Assignment 8-Probability and Random Variable

Annu-EE21RESCH01010

Download latex code from here-

https://github.com/annu100/AI5002−Probability−and−Random−variables/tree/main.tex/ASSIGNMENT_8

Download python code from here-

https://github.com/annu100/AI5002−Probability−and−Random−variables/tree/main.py/ASSIGNMENT_8

I. Problem Statement-Problem 3.7

Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed 6 times. What are possible values of X?

II. Solution

Let X_1 denotes the number of heads and X_2 denotes the number of tails that occur when a coin is tossed 6 times.

let n is total number of tosses and p is probability of getting head
p=q=0.5
Clearly, $X_1 \sim Bin(n = 6, p)$
and $X_2 \sim Bin(n = 6, 1 - p = q)$.
$\therefore n - X_2 \sim Bin(6, p)$.
By reproductive property,

$$X_1 + n - X_2 \sim Bin(6 + 6, p) \tag{1}$$

$X = X_1 - X_2$.

$$\therefore P(X = x) = \binom{12}{6+x}\frac{1}{2}^{12}, x = -6 \text{ to } 6$$

therefore,X can have any values between -6 to 6.

III. Simulations

Question-Plot the sum and difference of 2 bernaulli random variables

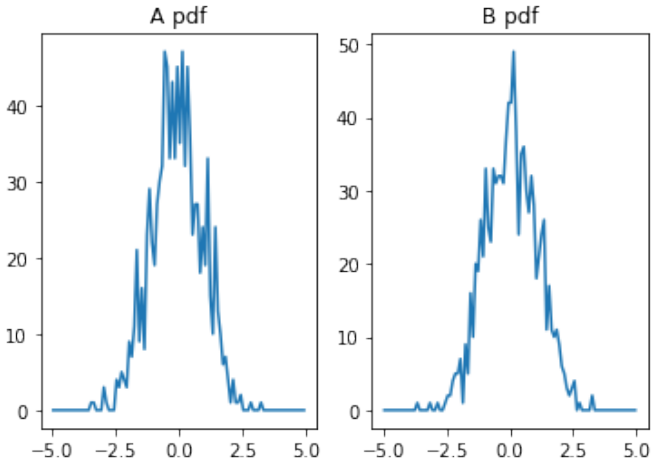
A. Simulations-solutions

z=(x-μ)/$\sigma \sim N(0, 1)$
where
μ=n*p
and σ= $\sqrt{n * p(1 - p)}$
So,basically normal distributions are approximation of binom

PDF of 2 individual binomial random variables are plotted.

PDF of sum of 2 individual random variables and sum of their individual pdfs are plotted and compared.
PDF of difference of 2 individual random variables and difference of their individual pdfs are plotted and compared.
CDF of 2 individual binomial random variables are plotted.

CDF of sum of 2 individual random variables and sum of their individual Cdfs are plotted and compared.
CDF of difference of 2 individual random variables and difference of their individual cdfs are plotted and compared.
If x is a random variable with distribution Bin(n, p), then for sufficiently large n, the distribution of the variable.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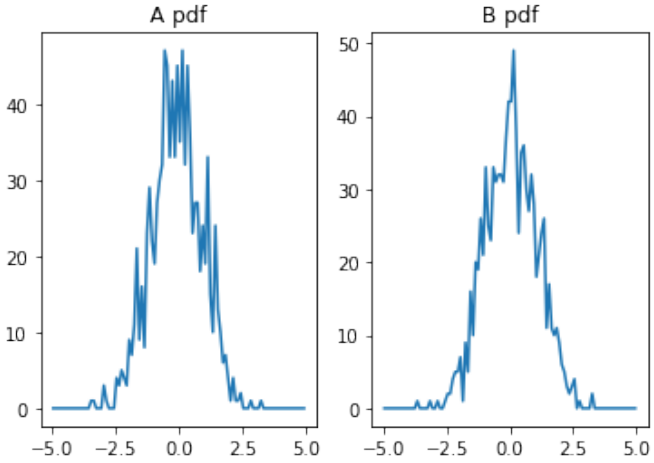
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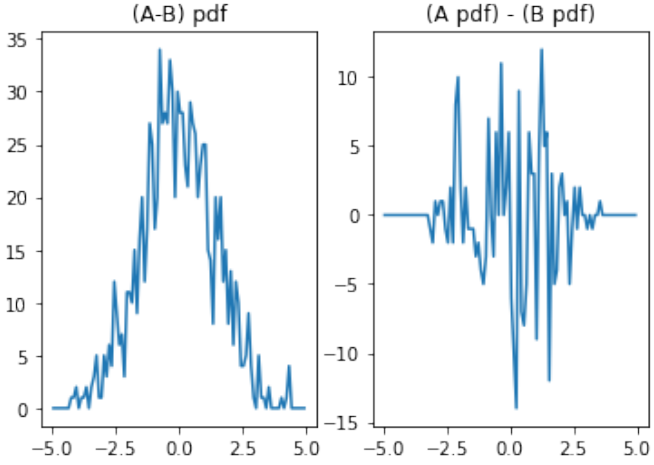
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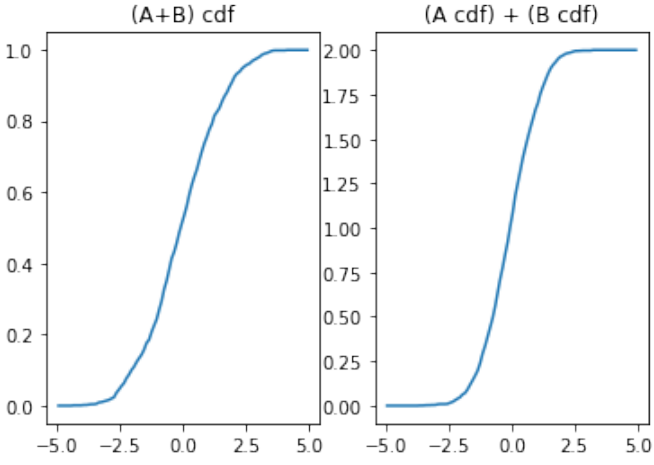
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