CSDS 440: Assignment 7

Shaochen (Henry) ZHONG, sxz517

Mingyang TIE, mxt497

Due and submitted on 10/23/2020

Fall 2020, Dr. Ray

Problem 28

Rewrite the $Ax \geq b$ to $-(Ax - b) \leq 0$ of $\min_x c^T x$. The largrangian for primal will be $\ell(x, u) = c^T x - u^T(Ax - b)$. Then

$$\begin{aligned}\nabla\ell(x,u) &= \nabla(c^T x - u^T(Ax-b)) = 0 \\ &= c^T - u^T A = 0 \\ \Longrightarrow & c = A^T u\end{aligned}$$

Now for the dual $\max_{u:u\geq 0} D(u) - b^T A$. $\nabla\ell(x, u) \geq 0$ suggests the dual is stilling moving towards the maximum direction of $b^T A$. So we have obtained the asked $\max b^T A s.t. A^T u \leq c, u \geq 0$.