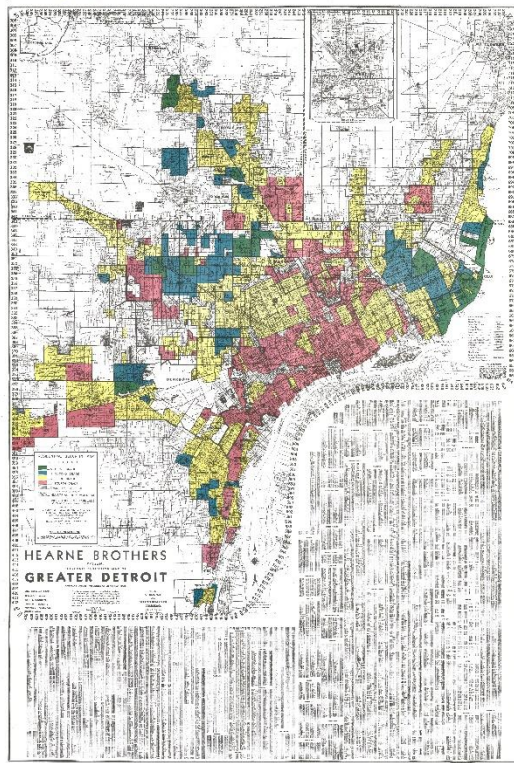


HW 4 – Using JSON & APIs in the wild. Redlining Example 2



In the prior homework we replicated a simulation of residential segregation that explained segregation through individual preference. However, this model did not account for the active policy interventions that have led to segregation in the United States. One such policy intervention is the use of ‘residential security maps’ to determine which neighborhoods would be granted government-backed low interest rate mortgages. These maps were used explicitly to exclude neighborhoods with high African American representation from receiving government investment. Those neighborhoods, were marked in red, and the practice has become known as redlining. All of the non-python readings linked in this HW are not required.

(<https://www.smartcitiesdive.com/ex/sustainablecitiescollective/short-history-redlining/1162160/>)

In today’s homework we will recreate a redlining map of Detroit as we practice the following technical skills:

- Parsing new JSON files
- Navigating new APIs
- General python skills including list comprehensions, dictionaries etc.

Step 1: Using the python methods we used in class obtain the json file located at:

<https://dsl.richmond.edu/panorama/redlining/static/downloads/geojson/MIDetroit1939.geojson> and access it within python.

Step 2: Background The json is digitized version of the original dataset used in 1936. The file divides Detroit into 238 districts. Each district has a set of latitude and longitude coordinates, a letter grade (A, B, C, or D), and a text description of the demographics of the neighborhoods. The district grades are associated with the following colors and designations: green for the “Best,” blue for “Still Desirable,” yellow for “Definitely Declining,” and red for “Hazardous.” These grades were determined primarily by the racial composition of the districts (<https://www.esri.com/arcgis-blog/products/arcgis-living-atlas/announcements/redlining-data-now-in-arcgis-living-atlas/>)

Content warning – the text descriptions are from 1936, and contain offensive language and ideas. Reading those text description is NOT needed for this assignment.

You need to determine the structure of the JSON object and then use list comprehensions to populate the following dictionary with lists of information for each district.

```
thisDict ={
    "Coordinates": [], add lists of coordinates from the json file for each
district
    "Holc_Grade": [], # add the grades from the json file for each district
"Holc_Color": [], #add the appropriate color for each district based on the
instructions below
    "name": [] # the name of the district is up to you, you might use a number
or other iterator
}
```

Districts with grade A should be assigned the color 'darkgreen'

Districts with grade B should be assigned the color 'cornflowerblue'

Districts with grade C should be assigned the color 'gold'

Districts with grade D should be assigned the color 'maroon'

Step 3. One of the learning objectives of this course is to be able to use documentation to figure out how to use packages you have not been taught. This will be a critical skill in your internships and your year 2 courses. In line with this objective you will be asked to complete the following code in order to produce a redlining map of Detroit.

```
import numpy as np
import matplotlib.pyplot as plt
import matplotlib

districts = []
fig, ax = plt.subplots()

####you must use the matplotlib documentation to figure out how to create a
####polygon for each district, and give it the color appropriate to that
#####district. Keep the edgecolor as black. Add these polygon objects to the
### districts list initiated above. Matplotlib documentation can be found here:
## https://matplotlib.org/3.1.1/index.html Please note that polygon is a specific
### thing in matplotlib. You're

for u in districts:
    ax.add_patch(u)

ax.autoscale()
plt.rcParams["figure.figsize"] = (15,15)
plt.show()
```

The map you create should look roughly like the one in the beginning of the document. Are the colors in the right location??

