



Einladung zum Oberseminar Wissenschaftliches Rechnen

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Wissenschaftliches Rechnen IX

Prof. Dr. Giovanni Manfredi

Institut de Physique et Chimie des Matériaux de Strasbourg

Stochastic thermodynamics: From optimal protocols to quantum analogues

We study, theoretically and experimentally, the stochastic motion of a Brownian particle confined in an optical trap. We propose an optimal strategy to transfer this system from one thermal equilibrium to another by controlling the stiffness of the harmonic trap. This strategy, based on a variational principle that minimizes both the time duration Δt of the process and the expended work ΔW , leads to a family of protocols that are either optimally cheap for a given duration or optimally fast for a given energetic cost. This approach unveils a universal “uncertainty relation” of the type: $\Delta t \Delta W \geq \text{const.}$

Next, we study protocols that use correlated (“colored”) noise and perform the transfer by acting on the correlation time (i.e., the “color”) of the noise. We unveil an intriguing relationship between the informational content of the noise signal and the heat transferred to the Brownian particle.

Finally, we construct optimal protocols that perform the same transfer by controlling the temperature of the system. In that case, we minimize simultaneously the time duration and the production of entropy during the transfer process.

If time permits, I will also discuss how these (classical) stochastic systems can be used to develop precise mathematical analogies with open or close quantum systems.

Ort: Raum 30.02.003 (Mathematik West, 2.Stock)

Zeit: Montag, 07.07.2025, 14:15 Uhr

Zu diesem Vortrag laden wir Sie herzlich ein.
You are cordially invited to this lecture.

gez. Prof. Dr. Alfio Borzi
gez. Prof. Dr. Frank Werner