Probability&RV Assignment-03

U Anuradha-ee21resch01008

download Python code from

https://github.com/Anuradha−Uggi/Assignments−AI5002−Probability−and−Random−Variables/blob/main/Prob_ass03/Rvsp_3.py

Download Latex code from

https://github.com/Anuradha−Uggi/Assignments−AI5002−Probability−and−Random−Variables/blob/main/Prob_ass03/AssRv3.tex

I. QUESTION(2.8)

Two groups are competing for the position on the board of directors of a corporation.the probability that the first and the second groups will win are 0.6 and 0.4 respectively.Further, if the first group wins ,the probability of introducing a new product is 0.7 and the corresponding probability is 0.3 if the second group wins.Find the probability that the new product introduced was by the second group.

II. SOLUTION

Let $P(X_1 = 0)$ is the winning probability of 1st group.
$P(X_2 = 1)$ is the winning probability of 2nd group.
$P(X_2 = 1 \mid X_1 = 0)$ is the probability that the 1st group introduces a new product.
$P(X_2 = 1 \mid X_1 = 1)$ is the probability that the 2nd group introduces a new product.

x_1	0	1
x_2	1	1
$P(X_1 = x_1)$	0.6	0.4
$P(X_2 = x_2 \mid X_1 = x_1)$	0.7	0.3

From Bays Theorem
Probability that the new Product introduced was by Group2 is Expressed as

$$P(X_1 = 1 \mid X_2 = 1) = \frac{P(X_2 = 1 \mid X_1 = 1) \times P(X_1 = 1)}{P(X_2 = 1 \mid X_1 = 1) \times P(X_1 = 1) + P(X_2 = 1 \mid X_1 = 0) \times P(X_1 = 0)}$$

Substituting Given all Values in above Equation gives

$$P(X_1 = 1 \mid X_2 = 1) = \frac{0.3 \times 0.4}{0.3 \times 0.4 + 0.7 \times 0.6}$$

$$P(X_1 = 1 \mid X_2 = 1) = \frac{2}{9} = 0.222222222.$$

III. CONCLUSION

Probability that the new Product was actually Launched by second group is

$$P(X_1 = 1 \mid X_2 = 1) = \frac{2}{9}$$