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

Donnerstag, 15. Dezember 2022, 14:15 Uhr

Ort: Seminarraum 108/109
(Fachbereich Mathematik und Informatik, Arnimallee 6, 14195 Berlin)

Disputation über die Doktorarbeit von

Frau Laura Cifuentes Fontanals

Thema der Dissertation:
Methods for control strategy identification in Boolean networks

Thema der Disputation:
Computational algebra methods for Boolean networks

Die Arbeit wurde unter der Betreuung von **Prof. Dr. H. Siebert** durchgeführt.

Abstract: Boolean networks are a common framework for modeling biological systems. They are able to capture the qualitative behavior of the system by using coarse representations of the components and their interactions. Components are represented by binary-valued nodes and their interactions are described by logical regulatory functions, represented as Boolean functions. Boolean functions can be transported to the algebra setting by expressing them as polynomials over the finite field $F2 = 0, 1$ with the usual addition and multiplication. The representation of Boolean networks as polynomial dynamical systems allows the application of theoretical concepts from computational algebra. Key problems such as the determination of steady states or the identification of control targets can be solved using this formalism [1]. In addition, a wide variety of methods and tools is available for dealing with the associated computations [2]. In this talk, I will focus on the use of computational algebra methods for solving control problems in Boolean networks. I will start by giving an overview of Boolean networks, their set up in the algebra framework and types of control. Then, I will present a control method that uses computational algebra techniques to solve different control problems [1, 3]. Finally, I will show the results of the application of this approach to a biological system modeling pancreatic cancer cells [3] and how these results compare to other control methods.

[1] David Murrugarra, Alan Veliz-Cuba, Boris Aguilar, and Reinhard Laubenbacher. Identification of control targets in Boolean molecular network models via computational algebra. BMC Systems Biology, 10(1):94, 2016.
[2] Daniel R. Grayson and Michael E. Stillman. Macaulay2, a software system for research in algebraic geometry. Available at https://math.uiuc.edu/Macaulay2/.
[3] Daniel Plaugher and David Murrugarra. Modeling the pancreatic cancer

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

Interessierte werden hiermit herzlich eingeladen

Die Vorsitzende der Promotionskommission
Prof. Dr. H. Siebert