Step 4.

The following code will pick a latitude and longitude coordinate from each of the districts

```
import random as random
random.seed(33)
from matplotlib.path import Path
import numpy as np
xgrid = np.arange(-83.5, -82.8, .004)
ygrid = np.arange(42.1, 42.6, .004)
xmesh, ymesh = np.meshgrid(xgrid, ygrid)
points = np.vstack((xmesh.flatten(), ymesh.flatten())).T

for j in range(????):
    p = Path(thisDict['Coordinates'][j])
    grid = p.contains_points(points)
    print(j, " : ", points[random.choice(np.where(grid)[0])])
```

Comment this code so you understand it. Search documentation to understand the parts you are not familiar with. This is an essential skill!

Modify this code so that you capture those random coordinates – be sure to use `random.seed(33)` so your results are replicable.

Once you have captured those coordinates, use the following API to get a code for the census tract for each of those coordinates <https://geo.fcc.gov/api/census/>

There is a 12 or 13 digit code associated with each lat/long. The first 2 digits of that code represent the state, the next 3 digits of that code represent the County, the following 5 digits of that code are for your census block.

You will need to use JSON parsing and then string manipulation to get the census tract for each point and add that info to your dictionary of information about each district.

Step 5. Background Redlining played a critical role in preserving and exacerbating racial wealth inequality in the United States. Appreciation of property value is one of the key mechanisms of intergenerational wealth transfer in the United States. By blocking access to home-ownership by limiting access to government insured mortgages (the alternatives were twice as expensive or more), African American citizens were not allowed to benefit from the infrastructure investments of the United States government. This mechanism is detailed in the following article: <https://www.npr.org/2017/05/03/526655831/a-forgotten-history-of-how-the-u-s-government-segregated-america>. Additionally, it is important to know that while official government redlining was banned in the 1960s, there is some evidence of algorithmic redlining going on in the present.

- <https://revealnews.org/article/for-people-of-color-banks-are-shutting-the-door-to-homeownership/>
- <https://www.washingtonpost.com/news/wonk/wp/2018/03/14/the-senate-rolls-back-rules-meant-to-root-out-discrimination-by-mortgage-lenders/>

Now we will check for evidence of the legacy of redlining in Detroit.

- Sign up for an API key for the US Census at : https://api.census.gov/data/key_signup.html
- Examine the documentation at <https://api.census.gov/data/2015/acs/acs5/variables.html> and <https://api.census.gov/data/2015/acs/acs5/examples.html> and use your census tract info to find the MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2015 INFLATION-ADJUSTED DOLLARS) for each tract. You will need to use your API and JSON skills from the last lecture.
- Add the median household income to your dictionary

Step 6.

For each district grade (A, B, C, D). Calculate the mean and median of the median household income data that you gathered.

assign those to the variables that are descriptively named with the following pattern:

A_mean_income

A_median_income

B_mean_income

B_median_income

Bonus 1: 5 points

Modify the map code above so that the edgecolor is color of the district grade and the district is filled in with a color based on its median income. Use the matplotlib documentation and/or google to figure out how to create use a color gradient.

Bonus 2: 5 points Write 1 paragraph that responds to one of the following prompts. All good faith (in terms of effort) responses, regardless of content or point of view will receive the bonus points.

Did the results in Step 6 surprise you? Does <https://www.brookings.edu/research/americas-formerly-redlines-areas-changed-so-must-solutions/> help in your interpretation?

Has HW3 and HW4 changed your prior understanding of segregation in any way? How can these HW assignments be improved? What systemic effects would you want to simulate with the python skills you have now?