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Comparing mixing times on sparse random graphs

It is natural to expect that nonbacktracking random walk will mix faster than simple random walks, but so far this has only been proved in regular graphs. To analyze typical irregular graphs, let G be a random graph on n vertices with minimum degree 3 and a degree distribution that has exponential tails. We determine the precise mixing time for simple random walk on G from all starting points: with high probability, this mixing time is asymptotically $\mathbf{h}^{-1} \log n$, where $\mathbf{h}$ is the asymptotic entropy for simple random walk on a Galton–Watson tree that approximates G locally. (Previously this was only known for typical starting points.) Furthermore, we show that this asymptotic mixing time is strictly larger than the mixing time of nonbacktracking walk, via a delicate comparison of entropies on the Galton–Watson tree.

Joint work with A. Ben-Hamou and Y. Peres