

Johannes Zimmer (University of Bath):

From fluctuations in particle systems to gradient flows

Abstract:

Fluctuations of particle systems encode information about the macroscopic evolution, as will be shown in the talk. There are different descriptions of such fluctuations: among them variational formulations related to Onsager-Machlup theory, and infinite-dimensional fluctuation-dissipation theorems. Both these variational representations of large deviation type and fluctuation-dissipation theorems can be linked to equations of fluctuating hydrodynamics. In the talk, this will be discussed for a class of particle models with nonlinear diffusion as many-particle (hydrodynamic) limit. Furthermore, it will be shown how this interplay of fluctuating hydrodynamics and fluctuation-dissipation relations is linked to the theory of gradient flows in metric spaces as a representation of the hydrodynamic limit. This connection will enable us to compute transport coefficients from particle data. In a second step, this leads to a method to determine evolution operators of Wasserstein form directly from particle simulations. The talk will focus on simple situations and discuss open problems.

This is joint work with P. Embacher, N. Dirr, X. Li and C. Reina.