

Adaptive modelling, optimisation and learning strategies for image analysis

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ABSTRACT

Digital modelling via simulation-based engineering has experienced an exponential growth during the last decades, with successful applications encompassing industrial design and manufacturing, personalised medicine and the emerging field of augmented and virtual reality for the metaverse. Nonetheless, in the application of predictive simulation tools to complex problems, preprocessing operations --starting from image analysis to surface reconstruction, data filtering and inverse analysis-- still represent the steps in which about 80% of engineering time is being spent.

Efficient, reliable and robust algorithms to preprocess large amounts of multi-fidelity data stemming from complex, possibly noisy, images are thus crucial. In this context, this minisymposium aims to bridge the mathematical imaging community with computational scientists, engineers and physicists, with the objective of fostering transdisciplinary discussions and mutual transfer of knowledge.

This minisymposium will offer a platform for cross-fertilisation of ideas on recent modelling and methodological advances in image analysis and simulation tools, including --but not limited to-- inverse identification problems, parameters estimation, PDE-constrained optimisation, Bayesian optimisation, bilevel optimisation, finite element-based image analysis, adaptivity (mesh, discretisation, regularisation, ...), total variation discretisation, sparsity promotion, learning algorithms and dimensionality reduction.

Contributions on emerging technologies bridging computer vision and machine perception towards the construction of cognitive digital twins are particularly welcome.