Automatic Tolerance Selection for Approximate Bayesian Computation

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Research Article

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Abstract

Approximate Bayesian Computation (ABC) can provide inferences from the (approximate) posterior distribution based on intractable likelihoods. The quality of ABC inferences relies on the choice of tolerance for the distance between the observed data summary statistics, and the pseudo-data summary statistics simulated from the likelihood, used within the context of an algorithm which samples from the approximate posterior. However, the ABC literature does not provide an automatic method to select the best tolerance level for the given dataset at hand, and in ABC practice finding the best tolerance level can be time consuming. This note introduces a fast automatic estimator of the tolerance, based on the parametric bootstrap. After the tolerance estimate is calculated, it can then be input into any suitable importance sampling or MCMC algorithm to approximate from the target approximate posterior distribution. This tolerance estimator is illustrated through ABC analyses of simulated and real datasets involving several intractable likelihood models. This includes the analysis of a real 23,000-node network dataset involving stochastic search model selection.

Full Text

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