Seminar on Combinatorial Computing
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Room 8404, Graduate Center
365 Fifth Avenue, New York

# k-sets in 2 and 3 dimensions

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**Abstract**

Given finite set $S$ of points in $d$-space, a subset $S'$of $S$ of size $k$ is called a $k$-set (of $S$) if it can be separated from $S - S'$ by a hyperplane. It is an important and well studied problem for given $n, k$, and $d$ to find the maximal number of $k$-sets of an $n$ element set in $d$-space.

In the plane ($d = 2$), the best upper bound is the result of T. K. Dey: n points in the plane determine $O(nk^{1/3})$ $k$-sets. We established an $O(nk^{3/2})$ upper bound for the number of $k$-sets in 3-space with M. Sharir and S. Smorodinsky.

The best lower bounds are only slightly superlinear: G. Tóth constructed n points in the plane with $n2^{\Omega(\sqrt{\log k})}$ $k$-sets, and with $nk2^{\Omega(\sqrt{\log k})}$ $k$-sets in 3-space.

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