IBM Capstone Final

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Question:

CAN WE USE ECONOMIC INDICATORS, POPULATION DENSITY, AND INFORMATION ON COMPETITORS FOR EACH ZIP-CODE, TO FIND AN OPTIMAL LOCATION FOR OUR FRANCHISE?

1. Problem Background

- My children work for a local delicatessen. Besides providing locally sourced cold- cuts, the deli also makes sandwiches and hoagies and either a soup or hot sandwich selection ranging daily from hot roast beef, pork, or meatballs. If I were to secure franchise rights, one of the first problems would be where would I locate the franchise? Before creating a financial profile, I would like to get the economic outlook and demographic data to see if I can optimize a location. The original store is in the Roxborough section of Philadelphia, specifically the “19128” zip code. I am also located in the same zip code.

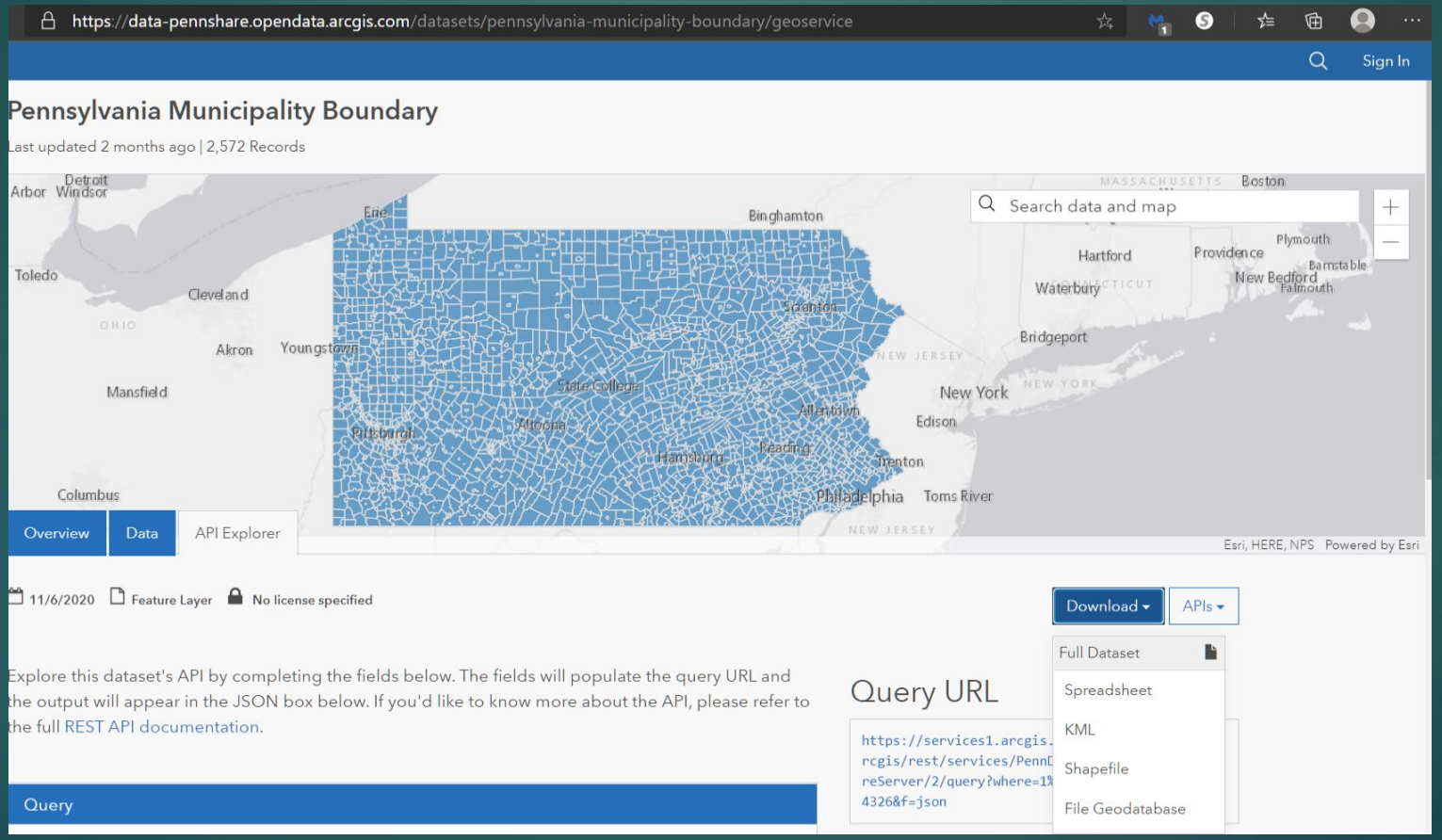
2 Uses for data

- Location Location Location
- This type of research is invaluable to
- Homebuyers and businesses alike.
- For homebuyers, you could add data like crime stats
- Businesses may be interested in Tax deals and other area incentives to relocate
- Police can use this data to adequately reposition staff
- Amazon used it to find a second headquarters
- Municipalities can adequately review construction and street closures, traffic patterns and a host of other functions

3. Description of Data

- This project consists of the following information
  - Zip code information for Pennsylvania including center Longitude and Latitude, zip code shapes and population size and density.
  - Financial information by zip code including:
    - Average Salary
    - Median Housing Costs
    - Avg Income for business by zip code
    - Number of returns filed by individual and business by zip code
    - Counts of small food service establishment by zip code

