Clasificación

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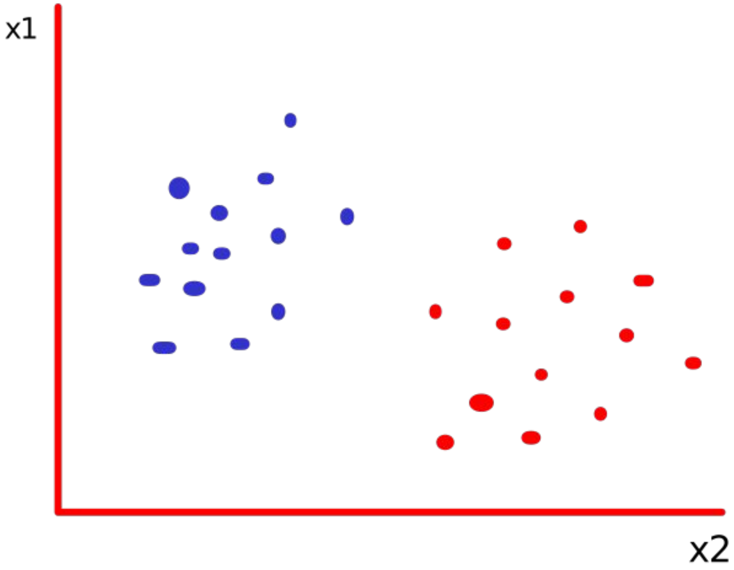
IPRODAM3D - Research group

