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15. Exercise: Correlation coefficient

Exercises due Mar 25, 2020 05:29 IST Completed

Exercise: Correlation coefficient

1/1 point (graded)

It is known that for a standard normal random variable X, we have $\mathbf{E}[X^3]=0$, $\mathbf{E}[X^4]=3$, $\mathbf{E}[X^5]=0$, $\mathbf{E}[X^6]=15$. Find the correlation coefficient between X and X^3 . Enter your answer as a number.

✓ Answer: 0.77460

Solution:

Since $\mathbf{E}\left[X\right]=\mathbf{E}\left[X^3\right]=0$, we have $\mathsf{Cov}\left(X,X^3\right)=\mathbf{E}\left[X\cdot X^3\right]=\mathbf{E}\left[X^4\right]=3$. Furthermore, since $\mathsf{Var}\left(X\right)=1$ and $\mathsf{Var}\left(X^3\right)=\mathbf{E}\left[X^6\right]=15$, we obtain

$$ho\left(X,X^3
ight)=rac{3}{\sqrt{1}\cdot\sqrt{15}}=\sqrt{3/5}.$$

Interestingly, even though the random variables are strongly dependent (the value of one determines the value of the other), the value of the correlation coefficient is moderate.

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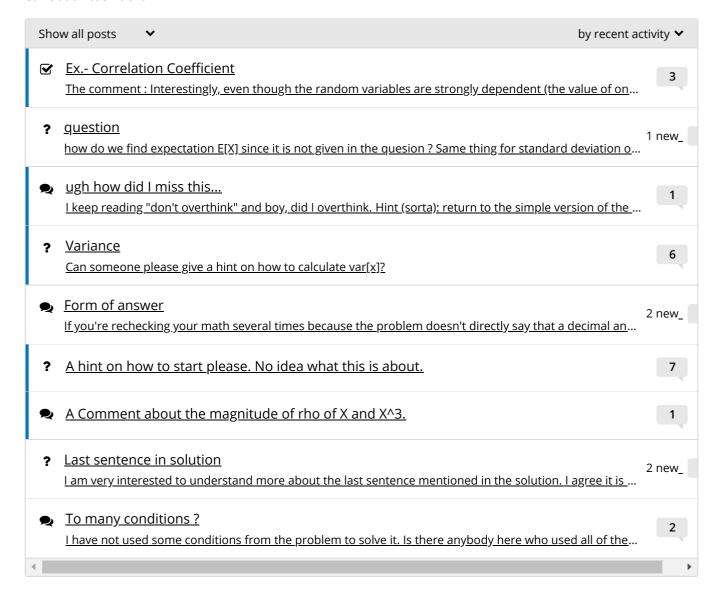
1 Answers are displayed within the problem



Discussion

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Topic: Unit 6: Further topics on random variables:Lec. 12: Sums of independent r.v.'s; Covariance and correlation / 15. Exercise: Correlation coefficient



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