

# LMS Seminars 2024 – 25

## Contributions of 4D imaging in mechanics of materials

François Hild

Laboratoire de Mécanique Paris-Saclay

Université Paris-Saclay / CentraleSupélec / ENS Paris-Saclay / CNRS

**Date and Time:** March 20, 2025 (2 – 3 pm)

**Venue:** Amphi 104 (Pole Meca)

### Abstract

3D imaging (e.g., via x-ray tomography) has become popular for analyzing material microstructures and quantifying their temporal changes. When time lapse series of 3D pictures are acquired during a single experiment, it is possible to measure displacement fields via digital volume correlation (DVC), thereby leading to 4D results. Such 4D analyses have been performed for more than a decade in the field of mechanics of materials. The presentation aims at reviewing the achievements of and challenges faced by such measurement technique. A general and unified DVC framework is introduced and its extension to 4D spacetime registrations is discussed. The analysis of in-situ experiments illustrates how mechanically relevant parameters are extracted and how models may be validated. The current challenges are examined and some propositions are given to address them.

### About the speaker

François HILD is CNRS research professor at the Laboratory of Mechanics Paris-Saclay (LMPS, University Paris-Saclay). The main goal of Dr. Hild's work is the prediction of the deformation, degradation and failure of heterogeneous materials and structures with constitutive models that are calibrated and validated with full-field measurements at different scales and various modalities.

He received the Hetényi and Lazan awards of the Society for Experimental Mechanics, as well as the CNRS 2017 silver medal for all his work. He is a fellow of the International DIC Society and the Society for Experimental Mechanics.

