Methods in Quantitative Sociology, Spatial Data and Mapping
Instructor: Hesu Yoon

Evaluation Exercise

Instructions

Submit (1) your text document with answers to [text] questions (either pdf or word doc) and (2) your R code responding to [code] questions. Save all your figures using the "ggsave" function and include them in the text document. Type out the answers in full sentences. While using R markdown is highly encouraged, the basic R script is sufficient to get full credit. Clean annotations and clearly structured R code will be accounted for grading. Format the file names as the following:

- text document: [LAST NAME]_module3_text (e.g., Yoon_module3_text)
- code: [LAST NAME]_module3_code (e.g., Yoon_module3_code)

Data

- sfnh.geojson: San Francisco "Analysis" Neighborhood boundaries
- sfnh_dem.csv: Neighborhood-level demographic attributes
- sfbiz_by_type.csv: Retail businesses by type in San Francisco
- cultural_district.geojson: Designated cultural districts in San Francisco

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In the first exercise, you will examine demographic patterns in San Francisco by creating a typology map.

1. [code] Import San Francisco neighborhood boundaries and neighborhood-level demographic attributes data.
2. [code] Join attributes to neighborhood boundaries.
3. [code] Using the "pwhite" (the share of white residents) variable, create a neighborhood racial typology with three neighborhood categories according to the following definition:
    a. White: The share of white residents is above 70%
    b. Mixed: The share of white residents is above 30% and below or equal to 70%
    c. Minority: The share of white residents is below or equal to 30%.
4. [code] Create a typology map displaying this variable.
5. [text] Discuss neighborhood racial typology in San Francisco in your text document.
    a. Insert your map
    b. Discuss the patterns of neighborhood racial typology in SF. As you discuss, mention 2-3 specific neighborhood names per category.

Next, you will explore economic activities in San Francisco.

1. [code] Convert the business data to a spatial object with geometries.
2. [code] Create a point map using symbology
    a. Based on the "biz_type" variable, create a new variable classifying "art" (art dealers) and "coffee shop" as "discretionary" businesses and "grocery" and "barber" as "essential" businesses.
    b. Visualize how discretionary vs. essential businesses are distributed in San Francisco using symbols.
3. [code] Perform spatial join and aggregate the number of businesses at the neighborhood level.
4. [code] Create a proportional symbol map, visualizing the distributions of businesses in San Francisco.
5. [code] Combine the symbology map and the proportional symbol map into one figure and save.
6. [text] Insert your map into the text document. Discuss the pros and cons of each map. Combining information from both maps, describe the patterns of local businesses in San Francisco.

Finally, you will investigate cultural districts in San Francisco.

1. [code] Calculate distances between each neighborhood and cultural district and identify the nearest neighbor.
2. [code] For Bayview Hunters Point, Outer Richmond, Potrero Hill, and Castro/Upper Market neighborhoods, create a table consisting of the name of the nearest cultural district, the distance, and the share of each racial group.
3. [text] Insert the table of four San Francisco neighborhoods created above into the text document. Discuss their nearest cultural districts and their racial compositions.