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Averaged Dynamics

Thursday, 20 June 2019 12:00 (45 minutes)

Perturbation and Approximation underly almost all applications of physical mathematical models. The averaging method, first introduced for approximate periodic motions, is now widely used for a large class of problems in both pure and applied mathematics. We will focus on averaged dynamics for two scale differential equations with randomness and report on new advancements in Stochastic Averaging.

The purpose of averaging is easy to describe. Suppose that we have a system of variables interacting with each other and moving at different scales of speed (of order 1 and of order $\frac{1}{\epsilon}$) with the fast variables 'fast oscillatory'. Both slow and fast variables evolve in time according to some rules, for example solving a family of differential or stochastic differential equations. The aim is to determine whether the slow variables can be approximated by an autonomous systems of equations, called the effective dynamic, as ϵ is taken to 0 and the speed of the fast variables tends to infinity.

We will discuss recent work with M. Hairer on averaged dynamics with memory, tackling equations driven by fractional noise. This leads to very different behaviour from the white noise case and requires new techniques recently developed in the context of rough path theory.

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