
EECS 127/227AT Optimization Models in Engineering
Spring 2020

Discussion 7

1. A simple example of strong duality

Consider the following minimization problem, with $\epsilon \in \mathbb{R}$:

$$\begin{aligned} p^* = \min_{x \in \mathbb{R}} \quad & x^2 \\ \text{s.t.} \quad & x \geq \epsilon \end{aligned}$$

(a) Solve this optimization problem for p^* .

(b) Write the Lagrangian function $\mathcal{L}(x, \lambda)$.

(c) Write the Lagrangian dual function $g(\lambda)$.

(d) Solve the dual problem. Does strong duality hold?

(e) Give the value of the dual variable λ that maximizes the dual problem as a function of ϵ .

2. Dual of an LP

Consider the general form of a linear program:

$$\begin{aligned} \min_{\vec{x}} \quad & \vec{c}^\top \vec{x} \\ \text{s.t.} \quad & A\vec{x} = \vec{b} \end{aligned}$$

(a) Write the Lagrangian function $\mathcal{L}(\vec{x}, \vec{\mu})$.

(b) Write the Lagrangian dual function $g(\vec{\mu})$.

(c) Write the dual problem.