LOCALISED INFECTIONS IN GEOMETRIC INHOMOGENEOUS RANDOM GRAPHS

CHRISTOPH KOCH

Geometric inhomogeneous random graphs (GIRGs) are a model for scale-free networks with an underlying geometry recently introduced by Bringmann, Keusch, and Lengler. We determine how the geometry of this model influences the spread of an infection which originates from a small region. The infection is modelled by a localised version of the classical bootstrap percolation process: initially a random subset of the vertices in a small region are infected, and subsequently each vertex with at least $r > 1$ infected neighbours is also infected. Once a vertex is infected, it remains so forever.

We show that the process exhibits a phase transition in terms of the initial infection rate ρ. For the supercritical regime, we determine the speed of the process up to lower order terms, and show that its evolution is fundamentally influenced by the underlying geometry. For vertices with given position and expected degree, we determine the infection time up to lower order terms. Finally, we show how this knowledge can be used to contain the infection locally by removing relatively few edges from the graph.

These results are joint work with J. Lengler (ETH Zürich).