THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Computational Science Seminar

Data-driven operator inference for learning physics-based low-dimensional models

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Abstract

This talk presents a non-intrusive data-driven approach for learning low-dimensional models for systems governed by time-dependent partial differential equations. Projection-based model reduction constructs the operators of a reduced model by projecting the equations of a full high-fidelity model onto a reduced space. Traditionally, this projection is intrusive, which means that the full-model operators are required explicitly in assembled form or implicitly through a routine that returns the action of the operators on a given vector; however, in many situations these full-model operators may be inaccessible. Our non-intrusive operator inference approach solves an optimization problem to infer approximations of the reduced operators directly from input and state data, without requiring the full model itself. The inferred operators are the solution of a least-squares problem and converge, with sufficient state trajectory data, in the Frobenius norm to the reduced operators that would be obtained via an intrusive projection of the full-model operators. Thus, while the approach is data-driven, it also embeds the physical constraints associated with the underlying system governing equations. Joint work with Benjamin Peherstorfer (U. Wisconsin Madison).

Date:	May 11, 2018 (Friday)
Time:	11:00am – 12:00noon
Venue:	Room 210, Run Run Shaw Bldg., HKU

All are welcome