DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS

The 2024 DCAMM Annual Seminar Speaker

Steven L. Brunton

Professor,
University of Washington
USA

gives the following lecture at

Aarhus University

Dept. of Mechanical and Production Engineering,
Room 139, Building 5008,
Helsingforsgade 8, 8200 Aarhus N

Machine Learning for Scientific Discovery, with Examples in Fluid Mechanics

Wednesday, September 25, at 12:30

There will be an open discussion after the lecture
at 13:30
(Refreshments are served)

This lecture aims at popularizing mechanical science to a broad audience of interested students and staff as well as engineers working in industry

The Danish Centre for Applied Mathematics and Mechanics, DCAMM, is a framework for internationally oriented scientific collaboration between staff members at a number of departments at the Technical University of Denmark, Aalborg University, Aarhus University and University of Southern Denmark. The "DCAMM Annual Seminar Speaker" is an initiative created to disseminate mechanics to a broader audience.
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BREAKING NEW GROUND AALBORG UNIVERSITY

AARHUS UNIVERSITY

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Machine Learning for Scientific Discovery, with Examples in Fluid Mechanics

Abstract

This work will discuss several key challenges and opportunities in the use of machine learning for nonlinear system identification. In particular, I will describe how machine learning may be used to develop accurate and efficient nonlinear dynamical systems models for complex natural and engineered systems. I will emphasize the need for interpretable and generalizable data-driven models, such as the sparse identification of nonlinear dynamics (SINDy) algorithm, which identifies a minimal dynamical system model that balances model complexity with accuracy, avoiding overfitting. I will also introduce several key benchmark problems in dynamical systems and fluid dynamics that provide a diversity of metrics to assess modern system identification techniques. Because fluid dynamics is central to transportation, health, and defense systems, we will emphasize the importance of machine learning solutions that are interpretable, explainable, generalizable, and that respect known physics.

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