5. Exercise: Conditional PDFs

Exercises due Mar 13, 2020 05:29 IST *Completed*

Exercise: Conditional PDFs

2/2 points (graded)

The random variables X and Y are jointly continuous, with a joint PDF of the form

$$f_{X,Y}(x,y) = \begin{cases} cxy, & \text{if } 0 \le x \le y \le 1, \\ 0, & \text{otherwise,} \end{cases}$$

where c is a normalizing constant.

For $x \in [0, 0.5]$, the conditional PDF $f_{X|Y}(x \mid 0.5)$ is of the form ax^b. Find a and b. Your answers should be numbers.

$a =$ 8 ✔ **Answer:** 8

$b =$ 1 ✔ **Answer:** 1

Solution:

We have $f_{X|Y}(x \mid 0.5) = \dfrac{f_{X,Y}(x, 0.5)}{f_Y(0.5)}$.

Having fixed $y = 0.5$, the conditional PDF is to be viewed as a function of x. For those values of x that are possible (i.e., $x \in [0, 0.5]$), the conditional PDF will be proportional to the joint PDF, hence of the form ax, for some constant a. This implies that $b = 1$. To find the normalizing constant, we use the normalization equation

$$1 = \int_0^{0.5} f_{X|Y}\left(x \,|\, 0.5\right)\, dx = \int_0^{0.5} ax\, dx = a \cdot \frac{x^2}{2}\Big|0_{0.5} = \frac{a}{8},$$

which yields $a = 8$.

Submit You have used 2 of 3 attempts

Answers are displayed within the problem

Discussion

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Topic: Unit 5: Continuous random variables:Lec. 10: Conditioning on a random variable; Independence; Bayes' rule / 5. Exercise: Conditional PDFs

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?	I have the value for b good, but after replacing, value of a is marked wrong? Hello. I have done the exercise, and got the part of b good, but when I replace the part of a (using b), it is...	3
	Can some one explain to me how b=1 as given in the solution? I am unable to get to the point where b = 1 based on what is given in the solution. Can someone please ...	4
?	Why is this wrong?	5
	An alternative approach 2 new	12
?	For x∈[0,0.5] - what does that mean?	3
?	Struggling with 0≤x≤y≤1 I'm not sure what this condition 0≤x≤y≤1 means	10
☑	The integration interval near the end of the solution needs to be looked at I think the integration interval near the end of the solution needs to be looked at.	2
?	Help with the display for the exercise Hello, I was able to see the exercise then when the page reloaded, I could not longer see it. This was wha...	4
?	I thought conditioning on y should include all values of x when y is at 0.5	

? Clarification on limits

Hi, I frustratingly keep getting the same wrong answer. Is it correct to say that the limits of x should be 0 ...

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