Statistics 222, Spatial Statistics.

Outline for the day:

1. Review list.
2. Review oldexam.
3. More exercises.

1. Info about the exam.

The exam on Nov20 will be from 12:30pm to 1:45pm Pacific Time, but it will be ONLINE. I will post the exam on the course website,

http://www.stat.ucla.edu/~frederic/222/F23 at 12:30pm, in a file called 222exam.pdf .

It will have 13 questions, all multiple choice. They are all worth the same amount but some might be harder than others.

None of the above?

Email me your answers to frederic@stat.ucla.edu by 1:45pm. 1:50pm is ok, but anything later than that and we have a problem. Include your name. You do not need to write anything else aside from your name and your answers. You can just say, for instance

Rick Schoenberg

AFE CCB DEA HBG E.

Make sure your answers are in the correct order!

You can use any notes or books you want.

Grading. 12-13 A+. 10-11 A. 8-9 A-. 6-7. B+.
5. B. 4. B-. 3. C. 2. D. 0-1. F.

Review list.

1. PP as a random measure.
2. Integration, $\int f(t,x,y)\, dN$.
3. Simple and orderly.
4. Cond. intensity and Papangelou intensity.
5. Poisson processes.
6. Mixed Poisson processes.
7. Compound Poisson processes.
8. Poisson cluster processes.
9. Cox processes.
10. Gibbs and Strauss processes.
11. Matern processes.
12. Hawkes and ETAS processes.
13. Likelihood and MLE.
14. Covariance and variogram.
15. Kriging.
16. F,G,J,K, and L functions.
17. Simulation by thinning.
18. Martingale formula.
19. Kernel smoothing.
20. Marked G and J functions.
21. Weighted K function.
22. Nonparametric triggering function est.
23. Deviance, Voronoi, and superthinned residuals.
24. CAR, SAR models.

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You need to know the very basics of integrals, like $\int(f(x)+g(x))dx = \int f(x)dx + \int g(x)dx$ and be able to compute the integral of f(x) dx, where f(x) is

$f(x) = c$, or $f(x) = \log(x)$, or $f(x) = x^a$ where a is an integer, or $f(x) = e^{ax}$.

What is $\int_1^3 \int_1^3 (4+3/x)\, dx\, dy$?

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What is $\int_1^3 \int_1^3 (4+3/x)\, dx\, dy$?

$2(4x + 3\log(x)]_1^3) = 12 + 3\log(3) – 4 – 3\log(1) = 8 + 3\log(3)$.

3. More review questions.

Which of the following is not true regarding the differences between a CAR model, a SAR model, and kriging?

a. For a CAR model, the errors are correlated with each other, whereas with SAR the errors are uncorrelated.

b. For a CAR model, the errors at one location are uncorrelated with the values of the random field at other locations, whereas with SAR the errors and the random field are correlated with each other.

c. With CAR and SAR, only neighboring values are used to predict a certain value of the random field, whereas kriging uses all the values and as a result under general conditions is optimal for prediction.

d. With CAR and SAR, typically the covariance function is zero unless two values are neighbors, whereas this is not typically assumed in kriging.

e. None of the above.

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e. None of the above.

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Suppose a point process is generated on B = [0,10] days x [0,1] x [0,1]. First one generates parent points according to a stationary Poisson process with rate 0.3. Then each parent point gives birth to exactly one child point placed uniformly within 1 day after the parent and anywhere in the unit square. The resulting process consists of both the parents and children points.

One realization of this process results in four points, at (3, 0.4, 0.5), (3.4, 0.7, 0.8), (7.2, 0.4, 0.5), and (7.5, 0.9,0.1). What is the loglikelihood, L?

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(7.2, 0.4, 0.5), and (7.5, 0.9,0.1). What is the loglikelihood, L?

$L = \sum \log(\lambda) - \int \lambda(t,x,y)\, dt\, dx\, dy$

$= \log(.3) + \log(1.3) + \log(.3) + \log(1.3) - 0.3 \times 10 - 2$

$\sim -6.883.$