AI1103-Assignment 1

Name: Avula Mohana Durga Dinesh Reddy , Roll Number: CS20BTECH11005

Download all python codes from

https://github.com/DineshAvulaMohanaDurga/AI1103/tree/main/assignment%201/codes

and latex codes from

https://github.com/DineshAvulaMohanaDurga/AI1103/blob/main/assignment%201/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

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

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

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

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.
The event that all of then are non-defective be E_1.
probability that all of them are non defective

$$P(E_1) = (0.95)^{10} \tag{2.0.3}$$

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

let E_2 be the event where only one of the 10 items is defective.
probability that one of them is defective

$$P(E_2) = {}^{10}C_1 \times (0.95)^9 \times (0.05) \tag{2.0.5}$$

- 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

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

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

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