Beyond forward simulations: From reduced-order models to digital twins with computational science

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ABSTRACT

Digital twins represent the next frontier in the impact of computational science on grand challenges across science, technology and society. A digital twin is a computational model or set of coupled models that evolves over time to persistently represent the structure, behavior, and context of a unique physical system or process. A digital twin is characterized by a dynamic and continuous two-way flow of information between the computational models and the physical system. This talk will highlight the important roles of reduced-order modeling and uncertainty quantification in achieving robust, reliable digital twins at scale. The methodology will be illustrated for applications in aircraft digital twins and cancer patient digital twins, the latter being created in collaboration with the Oden Institute Center for Computational Oncology.