AI1103 Assignment-2

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Download all python codes from

https://github.com/vrahul02/AI1103-Probabilityand-Random-Variables/tree/main/Assignment -2/Codes

and latex-tikz codes from

https://github.com/vrahul02/AI1103-Probabilityand-Random-Variables/tree/main/Assignment -2/Assignment-2.tex

PROBLEM GATE-28

Consider two independent random variables X and Y with identical distributions. The variables X and Y take value 0,1 and 2 with probabilities $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{4}$ respectively. What is the conditional probability Pr(X + Y = 2 | X - Y = 0)?

- 1) 0
- 2) $\frac{1}{10}$
- 3) $\frac{1}{6}$
- 4) Ĭ

Solution

The values that the random variable X can take along with its probabilities are given by

X	0	1	2
Pr(X)	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$

The values that the random variable Y can take along with its probabilities are given by

$$\begin{array}{|c|c|c|c|c|c|c|c|c|} Y & 0 & 1 & 2 \\ \hline Pr(Y) & \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \end{array}$$

$$Pr(X - Y = 0) = \frac{1}{2} \times \frac{1}{2} + \frac{1}{4} \times \frac{1}{4} + \frac{1}{4} \times \frac{1}{4} = \frac{6}{16}$$

$$(0.0.1)$$

$$Pr((X + Y = 2) + (X - Y = 0)) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

$$(0.0.2)$$

$$\Pr(X + Y = 2 \mid X - Y = 0)$$

$$= \frac{\Pr((X + Y = 2) + (X - Y = 0))}{\Pr(X - Y = 0)}$$

$$= \frac{\frac{1}{16}}{\frac{6}{16}} = \frac{1}{6}$$
 (0.0.3)

Thus option c) is correct