

On Sidorenko's Conjecture

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Abstract

Sidorenko's conjecture states that if H is a bipartite graph then the random graph with edge density p has in expectation asymptotically the minimum number of copies of H over all graphs of the same order and edge density. It is known to be true for various families of graphs, including trees, even cycles, cubes and bipartite graphs with one vertex complete to the other side.

In 2014 Balázs Szegedy developed a new method for proving Sidorenko's conjecture for new classes of graphs. He introduces a family of graphs H that admit a probability distribution of copies in an arbitrary graph G obtained by iterating conditionally independent couplings starting from the uniform distribution on edges. As a tool he uses an inclusion exclusion type formula for relative entropy. He claims that the method gives a unified treatment for most known cases of the conjecture and it implies various new results as well. This was part of my master's thesis.