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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 Erdős-Rényi graph of \( M=\frac{Nd}{2} \) 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.