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Interdisciplinary Center for Scientific Computing

UNIVERSITÄT HEIDELBERG
ZUKUNFT SEIT 1386

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Adjoint-based Calibration of Nonlinear Stochastic Differential Equations

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.

Also streamed via Zoom

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