AI1103-Assignment 1

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

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 p be the probability for an item to be defective
Given percentage of defective items in a bunch of items =5%

$$p = 0.05 = 5\% \tag{2.0.1}$$

Lets assume that we are given 10 items and the event that given condition is satisfied be E.
From binomial distribution

$$\Pr(X = k) = {}^{10}C_k \times (0.95)^{10-k} \times (0.05)^k \tag{2.0.2}$$

probability that all of them are non defective

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

probability that one of them is defective

$$\Pr(X = 1) = {}^{10}C_1 \times (0.95)^9 \times (0.05) \tag{2.0.4}$$

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

$$\begin{aligned}
\Pr(E) &= \Pr(X \le 1) && (2.0.5)\\
&= \Sigma_{k=0}^{1} \Pr(X = k) && (2.0.6)\\
&= \Pr(X = 0) + \Pr(X = 1) && (2.0.7)\\
&= (0.95)^{10} + {}^{10}C_1 \times (0.95)^9 \times (0.05)\\
&= 0.9139\\
&= 91.39\% && (2.0.8)
\end{aligned}$$

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