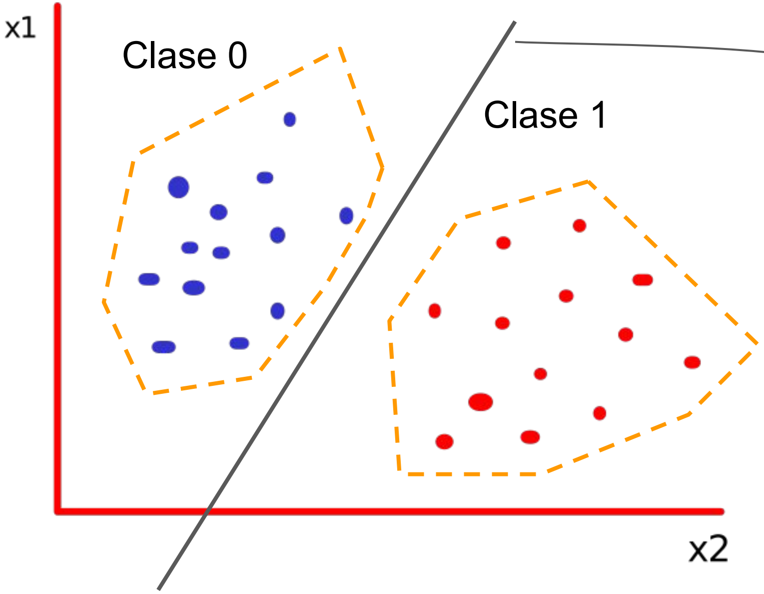
2022

Clasificación

Clasificación Logística

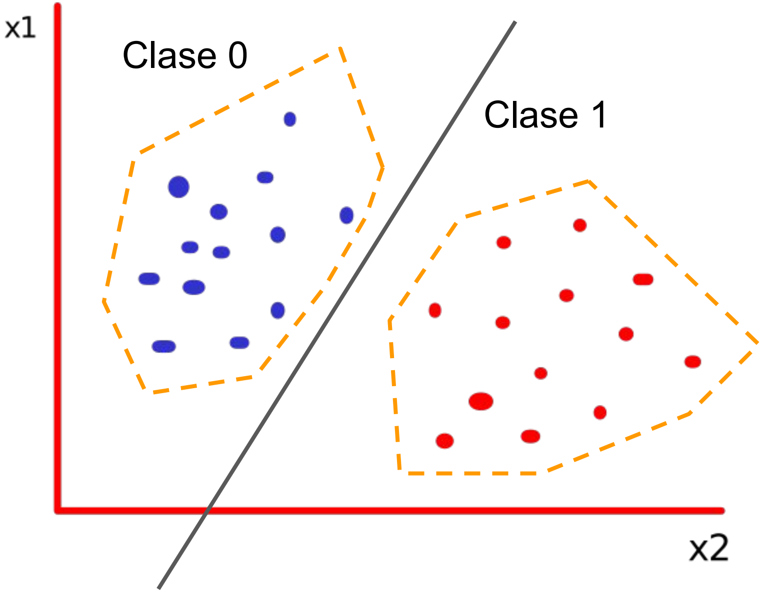

x1
x2

Clasificación Binaria



$$h(x_i) = w_0 + x_1 w_1$$

Clasificación Binaria



$$\boxed{h(x_i)} = w_0 + x_1 w_1$$

$$s(x_i) = \frac{1}{1 + e^{\boxed{-h(x_i)}}}$$

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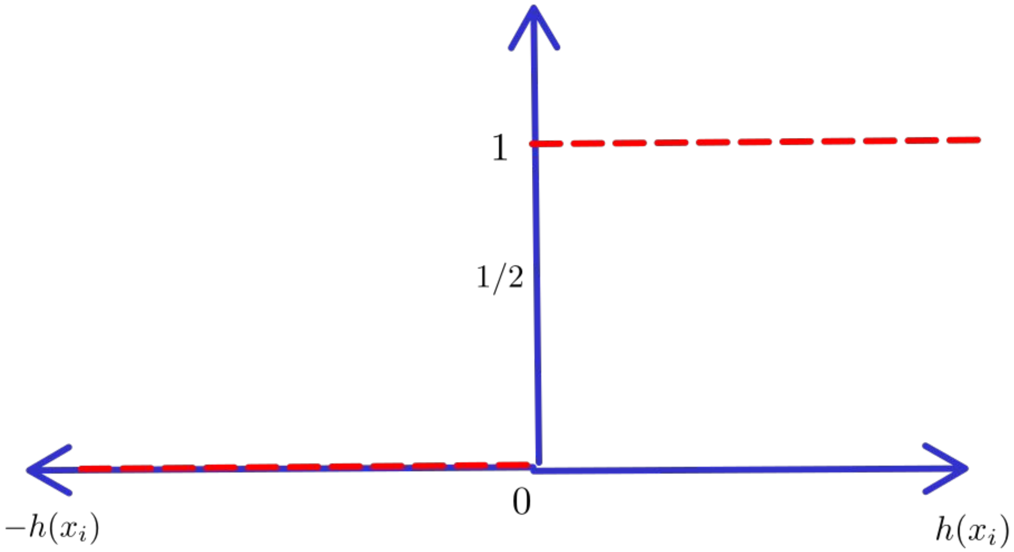
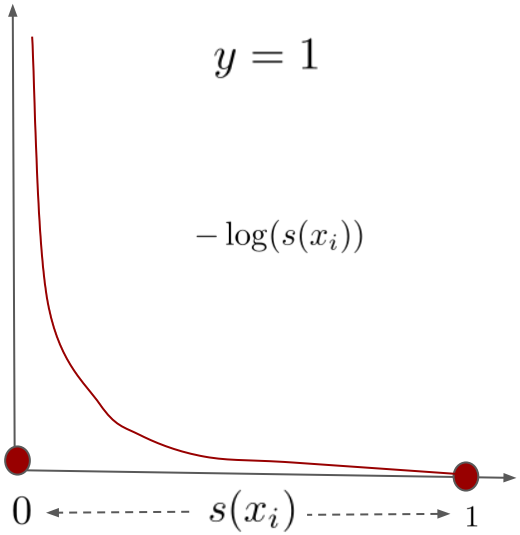
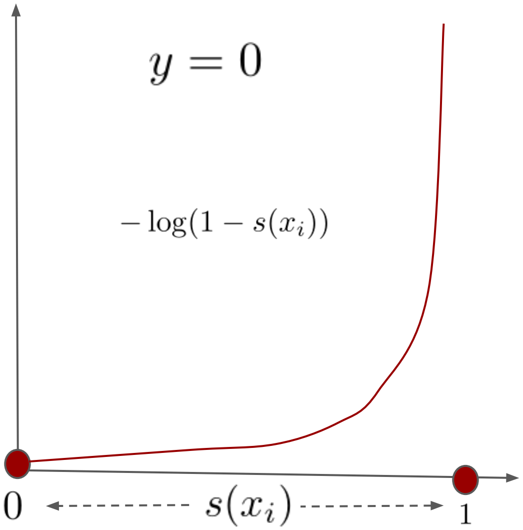


Hipótesis $$s(x_i) = \frac{1}{1 + e^{-h(x_i)}}$$

Loss $$\mathcal{L} = -\sum_{i=1}^{n} (y_i \log(s(x_i)) + (1 - y_i) \log(1 - s(x_i)))$$





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Loss $$\mathcal{L} = -\sum_{i=1}^{n} (y_i \log(s(x_i)) + (1 - y_i) \log(1 - s(x_i)))$$

Derivadas $$\frac{\partial L}{w_j} = \frac{1}{n} \sum_{i=1}^{n} (y_i - s(x_i))(-x_{ij})$$

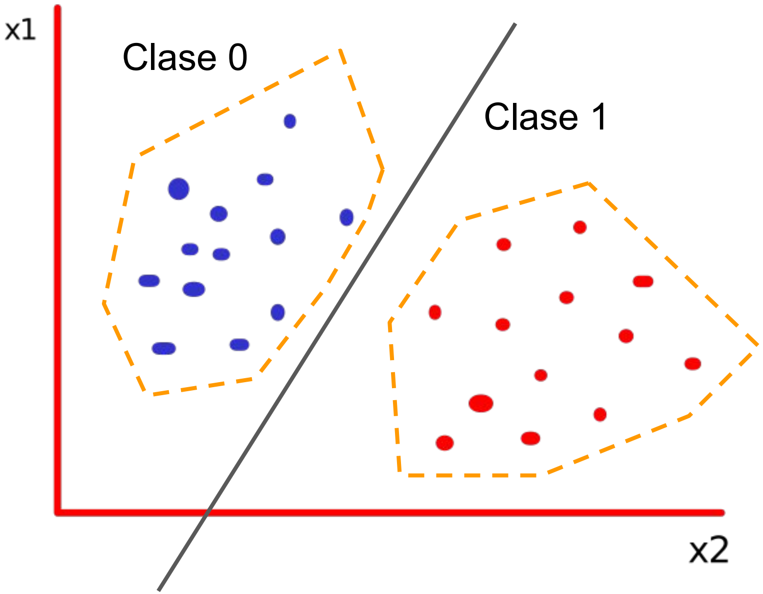
Hipótesis $$s(x_i) = \frac{1}{1 + e^{-h(x_i)}}$$

Loss $$\mathcal{L} = -\sum_{i=1}^{n} (y_i \log(s(x_i)) + (1 - y_i) \log(1 - s(x_i)))$$

SVM

Máquinas de Soporte Vectorial

¿Cuál es la mejor recta que separa ambos grupos?



