Minimal contagious sets in random regular graphs.

Epidemic processes are dynamical evolutions of the states of the vertices of a graph, with contagion rules based on the state of the neighboring vertices. If the evolution of such processes starting from a random initial configuration is usually rather easy to study, they also give birth to many difficult inference and optimization problems, for instance finding the origin of the epidemy given a snapshot of its later evolution, or targetting some nodes to be vaccinated in order to minimize the spreading of the epidemy. We will consider another optimization problem, namely the determination of the minimal number of initially infected vertices that trigger the propogation of the epidemy to the whole graph. This problem can be recast under the form of a statistical mechanics model on a sparse random graph, for which the so-called cavity method can be applied. The basic ingredients of this method will be reviewed, as well as some results for this specific problem.