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Core Forging by Warning Propagation

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The k-core of a graph is the largest subgraph of minimum degree k. It can be determined algorithmically by the peeling process that removes an arbitrary vertex of degree less than k while there is one. In this paper we study the k-core of the Erdős-Rényi random graph $G(n, m)$ for $m = \frac{dn}{2}$ with some fixed positive constant $d > 0$.

We propose a new approach to the k-core problem in random graphs. More precisely, we devise a randomised algorithm that produces graphs with a k-core of a given order and size.

This algorithm is based on an enhanced "configuration model" that explicitly designates which vertices will wind up in the core. As it turns out, the necessary structure to construct such configuration model can be set out by way of Warning Propagation, a message passing scheme that plays an important role in physics work on random constraint satisfaction problems.

This is joint work with Amin Coja-Oghlan, Oliver Cooley and Mihyun Kang.

Mihyun Kang