

PROBABILITY AND RANDOM VARIABLES

Assignment 1

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Download latex-tikz codes from

https://github.com/VARSHITHAGANJI/AI1103_PROBABILITY-AND-RANDOM-VARIABLES/blob/main/Assignment1.tex

PROBLEM

Assigned Problem 6.9

If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

- 1) $\Pr(A|B) = \frac{\Pr(B)}{\Pr(A)}$
- 2) $\Pr(A|B) < \Pr(A)$
- 3) $\Pr(A|B) \geq \Pr(A)$
- 4) None of these

SOLUTION

We know that A is the subset of B .

\Rightarrow Every element of A is an element of B .

$$\therefore AB = A \quad (0.0.1)$$

We know that

$$\begin{aligned} \Pr(A|B) &= \frac{\Pr(AB)}{\Pr(B)} \\ &= \frac{\Pr(A)}{\Pr(B)} \end{aligned} \quad (0.0.2)$$

Given $0 < \Pr(B) \leq 1$

$$\Rightarrow \frac{1}{\Pr(B)} \geq 1 \quad (0.0.3)$$

By multiplying with $\Pr(A)$ on both sides of the inequality, we get

$$\frac{\Pr(A)}{\Pr(B)} \geq \Pr(A) \quad (0.0.4)$$

Using 0.0.2, we have

$$\Pr(A|B) \geq \Pr(A)$$

Therefore, option 3 is correct.