Assignment 1

AI1110 : Probability and Random Varriables
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,

$$\Pr(A) = 0.54 \tag{1}$$
$$\Pr(B) = 0.69 \tag{2}$$
$$\Pr(AB) = 0.35 \tag{3}$$

1) We know that,

$$\Pr(A + B) = \Pr(A) + \Pr(+)\, B - \Pr(AB) \tag{4}$$
$$= 0.54 + 0.69 - 0.35 \tag{5}$$
$$= 0.88 \tag{6}$$

2) By De Morgan's Law,

$$A'B' = (A + B)' \tag{7}$$
$$\implies \Pr(A'B') = \Pr(A + B)' \tag{8}$$
$$= 1 - \Pr(A + B) \tag{9}$$
$$= 1 - 0.88 \tag{10}$$
$$= 0.12 \tag{11}$$

3) We know that,

$$B + B' = 1 \tag{12}$$
$$BB' = 0 \tag{13}$$
$$A = A(B + B') = AB + AB' \tag{14}$$
$$\implies \Pr(A) = \Pr(AB) + \Pr(AB') - \Pr(ABB') \tag{15}$$
$$= \Pr(AB) + \Pr(AB') \tag{16}$$
$$\implies \Pr(AB') = \Pr(A) - \Pr(AB) \tag{17}$$
$$= 0.54 - 0.35 \tag{18}$$
$$= 0.19 \tag{19}$$

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4) From eq. 17,

$$\Pr(BA') = \Pr(B) - \Pr(AB) \tag{20}$$
$$= 0.69 - 0.35 \tag{21}$$
$$= 0.34. \tag{22}$$