Teórico

Regresión Lineal

Práctico (ML)

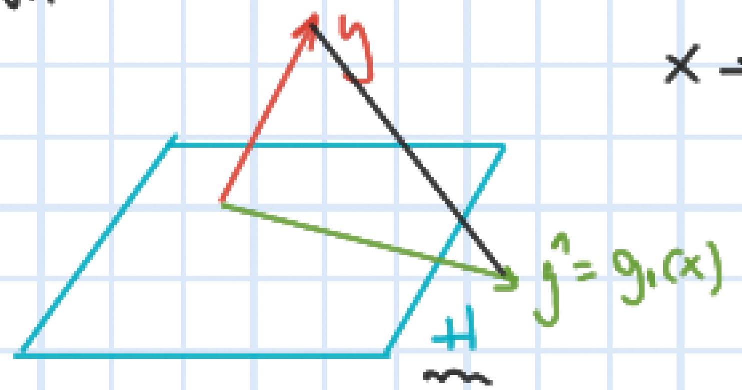
$X = [x_1, x_2, \dots, x_n]^T$, $y = [y_1, y_2, \dots y_n]^T$, $f_{\bar{x}y}(\bar{x}, y)$

$\underset{VA}{\hat{y}} = \underset{VA}{g(\bar{x})} \longrightarrow \boxed{\text{Distancia}}$

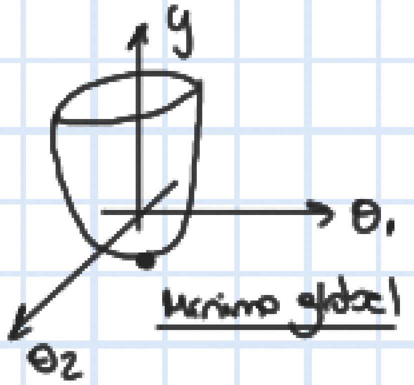
Distancia $\rightarrow$ Producto interno

$\underbrace{\langle x, y\rangle}_{VA} = \mathbb{E}[xy] = \iint_{\mathbb{R}^2} xy\, f_{xy}(x,y)\,dx\,dy$

$x \rightarrow \boxed{h} \rightarrow y$



Contiene todas las g_1



$\min_{g_1(x)} \|\hat{y} - y\| \rightarrow \min_{g_1(x)} \sqrt{\langle \hat{y} - y\rangle \langle \hat{y} - y\rangle}$

$= \min_{g_1(x)} \sqrt{\mathbb{E}[(\hat{y} - y)^2]} \rightarrow \underbrace{\min_{g_1(x)} \mathbb{E}[(g_1(x) - y)^2]}_{ECM}$

$\boxed{\underset{VA}{g_1(x) = \mathbb{E}(y/x)}}$

No conozco distribución conjunta

$$\begin{array}{c|cccc}
 & x_1 & x_2 & \dots & x_m \quad y \\
\text{vector aleatorio} \rightarrow & \begin{bmatrix} x_{1,1} & x_{1,2} & \dots & x_{1,m} & y_1 \\ \vdots & & \ddots & & \vdots \\ x_{n,1} & \dots & \dots & x_{n,m} & y_n \end{bmatrix}
\end{array}$$

VA

No tengo acceso al dataset completo

$\hat{y} = g_2(\bar{x})$

(1) R.L

(2) MV

(3) Bayesiano

(1) $l(g_2(x), y) = (g_2(x) - y)^2$ E.C.M

$L = \frac{1}{n} \sum_{i=1}^{N} l(g_2(x), y)$ $\quad \hat{y} = \underbrace{g_2(x)}_{h} = \bar{w}^T x$

$\bar{w} = \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_m \end{bmatrix} + n$

$\underset{n\times m}{X} \cdot \underset{m\times 1}{w} = \underset{n\times 1}{\hat{y}}$

(1) $$L_{g_2} = \frac{1}{n}\sum_{i=1}^{N}\Big(\underbrace{w^T x_i}_{g_2(x)} - y_i\Big)^2 \xrightarrow{\min} \nabla_w L_{g_2} = 0$$

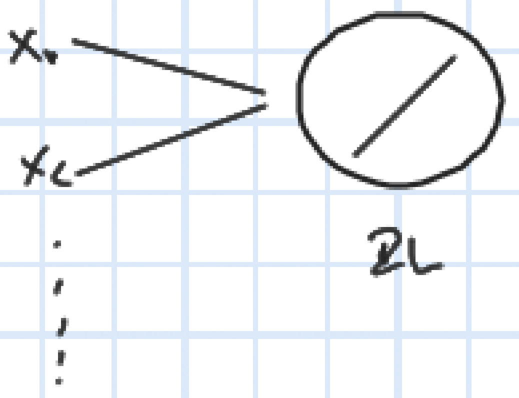
$$\nabla_w \|X\bar{w} - y\|_2^2 = \frac{1}{n}\nabla_w (X\bar{w} - y)^T (X\bar{w} - y)$$

$$= \frac{1}{n}\nabla_w\left(\bar{w}^T X^T X \bar{w} - 2\bar{w}^T X^T y + y^T y\right) = 0$$

$$\phi(x) = x^2$$

$$2X^T X\bar{w} - 2X^T y = 0$$

$$\boxed{\bar{w} = (X^T X)^{-1} X^T y} \qquad \boxed{\bar{w} = \left(\phi(x)^T \phi(x)\right)^{-1} X^T y}$$



$y = w^T x + b \rightarrow \sigma(y)$

Función de NL

Activación

$\hat{y} = w^T x \quad \hat{y} = w^T x + b$

$$X = \begin{bmatrix} x_{11} & \cdots & x_{m} & 1 \\ \vdots & & \vdots & \vdots \\ x_{n1} & \cdots & x_{nm} & 1 \end{bmatrix} \qquad \bar{w} = \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_m \\ b \end{bmatrix}$$