

# The ancestral selection graph for a Lambda-asymmetric Moran model

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26 June 2024, 16:15–17:15\* Berlin time  
IRTG 2544: "Stochastic Analysis in Interaction"  
— Berlin Probability Colloquium —

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## Abstract

Motivated by the question of the impact of selective advantage in populations with skewed reproduction mechanisms, we study a Moran model with selection. We assume that there are two types of individuals, where the reproductive success of one type is larger than the other. The higher reproductive success may stem from either more frequent reproduction, or from larger numbers of offspring, and is encoded in a measure  $\Lambda$  for each of the two types.

Our approach consists of constructing a  $\Lambda$ -asymmetric Moran model in which individuals of the two populations compete, rather than considering a Moran model for each population. Under certain conditions we can couple these measures. This allows us to construct what we call the  $\Lambda$ -asymmetric ancestral selection graph, which leads to a pathwise duality of the forward in time  $\Lambda$ -asymmetric Moran model with its ancestral process. Interestingly, the construction also provides a connection to the theory of optimal transport. We apply the ancestral selection graph in order to obtain scaling limits of the forward and backward processes, and note that the frequency process converges to the solution of an SDE with discontinuous paths.

Another application is a Griffiths representation for the generator of the SDE which may be used to find a semi-explicit formula for the probability of fixation of the less beneficial of the two types.

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\*Punctual, i.e. sine tempore!