Kempner Colloquium

The Contact Process on Power Law Random Graphs

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The contact process on a graph G is an interacting particle system that models the spread of an infection in a population. Every infected node transmits the infection to each neighbour with rate $\lambda > 0$ and recovers from the infection with rate one. If G is the d-dimensional integer lattice, the process exhibits a phase transition as λ varies: if λ is smaller than a certain threshold, then the infection disappears quickly, but if it is larger, then there is a chance for a massive epidemic. In this talk we consider the case when G is a uniformly chosen random graph on n vertices with a fixed heavy-tailed degree distribution. It is a result due to Chatterjee and Durrett (2009) that on such graphs, for any positive value of λ, the epidemic prevails for a long time. We study both the amount of time for the epidemic to halt and the typical density $\rho(\lambda)$ of infected vertices at times when the process is still active. We show that the small-λ behaviour of $\rho(\lambda)$ depends sensitively on the exponent a of the power law of the degree distribution of G: the decay of $\rho(\lambda)$ as λ goes to zero exhibits three different phases if $2 < a \leq 2.5$, $2.5 < a \leq 3$ or $3 < a$. Talk based on joint work with Thomas Mountford and Qiang Yao.

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MATH 350