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OPTIMAL EXPERIMENTAL DESIGN IN COMPUTATIONAL SCIENCE AND ENGINEERING

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ABSTRACT

Data are essential for developing models in computational science and engineering, and to reduce uncertainty and enable high-confidence simulations that are imperative for discovery, prediction, design, and control. However, opportunities for data acquisition from physical experiments and high-fidelity computations are often expensive and sparse. It is therefore crucial to maximize the value of these experiments. This challenge of optimal information gathering can be formalized through the framework of *optimal experimental design*. Yet extending classical design methodologies to tackle problems of greater scale, dimension, and dynamic complexity, and to find optimal sequential designs, requires new algorithms and formulations. The goal of this minisymposium is to gather a wide variety of approaches with topics including but not limited to: design for large-scale inverse problems, design in the presence of model error, and the approximation and optimization of information metrics. Relevant techniques include surrogate modeling, model reduction, efficient sampling, asymptotic approximations, PDE-constrained optimization, stochastic optimization, dynamic programming, and reinforcement learning. We invite contributions focused on methodology and motivated by engineering and science applications.