

CCSU
DEPARTMENT OF MATHEMATICAL SCIENCES
COLLOQUIUM

Friday, October 30
3:00 – 4:00 PM
Maria Sanford, Room 101

**LEARNING THE EQUATIONS BEHIND THE
DATA: AN INTRODUCTION TO SINDY**

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Abstract: Scientists can now measure changing systems in remarkable detail, from mechanical motion and fluid flows to populations and ecosystems. Yet turning those measurements into interpretable differential equations remains challenging. Flexible machine-learning models can predict behavior without yielding explicit governing equations, while physics-informed approaches typically incorporate equations specified in advance. Can we instead learn the equations themselves from data?

This talk introduces **Sparse Identification of Nonlinear Dynamics (SINDy)**, which approaches equation discovery as a variable-selection problem. We estimate rates of change, construct a library of candidate functions, and use sparse regression to identify a compact model. Examples involving population growth and the chaotic Lorenz system will illustrate both the promise of this approach and its sensitivity to noise, library choice, and observed variables. We will also discuss weak formulations, which reduce reliance on numerical differentiation, and illustrate questions arising in a recent interdisciplinary research project on American shad migration.

The talk is intended for students and faculty interested in data driven mathematical modeling.

To join us online use the following link: <https://ccsu.webex.com/meet/gotcheyv>

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<http://mathcolloquium.sites.ccsu.edu/>