



Bookmarks



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Unit overview

Lec. 14: Introduction to Bayesian inference

Exercises 14 due Apr 06, 2016 at 23:59 UTC

Lec. 15: Linear models with normal noise

Exercises 15 due Apr 06, 2016 at 23:59 UTC

Problem Set 7a

Problem Set 7a due Apr 06, 2016 at 23:59 UTC

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Exercise: Moments of the Beta distribution

(2/2 points)

 Suppose that Θ takes values in $[0, 1]$ and its PDF is of the form

$$f_{\Theta}(\theta) = a\theta(1 - \theta)^2, \quad \text{for } \theta \in [0, 1],$$

 where a is a normalizing constant.

Use the formula

$$\int_0^1 \theta^{\alpha} (1 - \theta)^{\beta} d\theta = \frac{\alpha! \beta!}{(\alpha + \beta + 1)!}$$

to find the following:

 a) $a =$ Answer: 12

 b) $\mathbf{E}[\Theta^2] =$ Answer: 0.2

Answer:


 a) Let $\mathbf{I}(\alpha, \beta)$ be the integral in the formula given in the problem statement. The normalizing constant must be equal to $1/\mathbf{I}(1, 2)$: this is needed for the PDF to integrate to 1. We have $\mathbf{I}(1, 2) = 2!/4! = 1/12$, so that $a = 12$.

b)


$$\mathbf{E}[\Theta^2] = \int_0^1 \theta^2 f_{\Theta}(\theta) d\theta = \int_0^1 a\theta^3 (1 - \theta)^2 d\theta = a \cdot \mathbf{I}(3, 2) = 12 \cdot \frac{3! 2!}{6!} = \frac{1}{5}.$$

You have used 1 of 2 submissions


Lec. 16: Least mean squares (LMS) estimation

Exercises 16 due Apr 13, 2016 at 23:59 UTC 

Lec. 17: Linear least mean squares (LLMS) estimation

Exercises 17 due Apr 13, 2016 at 23:59 UTC 

Problem Set 7b

Problem Set 7b due Apr 13, 2016 at 23:59 UTC 

Solved problems**Additional theoretical material****Unit summary**

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