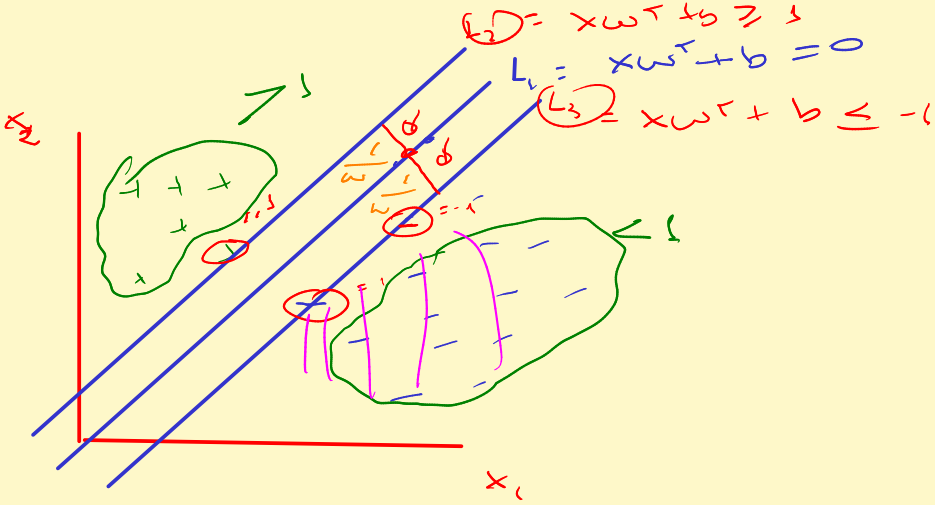


$$\max 2d \quad s.t \quad y_i(x_i w^T + b) \geq 1$$

$$d = \frac{1}{\|w\|}$$

$$\max \frac{2}{\|w\|} \quad s.t \quad y_i(x_i w^T + b) \geq 1$$

$$\min \frac{\|w\|}{2} \quad s.t \quad y_i(x_i w^T + b) \geq 1 \quad \forall i \in \{0, n\}$$

$$\min \frac{\|w\|^2}{2} \quad s.t \quad y_i(x_i w^T + b) \geq 1$$

$$\min F(x) \quad s.t \quad g(x) \geq c$$

$$\frac{\partial F}{\partial x} = \lambda \frac{\partial g}{\partial x}$$

$$\frac{\partial \left(\frac{w^2}{2}\right)}{\partial w_j} = \frac{\partial \left[\sum_{i=0}^{\hat{}} \lambda_i y_i (x_i w^T + b) \geq 1\right]}{\partial w}$$

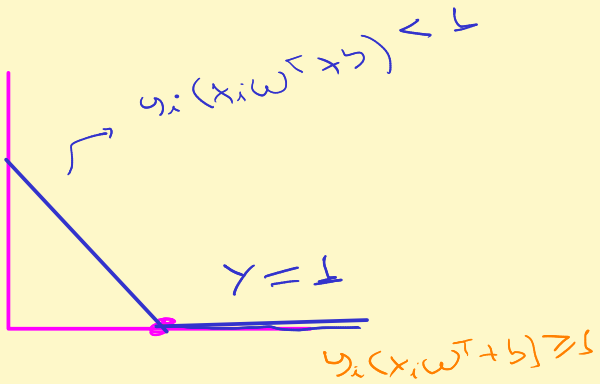
$$w = \sum_{i=0}^{\hat{}} \lambda_i y_i x_i$$

$$x(w^T) + b = 0$$

$$b = \frac{1}{n} \sum_{i=0}^{\hat{}} \lambda_i y_i x_i x_j$$

$$\text{Loss} = \frac{w^2}{2} + C \sum_{i=0}^{n} \max(0, 1 - y_i(x_i w^T + b))$$

$$= \sum_{i=0}^{n} \xi_i + \frac{w^2}{2}$$



$$\text{Loss} = \frac{w^2}{2} + C \sum_{i=0}^{n} \max(0, 1 - y_i(x w^T + b))$$

$$\frac{\partial L}{\partial w} = \begin{cases} w & \text{si } y(x w^T + b) \geq 1 \\ w - C \sum_{i=0}^{n} y_i x_i & \text{si no} \end{cases}$$

$$\frac{\partial L}{\partial b} = \begin{cases} 0 & \text{si } (y(x w^T + b) \geq 1 \\ -y_i & \text{si no} \end{cases}$$

$$w = w - \alpha \frac{\partial L}{\partial w}$$

$$b = b - \alpha \frac{\partial L}{\partial b}$$

```
def Train(X, Y, alpha, epoch, C):
    E = []
    For i in range(epoch):
        dw, db = GetDerivada(X, Y, C, w)
        w, b = changeParam(w, b, dw, db)
        Error = w^2/2 + C * sum_{i=0}^{n} max(0, 1 - y_i(x w^T + b))
        E.append(Error)
```

$$L = \frac{w^2}{2} + C \sum_{i=0}^{\hat{}} \max(0, 1 - y_i [x_i w^T + b])$$

$y_i (x_i w^T + b) \neq 1$ — mode

$y = 1$

$y = -1$

$1 - y_i (x_i w^T + b) \neq 0$

-1 $\quad$ -1 — mode

$\max(0, 1 - y_i [x_i w^T + b])$

1 $\quad$ ≥ 1

$+ \geq 1 - 1$

Error

mode

$y_i [x_i w^T + b] \geq 1$