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

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

$$q = 1 - p = 0.95 = 95\% \tag{2.0.2}$$

Let X be the random variable defining the number of defective items in the given sample.

$$X = B(n, p) \tag{2.0.3}$$

From binomial distribution

$$\Pr(X = k) = {}^{10}C_k \times (0.95)^{10-k} \times (0.05)^k \tag{2.0.4}$$

$$\Pr(X = 0) = (0.95)^{10} \tag{2.0.5}$$

$$\Pr(X = 1) = {}^{10}C_1 \times (0.95)^9 \times (0.05) \tag{2.0.6}$$

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

$$\Pr(E) = \Pr(X \leq 1) \tag{2.0.7}$$

$$= \Sigma_{k=0}^{1} \Pr(X = k) \tag{2.0.8}$$

$$= \Pr(X = 0) + \Pr(X = 1) \tag{2.0.9}$$

$$= (0.95)^{10} + {}^{10}C_1 \times (0.95)^9 \times (0.05)$$

$$= 0.9139$$

$$= 91.39\% \tag{2.0.10}$$

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