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Maximizing the size of the giant

Tom Britton*
Pieter Trapman†

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Abstract

We consider two classes of random graphs:

(a) Poissonian random graphs in which the n vertices in the graph have i.i.d. weights distributed as X, where $E(X) = \mu$. Edges are added according to a product measure and the probability that a vertex of weight x shares and edge with a vertex of weight y is given by $1 - e^{-xy/(\mu n)}$.

(b) A thinned configuration model in which we create a ground-graph in which the n vertices have i.i.d. ground-degrees, distributed as D, with $E(D) = \mu$. The graph of interest is obtained by deleting edges independently with probability $1 - p$.

In both models the fraction of vertices in the largest connected component converges in probability to a constant $1 - q$, where q depends on X or D and p.

We investigate for which distributions X and D with given μ and p, $1-q$ is maximized. We show that in the class of Poissonian random graphs, X should have all its mass at 0 and one other real, which can be explicitly determined. For the thinned configuration model D should have all its mass at 0 and two subsequent positive integers.

*Mathematical Statistics, Stockholm University. Email: tomb@math.su.se
†Mathematical Statistics, Stockholm University.