**8102 Lab 4** Yue Lin

**Assignment Ⅰ**

The covariogram map that shows the spatial structure in the covariance matrix based on a true exponential covariance model is presented in Figure 1. Parameters “*theta1*” and “*theta2*” are set to 5 and 0.5, respectively.

A screenshot of a cell phone

Description automatically generated

Figure 1. The covariogram map generated based on a true exponential covariance model.

The plot of simulated spatial process with map overlay from the Gaussian model is presented in Figure 2, with one using all original realization and the other using only 30% of the original realization.

A screen shot of a video game

Description automatically generated

Figure 2. Plots of simulated spatial process from the Gaussian model with all and 30% of the original realization, respectively.

The plot of empirical, fitted and true semi-variograms as well as the plot of the empirical semi-variogram in each of 4 principle directions are presented in Figure 3. When the distance is below 1.0, the empirical semi-variogram fits well with the true semi-variogram; as the distance increases, the empirical values tend to be higher than the true values.

A screenshot of a cell phone

Description automatically generated

Figure 3. Plot of empirical, fitted and true semi-variograms and plot of the empirical semi-variogram in each of 4 principle directions.

Fit an appropriate model to the empirical semi-variogram. Plot the empirical, fitted, and true semi-variograms together. How does your empirical semi-variogram compare with the truth? How do the estimated spatial parameters compare with the true values? Is the assumption of isotropy valid here? Should it be?

**Assignment Ⅱ**