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COMBINING PHYSICS-BASED AND DATA-DRIVEN APPROACHES FOR UNCERTAINTY QUANTIFICATION

1700

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ABSTRACT

This mini symposium deals with the development of safe and reliable intelligent systems through the combination of physics-based and data-driven approaches. Several main challenges of non-deterministic approaches are related to the limitations of the two main modelling strategies available: physics-based (white-box) or data-driven (black-box). Black-box models are fast and able to capture very complex behaviors but they are incapable of accurate forecasting, limiting their usage in the context of large uncertainties. The Physics-based models can have great accuracy on vast domains of validity but their computation burden often makes them unusable for non-deterministic approaches. A current trend in the uncertainty quantification community is to explore ways of integrating both approaches in highly efficient methods, sometimes referred to as grey-box models. These approaches can be tailored for a large variety of applications depending on data availability, black-box architecture, type of uncertainty, industrial application, or even the stochastic problem to be solved (e.g. design optimization, sensitivity analysis, reliability analysis or process monitoring).

Therefore, this symposium is aimed at gathering contributions that discuss new theoretical developments and advanced applications related to the efficient combination of computationally intensive numerical simulation codes with efficient surrogate models and/or data-driven black-box approaches, as well as grey-box and other hybrid combinations of machine learning and numerical modelling.