

# Assignment 1

**AI1110** : Probability and Random Variables  
Indian Institute of Technology Hyderabad

Manpurwar Ganesh\*

**Problem 11.16.4.7** :  $A$  and  $B$  are two events such that  $\Pr(A) = 0.54$ ,  $\Pr(B) = 0.69$  and  $\Pr(AB) = 0.35$ . Find

- 1)  $\Pr(A + B)$
- 2)  $\Pr(A'B')$
- 3)  $\Pr(AB')$
- 4)  $\Pr(BA')$  .

**Solution:**

Given,

$$\Pr(A) = 0.54 \quad (1)$$

$$\Pr(B) = 0.69 \quad (2)$$

$$\Pr(AB) = 0.35 \quad (3)$$

1) We know that,

$$\Pr(A + B) = \Pr(A) + \Pr(B) - \Pr(AB) \quad (4)$$

$$= 0.54 + 0.69 - 0.35 \quad (5)$$

$$= 0.88 \quad (6)$$

2) By De Morgan's Law,

$$A'B' = (A + B)' \quad (7)$$

$$\implies \Pr(A'B') = \Pr(A + B)' \quad (8)$$

$$= 1 - \Pr(A + B) \quad (9)$$

$$= 1 - 0.88 \quad (10)$$

$$= 0.12 \quad (11)$$

3) We know that,

$$B + B' = 1 \quad (12)$$

$$BB' = 0 \quad (13)$$

$$A = A(B + B') = AB + AB' \quad (14)$$

$$\implies \Pr(A) = \Pr(AB) + \Pr(AB') - \Pr(ABB') \quad (15)$$

$$= \Pr(AB) + \Pr(AB') \quad (16)$$

$$\implies \Pr(AB') = \Pr(A) - \Pr(AB) \quad (17)$$

$$= 0.54 - 0.35 \quad (18)$$

$$= 0.19 \quad (19)$$

\*The student is with the Department of AI , Indian Institute of Technology, Hyderabad 502285 India e-mail: ai22btech11017@iith.ac.in.

4) From Equation ( 17),

$$\Pr(BA') = \Pr(B) - \Pr(AB) \quad (20)$$

$$= 0.69 - 0.35 \quad (21)$$

$$= 0.34. \quad (22)$$