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BOLTZMANN SAMPLING AND OPTIMAL EXACT-SIZE SAMPLING FOR DIRECTED ACYCLIC GRAPHS

We propose two efficient algorithms for generating uniform random directed acyclic graphs with a randomly varying size, as well as an asymptotically optimal exact-size sampler based on them, that performs $\frac{n^2}{2} + o(n^2)$ operations and requests to a random generator. This was achieved by extending the Boltzmann model for graphical generating functions and by using various decompositions of directed acyclic graphs. The presented samplers improve upon the state-of-the-art algorithms in terms of theoretical complexity, offer a significant speed-up in practice, and open perspectives regarding edge-constrained sampling.

This is joint work with Zbigniew Gołębiewski, and Martin Pèpin.