

MATHEMATICS, ALGORITHMS AND SOFTWARE FOR PREDICTIVE DIGITAL TWINS IN CFD

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ABSTRACT

Digital Twins (DTs) are rapidly becoming a key enabling technology that capitalizes on decades of investment in computational modeling to bring about capabilities beyond forward simulations such as dynamic data assimilation and data-driven decision-making informed by system-specific analysis. This minisymposium provides a forum for exchange of ideas spanning foundational DT technologies such as data-driven, reduced order and surrogate models, advanced couplings, and data assimilation. Also of interest is the application of DTs such as dynamic optimal experiment design and optimal control with particular emphasis on fluid flow problems in a wide range of scientific and engineering applications. We anticipate talks aligned with the following themes: (i) nonlinear dimensionality reduction, (ii) preservation of topological, structural, and qualitative properties under model order reduction, (iii) deep learning surrogates, (iv) couplings between data-driven, first-principles models, and multi-fidelity models and (v) software architectures supporting the DT paradigm.