VANDERBILT UNIVERSITY
CE 5999
INTRO TO OPTIMIZATION

HOMEWORK # 4
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Due date of the homework: March 5th, midnight. Most of these problems have very short answers, so do not be surprised. They just require some thinking.

1. Given M points in $\mathbb{R}^n$, that is, $y^{(1)}, \dots, y^{(M)} \in \mathbb{R}^n$, find a point with the property that the sum of squared Euclidean distances from $y^{(i)}$ is minimized. The problem is formulated as follows:

$$\min_{x \in \mathbb{R}^n} \quad \sum_{i=1}^{M} \|x - y^{(i)}\|_2^2$$

   Note that here the distances are squared. You should be able to find the solution in closed form.

2. Boyd-Vandenberghe 4.1.

3. Boyd-Vandenberghe 4.3.

   Hint: Apply the optimality condition we learned in class for any optimal point.

4. Boyd-Vandenberghe 4.9.

   Hint: Apply a change of variables $y = Ax$ and then observe the resulting optimization objective function and constraints.

5. Boyd-Vandenberghe 4.11.

   Hint: Explain the equivalence of the given problems and the LPs you derive.

6. Boyd-Vandenberghe 4.12. Read the problem description carefully.

7. Boyd-Vandenberghe 4.13.

   Hint: The problem is simpler than you might think. Use absolute values. ;)

8. Boyd-Vandenberghe 4.15.

9. Boyd-Vandenberghe 4.16.

10. Boyd-Vandenberghe 4.23.

11. Boyd-Vandenberghe 4.26-a). Verify the claim first then solve part a) of the problem.

12. Boyd-Vandenberghe 4.33.