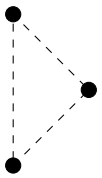
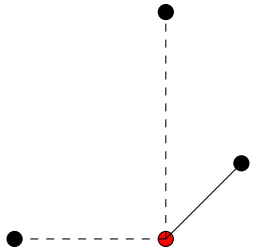
Simple Overview of Statistical Concepts of week 10

Distance methods. Distance methods are used to analyse spatial point patterns and understand the spatial relationships between the points. There are several types of distance methods commonly used in spatial point pattern analysis, including pairwise distances, nearest neighbour distances, and empty space distances.

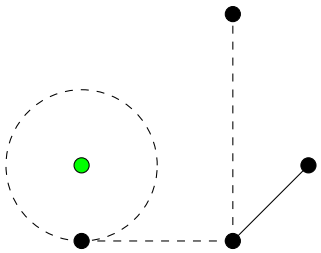
Pairwise distances measure the distance between every pair of points in the pattern. This can be useful in determining the overall spread of the pattern and identifying any clustering or regularity in the spacing of the points. For example, in a two-dimensional point pattern with points at (1,1), (2,2), and (1,3), the pairwise distances between these points are lengths of 3 dashed line segments shown in the picture:



Nearest neighbour distances measure the distance between each point and its nearest neighbour in the pattern. This can be useful in identifying any clustering or spatial dependence in the pattern. For example, in a two-dimensional point pattern with points at (1,1), (2,2), and (1,4), (-1,1) the nearest neighbour distances for (1,1) is shown as a solid line segment:



Empty space distances measure the distance between each point (not necessarily from a point that exists in a given point patters) and its nearest neighbour. This can be useful in identifying any clustering or regularity in the pattern that is not explained by chance. For example, for the above two-dimensional point pattern and the point (-1,2) the empty space distance circle is shown below:



$\mathcal{F}$ and $\mathcal{G}$ functions. The $\hat{\mathcal{F}}(r)$ and $\hat{\mathcal{G}}(r)$ functions are summary statistics that are used to determine the type of spatial point pattern exhibited by a set of points.

If the estimated $\hat{\mathcal{F}}(r)$ is greater than the expected function for the Poisson pattern, it suggests regularity , while if it is less, it suggests clustering . If the observed distribution is roughly equal to the expected distribution, it suggests CSR.

Conversely, if the $\hat{\mathcal{G}}(r)$ function is less than the expected function for the Poisson pattern, it suggests regularity, while if it is greater, it suggests clustering. If the $\hat{\mathcal{G}}(r)$ function roughly follows the expected function for the Poisson pattern, it suggests CSR.

Spatio-temporal point processes. A spatio-temporal point process is a model used to describe the locations and times of events that occur in space and time.

One important aspect of spatio-temporal point processes is the notion of spatial and temporal intensities. The spatial intensity refers to the rate at which events occur in a particular region of space, while the temporal intensity refers to the rate at which events occur at a particular time.

The cumulative number of cases over time in a spatio-temporal point process refers to the total number of events (or cases) that have occurred up to a particular point in time. For example, the cumulative number of insurance claim over time would represent the total number of individuals who submitted their claims before a particular point in time.