Complementary slackness

$$\begin{aligned} \min \quad & x + y \\ & 2x + y \geq 2 \\ & x - 3y + 6 \geq 0 \\ & -3x + y + 3 \geq 0 \end{aligned}$$

$$\begin{aligned} \max \quad & 2a - 6b - 3c \\ & 2a + b - 3c = 1 \\ & a - 3b + c = 1 \\ & a, b, c \geq 0 \end{aligned}$$

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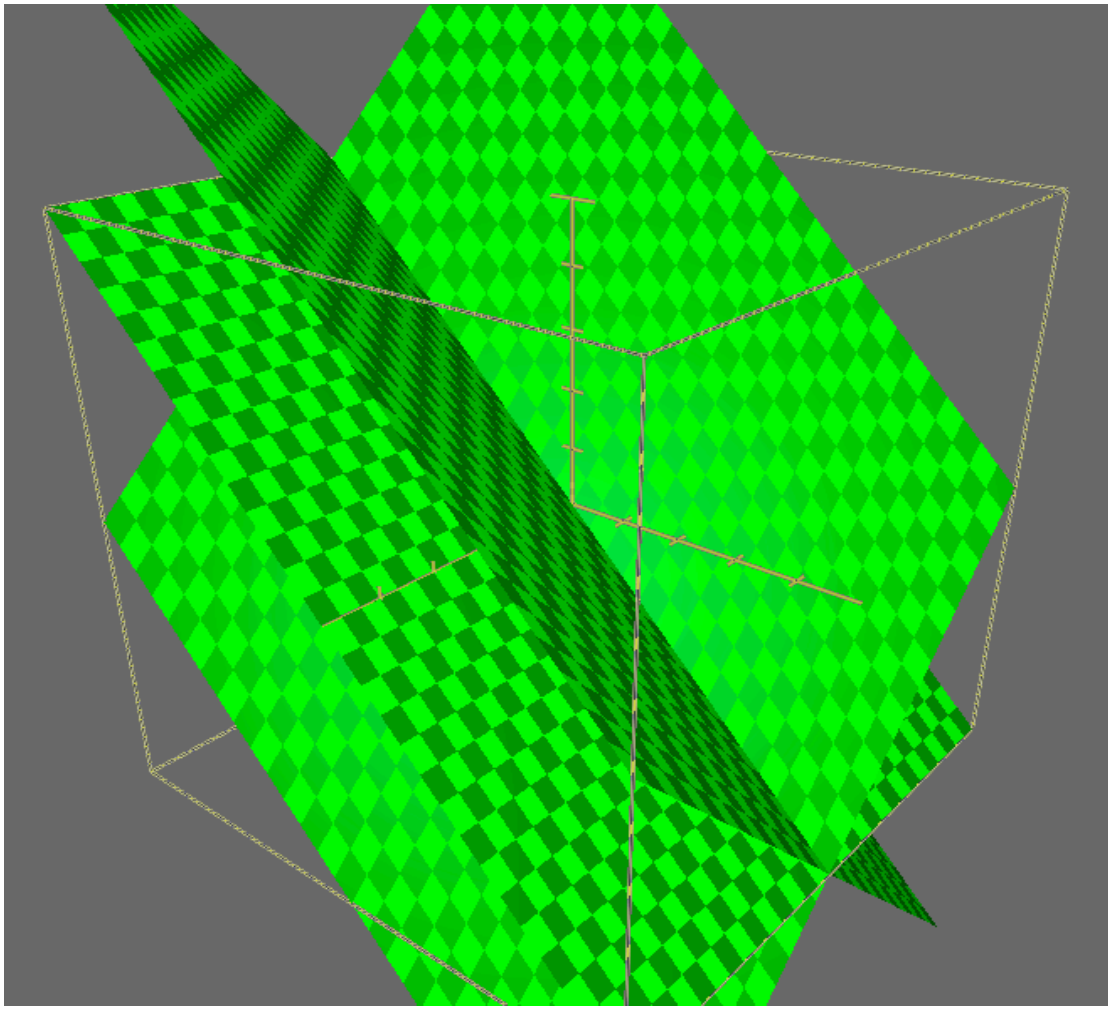
$$\begin{aligned} \max \quad & 2a - 6b - 3c \\ 2a + b - 3c &= 1 \\ a - 3b + c &= 1 \\ a, b, c &\geq 0 \end{aligned}$$

Complementary slackness in 3D

$$\begin{aligned} \min\ & -y + z \ \text{ s.t.} \\ & -x - y + z \geq 0 \\ & x - y + z \geq 0 \\ & -y + z \geq 0 \end{aligned}$$



What about QP duality?

- min $x^2 + y^2$ s.t.

  $x + 2y \geq 2$

  $x, y \geq 0$
- How can we lower-bound OPT?

Works at other points too

- min $x^2 + y^2$ s.t.

  $x + 2y \geq 2$

  $x, y \geq 0$
- Try Taylor @ (x, y) = (v, w)

SVM duality

- Recall: min s.t.
- Taylor bound objective:
- Generic constraint:

- To get bound, need:

SVM dual

- $\max_{\alpha,v} \Sigma_i \alpha_i - ||v||^2/2$ s.t.

  $\Sigma_i \alpha_i y_i = 0$

  $\Sigma_i \alpha_i y_i x_{ij} = v_j \quad \forall j$

  $\alpha_i \geq 0 \quad \forall i$