The University of Mississippi
Department of Mathematics

Research Job Talk

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Title: Iterated Filtering and Iterated Smoothing Algorithms

4:00 pm, Monday, Feb 13, 2017
Hume Hall 321

Abstract: Partially observed Markov process (POMP) models are ubiquitous tools for modelling time series data in many fields including statistics, econometrics, ecology, and engineering. Because of incomplete measurements, and possibly weakly identifiable parameters, making inferences on POMP models can be challenging. Standard methods for inference (e.g., maximum likelihood) with restrictive assumptions of linear Gaussian models have often led to unsatisfactory results when the assumptions are violated. To relax these assumptions, this talk develops a class of simulation-based algorithms called iterated filtering and smoothing for POMP models. First, a novel filter, called Bayes map iterated filtering, is introduced. This filter recursively combines parameter perturbations with latent variable reconstruction, stochastically optimizing the approximated likelihood of latent variable models and providing an asymptotic guarantee of the performance of this inference methodology. Second, a fast, light-weight algorithm, called second-order iterated smoothing is proposed to improve on the convergence rate of the approach. The goal of this part is to demonstrate that by exploiting Fisher Information as a by-product of the inference methodology, one can achieve both statistical and computational efficiencies without sacrificing applicability to a general class of models. Finally, we validated the properties of the proposed methodologies through applying them to a challenging inference problem of fitting a malaria transmission model with control to time series data, finding substantial gains for our methods over current alternatives.