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# On the approximability of Koopman-based operator Lyapunov equations

Computing the Lyapunov function of a system plays a crucial role in optimal feedback control, for example when the policy iteration is used. This talk will focus on the Lyapunov function of a nonlinear autonomous finite-dimensional dynamical system which will be rewritten as an infinite-dimensional linear system using the Koopman operator. Since this infinite-dimensional system has the structure of a weak- $*$ -continuous semigroup in a specially weighted  $L_p$ -space one can establish a connection between the solution of an operator Lyapunov equation and the desired Lyapunov function. It will be shown that the solution to this operator equation attains a rapid eigenvalue decay, which justifies finite rank approximations with numerical methods. The usefulness for numerical computations will also be demonstrated with two short examples.

This is joint work with Bernhard Höveler (TU Berlin).