Course Outlines

Spatial Point Pattern
Regional Data (Areal Data)
Continuous Spatial Data (Geostatistical Data)

Representation and Operations of Spatial Data

What is Special about Spatial?
Characteristics of Spatial Data and Map Projection
Map Projection

- Elements in map projection
  - datum
  - developable surface
  - projection

- Distortions
  - distance
  - shape
  - area
  - direction

- how to choose map projections?
  - depending on purposes, you may need to preserve a certain spatial property - most commonly shape or area - to achieve that purpose
What is special about spatial

Characteristics of spatial data

- *first law of geography*, spatial correlation (spatial context or spatial pattern in different context)
- *second law of geography*, spatial heterogeneity
  - Simpson paradox in a spatial setting
- fractal behaviors
  - scale issues
  - measuring the length of coastline of Maine
  - travel traces of ‘ants’ vs. ‘elephant’
Spatial Analysis

Object-based approach

- geometric primitives: points, lines and polygons
- convex hull, Voronoi diagram
- vector analysis
  - point-in-polygon
  - buffer
  - spatial query
  - overlay, spatial join
- data structures for spatial data
  - spaghetti models
  - NAA
Spatial Analysis

Field-based approach

- representation: points, contours, raster/lattice, triangulation (Delaunay triangulation)
- raster analysis:
  - local operators: map algebra
  - focal operators: focal statistics, aspect, slope
  - zonal operators: zonal statistics, viewshed, watershed analysis

Object-based vs Field-based

- Pros and cons
Spatial Analysis

Model builder
- automate processing, graphic programming, reproducibility

Geocoding
- converting human readable address to geographic coordinate pairs
- what could affect the geocoding results
Exam format

- Thursday 12:30-1:30pm
- open books and open notes, but access to any digital devices (e.g., phones, tables, computers) are not allowed
- multiple choices (multiple correct answers) plus writing questions
Thank you, any questions/comments