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14. Exercise: The posterior of a coin's bias

Exercise: The posterior of a coin's bias

2/3 points (graded)

Let Θ be a continuous random variable that represents the unknown bias (i.e., the probability of Heads) of a coin.

a) The prior PDF f_{Θ} for the bias of a coin is of the form

$$f_{\Theta}(heta) = a heta^9(1- heta), \ \ ext{ for } heta \in [0,1],$$

where $m{a}$ is a normalizing constant. This indicates a prior belief that the bias $m{\Theta}$ of the coin is

High ▼ **✓ Answer:** High

b) We flip the coin 10 times independently and observe 1 Heads and 9 Tails. The posterior PDF of Θ will be of the form $c\theta^m(1-\theta)^n$, where c is a normalizing constant and where

$$m = \begin{bmatrix} 1 \\ m = \end{bmatrix}$$
 Answer: 10

 $n = \begin{bmatrix} 10 \\ \end{bmatrix}$ Answer: 10

Solution:

- a) Because of the high exponent, the term θ^9 is very small when θ is small. This prior, as can also be seen by plotting it, is concentrated on high values of θ and indicates a prior belief in favor of large values.
- b) As we saw in the last video, the power to which θ (respectively, $1-\theta$) is raised needs to be incremented by the number of Heads (respectively, Tails) observed, leading to m=9+1=10 and n=1+9=10. Notice that the resulting posterior is symmetric around 0.5.

This exercise indicates that the strength of the "evidence" incorporated in a prior with $\alpha=9$ and $\beta=1$ is exactly counterbalanced by observing 1 Heads and 9 Tails. Differently said, a prior with $\alpha=9$ and $\beta=1$ can be thought of as equivalent to prior "evidence" based on 9 Heads and 1 Tails.

Answers are displayed within the problem

讨论

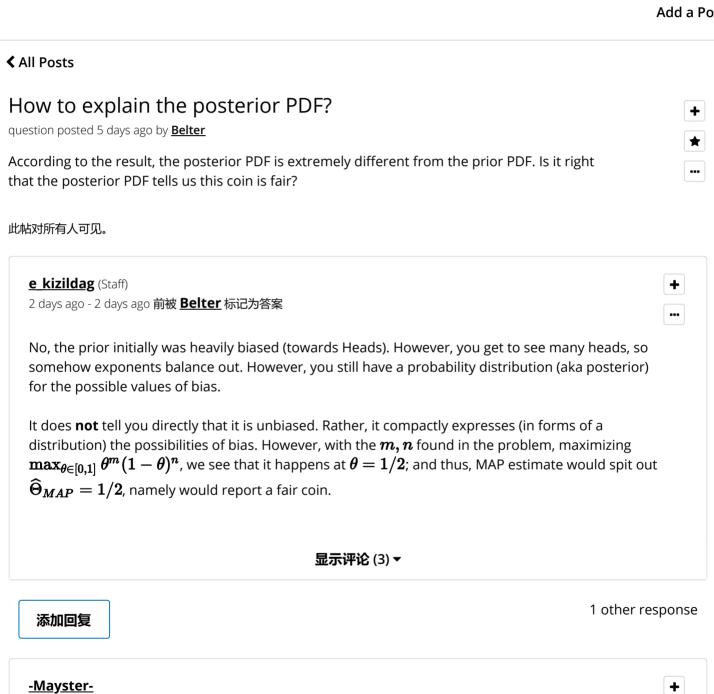
4 days ago

I came up to the same question:)

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隐藏讨论

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| even. Essentially more co | oin tosses will answer the question of whether the coin is fair. | |
|----------------------------|--|----|
| markweitzman (Commu | nity TA) 在4 days ago前发表 | |
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