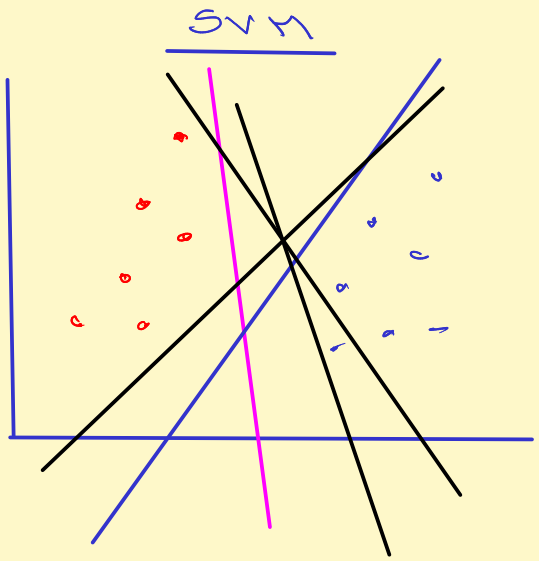
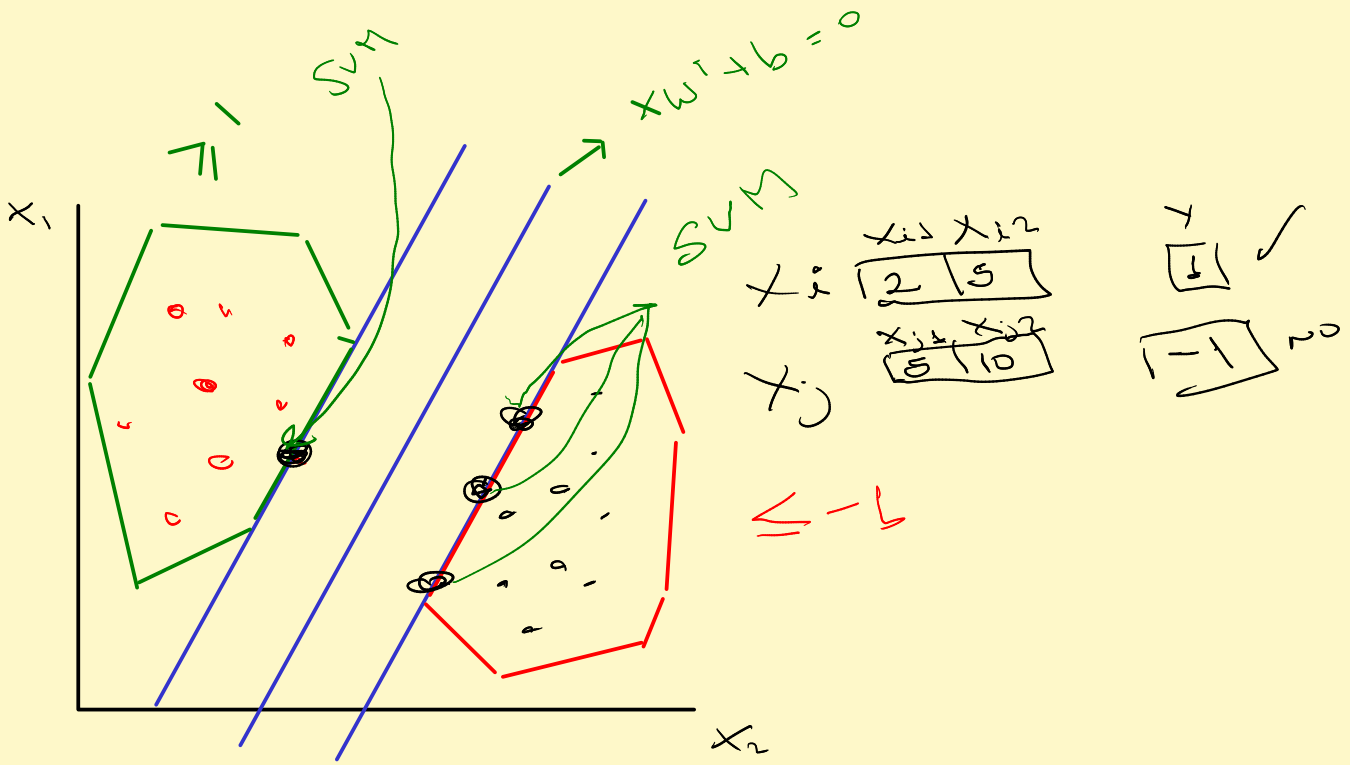