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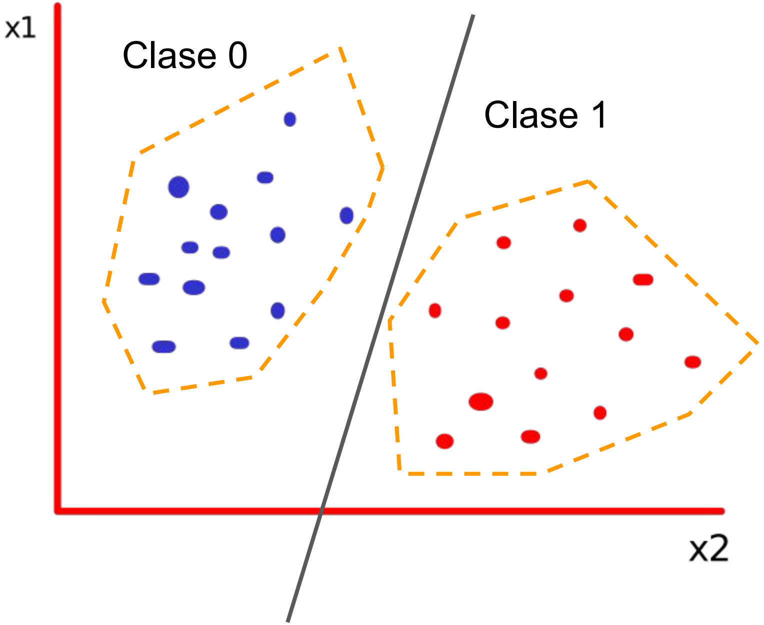
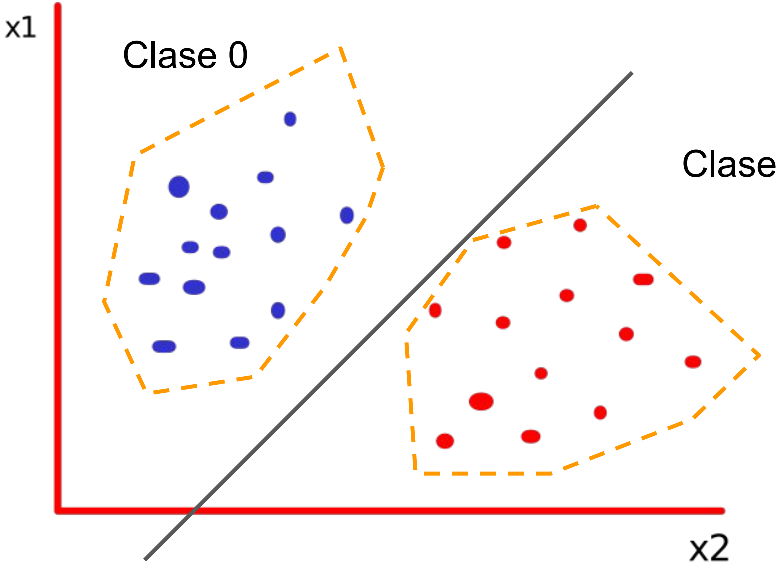
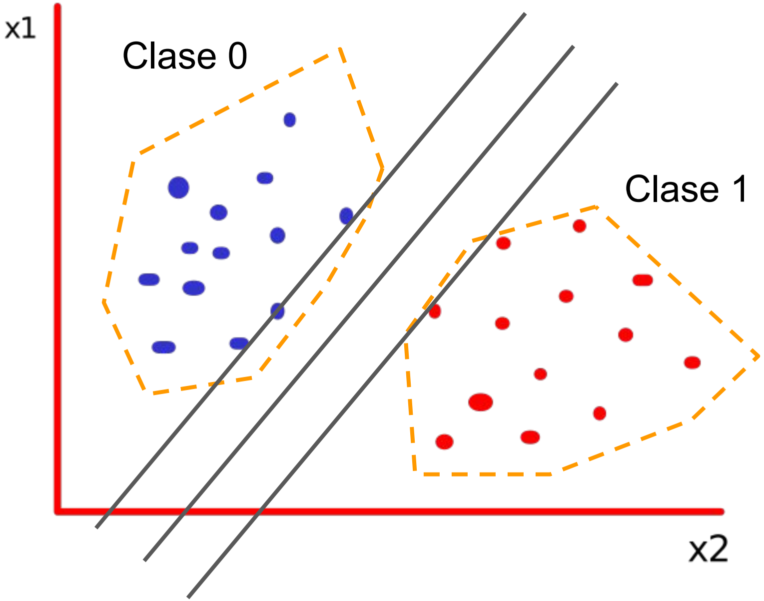


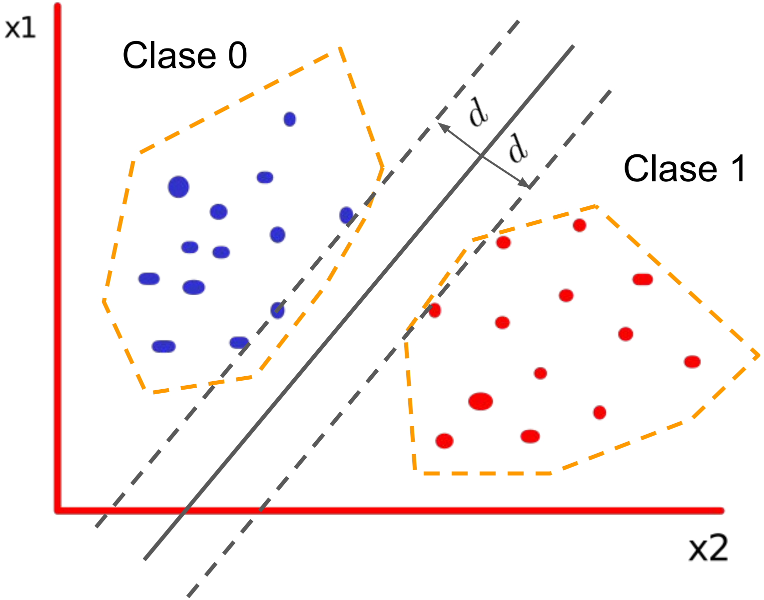
¿Cuál es la mejor recta que separa ambos grupos?

