



Bookmarks

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## Exercise: LLMS drill

(2/2 points)

Suppose that  $\Theta$  and  $W$  are independent, both with variance **1**, and that  $X = \Theta + W$ . Furthermore,  $\mathbf{E}[\Theta] = \mathbf{1}$  and  $\mathbf{E}[W] = \mathbf{2}$ . The LLMS estimator  $\hat{\Theta} = aX + b$  has

$a =$

✓ Answer: 0.5

$b =$

✓ Answer: -0.5

*Hint:* Remember the formula

$$\text{cov}(X + Y, Z) = \text{cov}(X, Z) + \text{cov}(Y, Z).$$

Answer:

We have  $\mathbf{E}[X] = \mathbf{E}[\Theta] + \mathbf{E}[W] = \mathbf{3}$  and  $\text{var}(X) = \text{var}(\Theta) + \text{var}(W) = \mathbf{2}$ . Also,


$$\text{cov}(X, \Theta) = \text{cov}(\Theta, \Theta) + \text{cov}(\Theta, W) = \text{var}(\Theta) + 0 = \mathbf{1}.$$

Therefore, the LLMS estimator is


$$\hat{\Theta} = 1 + \frac{1}{2}(X - 3) = \frac{1}{2}X - \frac{1}{2}.$$

*You have used 1 of 2 submissions*


**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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