Statistical challenges in Single-Particle Tracking
Mini-colloquium 26

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Keywords: biophysics, statistics, diffusion

The statistical analysis and meaningful physical interpretation of stochastic processes have become indispensable tools in fields as diverse as non-equilibrium statistical physics, biophysics, geophysics, ecology, nanoscale condensed matter systems, laser cooling, or finance [1, 2, 3, 4, 5, 6, 7, 8, 9]. Examples of stochastic data to be analyzed range from random trajectories of individual tracers in living cells to market stock prices. Inferring structural and dynamical properties of a system from a single realization of the stochastic process is a challenging and important problem that has attracted significant attention over the last five years, especially for biophysical and other micro- and nanoscopic applications.

For instance, the time averaged mean square displacement, a basic proxy of diffusivity, has been intensively studied for a variety of anomalous diffusions, with a special emphasis on optimal inference and weak ergodicity breaking, as well as the physical consequences for the dynamics of the system such as diffusion-limited processes or associated relaxation. Other statistical tools have been recently developed and employed, revealing intricate diffusive mechanisms in various visco-elastic complex media, notably, in living cells. The mini-colloquium aims at gathering physicists, biologists and statisticians to exchange the ideas and recently developed techniques, and to boost new interdisciplinary collaborations.

Acknowledgements
Partial support by ANR (Agence Nationale de la Recherche) project “INADILIC” is acknowledged.

References


