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Bootstrap percolation on geometric inhomogeneous random graphs

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Recently Bringmann, Keusch, and Lengler introduced a new random graph model – geometric inhomogeneous random graphs (GIRGs) – possessing many of the characteristic properties of complex real-world networks (Power-law degree distribution, small diameter, etc.). Each vertex consists of a geometric position and a weight and any two vertices u, v are connected by an edge independently with some probability $p_{u,v}$ depending on their weights and relative position. In particular, GIRGs generalise the well-studied model of hyperbolic random graphs and facilitate their analysis by stripping off most of the technical details.

In this talk we investigate the evolution of a well-known infection process called bootstrap percolation with localised initial infection on GIRGs. Given some infection parameter $r > 1$ and a ball B_0 of volume ν we initially infect any vertex lying in B_0 with some probability p_0. And then round after round, the infection spreads to all those still uninfected vertices which have at least r infected neighbors. Once a vertex becomes infected, it remains so forever. We show that this process exhibits a threshold behaviour in terms of p_0, in other words, there is a critical probability $p_c = p_c(\nu)$ such that the following holds: If $p_0/p_c \to \infty$ then the process starts to accelerate very quickly and eventually infects a large proportion of all vertices; while if $p_0/p_c \to 0$ then it stops without infecting substantially more vertices than those which were infected initially.

This extends some results by Candellero and Fountoulakis on bootstrap percolation with global initial infection on hyperbolic random graphs.

This is joint work with Johannes Lengler.

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