Polynomial method for point configurations

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Abstract. A celebrated theorem due to Bannai–Bannai–Stanton says that if A is a set of points in $\mathbb{R}^d$, which determines two distinct distances, then

$$|A| \leqslant \binom{d+s}{s}.$$

I want to discuss a short proof of this result which combines Sylvesters Law of Inertia for quadratic forms with the proof of the so-called Croot–Lev–Pach Lemma [1] from additive combinatorics. Based on a joint work [2] with C. Pohoata.

References

[1] E. Croot, V. Lev, and P. Pach, *Progression-free sets in $\mathbb{Z}_4^n$ are exponentially small*, Annals of Mathematics **185** (Jan. 2017), no. 1, 331–337.

[2] F. Petrov and C. Pohoata, *A remark on sets with few distances in $\mathbb{R}^d$*, Proceedings of the American Mathematical Society **149** (Nov. 2020), no. 2, 569–571.

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