SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS1005 26 February 2025

A DCAMM seminar No. 782 will be presented by

Scientist Ricardo Lebensohn
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The title of the lecture is

Fast Fourier Transform (FFT)-based modelling of microstructure/property relationships of polycrystalline materials

Abstract:

Crystal plasticity (CP) models are extensively used by the Mechanics of Materials community to obtain microstructure/property relationships of polycrystalline materials. FFT-based methods, originally proposed by Moulinec and Suquet for composites [1] and extended to polycrystals [2] (the most recent formulation, including non-local large-strain elasto-viscoplasticity reported in [3]) are very competitive compared with CP-Finite Elements for some applications, due their higher efficiency and their direct use of voxelized microstructural images. In this talk, we will report recent progress on FFT-based polycrystal plasticity that expands its applicability, including strain-gradient plasticity, achieving geometric accuracy working with voxelized images, non-periodic extensions, and dynamic effects. We will show applications of these methods to micromechanics of nano-metallic laminates, wave propagation in heterogeneous materials, multiscale coupling with Lagrangian hydrocodes, integration with 3-D characterization methods, and use for training and validation of machine-learning models.

[1] Moulinec, H., Suquet, P., A numerical method for computing the overall response of nonlinear composites with complex microstructure. CMAME 157, 69, (1998).

[2] Lebensohn, R.A., N-site modelling of a 3D viscoplastic polycrystal using Fast Fourier Transform. Acta Mater. 49, 2723 (2001).

[3] Zecevic M., Lebensohn R.A., Capolungo L., Non-local large-strain FFT-based formulation and its application to interface-dominated plasticity of nano-metallic laminates. JMPS 173, 105187 (2023).

DATE: **Wednesday, 12 March 2025**

TIME: **10:30 – 11:15**

PLACE: **Building 427, Room 119**
DTU, Technical University of Denmark

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

All interested persons are invited.

Jan Becker Høgsberg