Spatial Data Analysis

Spatial data encompasses information about the location and shape of objects on the Earth's surface. It plays a crucial role in understanding and visualizing various phenomena, ranging from weather patterns to population distribution. Spatial data can be broadly classified into three main types: raster data, vector data, and point data.

Vector data is represented as a collection of points, lines, and polygons. Points represent individual locations, lines represent linear features, and polygons represent areas. Vector data is commonly used to depict man-made features, such as roads, buildings, and boundaries.

Examples of Vector Data:

- Shapefiles
- Geodatabases
- CAD drawings

Areal Data Considerations

Data integration involves combining data from multiple sources, such as field observations, remote sensing imagery, and statistical data, into a single dataset. This process is crucial for creating comprehensive areal datasets.

- Example: A model of urbanization might be used to simulate the future growth of a city, considering factors like population growth, transportation infrastructure, and land availability.

Spatial data assumes there is some form of autocorrelation however most statistical analysis requires mutual exclusivity (independence) between the observations. Any spatial statistical model should account for autocorrelation to adequately simulate the data

There is an ongoing debate on how to best model spatial dependence. The authors suggest that Bayesian approaches may be best in assessing model fit given that priors can be manipulated and compared using sensitivity analysis. Spatial Data components to consider (Chapter 2)

- Coordinate Reference System
- Polygons
- Autocorrelation

Spatial Data Generation (Chapter 4), authors who created a package called spacetime generate data

Resources for Generating Spatial Data

- We must create spatial weights for neighbors (spdep, ade4, nb2neig, neig2nb)
- Display spatial weights (listW2mat)
- Testing for spatial autocorrelation (Moran’s I)