Assignment3

CS20Btech11035 -NYALAPOGULA MANASWINI

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GATE XE-C QUESTION 17

Box-S has 2 white and 4 black balls and box-T has 5 white and 3 black balls.A ball is drawn at random from box-S and put in box-T.Subsequently,the probability of drawing a white ball from box-T is? (rounding off to 2decimal places)

SOLUTION

Box-0 has 2 white and 4 black balls.
Box-1 has 5 white and 3 black balls.

Event	definition
W	Event of transfering white balls from box-0 to box-1
B	Event of transfering black balls from box-0 to box-1
C	Event of drawing white balls from box-1
$\Pr(W=1)$	Probability of transfering one whiteball from box-0 to box-1
$\Pr(B=1)$	Probability of transfering one blackball from box-0 to box-1
$\Pr(C=1\|W=1)$	Probability of drawing a whiteball from box-1 after transfering white ball to box-1.
$\Pr(C=1\|B=1)$	Probability of drawing a whiteball from box-1 after transfering black ball to box-1.

TABLE 0: Table 1

Probability	$\Pr(W=1)$	$\Pr(B=1)$	$\Pr(C=1\|W=1)$	$\Pr(C=1\|B=1)$
value	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{6}{9}$	$\frac{5}{9}$

TABLE 0: Table 2

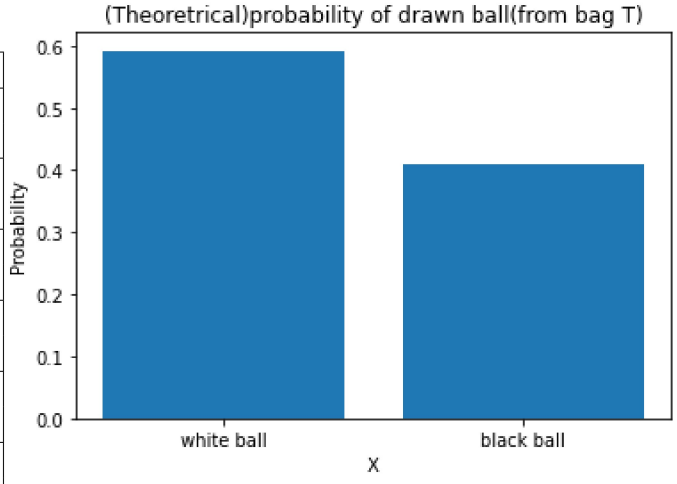
From Baye's theorem

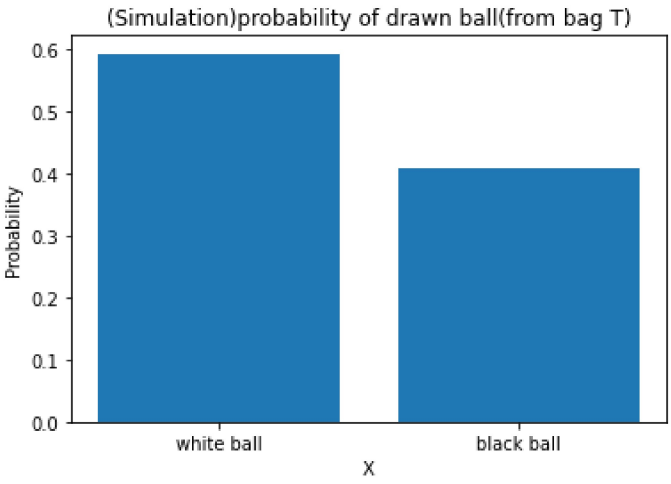
$$\Pr(\text{drawn ball is white}) = \Pr(C=1) \tag{0.0.1}$$
$$= \Pr(C=1|W=1)\times\Pr(W=1) + \Pr(C=1|B=1)\times\Pr(B=1) \tag{0.0.2}$$

Substiting values from table (0) in (0.0.2)

$$\Pr(C=1) = \frac{6}{9}\times\frac{1}{3}+\frac{5}{9}\times\frac{2}{3} \tag{0.0.3}$$
$$= \frac{16}{27} \tag{0.0.4}$$

$\therefore$ Probability of drawing white ball from box-1 $= \Pr(C=1) = \frac{16}{27} = 0.59$




(Simulation)probability of drawn ball(from bag T)
Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.6
white ball
black ball
X