

Probability&RV

Assignment-03

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

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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.

$P(X_2 = 1 | X_1 = 0)$ is the probability that the 1st group introduces a new product.

$P(X_2 = 1 | X_1 = 1)$ 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
$P(X_2 = x_2 X_1 = x_1)$	0.7	0.3

In the above defined random variables $X_2=1$ in both the cases since we don't have $X_2 = 0$ cases. it is given that the product is introduced. so we don't have any cases of not introducing products.

From Bays Theorem

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

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

Substituting Given all Values in above Equation gives

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

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

III. CONCLUSION

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

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