Assignment 4

S Goutham Sai - CS20BTECH11042

Download all python codes from

https://github.com/GouthamSai22/AI1103/blob/main/Assignment4/Codes

and latex-tikz codes from

https://github.com/GouthamSai22/AI1103/blob/main/Assignment4/main.tex

1 Problem 64 from GATE(ME) 2012

An automobile plant contracted to buy shock absorbers from two suppliers X and Y. X supplies 60% and y supplies 40% of the shock absorbers. All shock absorbers are subjected to a quality test.The ones that pass the quality test are considered reliable. Of X's shock absorbers are 96% are reliable. Of Y's shock absorbers 72% are reliable The probability that a randomly chosen shock absorber which is found to be reliable is made by Y is

1) 0.288
2) 0.334
3) 0.667
4) 0.720

2 Solution

Let A and B be two random variables that take values from the set {0,1}.
A:

- A=0 $\rightarrow$ shock absorber is from X
- A=1 $\rightarrow$ shock absorber is from Y

B:

- B=0 $\rightarrow$ shock absorber is not reliable
- B=1 $\rightarrow$ shock absorber is reliable

x_i	Description	P(A=x_i)
0	Shock absorber is from X	0.6
1	Shock absorber is from Y	0.4

TABLE 4: Values taken by X

Given,

$$\Pr(B=1|A=0) = 0.96 \tag{2.0.1}$$
$$\Pr(B=1|A=1) = 0.72 \tag{2.0.2}$$

Using the fact that $\Pr(E|F) = \frac{\Pr(E+F)}{\Pr(F)}$,

$$\Pr((B=1)+(A=0)) = \Pr(B=1|A=0)\times \Pr(A=0) \tag{2.0.3}$$

$$\Pr((B=1)+(A=0)) = 0.576 \tag{2.0.4}$$
$$\text{Similarly,} \Pr((B=1)+(A=1)) = 0.288 \tag{2.0.5}$$

Since the events (A=0) and (A=1) are mutually independent and mutually exhaustive, we can say that

$$\Pr(B=1) = \Pr((B=1)+(A=0)) + \Pr((B=1)+(A=1)). \tag{2.0.6}$$
$$\implies \Pr(B=1) = 0.864 \tag{2.0.7}$$

We need to find $\Pr(A=1|B=1)$

$$\Pr(A=1|B=1) = \frac{\Pr((A=1)+(B=1))}{\Pr(B=1)} \tag{2.0.8}$$

Substituting values from 2.0.5 2.0.7), we get

$$\Pr(A=1|B=1) = \frac{0.288}{0.864} \tag{2.0.9}$$
$$\implies \Pr(A=1|B=1) = 0.3333333 \tag{2.0.10}$$
$$\implies \Pr(A=1|B=1) = 0.334 \tag{2.0.11}$$