17. Exercise: The discrete Bayes rule

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

Exercise: The discrete Bayes rule

0/1 point (graded)

The bias of a coin (i.e., the probability of Heads) can take three possible values, $1/4$, $1/2$, or $3/4$, and is modeled as a discrete random variable Q with PMF

$$p_Q(q) = \begin{cases} 1/6, & \text{if } q = 1/4, \\ 2/6, & \text{if } q = 2/4, \\ 3/6, & \text{if } q = 3/4, \\ 0, & \text{otherwise.} \end{cases}$$

Let K be the total number of Heads in two independent tosses of the coin. Find $p_{Q|K}(3/4 \,|\, 2)$.

6/24

✖ **Answer:** 0.75

Solution:

The Bayes rule for discrete random variables gives

$$p_{Q|K}(3/4 \,|\, 2) = \frac{p_Q(3/4)\, p_{K|Q}(2 \,|\, 3/4)}{p_K(2)} = \frac{(3/6)\cdot(3/4)^2}{p_K(2)} = \frac{(3/6)\cdot(3/4)^2}{3/8} = \frac{3}{4}.$$

To find $p_K(2)$, we used the total probability theorem:

$$p_K(2) = \sum_q p_Q(q)\, p_{K|Q}(2 \,|\, q) = (1/6)\cdot(1/4)^2 + (2/6)\cdot(2/4)^2 + (3/6)\cdot(3/4)^2 = 3/8.$$

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

Discussion

Hide Discussion

Topic: Unit 5: Continuous random variables:Lec. 10: Conditioning on a random variable; Independence; Bayes' rule / 17. Exercise: The discrete Bayes rule

Show all posts by recent activity

Ex The discrete Bayes rule How there can be 3 biases of SAME coin. Can p(q) be taken as P(P(H))	5
more intuitive way? Did anyone come up with a more intuitive way of framing the question of this exercise? Don't really know how t...	2 new
Sense of random variable Q Hi, 1/6, 2/6 and 3/6 mean for the money ? Thx in advance.	2
Regarding the bias change of the coin between the two tosses Hi, From the question, it seemed like the bias of the coin can change between the two tosses. So, while calculati...	1
Suspicious I'm very suspicious on how I got the correct answer with a inverse logic or maybe bad luck, because now I´m pu...	5
Hint on how to compute same value of the bayes formula	2
What is the intuition or the concept behind this question that is related to the continuous random variable? Hi all! I am a little bit confused about why we are doing a discrete Bayes rule question in a unit of continuous ra...	4
Don't make this mistake q is the probability of having head; PQ(q) is probability of choosing coin with probability of head=q	2
Clarification	9
Some clarification with Bayes Rule Guys, I was working on this problem using Bayes Rules, but I'm not sure if I understood the definition of the pro...	2