Combinatorics Seminar

On the Erdős-Gyárfás distinct distances problem with local constraints

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In 1946 Erdős asked to determine or estimate the minimum number of distinct distances determined by an n-element planar point set V. He showed that a square integer lattice determines $\Theta(n/\sqrt{\log n})$ distinct distances, and conjectured that any n-element point set determines at least $n^{1-o(1)}$ distinct distances. In 2010-2015, Guth and Katz answered the Erdős question by proving that any n-element planar point set determines at least $\Omega(n/\log n)$ distinct distances.

In this talk, we consider a variant of this problem by Erdős and Gyárfás. For integers n, p, q with $p \geq q \geq 2$, determine the minimum number $D(n, p, q)$ of distinct distances determined by a planar n-element point set V with the property that any p points from V determine at least q distinct distances. In a recent paper, Fox, Pach and Suk prove that when $q = \binom{p}{2} - p + 6$, $D(n, p, q) \geq n^{8/7-o(1)}$. We will discuss a recent improvement of their result and some new bounds for a related (graph theoretic) Ramsey problem of Erdős and Shelah which arise.

This is joint work with Adam Sheffer.

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Mathematics & Science Center – E408

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