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# Inverse Problems Seminar

*Automated discovery of low-dimensional state variables from high-dimensional observation data*

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## Abstract

Physical laws can be described as relationships between state variables that give a complete and non-redundant description of the relevant dynamical systems. Most data-driven methods for modeling physical phenomena assume that observed data streams already correspond to given low-dimensional state variables. However, despite the prevalence of computing power and AI, the process of identifying a set of state variables themselves from high-dimensional observation data has resisted automation. We propose a framework for determining how many state variables an observed system is likely to have, and what these variables might be, directly from video streams. We also demonstrate the effectiveness of this approach using video recordings of a variety of dynamical systems, ranging from elastic double pendulum to fire flames. Without prior knowledge of the underlying physics, our algorithm discovers candidate sets of state variables and produces stable long-term predictions of the system dynamics.

Date: December 1, 2022 (Thursday)  
Time: 9:00am – 10:00am (Hong Kong Time)  
ZOOM link: <https://cuhk.zoom.us/j/98241093146>  
Meeting ID: 982 4109 3146

*All are Welcome*