

JOHANNES GUTENBERG-UNIVERSITÄT MAINZ - 55099 Mainz

Einladung zum Vortrag
im Oberseminar Analysis

A characterization of the detailed balance property of chemical networks by means of response functions

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In this talk, I will introduce a formalism useful to describe the interactions between different biochemical networks when a detailed knowledge of all the reactions taking place in the networks is not available. More precisely, we will see that renewal equations can be used to model these interactions. The advantage of this approach is that the kernels (or response functions) characterizing the renewal equations summarize the properties of the interacting chemical networks.

It is therefore interesting to study how the properties of a chemical network are reflected on properties of the response functions and vice versa how some properties of biochemical systems can be derived from the properties of the response functions.

In this talk we will focus on characterizing the property of detailed balance of a biochemical network via response functions. To this end we consider a biochemical network that interacts with other networks only exchanging two substances i and j . The response functions in this case are $R_{ij}(t)$ and $R_{ji}(t)$, where the function $R_{ij}(t)$ is the concentration of the substance j at time t , after the injection of a substance i at time $t = 0$. We study how to determine if this system satisfies the detailed balance condition using the response functions $R_{ij}(t)$ and $R_{ji}(t)$. In particular, we obtain a condition involving $R_{ij}(t)$ and $R_{ji}(t)$ that is necessary, but not sufficient for the detailed balance condition to hold in the network. Moreover, we prove that this necessary condition is also sufficient if a topological condition is satisfied, as well as a stability property that guarantees that the chemical rates are not fine-tuned.

This work has been done in collaboration with J. J. L. Velázquez and B. Kepka

Alle Interessierten sind herzlich eingeladen!

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