

Séminaire du laboratoire PIMM

Jeudi 20 mai 2021 à 13h30 sur Teams

Prof. Dr.-Ing. Dipl.-Math. techn. Felix FRITZEN

Institute of Applied Mechanics, University of Stuttgart, Germany

présentera dans le cadre du séminaire ses travaux intitulés :

Homogenized mechanical properties: from direct numerical simulation over reduced order modeling to data-driven surrogate models

The simulation of microstructured materials is an important field in computational materials science. The exploration of potential material designs using in silico predictions is continuously gaining significance in academia and industry. In this talk different approaches for solving challenging scale-bridging problems are addressed. Starting from image stacks (3D data), voxel discretizations in combination with regular trilinear finite elements are used. These are solved using FFT-based preconditioning in our solver FANS. Such direct numerical methods are interesting if a limited number of load cases is considered. However, when dealing with nonlinear problems and in many query settings (e.g. in two-scale simulations) the use of reduced order models (ROM). ROM can yield a satisfactory trade-off between accuracy on the one hand and performance on the other hand. Finally, machine learned surrogate models can often outperform ROM. However, they have a limited validity domain and they are not applicable in path-dependent problems without trickery. The presentation will close with an overview of the strengths and weaknesses of the different methods.