# SIAM/APPLIED AND NUMERICAL ANALYSIS SEMINAR

**Date:** February 24, 2021

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**Title:** Bayesian Calibration of Computer Experiments

**Abstract:** I will present a Bayesian approach to model calibration when the model is specified by a computationally expensive black-box computer code $f$. Here, calibration is a nonlinear regression problem: given a data vector $Y$ corresponding to the regression model $f(\beta)$, find plausible values of $\beta$. As an intermediate step, $Y$ and $f$ are embedded into a statistical model allowing transformation and dependence.

Typically, this problem is solved by MCMC sampling from the posterior density $\pi$ of $\beta$ given $Y$. However, since each evaluation of $\pi$ requires an expensive run of $f$, naive sampling of $\pi$ by MCMC to obtain a nontrivial effective sample size is computationally prohibitive. To reduce computational burden, we limit evaluation of $f$ to a small number of points chosen on a high-probability region of $\pi$ reached by optimization. Then, we approximate the logarithm of $\pi$ using radial basis functions and use the resulting cheap-to-evaluate surface in MCMC. The main challenge is to determine the approximation region properly.

Connections between this problem and non-statistical optimization approaches based on response surface approximations will be discussed.

The proposed approaches are illustrated on models arising in environmental engineering.