

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, 14. Juli 2025, 13:15 Uhr

Ort: Seminarraum 005

(Fachbereich Mathematik und Informatik, Takustr. 9, 14195 Berlin)

Disputation über die Doktorarbeit von

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Thema der Dissertation:

A Universal Mathematical Language for Argumentative Reasoning Agents

Thema der Disputation:

Higher-order Logic as Universal Meta-language for Reasoning Agents

Die Arbeit wurde unter der Betreuung von **Prof. Dr.-Ing. habil. C. Benz Müller** durchgeführt.

Abstract: This thesis explores the potential of classical higher-order logic (HOL) as a general-purpose meta-language capable of representing and formally reasoning about diverse domain-specific object languages. To demonstrate its versatility, we have developed a library composed of combinator-based modular building blocks within the Isabelle/HOL proof assistant, but easily translatable to other HOL-based systems. We propose that this library exemplifies a universal mathematical language layered over HOL, sufficiently powerful to capture and represent a broad range of logical formalisms—whether classical or non-classical—as well as their underlying classes of mathematical structures. To support this claim, we provide relevant references, primarily drawn from previous research. Moreover, we delve into the domain of multi-agent systems (MAS), introducing the concept of Argumentative Reasoning Agents (ARAs). This kind of agents, we suggest, are particularly well-suited to leverage the expressive power of the proposed library. In this manner, HOL emerges as an ideal common language—a lingua franca—for facilitating effective reasoning and interaction among argumentative reasoning agents in artificial intelligence.

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.-Ing. habil. C. Benz Müller