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Bookmark

Exercise: Convergence in probability

(1/3 points)

a) Suppose that X_n is an exponential random variable with parameter $\lambda = n$. Does the sequence $\{X_n\}$ converge in probability?



Answer: Yes

b) Suppose that X_n is an exponential random variable with parameter $\lambda = 1/n$. Does the sequence $\{X_n\}$ converge in probability?



Answer: No

c) Suppose that the random variables in the sequence $\{X_n\}$ are independent, and that the sequence converges to some number a , in probability. Let $\{Y_n\}$ be another sequence of random variables that are dependent, but where each Y_n has the same distribution (CDF) as X_n . Is it necessarily true that the sequence $\{Y_n\}$ converges to a in probability?



Answer: Yes

Answer:

a) In the first case, for any $\epsilon > 0$, we have $\mathbf{P}(X_n \geq \epsilon) = e^{-n\epsilon}$, which converges to zero. Therefore, we have convergence in probability.

b) In the second case, for any $\epsilon > 0$, we have $\mathbf{P}(X_n \geq \epsilon) = e^{-\epsilon/n}$, which converges to one. Therefore, we do not have convergence in probability.

c) Dependence will not make a difference because the definition of convergence in probability involves probabilities of the form $\mathbf{P}(|Y_n - a| \geq \epsilon)$. These probabilities are completely determined by the marginal distributions of the random variables Y_n , and these marginal distributions are the same as for the sequence X_n .

▶ Exam 2

▼ Unit 8: Limit theorems and classical statistics

Unit overview

**Lec. 18:
Inequalities,
convergence, and
the Weak Law of
Large Numbers**Exercises 18 due Apr
27, 2016 at 23:59 UTC**Lec. 19: The
Central Limit
Theorem (CLT)**Exercises 19 due Apr
27, 2016 at 23:59 UTC**Lec. 20: An
introduction to
classical statistics**Exercises 20 due Apr
27, 2016 at 23:59 UTC

Solved problems

Additional
theoretical
material**Problem Set 8**Problem Set 8 due Apr
27, 2016 at 23:59 UTC

Unit summary

You have used 1 of 1 submissions

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