

Resolvidos

1

$$H = - \sum_{k=1}^N p_k \log_2(p_k)$$

$$H = - (14 \times \log_2(14) + 64 \times \log_2(64) + 5 \times \log_2(5) + 10 \times \log_2(10) + 7 \times \log_2(7))$$

$$= 1.626 \text{ bps}$$

↳ Bits por Símbolo

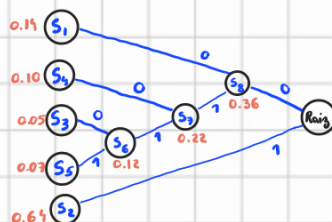
$$A = S_1 = 0.14 \rightarrow 00$$

$$B = S_2 = 0.64 \rightarrow 1$$

$$C = S_3 = 0.05 \rightarrow 0110$$

$$D = S_4 = 0.10 \rightarrow 010$$

$$E = S_5 = 0.07 \rightarrow 0111$$



$$N_m = \sum_{k=1}^N p_k \times m_k$$

$$N_m = 0.14 \times 2 + 0.64 \times 1 + 0.05 \times 4 + 0.10 \times 3 + 0.07 \times 4 = 1.7 \text{ bps}$$

$$H \leq N_m < H + 1$$

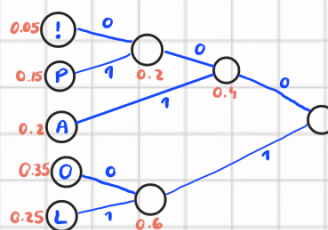
$$1000 \times H_b = 1700$$

$$1.626 < 1.7 < 2.626$$



3

Símbolo	Probabilidade	Código
A	0.2	01
!	0.05	000
L	0.25	11
P	0.15	001
O	0.35	10



b)

$$H = - \sum_{k=1}^N p_k \log_2(p_k) = - (0.2 \log_2(0.2) + 0.05 \log_2(0.05) + 0.25 \log_2(0.25) + 0.15 \log_2(0.15) + 0.35 \log_2(0.35))$$

$$= 2.1211$$

$$N_m = \sum_{k=1}^N p_k \times m_k = 0.2 \times 2 + 0.05 \times 3 + 0.25 \times 2 + 0.15 \times 3 + 0.35 \times 2$$

$$= 2.2$$

$$H \leq 2.2 < H + 1$$

c)

$$\text{"OLA!"} \rightarrow \underline{10} \underline{11} \underline{01} \underline{000}$$

O L A !

$$\text{"001000 10 11"} \rightarrow P!OL$$

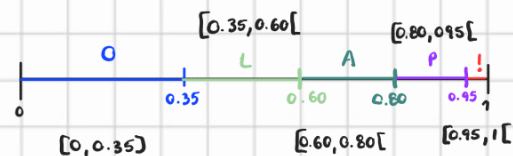
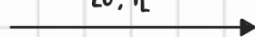
4

Símbolo	Probabilidade
O	0.35
L	0.25
A	0.2
P	0.15
!	0.05

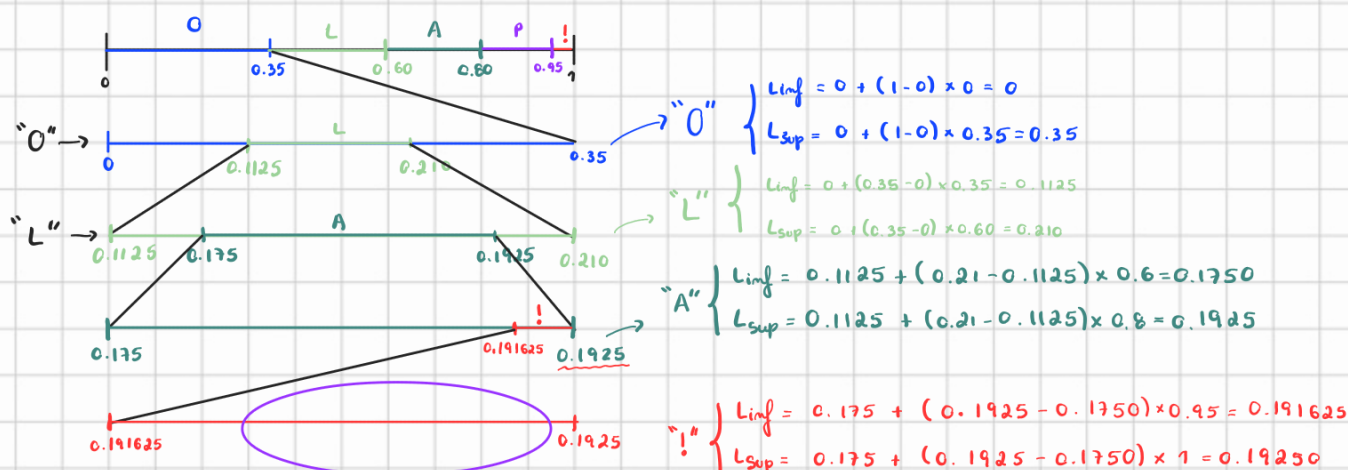
Ordenado

Divide-se no intervalo

[0; 1[



Codificar "OLA!":



Agora escolhemos um número dentro deste intervalo e convertemos

em binário, ex: 0.1924 → 0.00110001001

//podiam haver valores mais pequenos