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Multitype controlled branching process as a model for progenitor cell populations

Miguel González[1], Carmen Minuesa[1], Inés del Puerto[1], Anand N. Vidyashankar[2]

[1]Department of Mathematics and Institute of Advanced Scientific Computation, University of Extremadura, Spain
mvelasco@unex.es
cminuesaa@unex.es
idelpuerto@unex.es

[2]Department of Statistics, George Mason University, USA
avidyash@gmu.edu

We focus our attention on a specific biological application with the purpose of describing progenitor cell populations cultured in vitro. This problem was firstly treated in [1]. The population considered consists of two types of cells: the progenitor cells or type T_1 cells (immediate precursors of oligodendrocytes) and the oligodendrocyte cells or type T_2 cells (terminally differentiated oligodendrocytes). The development of these cells is as follows: oligodendrocytes rise from precursor cells; precursor cells can die without any offspring cell, can split off into two daughter cells of the same type or can terminally differentiate into oligodendrocytes, which do not have reproductive capacity. Moreover, there is a presence of censoring effects due to the migration of progenitor cells out of the microscopic field of observation. They modelled this biological system as a two-type age-dependent branching process with emigration, where the emigration models the effect of censoring. The authors developed the estimation of the offspring distribution in a frequentist context.

This work continues with the aforesaid line of research, tackling this problem from a different and richer perspective by considering the class of controlled branching processes, and by making use of the Bayesian outlook. The results that we present in this talk have been recently published in [2].

Keywords: branching process, controlled process, Bayesian estimation, cell proliferation

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References

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