Assignment 1
AI1110: Probability and Random Variables

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12.13.6.15 : Question. An electronic assembley consists of two subsystems,say A and B.From previous testing procedures, the following probabilities are assumed to be known:

$$\Pr(A\ fails) = 0.20$$

$$\Pr(B\ alone\ fails) = 0.15$$

$$\Pr(A\ and\ B\ fails) = 0.15$$

Evaluate the following probabilities

$$(i)\ \Pr(A\ fails\ given\ B\ has\ failed)$$

$$(ii)\ \Pr(A\ fails\ alone)$$

ans:

$$\Pr(A\ fails\ given\ B\ has\ failed) = 0.50$$

$$\Pr(A\ fails\ alone) = 0.05$$

Solution: Given , Probability that A fails

$$\Pr(A') = 0.20 \tag{1}$$

Probability that B fails alone

$$\Pr(AB') = 0.15 \tag{2}$$

Probability that both A and B fail

$$\Pr(A'B') = 0.15 \tag{3}$$

Now to find, Probability that both A fails given B has failed $\Pr(A'|B')$ and Probability that A fails alone $\Pr(BA')$ we use

$$\Pr(A'|B') = \Pr(A'B') / \Pr(B') \tag{4}$$

to obtain

$$\Pr(B')$$

we know that,

$$\Pr(B') = \Pr(AB') + \Pr(A'B') \tag{5}$$

$$= 0.15 + 0.15 \tag{6}$$

$$\Pr(B') = 0.30 \tag{7}$$

now to find $\Pr(A'|B')$

$$\Pr(A'|B') = 0.15/0.30 \tag{8}$$

$$\Pr(A'|B') = 0.50 \tag{9}$$

similiarly, to obtain $\Pr(BA')$ we have to use $\Pr(A'B')$ and $\Pr(A')$ we use

$$\Pr(BA') = \Pr(A') - \Pr(A'B') \tag{10}$$

$$= 0.20 - 0.15 \tag{11}$$

$$\Pr(BA') = 0.05 \tag{12}$$