic Prandtl-Tomlinson bath model are considered.

This is a joint work with Jan Bartsch and Robert Denk. The associated paper will appear in the Journal Applied Mathematics & Optimization.

Website Prof. Volkwein:

www.mathematik.uni-konstanz.de/en/volkwein/members/stefan-volkwein/

Website IWR Colloquium:

www.iwr.uni-heidelberg.de/events/iwr-colloquium