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EXPLORING DATA-ENHANCED FINITE ELEMENT SIMULATION

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ABSTRACT

As increasingly challenging problems are addressed using high-fidelity numerical models, new methodologies are required to handle severe nonlinearity, singular coefficients, evolving interfaces, multiscale and multiphysics couplings, while preserving essential properties such as accuracy, stability and robustness.

In parallel, the rapid development of data science and machine learning is creating new ways to enhance traditional numerical simulation. Topics of interest include adaptive strategies, error estimation and mesh adaptation, reduced-order modelling, operator learning, physics-informed machine learning, data assimilation, uncertainty quantification, etc.

This session will cover recent advances in finite element methods and emerging technologies for the simulation of complex engineering systems. Attention will be given to methods that combine high-fidelity finite element simulations with data-driven techniques to accelerate computations, improve predictive capabilities.

Trying to bring together a balanced mix of academic and industrial perspectives, the session aims to promote exchanges on emerging improvement of the finite element technology. Contributions ranging from methodological developments to industrial and societal applications are welcome, with particular emphasis on maintaining the reliability and interpretability required for scientific and engineering decision-making.