universität innsbruck

Department of Theoretical Physics

Theory Colloquium

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"Spectrum of Single Trajectories: Theory meets Experiment"

Abstract

The concept of power spectral density (PSD) provides one of the most useful and widespread theoretical tools for the characterization of random signals. Mathematically, the PSD is defined as an average over many realizations of a stochastic process monitored for an infinite time, something that may become hard to access in experimental instances.

The notion of single-trajectory PSD has emerged as a powerful tool that overcomes the limitations of standard approaches based on the average PSD. Indeed, a great deal of untapped information about temporal evolution and correlations is embedded in the spectral content of a single sufficiently long trajectory. This information can be experimentally retrieved thanks to the recent progress in single-particle tracking experiments.

The first part of the talk will be devoted to an introduction to the subject through an overview of some experiments showing the effectiveness of the single-trajectory PSD. The second part of the talk will provide a gentle overview of the state of the art in the development of new spectral fingerprints that have been proposed over the last few years. These concepts will play a role in a forthcoming series of single-particle tracking experiments with optically trapped tracers moving into complex media. The final part of the talk will offer a glimpse at the spectral content of a trapped bead in a viscoelastic medium, a system inspired by experiments with flickering membrane motion in red blood cells.

Wednesday | 13.11.2024 | 5pm

SR 1 | ICT Building