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From the Stationary State to Transition Rates and Vice Versa:

Resolving the Stationary Distributions for Competing Populations with Predefined
Rates, and the Inverse Problem; Inferring Transition Rates from Stationary Distributions

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Abstract:

In the talk, I will present two projects, both derived from a stationary Master equation. In the first part, a method to infer the transition rates from a stationary distribution is presented. In the second part of the talk, I will examine a process of multi-species ecological competition, and will present preliminary results.

Part 1: Stationary Distribution → Transition Rates

I will introduce an approach for estimating the transition rates between discrete states of a Markov process. In general, when given the birth and death rates of a process, one can obtain its stationary distribution. In the "inverse problem", we aim to reconstructing biochemical rates from observed stationary data. The method is general, and can be applied to other processes as well. For a given reaction network, our method allows us to extract the reactions rates between system components only from a "snapshot" of the concentration of the relevant species. This approach has three key features; First, we use for the birth-rate inference only the stationary PDF, without any dynamical information. Second, the production rate of a given molecule might depend on the number of other molecules in the system. Third, the structure/topology of the entire reaction network may remain arbitrary, thus the only specified part of the network is for the relevant species. We examine the validity of the approach for different properties of the systems

Part 2: Transition Rates for Competitors → Stationary Distributions

In the second part of the talk, I will discuss a particular process of multi-species dynamics under competition. Here, from the predefined transition rates, we obtain the approximated stationary states. We study the coexistence and extinction probability, the level of the dominate species (if exist), the extinction and invading times, and more.

https://zoom.us/j/97747207594?pwd=bWtCMVZNaTZ4VTZjYmFTODRLcWgxZz09

Date & Location:
Tuesday, June 24, 2020, 16:00
Zoom Lecture