Shape file for Pennsylvania

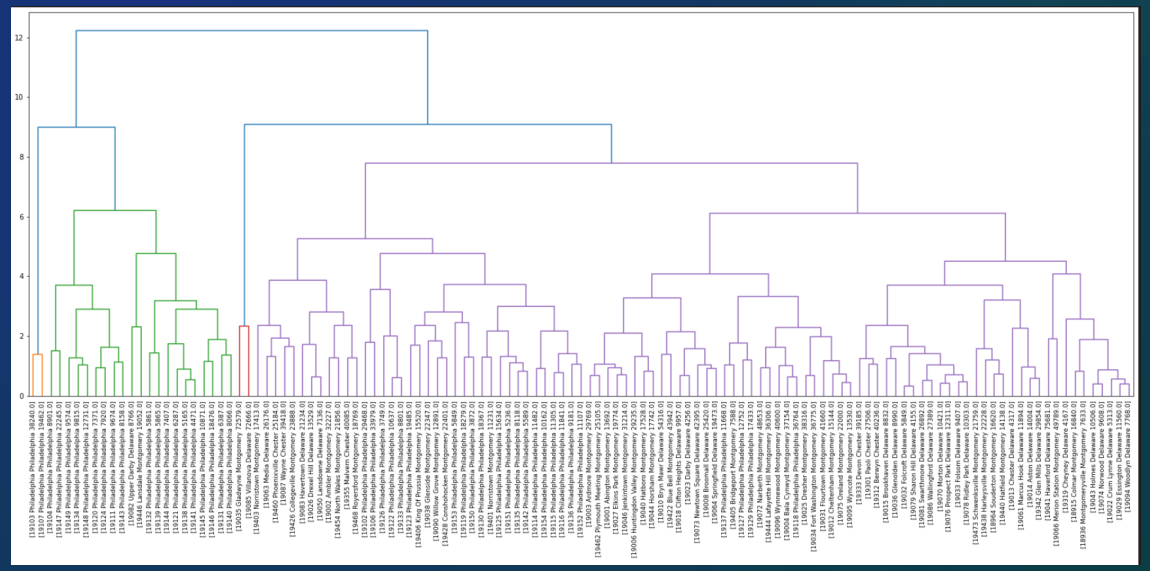


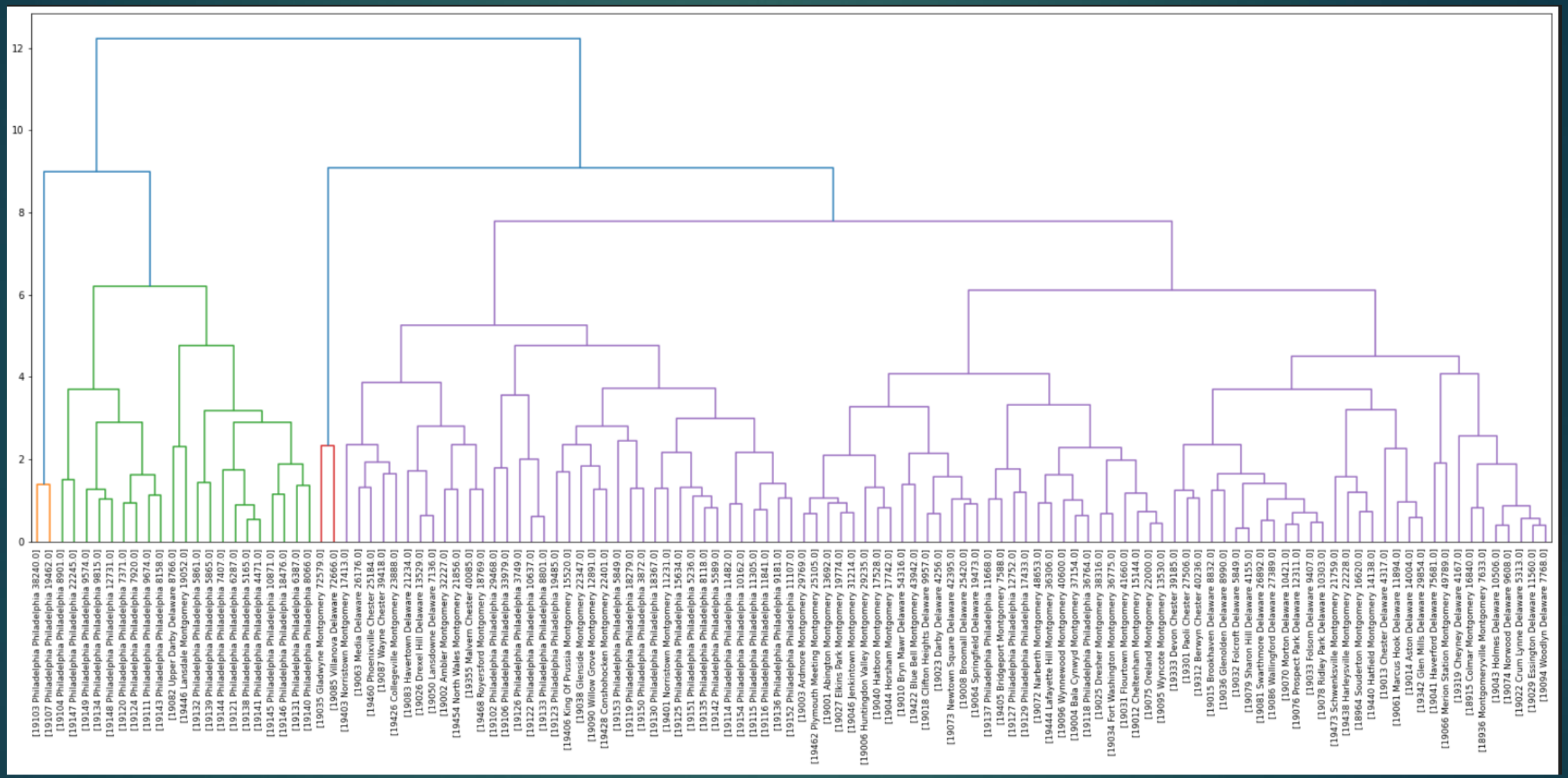
4. Methodology

- 1. Agglomerative Hierarchical Clustering
- 2. K-means
- 3. Visualization

Hierarchical Clustering

- We can see from this diagram that there are 2 clusters in red and orange that concentrate the wealth in the city. These are Center city and the areas surrounding Bryn Mahr.

