A U S H A N G

FREIE UNIVERSITÄT BERLIN
Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

D I S P U T A T I O N

Montag, 25. November 2013, 10.00 Uhr

Ort: Arnimallee 6, 14195 Berlin, Raum 108/109

Disputation über die Doktorarbeit von

Herrn Kaveh Pouran Yousef

Thema der Dissertation:

Stress responses in Escherichia coli and HIV as model systems of adaption to the environment

- A modeling approach based on stochastic dynamics -

Thema der Disputation:

Modeling the dynamics of biological signaling networks using stochastic methods

Die Arbeit wurde unter der Betreuung von **Prof. Dr. Chr. Schütte** durchgeführt.

Abstract: Mathematical models of cell signaling enable to integrate the increasing amount of data at multiple scales of biological organization into coherent systems, helping to better understand their interplay in the cell. They provide tools for the identification of mechanisms underlying diseases and for the improvement of medical treatment strategies.

In the first part of the talk I will give an overview of the various methodologies for modeling signaling networks. The main focus will be on dynamical models and the trade-off between their accuracy and computational costs. By describing the most prominent methods for the solution and inference for state-discrete stochastic models, I will finally discuss their applicability to the simulation of cellular signalling processes, such as stochastic switching dynamics.

In the second part I will describe an inference method for phenotypic parameters associated with mutational events of HIV-1 subject to drug application. The central idea is based on a coupling of the rates of stochastic growth of the virus, as the phenotypic readout, to its changing genetic background. We will see that a mapping of the model solution to the first two moments of the probability distribution of first hitting times enables a fast large-scale parameter estimation, overcoming the limitations associated with solving the full stochastic equations.

Die Disputation besteht aus dem o. g. Vortrag, danach der Vorstellung der Dissertation einschließlich jeweils anschließenden Aussprachen.

Interessierte werden hiermit herzlich eingeladen

Der Vorsitzende der Promotionskommission
Prof. Dr. Chr. Schütte