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Boris Bukh, Jiri Matousek and Gabriel Nivasch

Lower Bounds for Weak epsilon-Nets and Stair-Convexity

A subset N of R^d is called a "weak epsilon-net" (with respect to convex sets) for a finite point set X in R^d if N intersects every convex set that contains at least $\epsilon|X|$ points of X . For every fixed $d \geq 2$ and every $r \geq 1$ we construct subsets X of R^d for which every weak $1/r$ -net has at least $\Omega(r \log^{d-1} r)$ points; this is the first superlinear lower bound for weak epsilon-nets in a fixed dimension.