

Assignment 1

Probability And Random Processes

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12.13.6.18: Question. If $\Pr(A|B) > \Pr(A)$, then which of the following is correct :

- (A) $\Pr(B|A) < \Pr(B)$
- (B) $\Pr(AB) < \Pr(A)\Pr(B)$
- (C) $\Pr(B|A) > \Pr(B)$
- (D) $\Pr(B|A) = \Pr(B)$

Answer: (C) $\Pr(B|A) > \Pr(B)$.

Solution: We know:

$$\Pr(A|B) > \Pr(A) \quad (1)$$

$$= \frac{\Pr(AB)}{\Pr(B)} > \Pr(A) \quad (2)$$

$$= \Pr(AB) > \Pr(A)\Pr(B) \quad (3)$$

(A) To find, $\Pr(B|A)$

$$\Pr(B|A) = \frac{\Pr(AB)}{\Pr(A)} \quad (4)$$

Dividing $\Pr(A)$ on both sides of equation (1)

$$= \frac{\Pr(AB)}{\Pr(A)} > \frac{\Pr(A)\Pr(B)}{\Pr(A)} \quad (5)$$

$$= \Pr(B|A) > \Pr(B) \quad (6)$$

But given $\Pr(B|A) < \Pr(B)$ so option (A) is incorrect

(B) from equation (3) we have

$$= \Pr(AB) > \Pr(A)\Pr(B) \quad (7)$$

Therefore, option (B) is incorrect

(C) from equation (3) we have

$$= \Pr(B|A) > \Pr(B) \quad (8)$$

which matches the given option

Therefore, option (C) is correct

(D) from equation (6) we have

$$= \Pr(B|A) > \Pr(B) \quad (9)$$

but given $\Pr(B|A) = \Pr(B)$

Therefore, option (D) is incorrect