Title: Chasing the Giant Component in Random Graph Processes

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Abstract: We study the evolution of random graph processes that are based on the paradigm of the power of multiple choices. The processes we consider begin with an empty graph on n vertices. In each subsequent step a set with a specific number $\ell \geq 2$ of randomly chosen vertices is present, and we may select any edge among them to be included in the evolving graph. During the last few years the evolution of such processes has received considerable attention [1, 2, 3, 4, 5, 6, 7]. Among all possible rules that can be defined in this setting the most natural ones are the so-called size rules, whose choices depend only on the sizes of the components. In particular bounded-size rules, which have the additional property that all sizes larger than some absolute constant K are treated in the same way, were studied intensely. For example, if $\ell = 2, K = 0$ the rule corresponds to the classical Erdős-Rényi process. In this talk we consider a general family of bounded-size rules. This family of rules "approximate" formally any general size rule by a sequence of appropriately defined bounded-size rules, where the given size-bound increases gradually. We determine the typical size of the giant component shortly after the phase transition and provide bounds for the size distribution of small components. To this end we develop an analytic framework that allows us to study the solutions of a fairly general class of quasi-linear partial differential equations, arising from the class of Smoluchowski's coagulation equations.

References

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