# Assignment4

CS20Btech11035 -NYALAPOGULA MANASWINI

Download python code from

https://github.com/N−Manaswini23/assignment4/tree/main/python%20codes

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GATE 2021 XE-A QUESTION 7(PG:9)

A person who speaks truth 3 out of 4 times,throws a fair dice with six faces and informs the outcome is 5.The probability that the outcome is really 5 is

SOLUTION

Let $X \in \{0, 1\}$ represent the random variable,where 0 represents person speaking false,1 represents person speaking truth.
Let $Y \in \{1, 2, 3, 4, 5, 6\}$ represent random variable,where $1, 2, 3, 4, 5, 6$ represents person informs outcome of dice is $1, 2, 3, 4, 5, 6$,respectively.

| Event | definition | value |
|---|---|---|
| $\Pr(X = 1)$ | Probability of person speaking truth | $\frac{3}{4}$ |
| $\Pr(X = 0)$ | Probability of person speaking false | $\frac{1}{4}$ |
| $\Pr(Y = 5\|X = 1)$ | Probability of person informing outcome is 5 if person speaks truth | $\frac{1}{6}$ |
| $\Pr(Y = 5\|X = 0)$ | Probability of person informing outcome is 5 if person speaks false | $\frac{5}{6}$ |

TABLE 0: Table 1

From Baye's theorem

$$\Pr(Y = 5) = \Pr(Y = 5|X = 1) \times \Pr(X = 1) + \Pr(Y = 5|X = 0) \times \Pr(X = 0) \quad (0.0.1)$$

Substiting values from table (0) in (0.0.1)

$$\Pr(Y = 5) = \frac{8}{24} \quad (0.0.2)$$

$$\Pr((X = 1)(Y = 5)) = \Pr(Y = 5|X = 1) \times \Pr(X = 1) \quad (0.0.3)$$

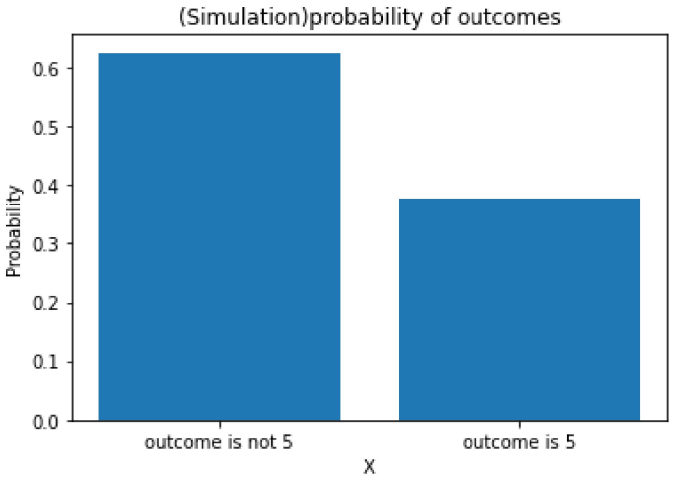
$$= \frac{3}{24} \quad (0.0.4)$$

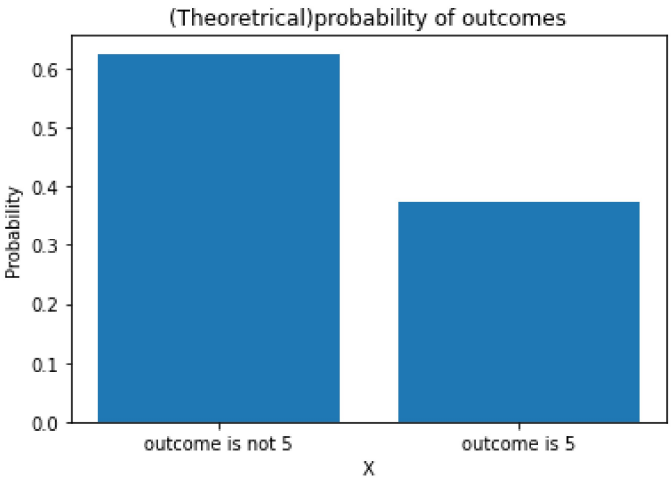
We need to find $\Pr(X = 1|Y = 5)$

$$\Pr(X = 1|Y = 5) = \frac{\Pr((X = 1)(Y = 5))}{\Pr(Y = 5)} \quad (0.0.5)$$

$$= \frac{3}{8} \quad (0.0.6)$$

$\therefore$ The desired probability that outcome is really 5 $= \frac{3}{8} = 0.375$




(Theoretrical)probability of outcomes
Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.6
outcome is not 5
outcome is 5
X