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Bootstrap percolation processes on inhomogeneous random structures

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Bootstrap percolation processes were considered for the first time in the late 1970s by Chalupa, Leath and Reich. This is a family of discrete time dissemination processes which evolve in rounds. Given a graph G, a natural number r and a subset of vertices of G which we consider as the set of initially infected vertices, in each round a vertex which has at least r infected neighbours becomes infected and remains so for ever. We analyse this process for the case where G is an inhomogeneous random graph (having a rank-1 kernel) and the initial set is uniformly random. We obtain a law of large numbers for the size of the final set. We also consider a special case of the above class of random graphs where the degree sequence follows a power law with exponent between 2 and 3. In this case, we determine a critical function $a_c(n)$ which grows sub-linearly such that if the size of the initial set is $a(n) \gg a_c(n)$, then the final set has linear size, which we determine, but if $a(n) \ll a_c(n)$, then the process does not evolve at all. We also show analogous results for another family of inhomogeneous random graphs, namely random graphs which are created through the preferential attachment model.

The above results are joint work with M. Abdullah (Birmingham), H. Amini (EPFL, Lausanne) and K. Panagiotou (LMU, Munich).

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