cvxopt.solvers.qp: $\underset{x}{\text{argmin}} \left(\frac{1}{2} x' P x + q' x \right)$

such that $Gx \leq h$

$Ax = b$

Our SVM optimization problem.

$$\underset{a}{\text{argmax}} \left(1^T a - \frac{1}{2} a^T H a \right)$$

such that $t^T a = 0$ ——— ①

$0 \leq a \leq C$ ——— ②

$$= \text{argmin} \left(\frac{1}{2} a^T H a - 1^T a \right)$$

$\therefore$ $x = a$

$P = H$

$q' = 1^T$

① $t^T a = 0$ $\therefore$ $A = t^T$

$Ax - b = 0$ $\quad b = 0$

② $0 \leq a \leq C \longrightarrow -a \leq 0 \,,\; a \leq C$

$$\begin{bmatrix} -1 \times a \\ 1 \times a \end{bmatrix} \leq \begin{bmatrix} 0 \\ C \end{bmatrix}$$

$$\begin{bmatrix} \begin{bmatrix} -1 & & 0 \\ & -1 \ddots & \\ 0 & & 1 \end{bmatrix} \\ \begin{bmatrix} 1 & & 0 \\ & 1 \ddots & \\ 0 & & 1 \end{bmatrix} \end{bmatrix} \begin{bmatrix} a_1 \\ \vdots \\ a_N \\ a_1 \\ \vdots \\ a_N \end{bmatrix} \leq \begin{bmatrix} 0 \\ \vdots \\ 0 \\ C \\ \vdots \\ C \end{bmatrix}$$

$$G = \begin{bmatrix} -I^{N \times N} \\ I^{N \times N} \end{bmatrix}$$

$$h = \begin{bmatrix} 0^{N \times 1} \\ C^{N \times 1} \end{bmatrix}$$