

Predictive data science for physical systems: From model reduction to scientific machine learning

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What is the connection between reduced-order modeling and machine learning? Model reduction methods have grown from the computational science and engineering (CSE) community, with a focus on reducing high-dimensional models that arise from physics-based modeling, whereas machine learning has grown from the computer science community, with a focus on creating low-dimensional models from black-box data streams. Yet recent years have seen an increased blending of the two perspectives and a recognition of the associated opportunities. This talk makes the case that projection-based model reduction provides the foundations for Scientific Machine Learning, yielding a new class of flexible data-driven methods that support high-consequence decision-making under uncertainty for physical systems.