

*Lab 07: Building spatial weights matrices***Read the instructions COMPLETELY before starting the lab**

This lab will help you become more comfortable with developing spatial weights matrices and working with spatially-lagged variables. It will also require you link multiple “hands on” portions of in-class work such that you demonstrate your understanding of underlying concepts and theory.

**Tasks:**

1. Select one of the datasets from the libpysal library (see <https://pysal.org/libpysal/notebooks/examples.html> for details). The dataset should include a polygon feature class, as you will make a choropleth map in a later task. It should also contain an “interesting” variable that you will use in a Moran plot.
2. If it is not projected, assign it a proper projection. Show this projection in the notebook.
3. Develop a contiguity-based spatial weights matrix of your choosing (i.e., rook or queen)
  1. Plot a histogram of the number of neighbors
  2. “Print” to the notebook the average number of neighbors
  3. Choose one areal unit of interest (e.g., a county), make a plot of the unit and its neighbors, similar to what we completed in class. NOTE, you MUST use a different (but appropriate) color scheme than what we used in class
  4. Row-standardized the  $W$
  5. Using a variable of interest in your dataset, calculate the a lagged variable
  6. Make a Moran Plot
4. Repeat #3 above with a  $W$  developed using the distance-band method
5. Using the dataset from #4 (the distance-band-based  $W$ ), write a script that:
  1. Finds those observations in the H-H category
  2. Plots a choropleth map of your dataset with a categorical color scheme, where the shading corresponds to the Moran plot (really, “LISA”) quadrants. Thus, your map will have four shades of color.

*Note, you have been provided all the information/knowledge/skills required to accomplish this task. THINK about how the lagged variables, the Moran plot, and quadrants work from a conceptual perspective FIRST.*

HINT: `numpy.where()` is a useful function for generating a new attribute based on a conditional test

**Questions:**

1. Describe in your own words: *what is a spatially-lagged variable?*
2. How does your analysis in this lab (as simple as it is) differ by how you have formalized  $W$  (e.g., space, neighbors) in two different methods? How might it affect analysis?
3. What does it mean if an observation falls in the “H-L” quadrant? Why might it be useful to detect such occurrences?
4. Walk me through your process in completing task 5 above. What challenges did you encounter and how did you overcome them?

**What to turn in**

- Your Jupyter notebook (or Python script). I must be able to run your code - do not turn in a screenshot or code pasted into a Microsoft Word document
- The answers to the above questions