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Maximizing the expected number of components in an online search of a graph

The following optimal stopping problem is considered. The vertices of a graph G are revealed one by one, in a random order, to a selector. He aims to stop this process at a time t that maximizes the expected number of connected components in the graph $\tilde{G}_t$, induced by the currently revealed vertices. The selector knows G in advance, but different versions of the game are considered depending on the information that he gets about $\tilde{G}_t$. We show that when G has N vertices and maximum degree of order $o(\sqrt{N})$, then the number of components of $\tilde{G}_t$ is concentrated around its mean, which implies that playing the optimal strategy the selector does not benefit much by receiving more information about $\tilde{G}_t$. Results of similar nature were previously obtained by M. Lasoń for the case where G is a k-tree (for constant k). We also consider the particular cases where G is a square, triangular or hexagonal lattice, showing that an optimal selector gains cN components and we compute c with an error less than 0.005 in each case.

This is joint work with Fabrício Siqueira Benevides.