מכון ויצמן למדע

THE WEIZMANN INSTITUTE OF SCIENCE

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Geometric Functional Analysis and Probability Seminar

Room 155 ,Ziskind Building
on Thursday, Aug 16, 2018
at 13:30

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Random graphs with constant r-balls

Abstract:

Let F be a fixed infinite, vertex-transitive graph. We say a graph G is `r-locally F' if for every vertex v of G, the ball of radius r and centre v in G is isometric to the ball of radius r in F. For each positive integer n, let G_n be a graph chosen uniformly at random from the set of all unlabelled, n-vertex graphs that are r-locally F. We investigate the properties that the random graph G_n has with high probability --- i.e., how these properties depend on the fixed graph F.

We show that if F is a Cayley graph of a torsion-free group of polynomial growth, then there exists a positive integer r_0 such that for every integer r at least r_0, with high probability the random graph $G_n = G_n(F,r)$ defined above has largest component of size between n^{c_1} and n^{c_2}, where $0 < c_1 < c_2 < 1$ are constants depending upon F alone, and moreover that G_n has a rather large automorphism group. This contrasts sharply with the random d-regular graph $G_n(d)$ (which corresponds to the case where F is replaced by the infinite d-regular tree).

Our proofs use a mixture of results and techniques from group theory, geometry and combinatorics.

We obtain somewhat more precise results in the case where F is L^d (the standard Cayley graph of Z^d): for example, we obtain quite precise estimates on the number of n-vertex graphs that are r-locally L^d, for r at least linear in d.

Many intriguing open problems remain: concerning groups with torsion, groups with faster than polynomial growth, and what happens for more general structures than graphs.

This is joint work with Itai Benjamini (WIS).

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