

# A U S H A N G

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## FREIE UNIVERSITÄT BERLIN Fachbereich Mathematik und Informatik

Promotionsbüro, Arnimallee 14, 14195 Berlin

## DISPUTATION

**Freitag, 20. Februar 2015, 11.00 Uhr**

**Ort: Raum 108, Pi-Gebäude, Arnimallee 6, 14195 Berlin**

**Disputation über die Doktorarbeit von**

**Frau Mareen Elisabeth Hallier**

**Thema der Dissertation:  
Formalization and Metastability Analysis  
of Agent-Based Evolutionary Models**

**Thema der Disputation:  
The Complexity of Computing Pure-Strategy Nash Equilibria  
in Congestion Games**

Die Arbeit wurde unter der Betreuung von **Prof. Dr. R. Klein** durchgeführt.

Abstract: The Nash equilibrium solution concept for games is the central notion in modern mathematical economics. One reason for this predominant role is the existence theorem for mixed-strategy Nash equilibria given by John Nash in 1950. Its proof relies on Brouwer's fixed-point theorem, which is inherently non-constructive. Thus, it leaves open the questions of how to actually compute a Nash equilibrium and, more generally, whether Nash equilibria are efficiently computable. It was only in the late 1980s that questions like these became a focus of research. In the special class of congestion games, Fabrikant et al. (2004) more recently showed that pure-strategy Nash equilibria can be computed in polynomially time in the symmetric network case, while the problem of computing pure-strategy Nash equilibria is in general complete for the complexity class PLS ("polynomially local search"), a class of computational problems thought to be of intermediate difficulty between (functional) P and NP. In this talk, I will motivate and present these results and discuss their implications.

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. R. Klein