



SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS990

27 September 2023

A DCAMM seminar No. 770 will be presented by

Professor Dr. Laura De Lorenzis
Dept. of Mechanical and Processing Engineering
ETH Zürich, Switzerland

The title of the lecture is

EUCLID: Efficient Unsupervised Constitutive Law Identification and Discovery

Abstract:

We propose a new approach for data-driven automated discovery of constitutive laws in continuum mechanics. The approach is unsupervised, i.e., it requires no stress data but only displacement and global force data, which can be realistically obtained from mechanical testing and digital image or volume correlation techniques; it can deliver either interpretable models, i.e., models that are embodied by parsimonious mathematical expressions, or black-box models encoded in artificial neural networks; it is one-shot, i.e., discovery only needs one experiment in principle - but can use more if available. The machine learning tool which enables discovery is sparse regression, leading to the automatic selection of a few relevant entries from a potentially very large model space. After discussing the basics of the methodology, the talk illustrates its first applications to hyperelasticity, plasticity and viscoelasticity, and its latest extension to generalized standard materials. The latter allows the discovery of the category of material behavior (elastic, viscous, plastic or any combinations thereof) along with discovery and calibration of the specific material model within this category, while guaranteeing by construction material stability and thermodynamic consistency.

DATE:	Wednesday, 11 October 2023
TIME:	10:00 – 10:45
PLACE:	Building 414, Room 061E DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Niels Leergaard Pedersen

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