

Cálculo de Entropía

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$$P(x, y) = P(y|x)$$

$y \backslash x$	1	2	3	4
1	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$	$\frac{1}{32}$
2	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{32}$	$\frac{1}{32}$
3	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
4	$\frac{1}{4}$	0	0	0

$P(y)$

↓

$\frac{1}{4}$

$\frac{1}{4}$

$\frac{1}{4}$

$\frac{1}{4}$

$$H(x) = H\left(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}\right)$$

$$= + \frac{1}{2} \log_2 2 + \frac{1}{4} \log_2 4 + 2 \times \frac{1}{8} \log_2 8$$

$$= \frac{1}{2} + \frac{1}{2} + \frac{3}{4} = \frac{7}{4} \text{ bits}$$

$$H(y) = 2 \text{ bits}$$

$$H(x, y) = - \sum_{x=1}^4 \sum_{y=1}^4 P(x, y) \log_2 P(x, y)$$

$$= \sum_{x=1}^4 \sum_{y=1}^4 P(x, y) \log_2 \frac{1}{P(x, y)}$$

$P(x) \rightarrow \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}$

$$H(x, y) = 2 \cdot \frac{1}{8} \log_2 8 + 6 \cdot \frac{1}{16} \log_2 16 + 4 \cdot \frac{1}{32} \log_2 32 + 1 \cdot \frac{1}{4} \log_2 4$$

$$= \frac{3}{4} + \frac{3}{2} + \frac{5}{8} + \frac{1}{2}$$

$$= \frac{27}{8} \text{ bits}$$

$$H(y|x) = \sum_{x=1}^4 P(x=i) H(y|x=i)$$

$$= \underbrace{\frac{1}{2}}_{P(x=1)} \cdot \underbrace{H\left(\frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{2}\right)}_{\frac{3}{4}} + \underbrace{\frac{1}{4}}_{P(x=2)} \cdot \underbrace{H\left(\frac{1}{4}, \frac{1}{2}, \frac{1}{4}, 0\right)}_{\frac{3}{2}}$$

$$+ \underbrace{\frac{1}{8}}_{P(x=3)} \cdot \underbrace{H\left(\frac{1}{4}, \frac{1}{4}, \frac{1}{2}, 0\right)}_{\frac{3}{2}} + \underbrace{\frac{1}{8}}_{P(x=4)} \cdot \underbrace{H\left(\frac{1}{4}, \frac{1}{4}, \frac{1}{2}, 0\right)}_{\frac{3}{2}}$$

$$= \frac{13}{8} \text{ bits}$$