Institute for Applied Mathematics, Bonn University

Oberseminar Stochastik

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Lipschitz-Saal (LWK 1.016)

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From clonal interference to Poissonian interacting trajectories

We consider a population whose size N is fixed over the generations, and in which random beneficial mutations arrive at a rate of order $1/\log N$ per generation. In this so-called Gerrish-Lenski regime, typically a finite number of contending mutations is present together with one resident type. These mutations compete for fixation, a phenomenon addressed as clonal interference. We study a system of Poissonian interacting trajectories (PIT) which arise as a large population scaling limit of the logarithmic sizes of the contending clonal subpopulations. We prove that this system exhibits an a.s. positive asymptotic rate of fitness increase (speed of adaptation), which turns out to be finite if and only if fitness increments have a finite expectation. We relate this speed to heuristic predictions from the literature. Furthermore, we derive a functional central limit theorem for the fitness of the resident population in the PIT. A main result of this work is that the Poissonian interacting trajectories arise as a large-population limit of a continuous time Moran model with strong selection. The subject of this talk is joint work with Felix Hermann, Adrián González Casanova, Renato Soares dos Santos, and Anton Wakolbinger.