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STA5001 **Additional Workshop 5** **Week 10**

1. Use the data **sic.100** from GEOR.

   (a) Fit Gaussian variogram for the data by using ordinary least squares. Plot the fitted variogram against the empirical variogram.

   (b) Optimize the monitoring network(the criterion is the minimum of mean kriging variances).

   (c) Produce the corresponding plot.

   (d) What are the first 5 candidate sited to remove?

   (e) Produce a spatial plot with circles centered at the data points and sizes equal to the mean kriging variances computed in 1b.

2. Let an inhomogeneous Poisson process with points $(x_i, y_i) \in [0, 10] \times [0, 10]$ satisfy the following properties:

   (a) points (x_i, y_i) form two groups;

   (b) the centers of these groups have random locations;

   (c) x_i and y_i coordinates of points in each group are within the distance of 1.0 of the x and y coordinates of group's centers respectively.

   Simulate this process two times and each time plot the simulated points.

3. Use the file Covid.csv from the LMS folder Data. This file was downloaded from

   https://discover.data.vic.gov.au/dataset/victorian-testing-site-locations-for-covid-19.

   The data provide a list of locations that are available to the public for COVID-19 testing in Victoria.

   (a) Use the Latitude and Longitude coordinates to create a ppp object with information about these testing locations.

   (b) Plot the locations.

   (c) Investigate the intensity of the locations.

   (d) Use the kernel smoothing method with an appropriate value of sigma to produce a plot of the estimated intensity. Add the locations to this plot.

   (e) Plot the locations and the contour plot for the estimated intensity in the same figure.

   (f) Perform the spatial Kolmogorov-Smirnov test for the uniform distribution of the Latitude coordinate. Then test the uniform distribution of the Longitude coordinate. Explain your results.

   (g) Simulate and plot the Poisson process with the estimated constant intensity.

(h) Perform the spatial Kolmogorov-Smirnov test for the uniform distribution of the Latitude coordinate for the locations simulated in 3g. Then test the uniform distribution of the Longitude coordinate for the locations simulated in 3g. Explain your results.