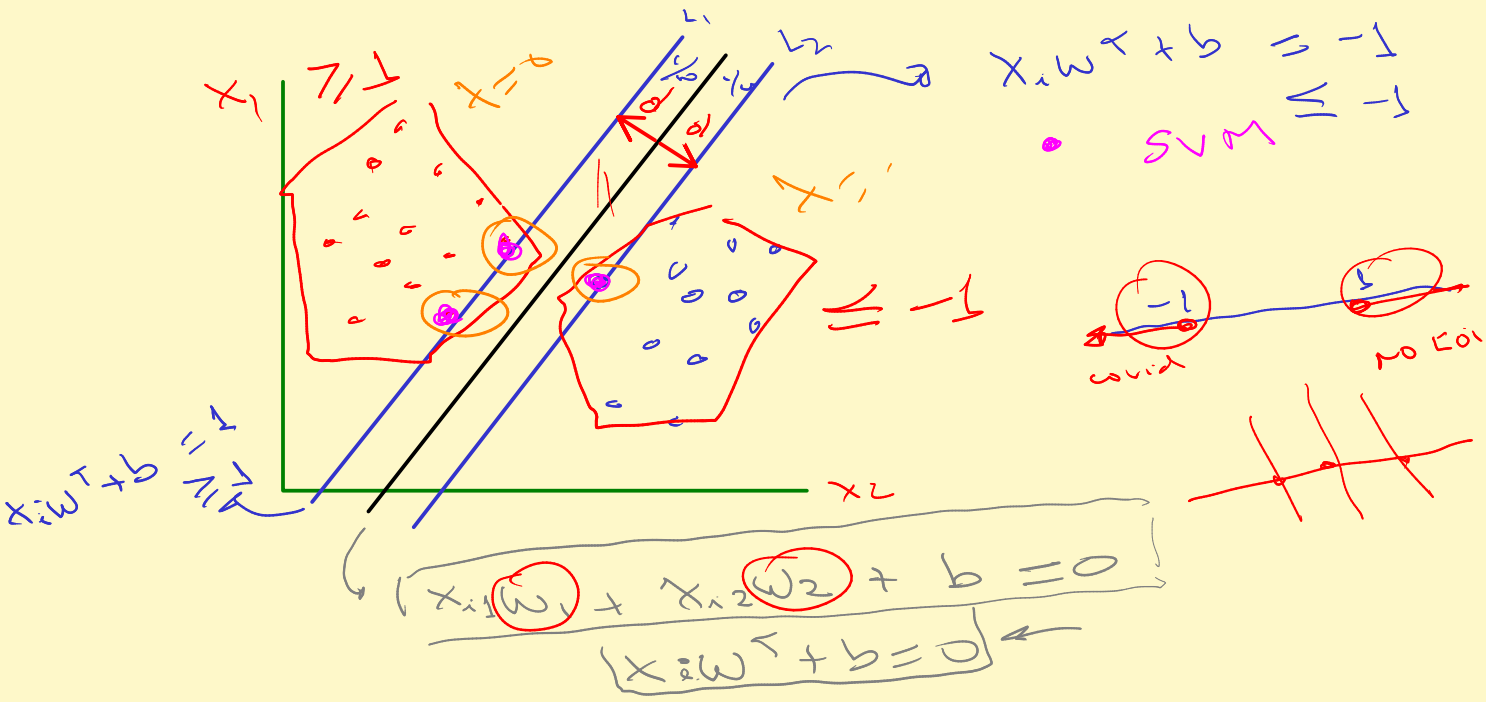

