



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

PHD STUDENT SEMINAR

**Enhancing Future Prediction of Linear and
Nonlinear Reduced-Order Models for
Transport-Dominated Problems Using Lagrangian Data**

By

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Abstract

Designing effective reduced-order models (ROMs) for parametrized transport-dominated problems remains challenging because of the well-known Kolmogorov barrier. Autoencoder-based nonlinear ROMs have been developed to improve the compression ability for such systems. However, despite their stronger compression ability, autoencoder-based ROMs constructed in the Eulerian frame may fail to accurately predict future solutions, due to the poor coherence between historical and future solutions in the Eulerian frame. In contrast, we show that representing transport-dominated dynamics in the Lagrangian frame can lead to a significantly faster decay of the Kolmogorov n -width and improve coherence between historical and future solutions. Building on these insights, we develop two non-intrusive ROMs leveraging Lagrangian data: a Lagrangian autoencoder-based ROM and a Lagrangian parametric dynamic mode decomposition. Numerical experiments demonstrate that these Lagrangian ROMs achieve more accurate and stable future predictions than their Eulerian counterparts.

Date : 14 May 2026 (Thursday)

Time : 11:00am

Zoom Meeting : <https://hkust.zoom.us/j/94566932667> (Passcode: 286097)

All are Welcome!