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MECHANICS OR MACHINE LEARNING APPROACHES FOR COMPUTATIONAL MATERIAL DESIGN

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ABSTRACT

The rapid development of advanced manufacturing technologies, such as additive manufacturing, nanotechnology, and biomimetic design, has led to the emergence of novel materials with complex microstructures and unique properties. These materials, including but not limited to 3D printed lattice structures, fibre-reinforced composites, shape-memory alloys, electroactive polymers, and metamaterials, present unprecedented opportunities for engineering applications. However, their complex and often nonlinear behaviour, including anisotropy, inelasticity, and multi-physical coupling, poses significant challenges for traditional constitutive modelling and computational design methods.

To effectively model and design such materials, innovative computational approaches are necessary. This mini-symposium will explore recent advances in material modelling and computational design, with a focus on integrating machine learning techniques, multiscale modelling, and analytical approaches. The aim is to develop models that are not only accurate and reliable but also efficient and scalable for practical engineering applications.

We invite contributions that address the following areas, but are not limited to:

Advanced Constitutive Material Models, Multiscale and Multiphysics Modelling, Machine Learning for Material Modelling, Computational Material Design, Topology Optimisation, Inverse Material Design, Mechanical Metamaterials.