

Geometric combinatorics, graphs and hypergraphs

Date Tuesday, February 26

Time 3 pm

Location 303 Mudd

Abstract: I will describe how several questions in geometric combinatorics translate into questions about graphs and hypergraphs.

1. Borsuk's problem.
2. Tverberg theorem and Tverberg's type problems. Tverberg's theorem asserts that $(r - 1)(d + 1) + 1$ points in d -space can be divided into r parts whose convex hull intersect. I will discuss situations where less points admit such a partition and connections with graph theory. (For more background, look at this MO question [Tverberg partitions with less than \$\(r - 1\)\(d + 1\) + 1\$ points](#) [[mathoverflow.net](#)])
3. Helly type theorems and conditions on induced subgraphs and sub-hypergraphs. I will explain the origin to the following conjecture of Meshulam and me: There is an absolute upper bound for the chromatic number of graphs with no induced cycles of length divisible by 3.
4. Embedding of 2-dimensional complexes and high dimensional minors. I will discuss the following conjecture: A 2-dimensional simplicial complex with E edges and F 2-dimensional faces that can be embedded into 4-space satisfies $F < 4e$. (For more background see my post [\$F \leq 4E\$](#) [[gilkalai.wordpress.com](#)])