



UNIVERSITY OF
GOTHENBURG



EUROPEAN
MECHANICS
SOCIETY

DATA-DRIVEN MECHANICS AND PHYSICS OF MATERIALS

EUROMECH COLLOQUIUM 656

Colloquium programme



Organizers

Mohsen Mirkhalaf - Chairman, University of Gothenburg, Sweden

Iuri Rocha - Chairman, Delft University of Technology, The Netherlands

Petter Uvdal - Organizing assistant, University of Gothenburg, Sweden

Joep Storm - Organizing assistant, Delft University of Technology, The Netherlands



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Scientific committee

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Francisco Pires - University of Porto, Portugal

Fodil Meraghni - Ecole Nationale Supérieure d'Arts et Métiers, France

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Miguel Bessa - Brown University, United States

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Surya R. Kalidindi - Georgia Institute of Technology, United States

WaiChing Sun - Columbia University, United States

Wei Tan - Queen Mary University of London, United Kingdom

Wednesday, May 21

08:30 - 09:00	Registration
09:00 - 09:05	Opening and welcome
09:05 - 10:05	Plenary Talk Digital twins for mechanics of materials applications Surya R. Kalidindi
10:05 - 10:30	Coffee break
10:30 - 12:30	Technical Session Probabilistic Machine Learning Chair: Fodil Meraghni
	Machine learning-based uncertainty quantification of failure predictions Runze Li, Mário Miranda, Silvestre T. Pinho
	Uncertainty Quantification in Multiscale Modeling of Composite Materials Using Physically Recurrent Neural Networks N. Kovacs, I. Rocha, F. van der Meer, C. Furtado, P. Camanho
	A Data-Driven Computational Workflow For The Growth Of Porous Anodized Aluminum Oxide: Integration Of Surrogate Modeling And Uncertainty Quantification Tamadur Albaraghteh, Christian Feiler, Mikhail Zheludkevich, Daniel Höche
	Exploring Flow Matching for Bifurcation: A Preliminary Framework for Buckling in Mechanical Metamaterials Fleur Hendriks, Vlado Menkovski, Martin Doškár, Marc G.D. Geers, Ondřej Rokoš
12:30 - 14:00	Lunch break
14:00 - 16:00	Technical Session Surrogate Modelling Chair: Magnus Ekh
	Graph Neural Networks for Efficient Prediction of Mechanical Response in Composite Structures with Models using Unstructured Meshes Luca Patrignani, Silvestre T Pinho
	A Machine Learning-Based Constitutive Model Incorporating History-Dependent Features for Cyclic Loading Scenarios Ronak Shoghi, Alexander Hartmaier
	Accelerating Multiscale Simulations using Uncertainty-Driven Phase-Field Mixtures of Constitutive Models J. Storm, W. Sun, I. B. C. M. Rocha, F. P. van der Meer
	A comparison between transformers and recurrent neural networks for non-linear elastoplastic behavior in 3D micro-mechanical modeling Petter Uvdal, Mohsen Mirkhalaf

Thursday, May 22

09:00 - 09:05	Opening
09:05 - 10:05	Plenary Talk How deep neural networks learn — a dynamical-systems perspective Bernhard Mehlig
10:05 - 10:30	Coffee break
10:30 - 12:30	Technical Session Learning from Physics and Data (part I) Chair: Marina Alves Maia
	Physics informed holomorphic neural networks for fracture mechanics Matteo Calafà, Henrik Myhre Jensen, Allan P. Engsig-Karup, Tito Andriollo
	Efficient Surrogate Modelling of Fully Coupled Thermomechanical Behavior of Composite Materials M. El Fallaki Idrissi, F. Meraghni, G. Chatzigeorgiou, F. Chinesta
	Unsupervised learning of constitutive models with neural networks Antoine Benady , Emmanuel Baranger, Ludovic Chamoin, Clément Jailin, Laura de Lorenzis
	Physics-Enforced Neural Network Modeling of History-Dependent Materials Knut Andreas Meyer
12:30 - 14:00	Lunch break
14:00 - 14:45	Keynote Talk Modeling corrosion-fatigue in bcc metals with unified mechanics theory Cemal Basaran
14:45 - 16:15	Technical Session Image-Based Deep-Learning Models and Tools Chair: Tito Andriollo
	Deeplay: Enhancing PyTorch with Customizable and Reusable Neural Networks Alex Lech , Mirja Granfors, Benjamin Midtvedt, Jesús Pineda, Harshith Bachimanchi, Carlo Manzo, Giovanni Volpe
	DeepTrack2: High-Quality Microscopy Simulations for Deep Learning Mirja Granfors , Alex Lech, Benjamin Midtvedt, Jesús Pineda, Harshith Bachimanchi, Carlo Manzo, Giovanni Volpe
	Physics-informed neural networks of moisture diffusion in bio-composites Zhe Han , Mohsen Mirkhalaf
19:30 - 23:30	Conference Dinner Restaurant ONE Stora Badhusgatan 26

Friday, May 23

09:30 - 09:35	Opening
09:35 - 10:35	Plenary Talk Interpretable machine learning for solid mechanics: from representation to forecast and back Steve WaiChing Sun
10:35 - 11:00	Coffee break
11:00 - 12:30	Technical Session Learning from Physics and Data (part II) Chair: Mahmoud Mousavi
	Multiscale Thermodynamics-Informed Neural Networks (MuTINN) for Nonlinear Prediction of Recycled Composite Behavior S. E. Sekkal, M. El Fallaki Idrissi, F. Meraghni , G. Chatzigeorgiou, F. Chinesta
	Cycle domain plasticity modeling using machine learning Nasrin Talebi, Magnus Ekh, Knut Andreas Meyer
	Exploring the latent space of Physically Recurrent Neural Networks in the low-data regime M.A. Maia, A.M.C.M. van Gils, I.B.C.M. Rocha, F.P. van der Meer
12:30 - 14:00	Lunch break
14:00 - 16:00	Technical Session Machine-Learning-Assisted Material Design and Manufacturing Chair: Knut Andreas Meyer
	Reinforcement Learning for Optimizing 3D Printing Paths R. Schmeitz, R.J.M. Wolfs, J.J.C. Remmers
	A methodology to estimate the fiber tow position during the fiber placement manufacturing processes of FRP laminates to homogenize the laminate's permeability I.R. Cózar, G. Broggi, C. Broggi, B. Caglar
	Inverse design of nonlinear shell metamaterials via diffusion language models Li Zheng, Siddhant Kumar, Dennis M. Kochmann
	Machine learning accelerated design of architected materials for tailored mechanics Sukheon Kang, Hyunbin Moon, Mahmoud Mousavi, Seunghwa Ryu
16:00 - 16:15	Closing and Acknowledgements