Semidefinite Optimization

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Contents

Chapter 1

First Chapter

1.1 Primal Problem and Dual Problem

DEFINITION (Primal Problem)**.** Let $C \in \mathbb{S}^n$. Let $b \in \mathbb{R}^m$. Let $\mathcal{A}$ be a linear transformation from $\mathbb{S}^n$ to $\mathbb{R}^m$. We define the **primal problem** to be the following.

$$\begin{aligned} \text{(P)} \qquad \inf \quad & \langle C, X \rangle \\ \text{subject to} \quad & \mathcal{A}(X) = b \\ & X \succeq 0 \end{aligned}$$

DEFINITION (Dual Problem)**.** We define the **dual problem** of the above primal problem to be the following.

$$\begin{aligned} \text{(D)} \qquad \sup \quad & b^\top y \\ \text{subject to} \quad & \mathcal{A}^* y + S = C \\ & S \succeq 0 \end{aligned}$$