AI1103-Assignment 1

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Download all python codes from

https://github.com/DineshAvulaMohanaDurga/AI1103/blob/main/assignment_1/codes/ai1103_assignment1.py

and latex codes from

https://github.com/DineshAvulaMohanaDurga/AI1103/blob/main/assignment_1/main.tex

1 Question

(Problem 1.10) There are 5% defective items in a large bulk of items.What is the probability that a sample of 10 items will not contain more than one defective items.

2 Answer

let A be the event where item is defective
Given percentage of defective items in a bunch of items =5%
$\Rightarrow$ probability of an item to be defective $= 0.05$

$$\Pr(A) = 5\% \tag{2.0.1}$$

$\Rightarrow$ probability of an item to be non-defective=0.95

$$\Pr(A') = 95\% \tag{2.0.2}$$

Required to find :- Probability that a sample of 10 items will not contain more than 1 defective items. Lets assume that we are given 10 items and the event that given condition is satisfied be E.
probability that all of them are non defective

$$\Pr(X = 0) = (0.95)^{10} \tag{2.0.3}$$

$\because$ probability of n independent events happening simultaneously $= p_1 \times p_2 \times .....p_{n-1} \times p_n$ (2.0.4)

probability that one of them is defective

$$\Pr(X = 1) = {}^{10}C_1 \times (0.95)^9 \times (0.05) \tag{2.0.5}$$

- here ${}^{10}C_1$ indicates choosing one out of 10 items which is defective
- 0.05 indicates the probability that the choosen item to be defective
- $(0.95)^9$ indicates the probability that the rest 9 items are non-defective
- $\because$ probability of n independent events happening simultaneously= $p_1 \times p_2 \times .....p_{n-1} \times p_n$

So the probability that 10 items does not have more than 1 defective item

$$\begin{aligned}\Pr(E) &= (0.95)^{10} + {}^{10}C_1 \times (0.95)^9 \times (0.05)\\ &= 0.9139\\ &= 91.39\%\end{aligned} \tag{2.0.6}$$

$\because$ the probability of n mutually exclusive events such that one of them happens $= p_1 + p_2 + ... + p_{n-1} + p_n$

$\therefore$ **the the probability that 10 items does not have more than 1 defective item is 91.39%**