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, and random variable Y $\in \{0, 1\}$ be the random variable deoting that item produced was defective when Y=1.

$$P(X = 0) = 0.5 \quad (0.0.1)$$
$$P(X = 1) = 0.3 \quad (0.0.2)$$
$$P(X = 2) = 0.2 \quad (0.0.3)$$
$$P(Y = 1/X = 0) = 0.01 \quad (0.0.4)$$
$$P(Y = 1/X = 1) = 0.05 \quad (0.0.5)$$
$$P(Y = 1/X = 2) = 0.07 \quad (0.0.6)$$

From conditional probability we say that

$$\text{P(X=0/Y=1)} = \frac{P(Y=1/X=0)P(X=0)}{\sum_{i=0}^{i=2} P(Y=1/X=i)P(X=i)}$$

$$\text{P(X=0/Y=1)} = \frac{(0.01)(0.5)}{(0.01)(0.5)+(0.05)(0.3)+(0.07)(0.2)}$$

$$\text{P(X=0/Y=1)} = \frac{5}{34}$$

$$\text{P(X=0/Y=1)} = 0.147058$$

Probability that defective item is produced by operator A is 0.147058