

Discrete Isoperimetry: Problems, Results, Applications, and Methods

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Discrete isoperimetric results initiated by Kruskal-Katona, Loomis-Whitney, Harper and others, play important role in several areas of combinatorics and in applications to other areas. In the talk, I will discuss problems and progress in two directions.

The first direction is trying to understand the near equality case of Harper's theorem. I will present and motivate a conjecture with Kahn that proposes a far-reaching generalization to results by Friedgut, Bourgain and Hatami. I will introduce the analytic methods used in this direction and the applications to probabilistic questions.

The second direction is trying to extend classical relations between the number of vertices and edges of planar graphs to higher dimensional embeddable complexes. I will present and motivate a conjecture by Sarkaria and me and mention the geometric and algebraic methods involved in its study.