

1 Optimal Diagonal Preconditioner via DSDP

Recall the optimal diagonal preconditioning problem

$$\begin{aligned} \min_{\kappa, D} \quad & \kappa \\ \text{s.t.} \quad & M \succeq D \\ & \kappa D \succeq M \\ & D \succeq 0 \end{aligned}$$

We can do a change of variable $\kappa \rightarrow 1/\kappa$ to obtain

$$\begin{aligned} \max_{(\tau, d)} \quad & \tau \\ \text{s.t.} \quad & D - M \preceq 0 \\ & \tau M - D \preceq 0 \end{aligned}$$

which is in standard dual SDP form, with D the diagonal matrix with d on the diagonal.