Title:
Simultaneous Inference from Simulation Experiments:
Figures of Merit

Abstract:
Retrieving the state of the atmosphere from remote sensing radiance measurements is a challenging statistical problem: The scientific model for the process is complex and highly nonlinear, the data are noisy, and the parameters are unknown. Simulation experiments are one of the tools used to test, validate, compare, and improve predictions of the multivariate atmospheric state from these models. This talk considers the traditional figures of merit (FOMs), namely bias, and mean squared prediction error that are typically used to evaluate simulation experiments. We define new FOMs that are nonlinear functions of the traditional FOMs, and that are closely tied to simultaneous multivariate inference on an unknown parameter or unknown state. The new FOMs can be used to visualise and evaluate predictors of the multivariate state and, critically, they can be used to compare predictions computed for different combinations of factor levels in the simulation experiment. Their usefulness is illustrated in a simple simulation experiment for predicting the state of the atmosphere in a column of air, based on simulated radiance measurements, where the goal is to determine the statistical properties of the predictions.

This is joint work with Prof. Noel Cressie.