Assignment 4

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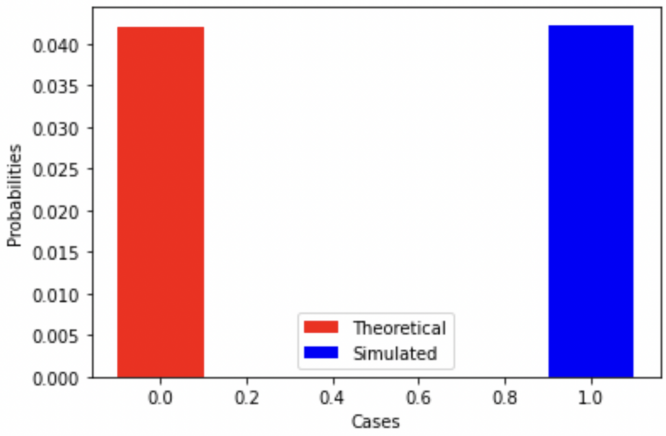
Download all python codes from

https://github.com/vaibhavchhabra25/AI1103-course/blob/main/Assignment-4/Codes/simulation_code.py

and latex codes from

https://github.com/vaibhavchhabra25/AI1103-course/blob/main/Assignment-4/main.tex

The graph of theoritical and simulated value is given below:



1 Problem

(GATE 2020 (ME -SET2), Q.36) A fair coin is tossed 20 times. The probability that 'head' will appear exactly 4 times in the first ten tosses, and 'tail' will appear exactly 4 times in the next ten tosses is....(round off to 3 decimal places)

2 Solution

The probability of getting exactly 4 heads in the first 10 tosses can be calculated as

$$\Pr(H=4, T=6) = {}^{10}C_4 \times \left(\frac{1}{2}\right)^4 \times \left(\frac{1}{2}\right)^6 \quad (2.0.1)$$

The probability of getting exactly 4 tails in the next 10 tosses can be calculated as

$$\Pr(T=4, H=6) = {}^{10}C_4 \times \left(\frac{1}{2}\right)^4 \times \left(\frac{1}{2}\right)^6 \quad (2.0.2)$$

Since these two probabilities are independent of each other, the required probability is the product of these two

$$= {}^{10}C_4 \times \left(\frac{1}{2}\right)^4 \times \left(\frac{1}{2}\right)^6 \times {}^{10}C_4 \times \left(\frac{1}{2}\right)^4 \times \left(\frac{1}{2}\right)^6 \quad (2.0.3)$$

$$= \frac{210^2}{2^{20}} = \frac{44100}{1048576} = 0.042 \quad (2.0.4)$$

So, the required probability is 0.042.