

AI1103-Assignment 2

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Download all python codes from

<https://github.com/vaishnavi-w/AI1103/blob/main/Assignment2/code2.py>

and latex-tikz codes from

<https://github.com/vaishnavi-w/AI1103/blob/main/Assignment2/latex2.tex>

Also given, transition probability = $\frac{1}{8}$. Transition probability is the probability with which the bit is transmitted correctly. That gives,

$$\Pr(Y = 1|X = 1) = \Pr(Y = 0|X = 0) = \frac{1}{8} \quad (0.0.3)$$

Probability that the bit is not transmitted correctly
= 1 – transition probability

$$= 1 - \frac{1}{8} = \frac{7}{8} \quad (0.0.4)$$

That gives,

$$\Pr(Y = 0|X = 1) = \Pr(Y = 1|X = 0) = \frac{7}{8} \quad (0.0.5)$$

Let E denote the event that bit is transmitted incorrectly. Probability of error, $\Pr(E)$

$$\Pr(E) = \Pr(X = 0) \Pr(Y = 1|X = 0) + \Pr(X = 1) \Pr(Y = 0|X = 1) \quad (0.0.6)$$

On substituting the values,

$$\Pr(E) = \frac{9}{10} \times \frac{7}{8} + \frac{1}{10} \times \frac{7}{8} \quad (0.0.7)$$

$$= \frac{63}{80} + \frac{7}{80} \quad (0.0.8)$$

$$= \frac{7}{8} \quad (0.0.9)$$

Answer: No option matches

QUESTION

A binary symmetric channel (BSC) has a transition probability of $1/8$. If the binary transmit symbol X is such that $\Pr(X = 0) = 9/10$, then the probability of error for an optimum receiver

- A) $\frac{7}{80}$
- B) $\frac{63}{80}$
- C) $\frac{9}{10}$
- D) $\frac{1}{10}$

SOLUTION

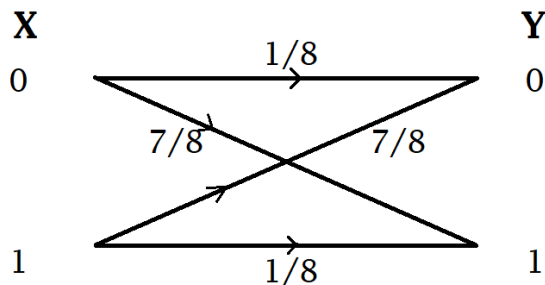


Fig. 4: Binary symmetric channel

Let random variables, $X \in \{0, 1\}$ denote the bit transmitted and $Y \in \{0, 1\}$ denote the output bit received.

From the given information,

$$\Pr(X = 0) = \frac{9}{10} \quad (0.0.1)$$

$$\Pr(X = 1) = 1 - \Pr(X = 0) = \frac{1}{10} \quad (0.0.2)$$