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Approximate Bayesian Computation: a French statistician perspective

Abstract
Approximate Bayesian Computation (ABC) is a family of likelihood-free inference techniques that are dedicated to models defined in terms of a stochastic generating mechanism. ABC originated in population genetics for calibrating coalescent models to genetic data. In a nutshell, Approximate Bayesian Computation proceeds by computing summary statistics from the data and giving more weight to the values of the parameters for which the simulated summary statistics resemble the observed ones. Here, we derive the asymptotic bias and variance of the standard estimators of the posterior distribution which are based on rejection sampling and linear adjustment. Additionally, we introduce an original estimator of the posterior distribution based on quadratic adjustment and we show that its bias contains a smaller number of terms than the estimator with linear adjustment. Although we find that the estimators with adjustment are not universally superior to the estimator based on rejection sampling, we find that they can achieve better performance when there is a nearly homoscedastic relationship between the summary statistics and the parameter of interest.