PROBABILITY AND RANDOM VARIABLES
Assignment 1

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Download latex-tikz codes from

https://github.com/VARSHITHAGANJI/AI1103_PROBABILTY-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.

$$\therefore AB = A \tag{0.0.1}$$

We know that

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

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

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

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

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

Using (0.0.2), we have

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

Therefore, option 3 is correct.