

Assignment 1

AI1110: Probability and Random Variables

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

$$\Pr(A \text{ fails}) = 0.20 \quad (1)$$

$$\Pr(B \text{ alone fails}) = 0.15 \quad (2)$$

$$\Pr(A \text{ and } B \text{ fails}) = 0.15 \quad (3)$$

Evaluate the following probabilities

- 1) $\Pr(A \text{ fails given } B \text{ has failed})$
- 2) $\Pr(A \text{ fails alone})$

ans:

$$\Pr(A \text{ fails given } B \text{ has failed}) = 0.50 \quad (4)$$

$$\Pr(A \text{ fails alone}) = 0.05 \quad (5)$$

Solution: Given ,

$$\Pr(A') = 0.20 \quad \Pr(AB') = 0.15 \quad \Pr(A'B') = 0.15 \quad (6)$$

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

$$\Pr(A'|B') = \frac{\Pr(A'B')}{\Pr(B')} \quad (7)$$

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

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

$$= 0.15 + 0.15 \quad (9)$$

$$\Pr(B') = 0.30 \quad (10)$$

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

$$\Pr(A'|B') = 0.15/0.30 \quad (11)$$

$$\Pr(A'|B') = 0.50 \quad (12)$$

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

$$\Pr(BA') = \Pr(A') - \Pr(A'B') \quad (13)$$

$$= 0.20 - 0.15 \quad (14)$$

$$\Pr(BA') = 0.05 \quad (15)$$