15. Exercise: Independent normals

Exercise: Independent normals

3/4 points (graded)

The random variables X and Y have a joint PDF of the form

$$f_{X,Y}(x,y) = c \cdot \exp\left\{-\frac{1}{2}\left(4x^2 - 8x + y^2 - 6y + 13\right)\right\}.$$

$\mathbf{E}[X] =$ 1 ✔ **Answer:** 1

$\mathbf{Var}(X) =$ 1 ✖ **Answer:** 0.25

$\mathbf{E}[Y] =$ 3 ✔ **Answer:** 3

$\mathbf{Var}(Y) =$ 1 ✔ **Answer:** 1

Solution:

We rewrite the joint PDF in the form

$$f_{X,Y}(x,y) = c \cdot \exp\left\{-\frac{1}{2}\left(\frac{(x-1)^2}{1/4} + (y-3)^2\right)\right\},$$

and we recognize that we are dealing with the joint PDF of two independent normals with $\mathbf{E}[X] = 1$, $\mathbf{Var}(X) = 1/4$, $\mathbf{E}[Y] = 3$, and $\mathbf{Var}(Y) = 1$.

提交 You have used 3 of 3 attempts

Answers are displayed within the problem

讨论

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Is there a trick to this problem?

question posted 8 days ago by **animalfriendly**

I was able to integrate numerically and get the answers; however, I cannot help feeling that there was some intended shortcut I missed. Any tips?

此帖对所有人可见。

markweitzman (Community TA)
8 days ago - 8 days ago 前被 **e_kizildag** (Staff) 标记为答案

There is no need to integrate at all. Just put the exponent in the form $\exp\left\{-\frac{1}{2}\left[\left(\frac{x-\mu_x}{\sigma_x}\right)^2+\left(\frac{y-\mu_y}{\sigma_y}\right)^2\right]\right\}$, and read off the means, and variances.

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