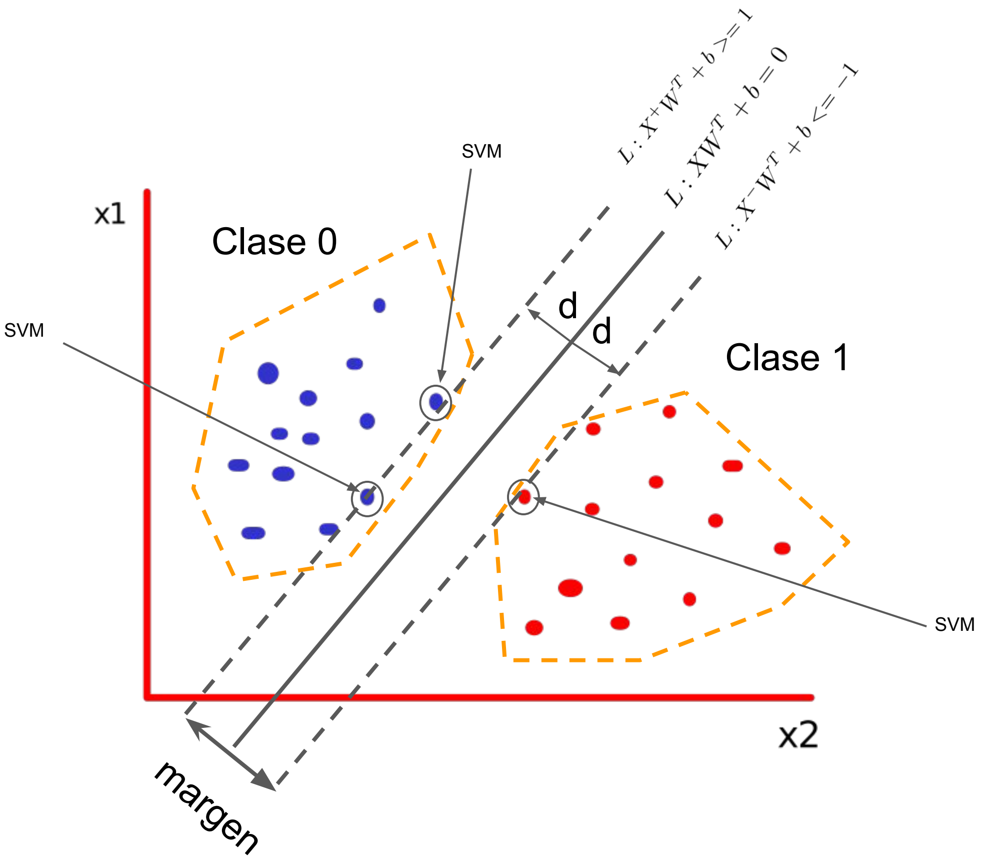


Tratar de encontrar la mejor recta que mejor separa ambos grupos



Maximizar la distancia d de modo que ambos clases estén lo más separadas posibles





