

KKT 条件.

$$\begin{aligned} \min f_0(x) \\ \text{s.t. } f_i(x) \leq 0 \\ h_i(x) = 0 \end{aligned}$$

拉格朗日乘子.

$$\begin{aligned} L(x, \lambda) &= f_0(x) - \sum \lambda_i f_i(x) \\ \lambda &\leq 0 \end{aligned}$$

$$\min C^T x$$

$$\text{s.t. } Ax = b \\ x \geq 0$$

$$L(x, \lambda, v) = C^T x - \lambda^T (Ax - b) - v^T x$$

$$\textcircled{1} \quad \nabla L(x, \lambda, v) = 0$$

$$C^T - \lambda^T A - v^T = 0$$

$$\Leftrightarrow C^T \geq A^T \lambda$$

$$\textcircled{2} \text{ 原可行 } Ax = b, x \geq 0$$

$$\textcircled{3} \text{ 对偶可行 } v \geq 0$$

$$\textcircled{4} \text{ 互补松弛性 } \begin{cases} \lambda^T (Ax - b) = 0 \\ v^T x = 0 \end{cases}$$

$$\Leftrightarrow C^T x = \lambda^T b$$

$$\lambda^T b = g(\lambda) = \inf_x L(x, \lambda, v) = C^T x$$