

abstract

SPECIAL COMPUTER SCIENCE/DISCRETE MATH SEMINAR

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

The cutoff phenomenon describes a sharp transition in the convergence of a family of ergodic finite Markov chains to equilibrium. Many natural families of chains are believed to exhibit cutoff, and yet establishing this fact is often extremely challenging. An important such family of chains is the random walk on $G(n,d)$, a random d -regular graph on n vertices. It is well known that the spectral gap of this class of chains for d fixed is constant, implying a mixing-time of $O(\log n)$. According to a conjecture of Peres, the simple random walk on $G(n,d)$ for any fixed d should then exhibit cutoff whp. As a special case of this, Durrett conjectured that the mixing time of the lazy random walk on a random 3-regular graph is whp $(6+o(1))\log_2(n)$.

In this work we confirm the above conjectures, and establish cutoff in total-variation, its location and its optimal window, both for simple and for non-backtracking random walks on $G(n,d)$. Namely, for any fixed d , the simple random walk on $G(n,d)$ whp has cutoff at $[d/(d-2)]\log_{d-1}(n)$ with window order $\sqrt{\log n}$. Surprisingly, the non-backtracking random walk on $G(n,d)$ whp has cutoff already at $\log_{d-1}(n)$ with constant window order. We further extend these results to $G(n,d)$ for any $d=n^{o(1)}$ (beyond which the mixing time is $O(1)$), provide efficient algorithms for testing cutoff, as well as give explicit constructions where cutoff occurs.

Joint work with Allan Sly.