THE UNIVERSITY OF CHICAGO

Computational and Applied Mathematics & Statistics Student Seminar

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Reinforcement Learning for Approximate Bayesian Computation via Tree-Based Recursive Partitioning

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ABSTRACT

Approximate Bayesian computation (ABC) is often the method of last resort for inference in simulation models with an obstructed access to the likelihood. One of the disadvantages of ABC is its computational inefficiency when no strong prior information is available. Indeed, ABC requires obtaining many prior parameter guesses to end up with only a small fraction that would yield data that is "indistinguishable" from the observed data. This motivates the development of self-aware ABC, a sequential version which learns from past rejections. We use recursive partitioning schemes to come up with an adaptive Thompson sampling style algorithm which sequentially refines high-posterior regions into boxes. Each box has a certain probability of being chosen for the next ABC evaluation, depending on the prior distribution and past rejections. The method places more splits in the area where the posterior resides, shying away from low-probability regions which would yield rejections. We provide two versions for (1) ABC posterior sampling, and (2) maximum a posteriori estimation. We demonstrate accurate approximability of ABC posteriors but at much lower additional cost.