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Machine Learning for Prediction, Data Assimilation, and Uncertainty Quantification of Dynamical Systems

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Deadline for manuscript submissions:
closed (31 December 2020)

Message from the Guest Editors

Modeling dynamical systems is ubiquitous in a large variety of applications in the sciences. As the capability to collect data advances, an important and growing challenge is to extract relevant information from large datasets in ways that can improve modeling. Recent empirical results suggest that various machine learning algorithms are effective tools in approximating the solution operator of the underlying dynamics without relying on a parametric modeling assumption, but instead leveraging the available datasets to learn the dynamics. While the empirical successes are an important first step, they naturally introduce many practical and theoretical questions.

In this Special Issue, we particularly welcome contributions that address the following problems (other contributions relevant to the topic are also welcome):

1. Capabilities and Limitations of Purely Data-Driven Models
2. Leveraging Information from Partial Models
3. Data Assimilation:
4. Uncertainty Quantification

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Message from the Editor-in-Chief

The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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