AI 1103 - Assignment 6

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Download all python codes from

https://github.com/rohanthota/Assignment_6/codes/Assignment_6.py

and latex codes from

https://github.com/rohanthota/Assignment_6/Assignment 6.tex

Question

The input x to binary symmetric channel (BSC) shown in figure is 1 with probability 0.8. The cross over probability is $\frac{1}{7}$. If the received bit y=0, conditional probability that 1 was transmitted is

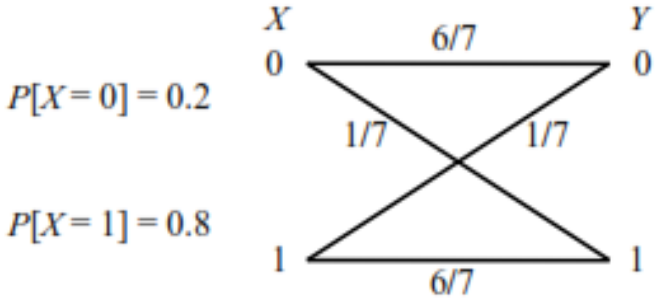

Fig. 0: Figure referred in the question

Solution

$$\Pr\left(X=1 \,\middle|\, Y=0\right) = \frac{\Pr\left(Y=0 \,\middle|\, X=1\right) \times \Pr\left(X=1\right)}{\Pr\left(Y=0\right)} \tag{0.0.1}$$

$$\Pr\left(Y=0 \,\middle|\, X=1\right) = \frac{1}{7} \; ; \quad \Pr\left(X=1\right) = 0.8 \tag{0.0.2}$$

$$\Pr\left(Y=0\right) = \Pr\left(X=0\right) \times \Pr\left(Y=0 \,\middle|\, X=0\right) + \Pr\left(X=1\right) \times \Pr\left(Y=0 \,\middle|\, X=1\right) \tag{0.0.3}$$

$$\Pr\left(Y=0\right) = 0.2 \times \frac{6}{7} + 0.8 \times \frac{1}{7} = \frac{2}{7} \tag{0.0.4}$$

$$\Pr\left(X=1 \,\middle|\, Y=0\right) = \frac{\frac{1}{7} \times 0.8}{\frac{2}{7}} = 0.4 \tag{0.0.5}$$