Objetivo: Maximizar 2d sujeto a 2 restricciones

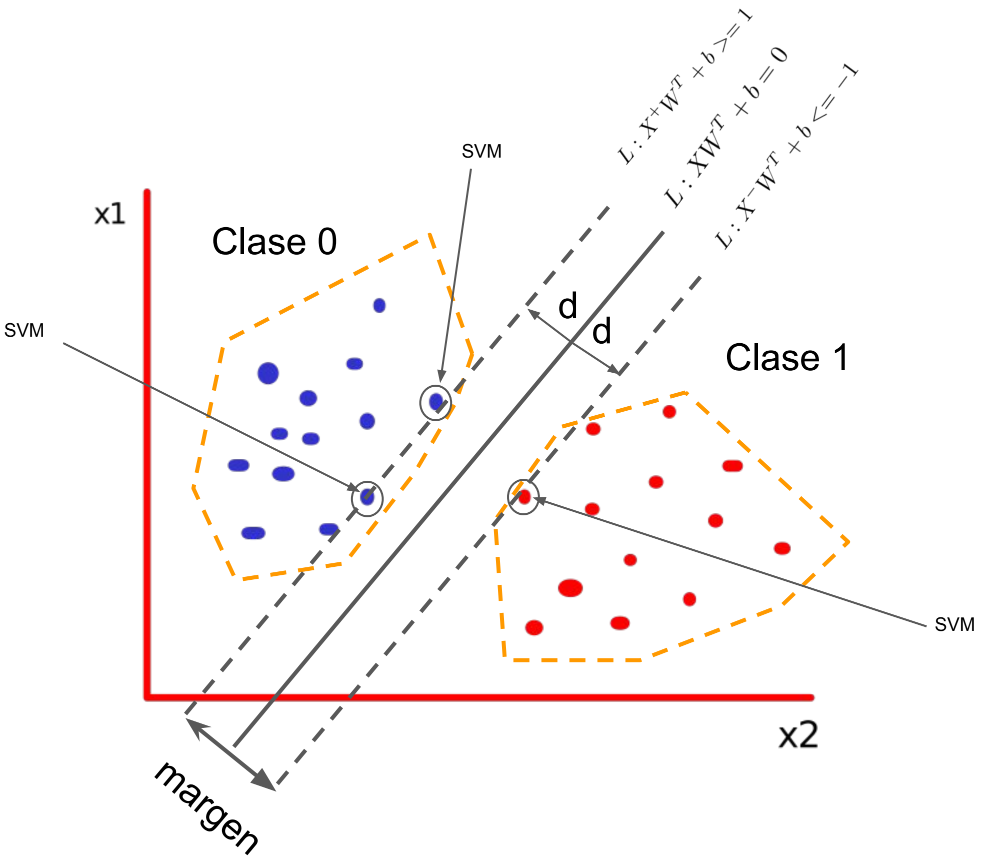
$$max(2d)\ s.t$$

$$X^{+}W^{T} + b >= 1$$

$$X^{-}W^{T} + b <= -1$$

x^{+} : Conjunto de datos con etiqueta +1

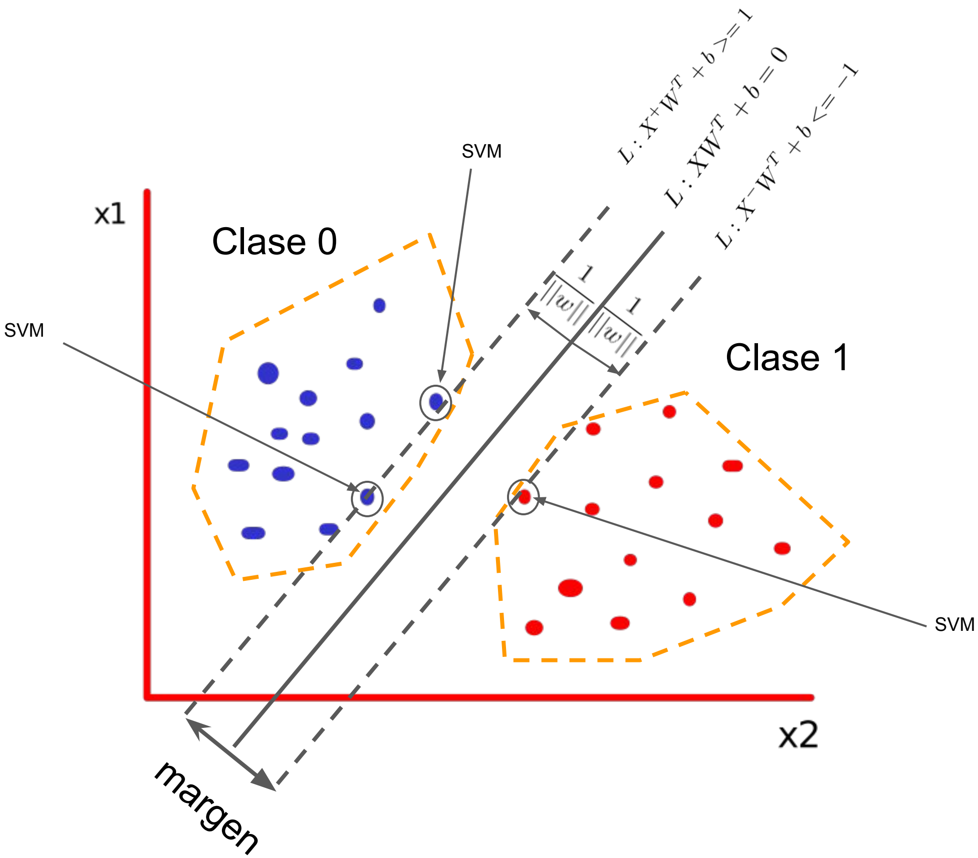
x^{-} : Conjunto de datos con etiqueta - 1



$$max(2d)\ s.t$$

$$Y(X^{-}W^{T} + b) >= 1$$

d = ?