SVM

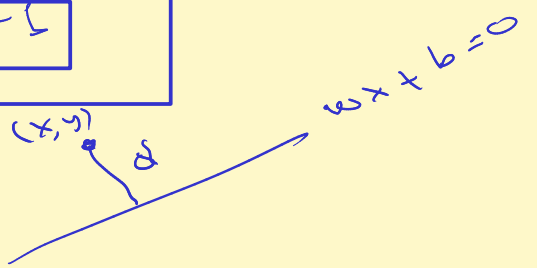

SVM
≥ 1
xw+b=0
SVM
x₁
x₂
xi
xj
xi1 xi2
2 5
xj1 xj2
5 10
Y
1
-1
no
≤ -1

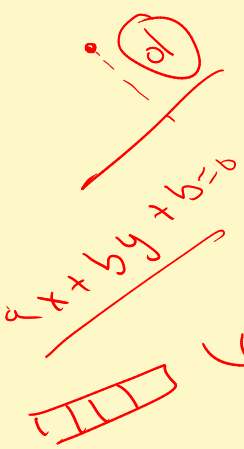


$$\max 2d \quad s.t$$

1. $x_i w^T + b \geq 1$
2. $x_i w^T + b \leq -1$

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





$$\max \frac{2}{\|w\|} \quad s.t$$

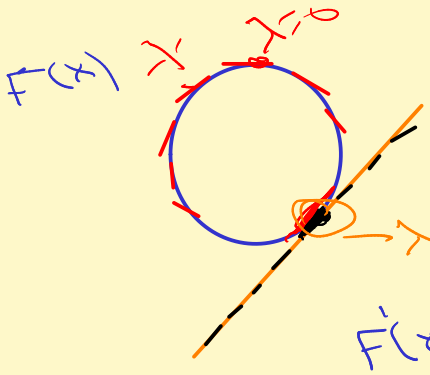
(1) $y_i (x_i w^T + b) \geq 1$

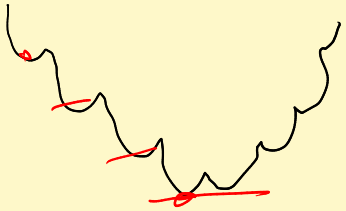
(b) $\max \frac{2}{\|w\|} = \min \frac{\|w\|}{2}$

$$\min \frac{\|w\|}{2} \quad s.t$$

$$y_i (x_i w^T + b) \geq 1$$

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





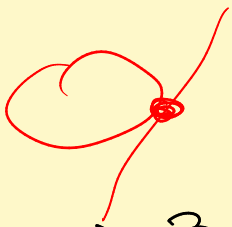
multiplicador de Lagrange

$$F(x) = f(x) + \lambda g(x)$$

$f(x) = y^2 + x^2$ s.t

$3x + y = 6$

$g(x) = 3x + y - 6$



$$\frac{\partial f}{\partial x} = \lambda \frac{\partial g}{\partial x} \Rightarrow 2x = \lambda 3$$

$$\frac{\partial f}{\partial y} = \lambda \frac{\partial g}{\partial y} \Rightarrow 2y = \lambda$$

$$\frac{2x}{3} = 2y$$

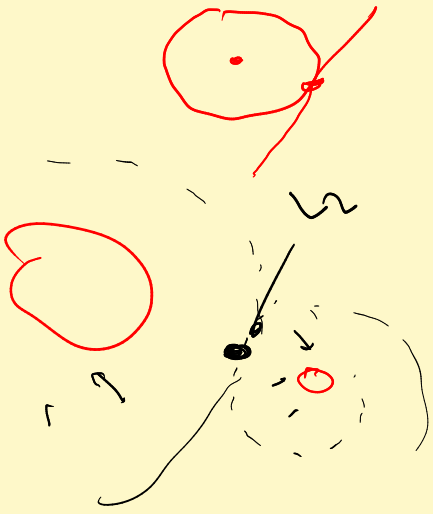
$$3y = x$$

$$3x + y = 6$$

$$3x + \frac{x}{3} = 6$$

$x = 1.8$

$y = 0.6$



$$x^2 + y^2 = r^2$$

$$(1.8)^2 + (0.6)^2 = r^2$$

$$\min \frac{\|w\|^2}{2} \quad s.t$$

$$y_i(x_i w^T + b) \geq 1$$

$$\min(L) = \frac{\|w\|^2}{2} - \sum_{i=0}^{n} \lambda_i \left[y_i(x_i w^T + b) - 1 \right]$$

$$\frac{\partial L}{\partial w} = \|w\| - \sum_{i=0}^{n} \lambda_i y_i x_i = 0$$

$$w_j = \sum_{i=0}^{n} \lambda_i y_i x_{ij}$$

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

$$b = -\frac{\sum_{i=0}^{n} x w^T}{n}$$