

Estimates of the Offspring Probabilities in a Class of Multitype Branching Processes with Binary Family Trees with Partial Observation

Nina Daskalova

Faculty of Mathematics and Informatics

Sofia University “St. Kliment Ohridski”, Sofia, Bulgaria

ninad@fmi.uni-sofia.bg

Keywords: Multitype Branching Processes, Cell Proliferation, Offspring Distribution, Maximum Likelihood Estimation, EM Algorithm.

Multitype branching processes (MTBP) traditionally serve as models in biology in studies of cell proliferation. A sampling scheme that appears frequently is observing the cell count in several independent colonies at discrete time points, sometimes only one. The process is not observable in the sense of the whole tree, but only as the generation at given moment in time, which consists of the number of cells of every type. The EM algorithms are widely used to obtain a maximum likelihood (ML) estimation with incomplete observation. An EM estimation of the offspring distribution is presented in the class of Markov branching processes with binary family trees. In this special case it leads to the same estimates, as using the whole tree observation. This result implies that there is no need to observe the whole process in laboratory experiments to obtain the estimates in such models.

Acknowledgments: The research was partially supported by the National Fund for Scientific Research at the Ministry of Education and Science of Bulgaria, grant DFNI-I02/17.