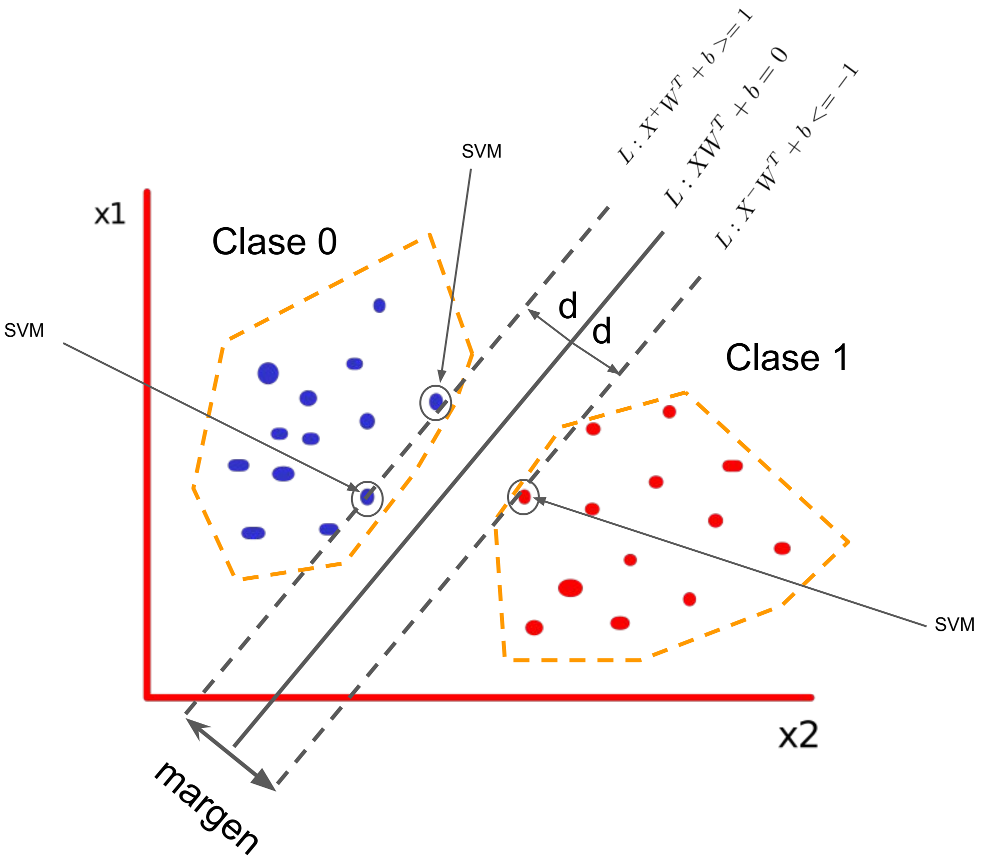


$$max(2d)\ s.t$$

$$Y(X^{-}W^{T} + b) >= 1$$

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

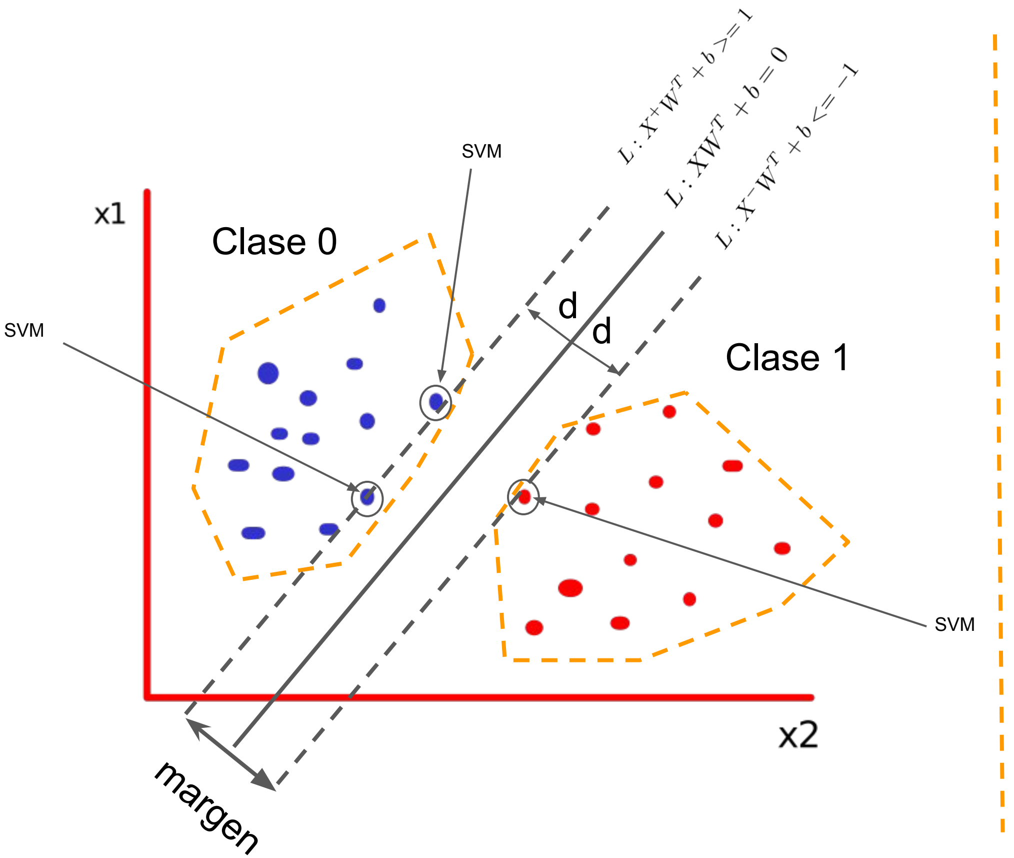
¿Demuestre que d = $\frac{1}{||w||}$?



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

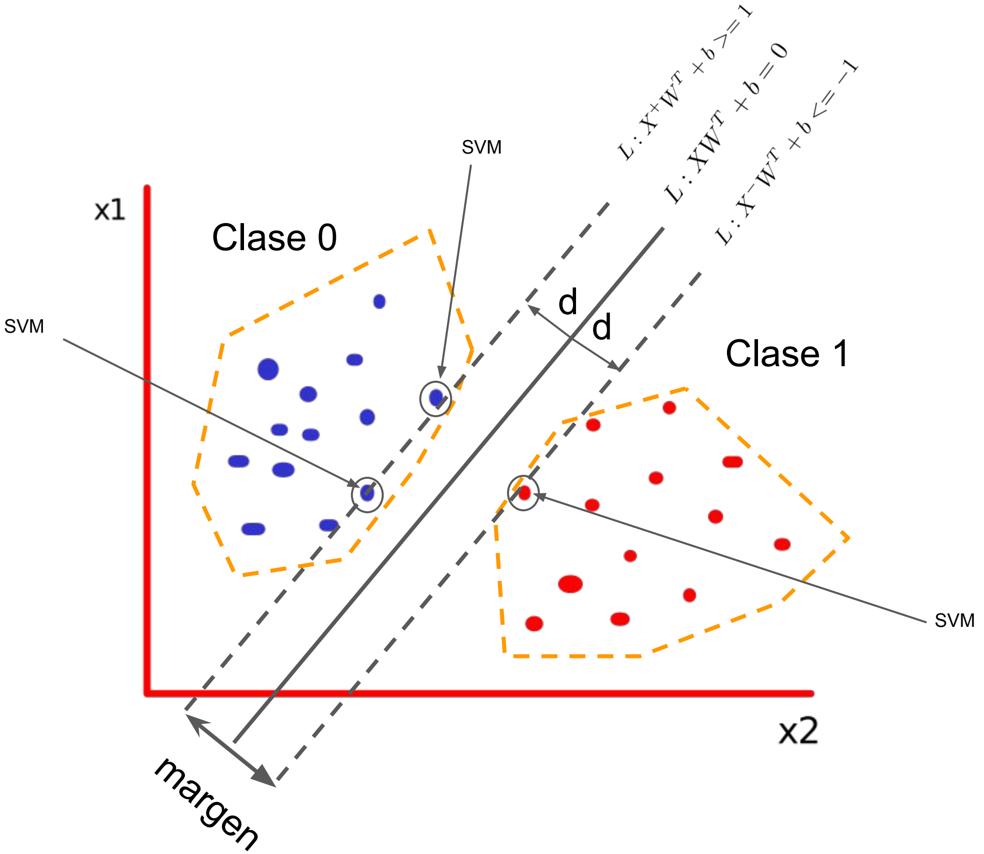
$$Y(X^-W^T + b) >= 1$$

¿Queremos maximizar?



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

$$Y(X^{-}W^{T} + b) >= 1$$



$$min \frac{||w||}{2} \quad s.t$$
$$Y(X^{-}W^{T} + b) >= 1$$

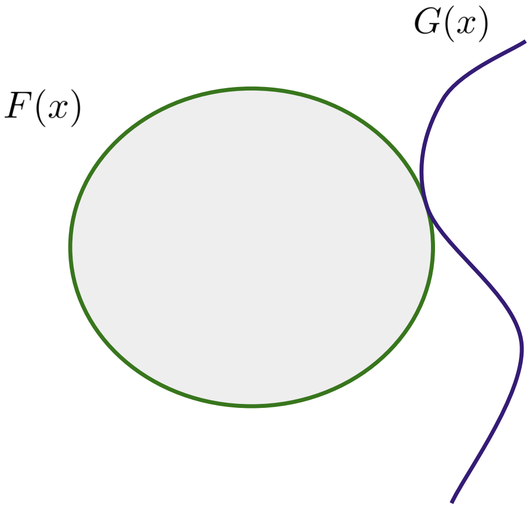
$$min \frac{||w||^{2}}{2} \quad s.t$$
$$Y(X^{-}W^{T} + b) >= 1$$

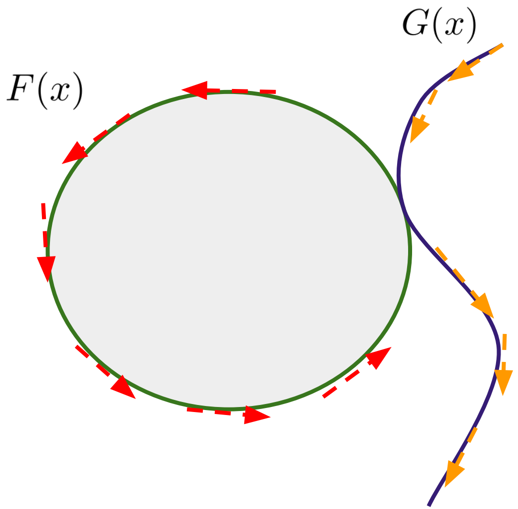
¿Cómo resolvemos esta ecuación?

