Extremal Cuts of Sparse Random Graphs

Abstract:

The Max-Cut problem seeks to determine the maximal cut size in a given graph. With no polynomial-time efficient approximation for Max-Cut (unless $P=NP$), its asymptotic for a typical large sparse graph is of considerable interest. We prove that for uniformly random $d$-regular graph of $N$ vertices, and for the uniformly chosen Erdos-Renyi graph of $M=Nd/2$ edges, the leading correction to $M/2$ (the typical cut size), is $P^* \sqrt{NM/2}$. Here $P^*$ is the ground state energy of the Sherrington-Kirkpatrick model, expressed analytically via Parisi’s formula.

This talk is based on a joint work with Subhabrata Sen and Andrea Montanari.