

Approximating extinction times in multitype Markov branching processes

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Abstract

We derive a distributional approximation to the time to extinction in a sub-critical continuous-time multitype Markov branching process. The argument is to combine (i) the classical exponential approximation to the extinction probabilities and (ii) the branching property to finally derive a Gumbel approximation for the extinction time. We show that the upper bound on the error for the corresponding density approximation in total variation distance is inversely proportional to a positive power of a weighted sum of the number of individuals of the different types. The power depends on the means and higher moments of the offspring distribution.

The accuracy of the approximation is illustrated by a model of parasitic resistance of the parasite *Toxoplasma gondii*, a serious public health problem.

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