Universität Münster

Allgemeines Physikalisches Kolloquium

Donnerstag, 05.11.2026 – 16 Uhr c.t.

IG1 – HS 2 | Wilhelm-Klemm-Str. 10

Kolloquiums-Kaffee ab 16 Uhr vor dem Hörsaal



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Thermodynamics and kinetics from a handful of short stochastic trajectories?

A notorious acute problem in the inference from time-series observations is the uncertainty of estimates in the presence of limited or insufficient sampling. In the worst case scenario, large uncertainties may lead to erroneous conclusions. So far it was rarely possible to make reliable and unbiased statements about the confidence of estimates without substantial knowledge or intuition of the observed process, which is typically not available. In the talk, I will present a novel general framework to characterize the confidence of estimates of thermodynamic and kinetic quantities inferred from stochastic trajectories of any duration and any sample size, which rests on the concentration-of-measure phenomenon. From a practical perspective this enables the control of uncertainty in kinetic and thermodynamic inference from undersampled data. The concentration behavior encodes interesting (and a priori unexpected) physical information and shows stark qualitative and quantitative differences between systems in equilibrium and those driven out of thermodynamic equilibrium. The results provide certainty about the uncertainty of the inferred estimates without prior knowledge about the details of underlying dynamics. Ultimately, the results provide explicit quantitative answers to when an observation is long enough and when a sample is large enough.