

# 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 2026, 10:00 Uhr**

**Ort: Seminarraum 2006**

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

**Disputation über die Doktorarbeit von**

**Felix Prause**

**Thema der Dissertation:**

**Predictive Maintenance in Rolling Stock Rotation Planning**

**Thema der Disputation:**

**An Introduction to Kalman Filtering**

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

**Abstract:** The Kalman filter is a fundamental algorithm for state estimation in discrete-time linear dynamical systems subject to uncertainty. Originally developed in the context of aerospace engineering, it has since found widespread application in areas such as navigation, signal processing, and robotics. In this talk, we provide an overview of the Kalman filter. We begin by motivating the underlying estimation problem arising in discrete-time linear systems with process and measurement noise. Building on this problem definition, we present the central idea of the Kalman filter as an estimator that combines model predictions with noisy observations. We then derive the Kalman filter equations and illustrate the method using a simple example, demonstrating how the filter recursively refines state estimates over time. Moreover, we discuss variants of the approach that are suitable for nonlinear systems, such as the Extended and Unscented Kalman filters. The goal of this talk is to convey both the intuition and the mathematical principles underlying Kalman filtering and how the classical framework can be extended to more general settings.

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. Borndörfer