universität innsbruck
Department of Mathematics

Inn'formal Probability Seminar

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"Unusually large components in some critical random graphs"

Abstract

We consider two classical random graph models, namely the binomial random graph as well as the (random) graph obtained through percolation on a random regular graph and investigate the sizes of largest connected components in these models when considered at criticality of their parameters. More specifically, we illustrate a robust probabilistic methodology to obtain matching upper and lower bounds on the probability of observing unusually large maximal components in these critical models, and discuss how these precise estimates can be used to analyses dynamical versions of these random graphs, in which edges are resampled (randomly) in continuous time. The above-mentioned probabilistic argument is simple and relies on three basic ingredients: (1) an exploration process, which (roughly speaking) is an algorithm to sequentially reveal the connected components of the underlying graph and which reduces the problem of studying component sizes to the problem of analyzing the positive excursion of a stochastic process; (2) a "ballot-type" estimate, concerning the probability that a random walk stays positive for a given number of steps and finishes at an arbitrary level; (3) and a Brownian motion approximation of random walk.

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