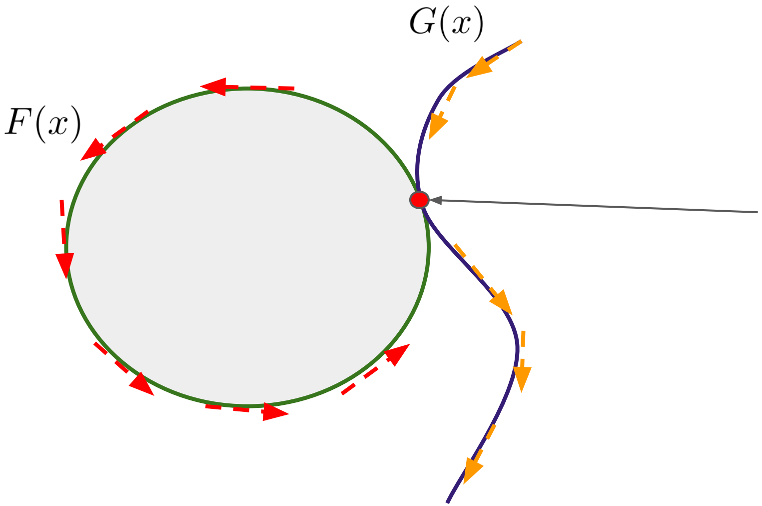
$$min\frac{||w||^2}{2} \quad s.t \;\; y_i(x_i w^t + b) >= 1 \quad \forall i; \;\; 1 <= i <= n$$

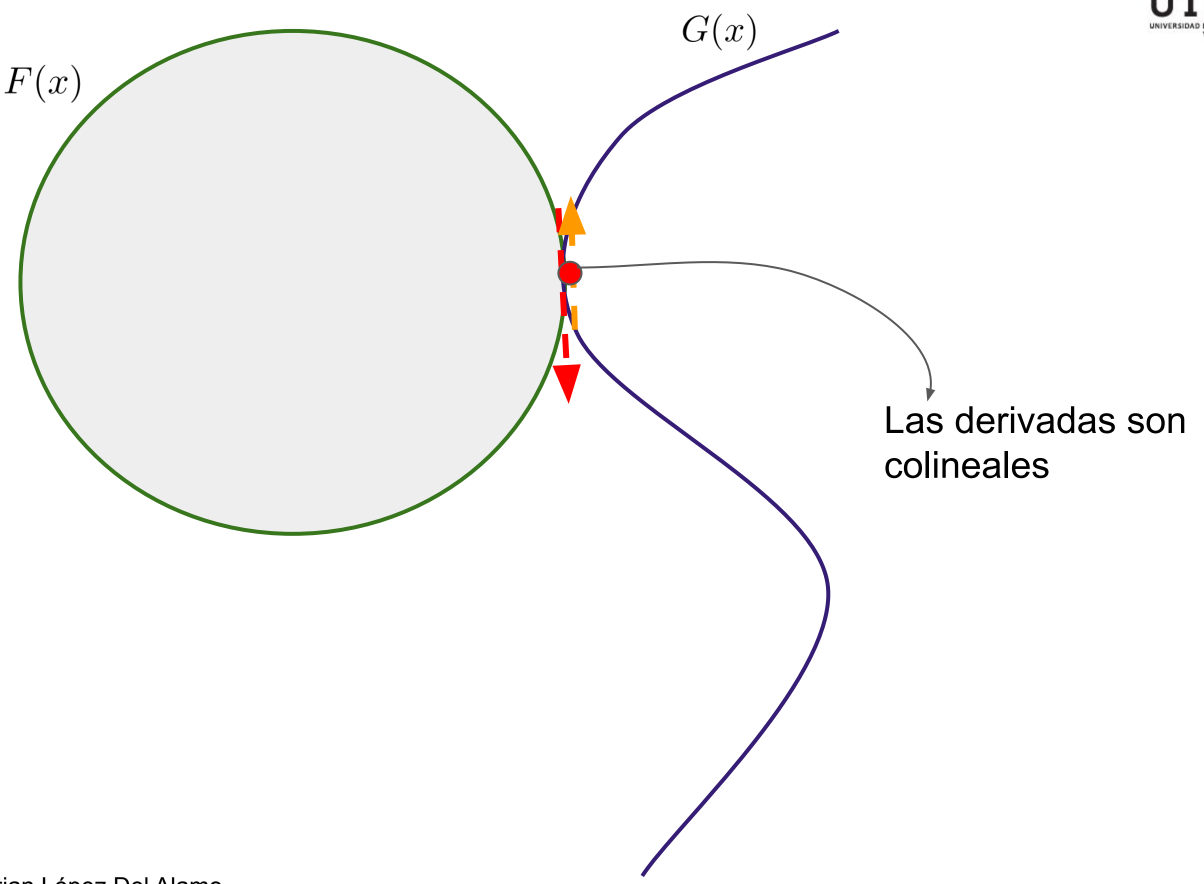
¿Cómo resolvemos esta ecuación?

