מכון ויצמן למדע

THE WEIZMANN INSTITUTE OF SCIENCE

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Geometric Functional Analysis and Probability Seminar

Room 261 ,Ziskind Building
on Thursday, Feb 05, 2015
at 11:05

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On the phase transition in random simplicial complexes

Abstract:

It is well-known that the model of random graphs undergoes a dramatic change around p=1/n. It is here that the random graph is, almost surely, no longer a forest, and here it first acquires a giant connected component. Several years ago, Linial and Meshulam have introduced the X_d(n,p) model, a probability space of n-vertex d-dimensional simplicial complexes, where X_1(n,p) coincides with G(n,p). Within this model we prove a natural d-dimensional analog of these graph theoretic phenomena. Specifically, we determine the exact threshold for the nonvanishing of the real d-th homology of complexes from X_d(n,p), and show that it is strictly greater than the threshold of d-collapsibility. In addition, we compute the real Betti numbers, i.e. the dimension of the homology groups, of X_d(n,p)for p=c/n. Finally, we establish the emergence of giant shadow at this threshold. (For d=1 a giant shadow and a giant component are equivalent). Unlike the case for graphs, for d > 1 the emergence of the giant shadow is a first order phase transition. The talk will contain the necessary toplogical backgorund on simplicial complexes, and will focus on the main idea of the proof: the local weak limit of random simplicial complexes and its role in the analysis of phase transitions. Joint work with Nati Linial.

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