

# 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, 28. Oktober 2022, 15:00 Uhr**

**Ort: WebEx**

**Disputation über die Doktorarbeit von**

**Herrn Moritz Hoffmann**

**Thema der Dissertation:**

**Efficient algorithms for simulation and analysis of many-body systems**

**Thema der Disputation:**

**Discovering governing equations from time-series data**

Die Arbeit wurde unter der Betreuung von **Prof. Dr. F. Noé** durchgeführt.

Abstract: Even when time-series data is readily and abundantly available, often the underlying dynamics and corresponding governing equations are unknown. In this talk, I will motivate and introduce the "Sparse Identification of Nonlinear Dynamics" (SINDy) machine learning method, which can identify dynamics based on time-series data.

SINDy finds coefficients of a linear combination of basis functions to best approximate the right-hand side of a dynamical system. One crucial assumption is that the number of terms is low, i.e., most coefficients are zero, which is achieved by applying sparse regression. The sparsity fosters simplicity of the estimated model, which not only regularizes the solution and can prevent overfitting but also vastly improves interpretability. Following the principle of Occam's razor, this leads to models which are more likely to be related to the ground truth.

As input, the method not only requires frames describing the state of the system, but also their corresponding time derivative. This requirement can pose significant challenges, which I will highlight.

The talk is concluded with some examples and a discussion of extensions, perspectives, and alternatives.

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. F. Noé