

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

Freitag, 19. September 2025, 16:00 Uhr

Ort: [WebEx](#)

Disputation über die Doktorarbeit von

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Thema der Dissertation:

Motion Planning for Driverless Shuttles, Passenger Cars, and Trucks

Thema der Disputation:

Reasoning in Large Language Models: From Autoformalization to Mathematical Problem-Solving and Engineering Applications

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

Abstract: Recent achievements by Large Language Models (LLMs) in solving complex mathematical challenges and developing novel algorithms for longstanding computational problems mark significant milestones in artificial intelligence development. These breakthroughs demonstrate the transformative potential of LLMs for advancing scientific research and engineering applications when deployed ethically and effectively. Understanding the underlying mechanisms and architectures of these systems is crucial for multiple reasons: it provides the foundation for developing more cost-effective and environmentally sustainable alternatives, enables broader democratization of the technology, fosters healthy competition and innovation, and empowers users to make more informed decisions about LLM deployment. In this presentation, I will trace the evolution of reasoning capabilities in LLMs, from the introduction of Chain-of-Thought prompting techniques, through specialized mathematical reasoning approaches to the recent paradigm of inference-time compute scaling, analyzing capabilities and limitations of reasoning LLMs. The presentation concludes with an analysis of future developments and opportunities for emerging applications.

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. Rojas