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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^{n} , and a set $G \ E(K_n)$ 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 polylogarithmic 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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