Capture small-noise-induced rare events in differential equations: from variation to sampling

Abstract:
In this talk, we will discuss some computational issues when applying the large deviation theory to study small-noise-induced rare events in differential equations. We focus on two specific problems: the most probable transition path for an ordinary differential equation and the asymptotically efficient simulation of rare events for an elliptic problem. Both problems are related to the large deviation theory. From a computational point of view, the former one is a variational problem while the latter one is a sampling problem. For the first problem, we have developed an hp adaptive minimum action method, and for the second problem, we will present an importance sampling estimator subject to a sufficient and necessary condition for its asymptotic efficiency.