13. Exercise: The variance of a sum

Exercises due Mar 25, 2020 05:29 IST *Completed*

Exercise: The variance of a sum

1/1 point (graded)

The random variables $X_1, \ldots, X_8$ satisfy $\mathbf{E}[X_i] = 1$ and $\mathsf{Var}(X_i) = 4$ for $i = 1, 2, \ldots, 8$. Also, for $i \neq j$, $\mathbf{E}[X_i X_j] = 3$. Then,

$\mathsf{Var}(X_1 + \cdots + X_8) =$ 144 ✔ **Answer:** 144

Solution:

For $i \neq j$, we have $\mathsf{Cov}(X_i, X_j) = \mathbf{E}[X_i X_j] - \mathbf{E}[X_i] \cdot \mathbf{E}[X_j] = 3 - 1 = 2$. Thus,

$$\mathsf{Var}(X_1 + \cdots + X_8) = 8 \cdot \mathsf{Var}(X_1) + 56 \cdot \mathsf{Cov}(X_1, X_2) = 32 + 112 = 144.$$

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Answers are displayed within the problem

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Topic: Unit 6: Further topics on random variables:Lec. 12: Sums of independent r.v.'s; Covariance and correlation / 13. Exercise: The variance of a sum

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? Naive math question

	question about number before covariance in explanation I'm trying to be spoiler free, so this might not make complete sense. I got most of the work right for this ...	5
?	question are we assuming here zero means?	3
	Use python It's nice to use python and do a quick nested loop to solve this problem !	4
	No Python needed The previous lecture gives you the formulas. Find cov(Xi, Xj) and voila.	5
	Hint: Don't assume zero mean while calculating the covariance.	1