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Data-driven Approximation of the Koopman Generator

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In the context of Koopman operator based analysis of dynamical systems, the generator of the Koopman semigroup is of central importance. Models for the Koopman generator can be used, among others, for system identification, coarse graining, and control of the system at hand.

Bounds for the approximation and estimation error in this context are paramount to a better understanding of the method. In this talk, I will first discuss recent results on estimating the finite-data estimation error for Koopman generator models based on ergodic simulations. I will then present recent advances allowing for the approximation of the generator on tensor-structured subspaces by means of low-rank representations. This approach allows modelers to employ high-dimensional approximation spaces, while controlling the computational effort at the same time. Model applications to molecular dynamics simulation datasets will conclude the talk.

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