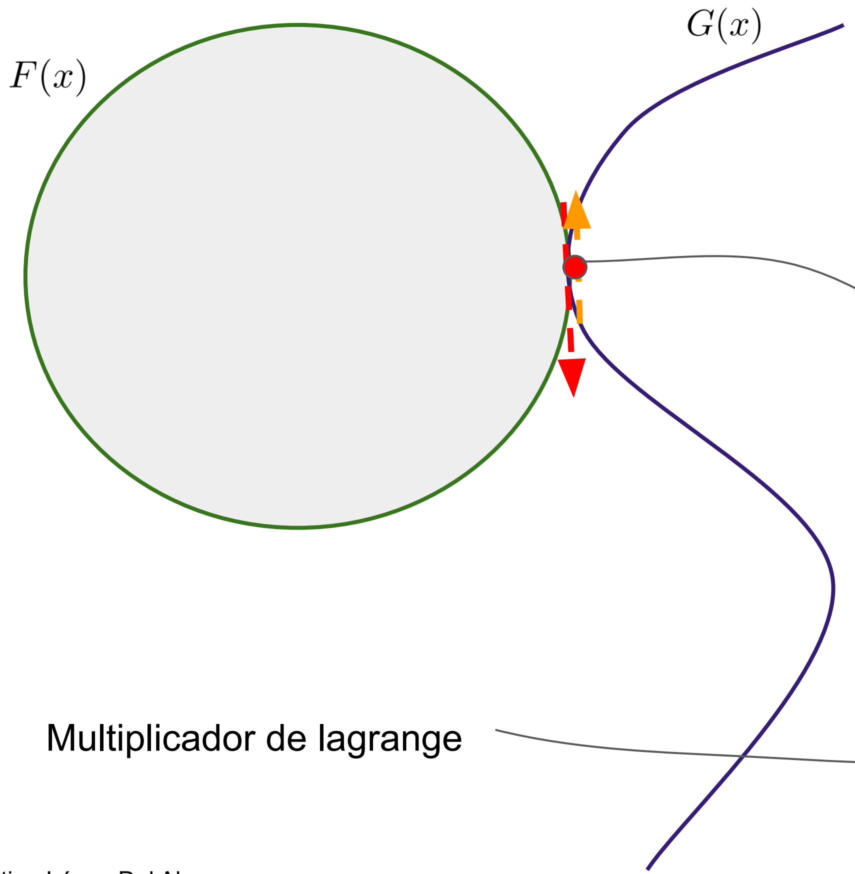
LAGRANGE


$G(x)$
$F(x)$


$F(x)$
$G(x)$


$G(x)$
$F(x)$

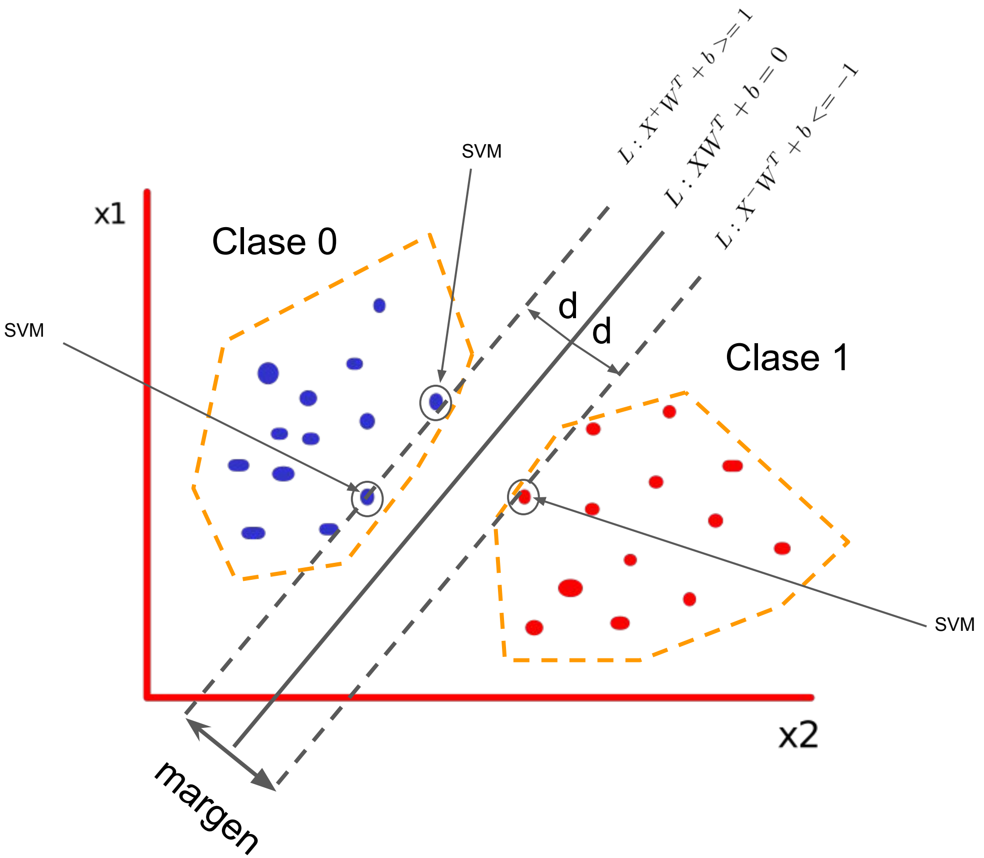

$F(x)$
$G(x)$
Las derivadas son colineales



Las derivadas son colineales

$$\frac{\partial F(x)}{\partial x} = \lambda \frac{\partial G(x)}{\partial x}$$

Multiplicador de lagrange



F(X) $\quad min \frac{||w||^2}{2} \quad s.t$

G(X) $\quad Y(X^{-}W^{T} + b) >= 1$

¿Cómo resolvemos esta ecuación?

$$min\frac{||w||^2}{2} \quad s.t \;\; y_i(x_i w^t + b) >= 1 \quad \forall i; \;\; 1 <= i <= n$$

$$\mathcal{L}(w, b, \lambda) = \frac{||w||^2}{2} - \sum_{i=0}^{n} \lambda_i(y_i(w^t x_i + b) - 1))$$

Encontrando derivadas:

$$\mathcal{L}(w, b, \lambda) = \frac{||w||^2}{2} - \sum_{i=0}^{n} \lambda_i (y_i (w^t x_i + b) - 1))$$

$$\frac{\partial \mathcal{L}(w, b, \lambda)}{\partial w} \qquad \frac{\partial \mathcal{L}(w, b, \lambda)}{\partial b}$$

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