

Algorithms for Big Data

Spring Semester 2022

Exercise Set 11

Exercise 1:

Write explicitly the LP for compressed sensing L_1 norm minimization.

Exercise 2:

(2 pts.)

What is the complexity of the decision version of the L_0 norm minimization for the compressed sensing: given A , b and k , is there k -sparse x such that $Ax = b$.

Exercise 3:

Given $p, q \geq 1$, find and prove tight bounds for $\frac{\|x\|_p}{\|x\|_q}$.

Exercise 4:

(Lemma 6 from lecture notes) Let A be a matrix with (k, ε) -RIP. Show that for any $S \subseteq [n]$ such that $|S| \leq k$, and for any vector x , there is

$$\|(I - A_S^T A_S)x_S\|_2 \leq \varepsilon \|x_S\|_2.$$