ERDOS PRIZE LECTURE 2022 BY WOJCIECH SAMOTIJ

Large deviations in random graphs

Abstract:

Suppose that $Y_1, \dots, Y_N$ are i.i.d. (independent, identically distributed) random variables and let $X = Y_1 + \dots + Y_N$. The classical theory of large deviations allows one to accurately estimate the probability of the tail events $X < (1-c)\mathbb{E}[X]$ and $X > (1+c)\mathbb{E}[X]$ for any positive c. However, the methods involved strongly rely on the fact that X is a linear function of the independent variables $Y_1, \dots, Y_N$. There has been considerable interest—both theoretical and practical—in developing tools for estimating such tail probabilities also when X is a nonlinear function of the Y_i. One archetypal example studied by both the combinatorics and the probability communities is when X is the number of triangles in the binomial random graph $G(n,p)$. I will discuss recent developments in the study of the tail probabilities of this random variable. The talk is based on joint works with Matan Harel and Frank Mousset and with Gady Kozma.

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