AI1103: Assignment 2

Chitneedi Geetha Sowmya
CS20BTECH11011

Download all latex codes from

https://github.com/Geetha495/Assignment2/blob/main/Assignment2.tex

1 Problem

Suppose A and B are two independent events with probabilities $\Pr(A) \neq 0$ and $\Pr(B) \neq 0$. Let A' and B' be their complements. Which one of the following statements is FALSE?

1) $\Pr(AB) = \Pr(A)\Pr(B)$
2) $\Pr(A|B) = \Pr(A)$
3) $\Pr(AB) = \Pr(A) + \Pr(B)$
4) $\Pr(A' + B') = \Pr(A')\Pr(B')$

2 Solution

1) As A, B are independent events, By definition,

$$\Pr(A + B) = \Pr(A)\Pr(B)$$

Thus option 1 is true.

2)

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

Thus option 2 is true.

3)

$$\begin{aligned}\Pr(AB) &= \Pr(A) + \Pr(B) - \Pr(A + B) \\ &= \Pr(A) + \Pr(B) - \Pr(A)\Pr(B)\end{aligned}$$

Thus option 3 is false.

4)

$$\begin{aligned}\Pr(A' + B') &= \Pr((AB)') \\ &= 1 - \Pr(AB) \\ &= 1 - \Pr(A) - \Pr(B) + \Pr(A + B) \\ &= (1 - \Pr(A))(1 - \Pr(B)) \\ &= \Pr(A')\Pr(B')\end{aligned}$$

Thus option 4 is true.

Hence, FALSE statement is option 3.