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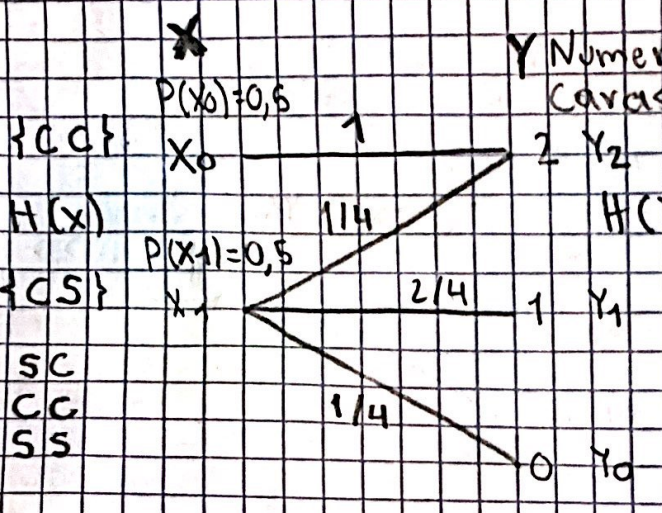
PARCIAL #1

1.



1 Falsa [CC]

1 Verdadera [CS] equiprobable

Saca 1 se tira 2 Veces

X1:
Dos caras CC = 1/4
Una cara CS, SC = 2/4
Cero caras SS = 1/4

2.

$$H(X) = \frac{1}{2}\log_2\left(\frac{1}{1/2}\right) + \frac{1}{2}\log_2\left(\frac{1}{1/2}\right) = 1 \text{ bit/simbolo}$$

$$P(Y=Y_2=2) = P(X=X_0)\,P\left(\frac{Y=Y_2}{X=X_0}\right) + P(X=X_1)\,P\left(\frac{Y=Y_2}{X=X_1}\right)$$

$$P(Y=Y_2=2) = 0,5\cdot 1 + 0,5\cdot\frac{1}{4} = 0,5 + 1/8 = 5/8$$

$$P(Y=Y_1=1) = P(X=X_1)\,P\left(\frac{Y=Y_1}{X=X_1}\right) = 0,5\cdot 2/4 = 1/4$$

$$P(Y=Y_0=0) = P(X=X_1)\,P\left(\frac{Y=Y_0}{X=X_1}\right) = 0,5\cdot 1/4 = 1/8$$

$$H(Y) = \frac{5}{8}\log_2\left(\frac{8}{5}\right) + \frac{1}{4}\log_2(4) + \frac{1}{8}\log_2(8)$$

$$H(Y) = 1,2987 \text{ bits/simbolo}$$

$$\begin{array}{c} \\ X_0 \\ X_1 \\ \text{IN} \end{array}\begin{array}{c} \begin{array}{ccc} Y_2 & Y_1 & Y_0 \end{array} \\ \begin{pmatrix} 1 & 0 & 0 \\ 1/4 & 2/4 & 1/4 \end{pmatrix} \end{array}\begin{array}{l} \text{OUT} \\ 1 \\ 1 \end{array}$$

Matriz que caracteriza el Canal de Comunicaciones

$$H(X/Y) = \sum P(X,Y) \log_2 \left(1/P(X/Y)\right)$$

Para la intersección

$$P(X,Y) = P(X)\, P(Y/X) = 0{,}5 \cdot 1$$

$$P(X,Y) = \begin{matrix} \\ X_0 \\ X_1 \end{matrix} \begin{matrix} \begin{matrix} Y_2 & Y_1 & Y_0 \end{matrix} \\ \begin{pmatrix} 0{,}5 & 0 & 0 \\ 1/8 & 1/4 & 1/8 \end{pmatrix} \end{matrix}$$

$P(X,Y) = 0{,}5 \cdot 1/4 = 1/8$

$P(X,Y) = 0{,}5 \cdot 2/4 = 1/4$

$P(X,Y) = 0{,}5 \cdot 1/4 = 1/8$

$$P(X/Y) = \frac{P(X)}{P(Y)}\, P(Y/X) \quad \text{; intersección}$$

$$P(X/Y) = \begin{matrix} \\ X_0 \\ X_1 \end{matrix} \begin{matrix} \\ \begin{pmatrix} \frac{0{,}5}{5/8} & 0 & 0 \\ \frac{1/8}{5/8} & \frac{1/4}{1/4} & \frac{1/8}{1/8} \end{pmatrix} \end{matrix} = \begin{pmatrix} \frac{4}{5} & 0 & 0 \\ \frac{1}{5} & 1 & 1 \end{pmatrix}$$

$$H(X/Y) = \frac{1}{2}\log_2\left(\frac{5}{4}\right) + \frac{1}{8}\log_2(5) + \frac{1}{4}\log_2(1) + \frac{1}{8}\log_2(1)$$

$$H(X/Y) = 0{,}4512 \text{ bits/símbolo}$$

$$H(Y/X) = \frac{1}{2}\log_2(1) + \frac{1}{8}\log_2(4) + \frac{1}{4}\log_2\left(\frac{4}{2}\right) + \frac{1}{8}\log_2(4)$$

$$H(Y/X) = 0{,}75 \text{ bits/símbolo}$$

$$I(X;Y) = H(X) - H(X/Y) = 1 - 0{,}4517 = 0{,}5488 \text{ bits/símb}$$

$$I(Y;X) = H(Y) - H(Y/X) = 1{,}2987 - 0{,}75 = 0{,}5487$$

3. Modelo tres tiros