

Impact of community structures on the spread
of an infection:
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Empirical studies show that communities such as households and workplaces strongly influence how an infection spreads and how long it persists. To understand this effect, we study the contact process on random intersection graphs and their local weak limit. In this finite random graph model, each individual belongs to a random number of communities of random size, and individuals sharing a community are connected. In the contact process, infected individuals infect each neighbour at rate λ and recover at rate 1.

We determine how long a sufficiently large community sustains an infection. Using this, we derive sufficient conditions on the membership and community-size distributions under which the phase transition for (strong) survival on the limiting graph is trivial, i.e. the infection strongly survives for every $\lambda > 0$. Under the same conditions, the infection survives on the finite graph for a time exponential in the graph size, with high probability. Finally, we compare our results with a “community-free” random graph with a similar degree distribution to highlight the impact of communities.

This talk is based on joint work with Júlia Komjáthy and Daniel Valesin.