AI1103 - Assignment 1

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Download all python codes from

https://github.com/rajasekhar156/AI1103/blob/main/assignment−−1.py\\ \\

and latex-tikz codes from

https://github.com/rajasekhar156/AI1103/edit/main/assignment−1.tex\\ \\ \\

QUESTION:
A manufacturer has three machine operators A, B and C. The first operator A produces 1% defective items, where as the other two operators B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the time, B is on the job for 30% of the time and C is on the job for 20% of the time. A defective item is produced, what is the probability that it was produced by A?

ANSWER:
Let X $\in \{0, 1, 2\}$ be the random variable denoting that item was produced by operator A when X=0, X=1 denoting that item was produced by operator B ,X=2 denoting that item was produced by operator C, and random variable Y $\in \{0, 1\}$ be the random variable deoting that item produced was defective when Y=1.

$$\Pr(X = 0) = 0.5 \tag{0.0.1}$$
$$\Pr(X = 1) = 0.3 \tag{0.0.2}$$
$$\Pr(X = 2) = 0.2 \tag{0.0.3}$$
$$\Pr(Y = 1/X = 0) = 0.01 \tag{0.0.4}$$
$$\Pr(Y = 1/X = 1) = 0.05 \tag{0.0.5}$$
$$\Pr(Y = 1/X = 2) = 0.07 \tag{0.0.6}$$

From conditional probability we say that

$$\begin{aligned}\Pr(X = 0/Y = 1) &= \frac{\Pr(Y = 1/X = 0)\Pr(X = 0)}{\sum_{i=0}^{i=2}\Pr(Y = 1/X = i)\Pr(X = i)} \\ &= \frac{(0.01)(0.5)}{(0.01)(0.5) + (0.05)(0.3) + (0.07)(0.2)} \\ &= \frac{5}{34} \\ &= 0.147058\end{aligned}$$

Probability that defective item is produced by operator A is 0.147058