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Graph bootstrap percolation

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Graph bootstrap percolation is a deterministic cellular automaton which was introduced by Bollob\'as in 1968, and is defined as follows. Given a graph H, and a set $G \subset E(K_n)$ of initially `infected' edges, we infect, at each time step, a new edge e if there is a copy of H in K_n such that e is the only not-yet infected edge of H. We say that G percolates in the H-bootstrap process if eventually every edge of K_n is infected. The extremal questions for this model, when H is the complete graph K_r, were solved (independently) by Alon, Kalai and Frankl almost thirty years ago. In this paper we study the random questions, and determine the critical probability $p_c(n,K_r)$ for the K_r-process up to a poly-logarithmic factor. In the case $r = 4$ we prove a stronger result, and determine the threshold for $p_c(n,K_4)$.

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