Statistics 222, Spatial Statistics.

Outline for the day:

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

The exam will be Thu May20, 2pm pacific time.

I will put the exam on the course website, http://www.stat.ucla.edu/~frederic/222/S21 , in a file called exam21.pdf.

at 2pm pacific time exactly. Email me your answers by 3:15pm to frederic@stat.ucla.edu. 3:20pm is ok, but after that we have a problem.

You can use any notes or books you want.

10 multiple choice questions. They are all worth the same amount but some might be harder than others. None of the above?

In your email, just write for example 1a. 2b. 3c. 4c. 5a. etc. Or you can write BAB CAD EAE BEB. etc. Be careful about which letter goes with which number.

The questions are all worth the same amount but have very different difficulties.

Grading. 9-10 A+.

7-8 A.

6 A-.

5. B+.

4. B.

3. B-.

2. C.

1. D. 0. 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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10.

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

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

~ -6.883.

4. Stoyan Grabarnik statistic.

See Baddeley et al. (2005).