$$\sigma^2 = \exp(w \cdot x)$$

$$\mu = \underbrace{w \cdot x}_{} \to \overbrace{p(y \mid \mu, \sigma^2)}^{\text{Gauss}}$$

$$\pi = \ell(\underbrace{w \cdot x}_{}) \to \underbrace{p(y \mid \pi)}_{\text{Bernoulli}}$$

$$\pi = p(y = 1)$$

link function

2

- $\boxed{NNet(X)}$ → Salida
- $\ell(\ )$ → parámetros

$p(y|x)$

0,1

$p(y|NN(x))$

$p(y|x) \rightarrow$ GAUSSIANO

$y \in \mathbb{R}$

$p(y|x) \rightarrow$ Bernoulli

$y = \{0, 1\}$

3 clase $\Rightarrow$ 0, 1, 2

CATEGÓRICA

ONE HOT CODING

$$[1, 0, 0] \Rightarrow 0$$

$$[0, 1, 0] \Rightarrow 1$$

$$[0, 0, 1] \Rightarrow 2$$

$k \Rightarrow \pi_k \quad [0, 0, \ldots, \underset{k}{1}, \ldots, 0]$

$$\prod p(y \le 1)$$

$$\pi_k = p(y = k) \quad \left\{ \begin{array}{ll} \pi_1 & [1, 0, 0] \\ \pi_2 & [0, 1, 0] \\ \pi_3 & [0, 0, 1] \end{array} \right.$$

Bern: $p(y = k) = \pi^{y} \cdot (1 - \pi)^{(1 - y)}$

Categ: $p(y) = \prod_{k=1}^{K} \pi_k^{y_k}$ ☺

$$y_0 = [1,0,0]; \quad y_1 = [0,1,0]; \quad y_2 = [0,0,1]$$

$$\begin{array}{ccc} 0 & 1 & 2 \end{array}$$

$$\pi = (0{,}4,\ 0{,}5,\ 0{,}1) \rightarrow \text{Sum}$$

$$1$$

$$P(y) = \prod_{k=1}^{K} \pi_k^{y_k}$$

$$P(y=0) = 0{,}4^1 \cdot \cancelto{1}{0{,}5^0} \cdot \cancelto{1}{0{,}1^0}$$

$$\pi = (0{,}4,\ 0{,}5,\ 0{,}1)$$

$x \Rightarrow y.$ $\boxed{(1,0,0)}$

$K = 1$

$$p(y) = \prod_{k=1} \pi_k^{y_k}$$

$$p(y=0) = 0{,}4^{1} \cdot \cancel{0{,}5}^{0} \cdot \cancel{0{,}1}^{0}$$

$$\prod_N p(y_n|x_n) = \prod_n \prod_k p(y_n = k) =$$

$$= \prod_N \prod_k \pi_k^{y_{nk}} \Rightarrow \sum_N \sum_k \log \pi_k^{y_{nk}} =$$

$$= \sum_n \sum_k y_{nk} \cdot \log \pi_k$$

$$\sum_k y_{nk} \cdot \log \pi_k \Rightarrow$$

$$y_{n0} \cdot \log \pi_0 + \cancel{y_{n1} \cdot \log \pi_1} \to 0 +$$

$$\cancel{y_{n2} \cdot \log \pi_2} \to 0 = \log \pi_0$$

$$y_{n0} = (1, 0, 0) \qquad \pi_0 = (0, 1)$$

$$p(y \mid \pi) \longrightarrow p(y \mid \pi(x))$$

$$\underbrace{\pi(x)}_{w \cdot x}$$

$$[\mathbb{R}] \longleftarrow \text{NNET}(X)$$

$$\pi_k \in [0, 1]^k$$

$$\sum \pi_k = 1$$

$\longrightarrow$ SOFTMAX

$$\pi_k = \frac{z_k}{\sum_k z_k}$$

$z_k = \mathrm{MLP}(x)$

logit

1 10 20

$\boxed{\;} \rightarrow p(y=1)$

$$\pi_1 = \frac{1}{31}$$

$$\pi_3 = \frac{20}{31}$$

$$\pi_2 = \frac{10}{31}$$

1

$$\pi_k = \frac{\exp(z_k)}{\sum_{z_k} \exp(z_k)} \Rightarrow \text{SOFTMAX}$$

$$\underbrace{\text{UNET}(\quad)}$$

CLASSIFICATORE

MULTICLASSE IN OUTPUT