13. Exercise: Stick-breaking

Exercise: Stick-breaking

3/3 points (graded)

Consider the same stick-breaking problem as in the previous clip, and let $\ell = 1$. Recall that $f_{X,Y}(x,y) = 1/x$ when $0 \le y \le x \le 1$.

a) Conditioned on $Y = 2/3$, the conditional PDF of X is nonzero when $a \le x \le b$. Find a and b.

$a =$ 2/3 ✔ **Answer:** 0.66667

$b =$ 1 ✔ **Answer:** 1

b) On the range found in part (a), the conditional PDF $f_{X|Y}(x \mid 2/3)$ is of the form cx^d for some constants c and d. Find d.

$d =$ -1 ✔ **Answer:** -1

Solution:

a) Since the joint PDF is nonzero only for $0 \le y \le x \le 1$, it follows that given that $Y = 2/3$, X ranges on the interval $[2/3, 1]$.

b) As a function of x, the conditional PDF has the same functional form (within a normalizing constant) as the joint PDF, and so it is of the form c/x, from which we conclude that $d = -1$.

To add up so that other learners can benefit, to find c; after having found d, all you need is to write the integral,

$$\int_{2/3}^{1} cx^d \, dx = 1 \implies c = \frac{1}{\int_{2/3}^{1} x^d \, dx}.$$

Answers are displayed within the problem

$f_Y(\frac{2}{3}) = \int f_{X,Y}(x,y)\,dx = \int_{\frac{2}{3}}^{1} \frac{1}{x}\,dx = \ln 1 - \ln\frac{2}{3}$
$= \ln(\frac{3}{2})$

讨论

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for part b: is fX|Y(x|y) uniform right?

question posted about 22 hours ago by **chechir**

but the answer doesn't make sense if it is.. x^d I'm watching the video and doing a similar calculation than the one made by the professor in minute 1.46 for fY|X(y|x). But replacing the conditioned variable with 2/3... The result should be just a constant right?

此帖对所有人可见。

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2 responses

markweitzman (Community TA)
about 22 hours ago

Remember how the joint probability scales when it is conditioned. Alternatively consider using the formula: $f_{X,Y}(x,y) = f_{X|Y}(x,y) \cdot f_Y(y)$.

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e_kizildag (Staff)
about 21 hours ago

As Mark suggested, recall that $f_{X,Y}(x,y) = f_{X|Y}(x|y) f_Y(y)$. Plug in $Y = 2/3$, and note what kind of a variable is $f_Y(2/3)$? (namely, is it a constant, or depends on x, or something else?) From here, you should be able to see how the shape of $f_{X|Y}$ is connected to the shape of $f_{X,Y}$.

It would be extremely helpful if the answer contained a more accurate description of the process.
The explanation here makes me think that I'm missing one step, but I can't figure out which one.

gra_vel 在about 19 hours ago前发表

oh, I see. many thanks! I think there's still some key concept that is taking me a while to assimilate

chechir 在about 19 hours ago前发表

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