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Stellingen

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Dormancy in Stochastic Interacting Systems

van

Shubhamoy Nandan

1. The genetic diversity in a Moran population consisting of both active and dormant individuals is lost at a slower speed than in a population of equal size with only active individuals. However, the survival probability of a given genotype remains the same if and only if the initial frequency of this genotype is the same in both populations. [Chapter 2]
2. Two different Lie algebras can represent the same Markov generator. For instance, the infinitesimal generator of the Moran process has representations in both the Special unitary Lie algebra $\mathfrak{su}(2)$ and the Heisenberg Lie algebra $\mathcal{H}(1)$. [Chapter 2]
3. The genealogy of an infinite population exhibiting dormancy is governed by a non-interacting seed-bank coalescent, while it is governed by an interacting seed-bank coalescent when the population is finite. [Chapter 2]
4. The long-term survival of genetic diversity in spatial populations crucially depends on the physical dimension of the geographic space. The presence of large seed-banks in the populations tends to reduce the critical dimension for loss of genetic diversity. [Chapter 3]
5. Stochastic duality is a useful tool for studying complex Markov processes. If the dual is not a simple process, then one can sometimes still compare it with an ‘auxiliary dual’ to deduce useful conclusions about the original process. [Chapter 3]

6. The bounded harmonic functions of an irreducible random walk on \mathbb{Z}^d are constants. Allowing the random walk to fall asleep from time to time does not alter this triviality. [Chapter 4]
7. Birkhoff's point-wise ergodic theorem is a powerful tool in ergodic theory that is frequently used to prove existence of limits for probabilistic models in random environment. Whether the limit is random or deterministic crucially depends on the assumption of some suitable form of ergodicity. [Chapter 4]
8. Dormancy is not inherent in biological systems alone. Also microscopic particles may become dormant every now and then. Whether or not this tendency is shared by the particles in a physical system may be confirmed by verifying that the total flow of the particles may be uphill, and therefore violates Fick's law of diffusion. [Chapter 5]
9. It is a common perception that pure mathematicians create new mathematics only for the pursuit of abstract beauty, with little or no regard for its relevance to the real world. Probabilists may aspire to change that perception by finding ways to model stochastic real-world phenomena, but often end up cherishing the mathematical rigour most.
10. Beethoven wrote to one of his fans in a letter: "Do not only practise your art, force your way into its secret." Although his original comment was on the art of music, he no doubt would have agreed that it applies to the art of mathematics as well.

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