Exercise: Poisson process definition

(1/1 point)

Consider a Poisson process with rate $\lambda = 4$, and let $N(t)$ be the number of arrivals during the time interval $[0, t]$.

Suppose that you have recorded this process in a movie and that you play this movie at twice the speed. The process that you will be seeing in the sped-up movie satisfies the following (pick one of the answers):

- is a Poisson process with rate 2
- is a Poisson process with rate 4
- is a Poisson process with rate 8 ✔
- is not a Poisson process

- Unit 6: Further topics on random variables
- Unit 7: Bayesian inference
- Exam 2
- Unit 8: Limit theorems and classical statistics
- **Unit 9: Bernoulli and Poisson processes**

Unit overview

Lec. 21: The Bernoulli process
Exercises 21 due May 11, 2016 at 23:59 UTC

Lec. 22: The Poisson process
Exercises 22 due May 11, 2016 at 23:59 UTC

Lec. 23: More on the Poisson process

Answer:
Let $M(t)$ be the number of arrivals in the sped-up movie between times 0 and t. By time t, you have watched in the sped-up movie whatever happens in the original process from time 0 through time $2t$. Thus, $M(t) = N(2t)$. The independence and time-homogeneity properties of the original process can be seen to imply the same properties for the sped-up process. Furthermore,

$$\mathbf{P}\big(M(\delta) = 1\big) = \mathbf{P}\big(N(2\delta) = 1\big) \approx \lambda \cdot (2\delta) = (2\lambda)\delta,$$

which leads to the rather intuitive conclusion that the sped up process has a rate of $2\lambda = 8$.

You have used 1 of 1 submissions

Exercises 23 due May 11, 2016 at 23:59 UTC

Solved problems

Additional theoretical material

Problem Set 9
Problem Set 9 due May 11, 2016 at 23:59 UTC

Unit summary

▸ Unit 10: Markov chains

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