

Constructing Appropriate Summary Statistics for ABC Methodology in the Class of Controlled Branching Processes

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Abstract

Controlled branching processes are stochastic growth population models in which the number of individuals with reproductive capacity in each generation is controlled by a random control function. The behaviour of these populations is strongly related to the main parameters of the process. In practice, these values are unknown and their estimation is necessary. The purpose of this work is to examine the Approximate Bayesian Computation methods in the context of the controlled branching processes. This methodology provides a satisfactory approach to intractable likelihood problems, approximating the posterior distribution of the parameters without explicit likelihood calculations. We provide the tolerance rejection algorithm and local linear regression algorithm based on simulating summary statistics. Finally, we illustrate the accuracy of the proposed methods by the way of a simulated example developed with the statistical software R.

Keywords: controlled branching process; approximate Bayesian computation methodology; summary statistics

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