

Second Workshop on Physics Enhancing Machine Learning in Applied Mechanics

20 November 2023

09:00 Registration and coffee

09:30 Welcome on behalf of the IOP Applied Mechanics group and structure of the day
Dr Alice Cicirello, University of Cambridge, UK

09:40 A brief introduction to Physics Enhancing Machine Learning in solid mechanics
Dr Alice Cicirello, University of Cambridge, UK

SESSION I

10:00 Keynote 1: Physics Enhanced Machine Learning for dynamics: at the nexus of data and models
Professor Eleni Chatzi, ETH, Switzerland

11:00 Coffee Break

11:30 Keynote 2 (remote): Physics-guided interpretable data-driven simulations
Dr Youngsoo Choi, Lawrence Livermore National Laboratory, USA

12:30 Lunch Break

SESSION II – CONTRIBUTED TALKS

13:30 Differentiable programming for mesh-free fluid control
Roussel Desmond Nzoyem, University of Bristol, UK

13:50 A frame-invariant physically recurrent neural network for microscale analysis of rate and path-dependent heterogeneous materials
Ms. Marina Maia, F P Van der Meer and I B C M Rocha, TU Delft, The Netherlands

14:10 A frame-invariant physically recurrent neural network for microscale analysis of rate and path-dependent heterogeneous materials
Mr Andreas Ioakim¹, Szymon Gres², Michael Döhler³, Luke J. Prendergast¹, and Eleni Chatzi²
¹University of Nottingham, UK ²ETH Zürich, Switzerland, ³Univ. Gustave Eiffel, France

14:30 Coffee Break

15:00 Normalising Flows and Nonlinear Normal Modes
Lawrence Bull¹, Nikolaos Dervilis², Tina Dardeno², and Keith Worden²
¹University of Cambridge, UK, ²University of Sheffield, UK

15:20 Gaussian Process Port-Hamiltonian Systems
Thomas Beckers, Vanderbilt University, USA

15:40 Integrating Physics in Graph Neural Networks for Interaction Modeling
Vinay Sharma, Keivan Faghieh Niresi and Olga Fink, EPFL, Switzerland

16:00 Tea Break

SESSION III: TALKS FROM INDUSTRIES AND RESEARCH CENTRES

- 16:30 Generative AI supporting preliminary engineering design
Babu Shiva, Rolls-Royce, UK
- 17:00 An Industrial Perspective to Machine Learning and Physics for Simulation and Digital Twi
Atak Onur, Siemens, UK
- 17:30 Physics - informed machine learning: a critique towards robust generalization and interpretability
Zack Xuereb Conti, The Alan Turing Institute, UK
- 18:00 **Drinks reception sponsored by DCE and Siemens**