



MITx: 6.041x Introduction to Probability - The Science of Uncertainty



Bookmarks

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- ▶ Entrance Survey
- ▶ Unit 1: Probability models and axioms
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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

Unit 5: Continuous random variables > Lec. 10: Conditioning on a random variable; Independence; Bayes' rule > Lec 10 Conditioning on a random variable Independence Bayes rule vertical9

Bookmark

Exercise: Discrete unknown, continuous measurement

(1/1 point)

Let K be a discrete random variable that can take the values **1**, **2**, and **3**, all with equal probability. Suppose that X takes values in $[0, 1]$ and that for x in that interval we have

$$f_{X|K}(x | k) = \begin{cases} 1, & \text{if } k = 1, \\ 2x, & \text{if } k = 2, \\ 3x^2, & \text{if } k = 3. \end{cases}$$

Find the probability that $K = 1$, given that $X = 1/2$.

4/11



Answer: 0.36364

Answer:

Using the appropriate form of the Bayes rule, we have

$$f_{K|X}(1 | 1/2) = \frac{p_K(1)f_{X|K}(1/2 | 1)}{f_X(1/2)} = \frac{(1/3) \cdot 1}{f_X(1/2)} = \frac{1/3}{11/12} = 4/11.$$

To find $f_X(1/2)$, we used the total probability theorem:

$$\begin{aligned} f_X(1/2) &= \sum_k p_K(k) f_{X|K}(1/2 | k) \\ &= (1/3) \cdot 1 + (1/3) \cdot (2 \cdot (1/2)) + (1/3) \cdot (3 \cdot (1/2)^2) \\ &= 11/12. \end{aligned}$$

You have used 1 of 2 submissions

Exercises 10 due Mar
16, 2016 at 23:59 UTC

**Standard normal
table**

Solved problems

Problem Set 5

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

Unit summary

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