



THE UNIVERSITY OF  
**CHICAGO**

THE COMMITTEE ON  
COMPUTATIONAL AND  
APPLIED MATHEMATICS

---

## COLLOQUIUM

---

HAIZHAO YANG

Departments of Mathematics and Computer Science (Affiliated), The University of  
Maryland Institute for Advanced Computer Studies  
University of Maryland

### **Finite Expression Method: A Symbolic Approach for Scientific Machine Learning**

**THURSDAY, May 23, 2024 at 4:00PM**  
Jones 303, 5747 S. Ellis Ave. Chicago, IL 60637

#### ABSTRACT

Machine learning has revolutionized computational science and engineering with impressive breakthroughs, e.g., making the efficient solution of high-dimensional computational tasks feasible and advancing domain knowledge via scientific data mining. This leads to an emerging field called scientific machine learning. In this talk, we introduce a new method for a symbolic approach to solving scientific machine learning problems. This method seeks interpretable learning outcomes via combinatorial optimization in the space of functions with finitely many analytic expressions and, hence, this methodology is named the finite expression method (FEX). It is proved in approximation theory that FEX can avoid the curse of dimensionality in discovering high-dimensional complex systems. As a proof of concept, a deep reinforcement learning method is proposed to implement FEX for learning the solution of high-dimensional PDEs and learning the governing equations of raw data.

---

#### Organizers:

Jeremy Hoskins, Department of Statistics (CAMI), [jeremyhoskins@statistics.uchicago.edu](mailto:jeremyhoskins@statistics.uchicago.edu) & Yuehaw Khoo,  
Department of Statistics (CAMI), [ykhoo@galton.uchicago.edu](mailto:ykhoo@galton.uchicago.edu)  
CAM Colloquium URL: <https://cam.uchicago.edu/events/cam-colloquium/>

If you wish to subscribe to our email list, please visit the following website:  
[https://lists.uchicago.edu/web/subscribe/cam\\_colloquium/](https://lists.uchicago.edu/web/subscribe/cam_colloquium/).