

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

Dienstag, 1. April 2025, 10:00 Uhr

Ort: Seminarraum 2006

(Zuse-Institut Berlin, Takustr.7, 14195 Berlin)

Disputation über die Doktorarbeit von

Ariane Ernst

Thema der Dissertation:

Mathematical modeling and analysis of neurotransmission

Thema der Disputation:

Synchronization of Kuramoto Oscillator

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

Abstract: Synchronization emerges in diverse natural contexts, from the flashing of fireflies to neuronal networks. Understanding how network structure influences this phenomenon remains a central challenge in dynamical systems. The Kuramoto model provides a powerful framework for studying this question, offering valuable insights despite its simple structure.

In this talk, we focus on the homogeneous case and explore structural conditions that guarantee global synchronization of Kuramoto oscillators on graphs, highlighting recent insights and open challenges. We begin by introducing the model, its gradient system formulation, and the concept of global synchronization. Next, starting from the well-known result for complete graphs, we examine connectivity as a sufficient condition for synchronization and review recently established bounds on the critical connectivity. We then shift our focus to the role of expansion, discussing a new result on global synchronization in expander graphs and its implications for Erdős–Rényi random graphs.

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. C. Schütte