CODES@EMORY
SEMINAR

Combining Bayesian inference with data-consistent inversion: Leveraging population-level information to construct informative priors

Rebekah (Bekah) White
Sandia National Labs

Abstract: Computational models underpin many important applications at Sandia, such as additive manufacturing, nuclear waste repository management, and structural dynamics. However, such models often contain uncertain or unknown parameters that must be estimated from observational data by solving an inverse problem. Bayesian inference is a popular approach to inverse problems, but when data is limited (as is often the case for Sandia applications), a highly informative prior is needed; in practice, the physical knowledge required to construct such priors may not be available. Consequently, this work presents an alternative, novel approach for leveraging data from "population" of related experiments or physical assets to construct highly informative Bayesian priors. Specifically, we use a more recently developed inversion technique, known as data-consistent inversion (DCI), to estimate properties of a given population. Combining DCI with Bayesian inference in this way is shown to improve the inference process overall, further reducing model parameter uncertainty. This talk will provide an overview of both Bayesian inference and data-consistent inversion, illustrate how such inversion techniques can be combined, and demonstrate the combined approach for a computational mechanics exemplar governed by partial differential equations (PDEs).

Friday, October 18, 2024, 10:00 am
Atwood 240, Atwood Chemistry Building

MATHEMATICS
EMORY UNIVERSITY