



Bookmarks



Bookmark

- ▶ Unit 0: Overview
- ▶ Entrance Survey
- ▶ Unit 1: Probability models and axioms
- ▶ Unit 2: Conditioning and independence
- ▶ Unit 3: Counting
- ▶ Unit 4: Discrete random variables
- ▶ Exam 1
- ▶ Unit 5: Continuous random variables
- ▶ Unit 6: Further topics on random variables
- ▼ Unit 7: Bayesian inference

Unit 7: Bayesian inference > Problem Set 7b > Problem 4 Vertical: LLMS estimation

Problem 4: LLMS estimation

(3/3 points)

Let $\mathbf{X} = \mathbf{U} + \mathbf{W}$ with $\mathbf{E}[\mathbf{U}] = \mathbf{m}$, $\text{var}(\mathbf{U}) = \mathbf{v}$, $\mathbf{E}[\mathbf{W}] = \mathbf{0}$, and $\text{var}(\mathbf{W}) = \mathbf{h}$. Assume that \mathbf{U} and \mathbf{W} are independent.

1. The LLMS estimator of \mathbf{U} based on \mathbf{X} is of the form $\hat{\mathbf{U}} = \mathbf{a} + \mathbf{b}\mathbf{X}$. Find \mathbf{a} and \mathbf{b} . Express your answers in terms of \mathbf{m} , \mathbf{v} , and \mathbf{h} using standard notation .

$$\mathbf{a} = \boxed{(\mathbf{h}^* \mathbf{m}) / (\mathbf{v} + \mathbf{h})} \quad \checkmark$$

$$\mathbf{b} = \boxed{\mathbf{v} / (\mathbf{v} + \mathbf{h})} \quad \checkmark$$

2. Suppose we further assume that \mathbf{U} and \mathbf{W} are normal random variables and then construct $\hat{\mathbf{U}}_{LMS}$, the LMS estimator of \mathbf{U} based on \mathbf{X} , under this additional assumption. Would $\hat{\mathbf{U}}_{LMS}$ be the identical to $\hat{\mathbf{U}}$, the LLMS estimator developed without the additional normality assumption in part (1)?


Yes ▼ ✓

You have used 1 of 2 submissions


DISCUSSION

Click "Show Discussion" below to see discussions on this problem.


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 


**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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