

Marston Morse Lectures

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The Codimension Barrier in Incidence Geometry

Larry Guth

Massachusetts Institute of Technology

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Incidence geometry is a part of combinatorics that studies the intersection patterns of geometric objects. For example, suppose that we have a set of L lines in the plane. A point is called r -rich if it lies in r different lines from the set. For a given L and a given r , how many r -rich points can there be? This question is answered by a theorem of Szemerédi and Trotter from the early 80's. Different generalizations of this theorem are a central topic in incidence geometry. For example, it would be interesting to know what happens if we consider k -planes in \mathbb{R}^n instead of lines in the plane. In particular there is a new difficulty for objects of codimension > 1 , such as lines in \mathbb{R}^3 . We explain why this type of problem is hard to understand using previous methods, and how the polynomial method has helped break the 'codimension barrier'.

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Dorothea Phares

phares@ias.edu

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- [School of Mathematics](#)