



Bookmarks



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## Unit overview

## Lec. 8: Probability density functions

Exercises 8 due Mar 16, 2016 at 23:59 UTC

## Lec. 9: Conditioning on an event; Multiple r.v.'s

Exercises 9 due Mar 16, 2016 at 23:59 UTC

## Lec. 10: Conditioning on a random variable; Independence; Bayes' rule

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## Standard normal table

## Solved problems

## Problem Set 5

Problem Set 5 due Mar 16, 2016 at 23:59 UTC

## Unit summary

Unit 5: Continuous random variables &gt; Lec. 10: Conditioning on a random variable; Independence; Bayes' rule &gt; Lec 10 Conditioning on a random variable Independence Bayes rule vertical8

## Exercise: The discrete Bayes rule

(1/1 point)

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  $p_{Q|K}(3/4 | 2)$ .

✓ Answer: 0.75

Answer:

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:

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

You have used 1 of 2 submissions

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