

# Assignment 1

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

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**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,

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

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

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

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

$$= 0.12 \quad (11)$$

- 3) We know that,

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

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

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

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

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

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

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

$$= 0.19 \quad (19)$$

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4) From eq. 17,

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

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

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