

Assignment 1

Muttareddy Sahil Chandra - CS20BTECH11033

Download all python codes from

<https://github.com/SAHIL150602/AI1103/blob/main/Assignment1/codes/Assignment.py>

and latex-tikz codes from

<https://github.com/SAHIL150602/AI1103/blob/main/Assignment1/Assignment1.tex>

the condition given was probability of getting at least one head must be greater than 90%

$$\Rightarrow \Pr(X \geq 1) > 0.9 \quad (2)$$

$$\Rightarrow 1 - \frac{1}{2^n} > 0.9 \quad (3)$$

$$\Rightarrow \frac{1}{2^n} < 0.1 \quad (4)$$

$$\Rightarrow 2^n > 10 \quad (5)$$

Hence $n = 4$

\Rightarrow The minimum number of times the coin has to be tossed so that the probability of getting atleast one head is greater than 0.9 is 4 times.

1 PROBLEM

How many times a man must toss a coin such that the probability of getting atleast one head is greater than 90%

2 SOLUTION

The probability of getting heads when an unbiased coin is tossed 1 time is $\frac{1}{2}$ and vice versa. By Binomial distribution the probability of getting k heads is

$$\begin{aligned} \Pr(X = k) &= {}^nC_k \left(\frac{1}{2}\right)^k \left(\frac{1}{2}\right)^{n-k} \\ &= \frac{{}^nC_k}{2^n} \end{aligned} \quad (1)$$

So the probability of getting atleast one head is $P(X > 0)$.

By binomial distribution we also know that

$$\sum_{i=0}^n P(X = i) = 1$$

So

$$\Pr(X \geq 1) + \Pr(X = 0) = 1$$

$$\Pr(X \geq 1) = 1 - \Pr(X = 0)$$

$$= 1 - \frac{{}^nC_0}{2^n}$$

$$\Pr(X \geq 1) = 1 - \frac{1}{2^n}$$