# System theoretic model reduction Recent advances and new perspectives

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**Abstract**

In this talk, we discuss system theoretic model order reduction (MOR) techniques for large-scale (nonlinear) control systems. In particular, we consider recent advances for balancing-based and $\mathcal{H}_2$-optimal MOR techniques in the context of bilinear control systems. As is well-known, this special class of control systems is closely related to linear stochastic differential equations (SDEs) and therefore allows to model, e.g., the Fokker-Planck equation. By means of the latter example, we show the performance of different reduction methods. We further report on a recently introduced interpolation-based approach for more general nonlinear systems and discuss its applicability to some common nonlinear PDEs such as Burgers' equation and the FitzHugh-Nagumo system. Finally, we present possible topics of ongoing and future research such as, e.g., model reduction for open quantum systems or the bidomain equations as well as optimal control of large-scale SDEs.