

University of California, Los Angeles
Department of Statistics

Statistics C173/C273

Instructor: Nicolas Christou

Types of spatial data

Note: See “Statistical Methods for Spatial Data Analysis,” by Oliver Schabenberger and Carol Gotway, Chapman & Hall/CRC, 2005.

A spatial process in d dimensions is denoted by

$$\{Z(s) : s \in D \subset R^d\}, \text{ with } d = 2 \text{ or } 3.$$

Z is the attribute we observe at location \mathbf{s} which is a $d \times 1$ vector of coordinates. The characteristics of the domain D describes the type of spatial data.

Types of spatial data:

a. Geostatistical data:

The domain D is continuous. Between two spatial locations s_1 and s_2 we can observe infinite number of samples. The attribute Z can be continuous or discrete, but the domain D is continuous! Often the goal to reconstruct the surface of the attribute Z . For example, suppose the attribute Z is ozone concentration observed at the fixed ozone monitoring stations in California. Using these observations at the fixed locations we will reconstruct the surface of ozone by making many predictions at unsampled locations. (See example in other handouts). We can also create an indicator variable that takes the value 1 if $Z > c$, where c is some threshold, 0 otherwise.

b. Lattice data (regional data):

The spatial domain D is discrete. For example, we observe an attribute by ZIP code, census tract, county, region, state, etc. For example, the domain D is the set of 58 counties in California (fixed and discrete) and the attribute of interest is unemployment rate, elections data, median income, etc. by county. Since the data are known for all counties the problem of prediction is not usually of interest. Instead, we may want to associate for example, the lattice data of unemployment rates to a lattice data that shows election data, clustering, etc. See R example for the 2009 unemployment rates in Iowa and California.

c. Point pattern data:

The domain D is random. (For geostatistical and lattice data the domain D is fixed.) For example, lightning strikes, earthquakes, etc.