Skeletons of near-critical branching processes with nearly neutral mutations

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Abstract

Skeletons of branching processes are defined as trees of lineages characterized by an appropriate feature that ensures future reproduction success. In the supercritical case a natural choice is to look for the lineages that survive forever. In the critical case it was earlier suggested to distinguish the particles with the total number of descendants exceeding a certain threshold. These two definitions lead to asymptotic representations of the skeletons as either pure birth process (in the slightly supercritical case) or critical birth-death processes (in the critical case conditioned on exceeding a high threshold value). The limit skeletons reveal typical survival scenarios for the underlying branching processes.

In this talk we consider near-critical Bienaymé-Galton-Watson processes proposing a flexible way for building the skeletons. In the single type case, each vertex of the family tree is independently marked with a small probability. The branch connecting the root with a marked vertex is called a marked branch. The marked branches form a subtree of the family tree of the branching process and this will be called a skeleton. Such a skeleton is approximated by a birth-death process. This approach is extended to the multi-type near-critical setting with rare nearly neutral mutations.

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