

Oberseminar Stochastik

Am **Dienstag, 12. Juli 2022**, wird

Herr **Manuel Esser (Universität Bonn)**

einen Vortrag halten mit dem Titel:

"Metastability and multi-scale analysis of individual-based population models "

Abstract:

The biological theory of adaptive dynamics aims at studying the interplay between ecology and evolution through the modeling of the basic mechanisms: heredity, mutations and competition. A rigorous derivation of the theory was achieved over the last two decades in the context of stochastic individual-based models. These Markov processes are driven by microscopic interactions between single individuals and evolve over time towards traits of higher fitness. The typical evolutionary behaviour can be studied by looking at limits of large populations and rare mutations.

This talk introduces multiple scaling parameters and gives an overview of time scales that are involved in the above model. We will then focus on the parameter regime of moderately rare mutations, where multiple new mutant traits are present at the same time. In this setting we can distinguish three important time scales:

- Ecological interactions between well-established subpopulations, like the competition for resources, can change the composition of the overall population within a short time of order one. This is related to classical Lotka-Volterra dynamics and leads to equilibrium states between the larger traits.
- Short-range mutations and the initial exponential growth of small mutant populations can be witnessed on a logarithmic time scale.
- Finally, long-range mutations - in particular those that need to traverse a Large fitness valley - are quite rare and occur on an even more accelerated time scale.

Looking at the limiting jump-processes for the short- and long-range mutations, respectively, we see that the first one is deterministic, while the later one again shows a random nature and can be seen as metastable transitions between so-called evolutionary stable conditions. I will outline the main ideas of constructing the limiting multi-scale processes and then demonstrate some interesting phenomena in the case of easy examples.

The talk is based on an ongoing collaboration with Anna Kraut and previous works of Anton Bovier, Lorene Coquille and Charline Smadi.

Zeit: Dienstag, 12. Juli 2022, 14 Uhr c.t.

Ort: Raum 05-136, Institut für Mathematik, Staudingerweg 9, 55128 Mainz

Alle Interessierten sind herzlich eingeladen!

gez. Lisa Hartung