THE UNIVERSITY OF CHICAGO

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DISSERTATION PROPOSAL

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Optimal Experimental Design and Improved Standard Resampling Algorithm

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Jones 304, 5747 S. Ellis Avenue

ABSTRACT

In this talk, I will discuss two projects on optimal experimental design and improved resampling algorithms respectively.

For the first project, I will present a numerical method for approximating the solution of convex integer programs stemming from optimal experimental design. The statistical setup consists of an infinite-dimensional Bayesian framework for linear inverse problems for which the direct relationship is described by a discretized integral equation. We aim to find the optimal sensor placement from a set of candidate locations where data are collected with measurement error. The resulting convex integer program is relaxed producing a lower bound, and an upper bound is obtained by constructing an integer solution via sum up rounding strategy. We have previously showed convergence to zero of the gap between upper and lower bounds as the mesh size goes to zero, and I will continue to discuss several directions for future work: one is to generalize some assumptions in this framework, and another is to improve algorithmic efficiency for optimization programs.

For the second project, I will talk about an innovative idea of adding tickets to resampling algorithms, which potentially reduces the variance in the estimate from stochastic simulation. It has been proved that in Diffusion Monte Carlo, the variance from ticketed algorithms is always lower than that from regular algorithms, and it is bounded even when the other increases to infinity. I will propose to extend this ticketed idea to standard resampling algorithms like multinomial, stratified and systematic resampling. The research goal is to understand the ticketed idea in depth and prove similar properties for standard resampling algorithms.
