Statistics Seminar

Department of Mathematics and Statistics

DATE:	Thursday, September 7, 2023
TIME:	1:15pm – 2:15pm
LOCATION:	WH 100E
SPEAKER:	Jia Zhao, Binghamton University
TITLE:	Discovery of Governing Equations with Recursive Deep Neural Networks

Abstract

Model discovery based on existing data has been one of the major focuses of mathematical modelers for decades. Despite tremendous achievements of model identification from adequate data, how to unravel the models from limited data is less resolved. In this talk, I will focus on the model discovery problem when the data is not efficiently sampled. This is common due to limited experimental accessibility and labor/resource constraints. Specifically, we introduce a recursive deep neural network (RDNN) for data-driven model discovery. By embedding the known physics knowledge, this recursive approach can retrieve the governing equation in a simple and efficient manner, and it can significantly improve the approximation accuracy by increasing the recursive stages. In particular, our proposed approach shows superior power when the existing data are sampled with a large time lag, from which the traditional approach might not be able to recover the model well. Several widely used examples of dynamical systems are used to benchmark this newly proposed recursive approach. Numerical comparisons confirm the effectiveness of this recursive neural network for model discovery.