Statistics 222, Spatial Statistics.

Outline for the day:

1. Exams.
2. Stoyan-Grabarnik statistic. Baddeley et al., 2005.
3. fitpoisstoyan.r
4. fitpoiscubicstoyan.r
5. fitpoisstoyancovariates.r
6. fithawkesstoyan.r

1. Exams.

1. d. 2.25.

2. a. $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{2} = 1/32$.

3. f. gamma(large h) - gamma(h near 0) = 11 - 1 = 10.

4. b. simple and λ doesn't depend on what other points have occurred.

5. e. log(3) + log(3+50/pi) - 30 - 2(.5) = -27.

6. a. $E\sum \log \lambda - \int \lambda \, d\mu = E \int \log(\lambda)\, \lambda - \lambda \, d\mu$

$= .5[(\log 10)(10)(10) - 100] + .5[(\log 20)(20)(10) - 200]$

$= 50 \log 10 + 100 \log 20 - 150 = 264.7025$.

7. g. $E \sum \log \lambda - \int \lambda d\mu = E\int \lambda \log(\lambda) - \lambda \, d\mu$

$= .5 \times .25 \times 10 \times (e+2e^2+3e^3+4e^4) - .5 \times 10 \times .25 \times (e+e^2+e^3+e^4)$

$+ .5 \times .25 \times 10 \times (2e^2+3e^3+4e^4+5e^5) - .5 \times 10 \times .25 \times (e^2+e^3+e^4+e^5)$

$= 1.25\,(e+2e^2+3e^3+4e^4) - 1.25\,(e+e^2+e^3+e^4) + 1.25\,(2e^2+3e^3+4e^4+5e^5)$
$- 1.25\,(e^2+e^3+e^4+e^5)$

$= e(0) + e^2(2.5-1.25+2.5-1.25) + e^3(3.75-1.25+3.75-1.25)$

$+ e^4(5-1.25+5-1.25) + e^5(6.25-1.25)$

$= 2.5e^2 + 6e^3 + 7.5e^4 + 5e^5 = 1290.538.$

8. f. You keep all the 3s, 4s, and 5s, plus 5/6 of the 6s. So you expect to have $2.5(3+4+5+5) = 17 \times 2.5 = 42.5$ points kept. The kept points form a Poisson process, so $\mathrm{var}(M(B)) = EM(B) = 42.5$.

9. E. $\mathrm{gamma}(h) = \rho(0) - \rho(h)$

$= 1/(2\beta) - \exp(-\beta h)/(2\beta).$

10. C. $E(D)=E\sum .4/\lambda=E\int .4/\lambda dN = E\int .4/\lambda \, \lambda d\mu = E\int .4 d\mu = 0.4 \times |B| = 4.$

2. Stoyan-Grabarnik statistic. Baddeley et al., 2005.

$E \sum 1/\lambda_i = E \int 1/\lambda \, \lambda \, d\mu = E \int d\mu = |B|$.

So, $\sum 1/\lambda_i - |B|$ should be close to zero.

What if we fit parameters by minimizing $(\sum 1/\lambda_i - |B|)^2$?

More specifically, imagine dividing up B into little grid cells, and within each cell, calculate this difference, $(\sum 1/\lambda_i - |B|)$,

and find the parameters minimizing the sum of squares?