



Numerical Analysis Seminar

A New Framework for Solving Dynamical Systems

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Abstract

Dynamical systems have a wide range of applications in mechanics, electrical engineering, chemistry, and so on. In this work, we propose the adaptive spectral Koopman (ASK) method to solve nonlinear autonomous dynamical systems. This novel numerical method leverages the spectral-collocation (i.e., pseudo-spectral) method and properties of the Koopman operator to obtain the solution of a dynamical system. Specifically, this solution is represented as a linear combination of the multiplication of Koopman operator's eigenfunctions and eigenvalues, and these eigenpairs are approximated using the spectral method. Unlike conventional time evolution algorithms such as Euler's scheme and the Runge-Kutta scheme, ASK is mesh-free, and hence is more flexible when evaluating the solution. Numerical experiments demonstrate high accuracy of ASK for solving ordinary and partial differential equations. We will also show ASK's connection with optimization algorithms based on gradient flow formulation.

Date:	November 30, 2022 (Wednesday)
Time:	10:00 - 11:00am
Venue:	ZOOM: https://hku.zoom.us/j/ Meeting ID: 913 6532 3891 Password: 310656

All are welcome