

Homework 5

CS 6810—David Steurer

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1 Dense distributions vs flat distributions

Do Exercise 19.7. You may assume the hyperplane separation theorem.

2 Min Max theorem from hyperplane separation

Do Exercise 19.6. You may assume the hyperplane separation theorem.

3 Limitations of combinatorial designs

Show the following limitation on combinatorial designs: If S_1, \dots, S_k are subsets of a universe U such that for some $\rho > 0$, $|S_i| = \rho|U|$ and $|S_i \cap S_j| \leq \rho^2|U|/2$ for every distinct $i, j \in [k]$ then $k \leq \lceil 2/\rho \rceil$.

Hint: Represent the sets S_1, \dots, S_k as $|U|$ -dimensional real-valued vectors such that the inner products between the vectors are a simple function of the intersection sizes of the sets.

Footnotes