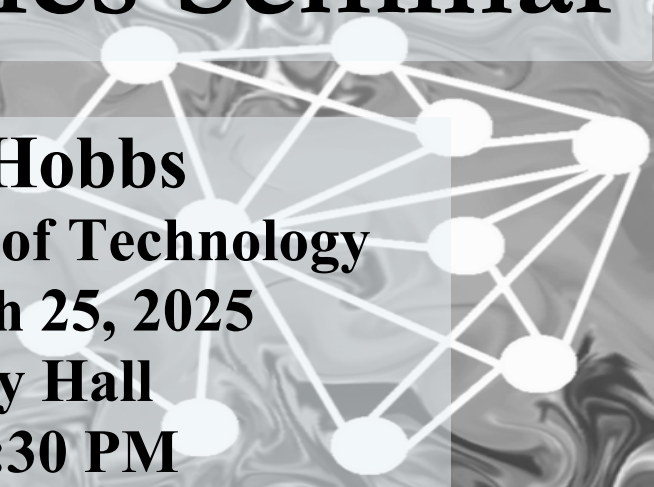


ACMS Statistics Seminar



Jonathan Hobbs
California Institute of Technology
Tuesday, March 25, 2025
108 Crowley Hall
3:30 PM – 4:30 PM

Flexible Emulation for Hydroclimate Scenarios with Bayesian Transport Maps

Understanding climate impacts on the global hydrological cycle will remain a critical challenge in the coming years and decades. Uncertainty quantification for hydroclimate scenarios requires a flexible and realistic representation of the probability distribution of multiple quantities of interest. Modern Earth-system models (ESM) integrate coupled hydrologic processes that operate at a range of spatio-temporal scales to give a comprehensive view of the hydrological cycle. However, comprehensive assessment of uncertainty for the ESM assumptions can be limited by computational demands. Under suitable experimental designs, model ensembles provide information on the desired probability distributions, but the limited ensemble sizes must be effectively leveraged. This work demonstrates an emulation capability through Bayesian transport maps (BTM) that enables fast unconditional and conditional sampling from a spatio-temporal model trained on a modest-sized collection of geophysical model runs. The approach is implemented for hydrologic variables from an ensemble of land- surface model experiments that is assembled from perturbed initial and boundary conditions. Probabilistic assessments for snow timing and extent under contemporary and future climate scenarios are illustrated with the BTM approach.

The Department of Applied and Computational
Mathematics and Statistics

Please visit acms.nd.edu to view the full list of speakers.