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:

$$\Pr(\text{A fails}) = 0.20 \tag{1}$$
$$\Pr(\text{B alone fails}) = 0.15 \tag{2}$$
$$\Pr(\text{A and B fails}) = 0.15 \tag{3}$$

Evaluate the following probabilities
1) $\Pr(\text{A fails given B has failed})$
2) $\Pr(\text{A fails alone})$

ans:

$$\Pr(\text{A fails given B has failed}) = 0.50 \tag{4}$$
$$\Pr(\text{A fails alone}) = 0.05 \tag{5}$$

Solution: Given ,

$$\Pr(A') = 0.20 \tag{6}$$
$$\Pr(AB') = 0.15 \tag{7}$$
$$\Pr(A'B') = 0.15 \tag{8}$$

Now to find,$\Pr(A'|B')$ we use

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

to obtain $\Pr(B')$ we use,

$$\Pr(B') = \Pr(AB') + \Pr(A'B') \tag{10}$$
$$= 0.15 + 0.15 \tag{11}$$
$$\implies \Pr(B') = 0.30 \tag{12}$$

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

$$\Pr(A'|B') = 0.15/0.30 \tag{13}$$
$$\implies \Pr(A'|B') = 0.50 \tag{14}$$

similiarly, to obtain $\Pr(BA')$ we use

$$\Pr(BA') = \Pr(A') - \Pr(A'B') \tag{15}$$
$$= 0.20 - 0.15 \tag{16}$$
$$\implies \Pr(BA') = 0.05 \tag{17}$$