

Structural integrity under extreme loads

Topic: High fidelity models and machine learning

TITLE: Numerical analysis of composite representative volume elements and development of machine learning-based surrogate models

RESEARCH BACKGROUND:

Composite materials are intrinsically multiscale materials that present multiple failure modes, which are challenging to describe through FE models. Numerical simulations may be combined with state-of-the-art machine learning methods to improve the computational efficiency and accuracy.

RESEARCH ACTIVITIES:

1. Numerical development of reference volume elements (RVEs) for composite materials (focus on interfacial properties fibre/matrix)
2. Investigation of state-of-the-art homogenization techniques for deriving the macro properties of RVEs.
3. Development of machine learning methods to replace computationally expensive numerical simulations.
4. Testing of the methodology on experimental and numerical data.

METHODOLOGY: Numerical

DURATION: 9 months

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