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### 3. Exercise: The sum of Poisson r.v.'s

Exercises due May 13, 2020 05:29 IST Completed

#### Exercise: The sum of Poisson r.v.'s

1/1 point (graded)

Consider a Poisson process with rate  $\lambda = 1$ . Consider three times that satisfy  $0 < t_1 < t_2 < t_3$ . Let  $M$  be the number of arrivals during the interval  $[0, t_2]$ . Let  $N$  be the number of arrivals during the interval  $[t_1, t_3]$ . Is the random variable  $M + N$  guaranteed to be Poisson?

No



✓ Answer: No

#### Solution:

Because the two time intervals overlap,  $M$  and  $N$  are not independent and the result in the preceding video does not apply. Consider the extreme case where  $t_1 \approx 0$  and  $t_2 \approx t_3$ . In that case, the two intervals almost coincide, and therefore  $M = N$  with high probability. In that case, the PMF of  $M + N$  is concentrated on the even integers, which cannot happen for a Poisson PMF.

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You have used 1 of 1 attempt

**i** Answers are displayed within the problem

### Discussion

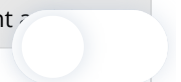
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**Topic:** Unit 9: Bernoulli and Poisson processes:Lec. 23: More on the Poisson process / 3. Exercise: The sum of Poisson r.v.'s

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? Even integers

"M+N is concentrated on the even integers" - why? (I guess I am just failing to realise something fundam...

2

💬 Superposition

Based on the video i may have chosen the obvious when considering disjoint distributions but i chose to...

3

💬 Useful discussion

What were the assumptions we studied in the last lecture?

3

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