Nonlinear large deviations bounds with applications to sparse Erdős-Renyi graphs

Abstract:

In this talk, I will present the framework of the so-called nonlinear large deviations introduced by Chatterjee and Dembo. In a seminal paper, they provided a sufficient criterion in order that the large deviations of a function on the discrete hypercube to be due by only changing the mean of the background measure. This sufficient condition was formulated in terms of the complexity of the gradient of the function of interest. I will present general nonlinear large deviation estimates similar to Chatterjee-Dembo's original bounds except that we do not require any second order smoothness. The approach relies on convex analysis arguments and is valid for a broad class of distributions. Then, I will detail an application of this nonlinear large deviations bounds to the problem of estimating the upper tail of cycles counts in sparse Erdos-Renyi graphs down to the connectivity parameter $n^{-1/2}$. 