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ADVANCED METHODS AND INNOVATIVE TECHNOLOGIES FOR THE OPTIMAL DESIGN OF STRUCTURES AND MATERIALS

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ABSTRACT

Additive manufacturing has opened unexplored possibilities in the fabrication of mechanical components, from macrostructures to architected materials. This innovative technology is disrupting the range of achievable designs, pushing the frontier of product customisation (e.g., for personalised medicine) and low manufacturing costs (e.g., for industries with small-batch productions).

In this context, advanced shape and topology optimisation methods play a crucial role in the design of both structures and materials. The goal of this Invited Session is twofold: (i) to showcase recent methodological advances in the optimal design of structures and metamaterials; (ii) to gather researchers from the mathematics, computational science, engineering and material science communities, both from academia and industry, for cross-dissemination of ideas.

The Invited Session will offer a transdisciplinary platform for discussion on state-of-the-art shape and topology optimisation topics including - but not limited to - multi-scale, multi-physics and multi-objective problems; manufacturing constraints and design under uncertainty; microstructure design techniques and inverse homogenisation for the proposal of innovative lattices, graded materials and infill patterns. As far as the mathematical modelling is concerned, we encourage the dissemination of works exploiting filtering techniques, artificial intelligence, reduced order models, mesh adaptation, deep and reinforcement learning.