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Parametric Bayesian Inference for controlled branching processes with random control function

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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 probabilistic theory of controlled branching processes, in particular the study of its extinction problem and its limiting behaviour, has been extensively investigated, see for example Sevastyanov and Zubkov (1974), Bagley (1986) and González et al. (2005) (and references therein). The behaviour of these populations is strongly related to the main parameters of the offspring distribution. In practice, these values are unknown and their estimation is necessary. Usually it must be observed the whole family tree up to a given generation in order to estimate the offspring distribution. In this work, we deal with the problem of estimating the main parameters of the model assuming that the only observable data are the total number of individuals in each generation. To approximate the posterior distribution of the main parameters of the reproduction law, we provide an algorithm based on the Gibbs sampler. By way of a simulated example, developed with the statistical software R, we illustrate the accuracy of the proposed algorithm. Acknowledgement: The research was supported by Universidad de Extremadura.

Key words and phrases: Controlled branching processes. Parametric Bayesian inference. Gibbs sampler.

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