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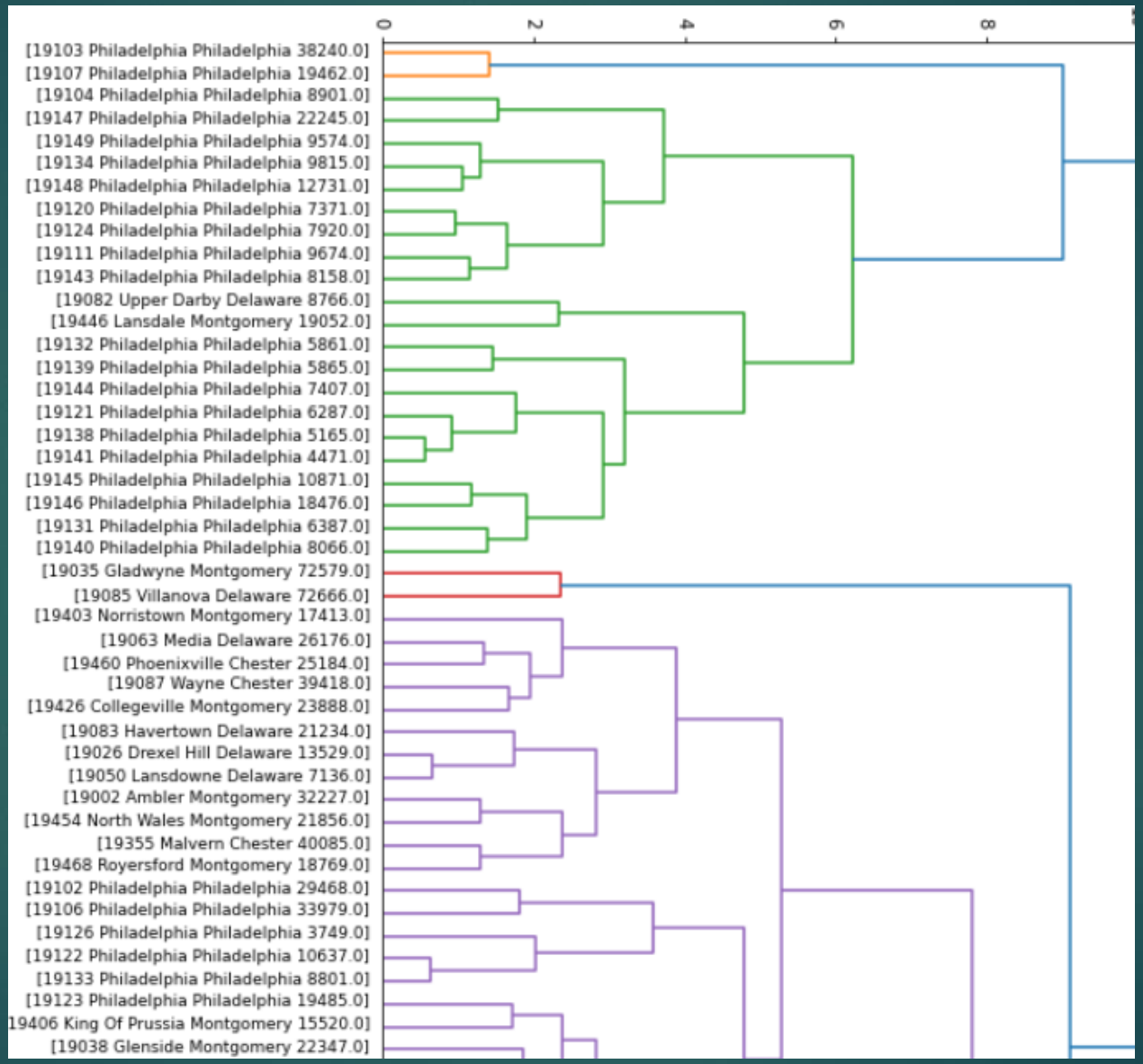
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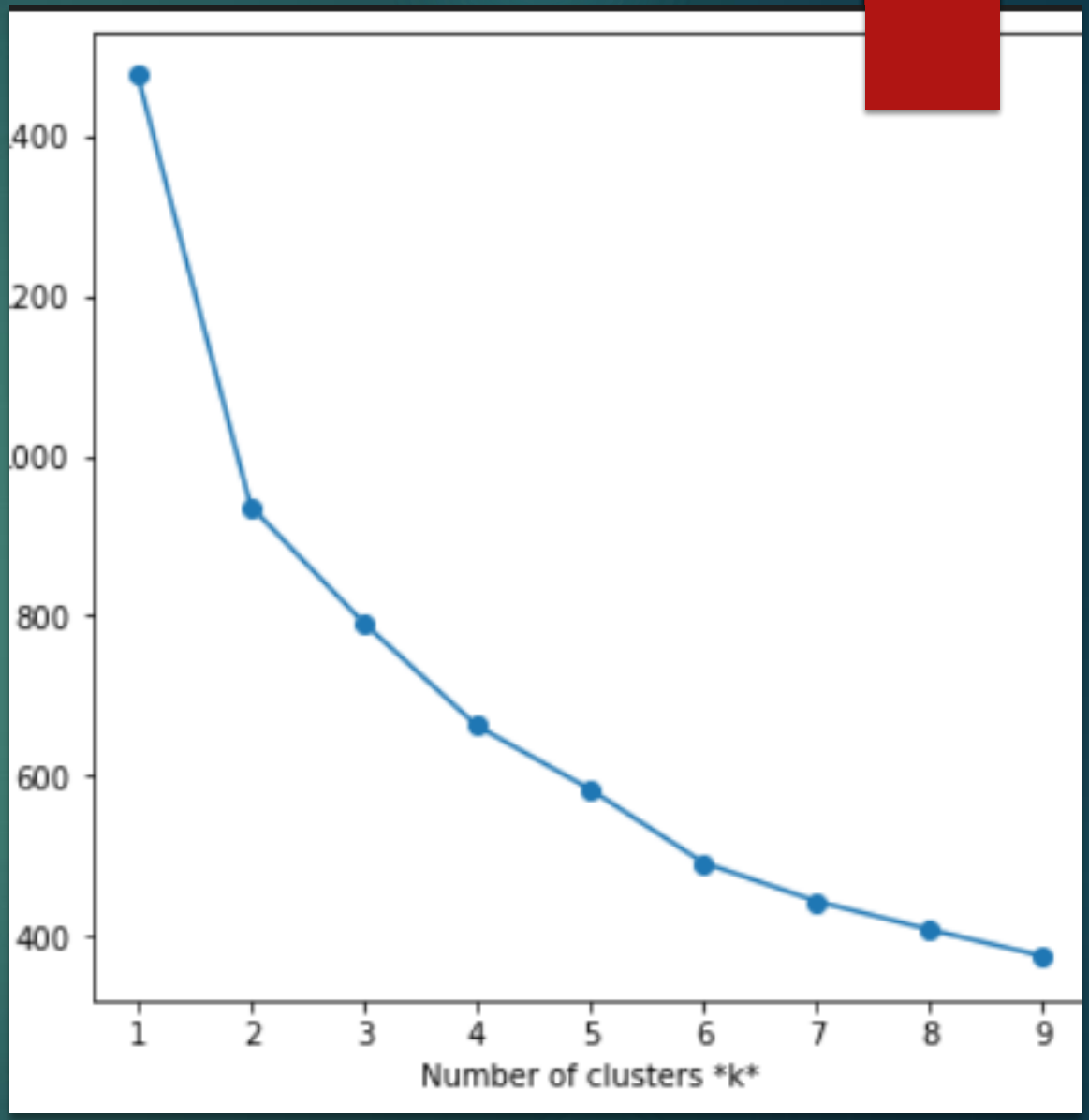
Hierarchical Clustering

- This model is maximized by the elbow method which finds where the slope stops descending rapidly.
- The elbow compares the Sum of the Squared Distance with the Number of Clusters
- Our optimum is 4 or 5, but since we had 4 counties, I went with 4.

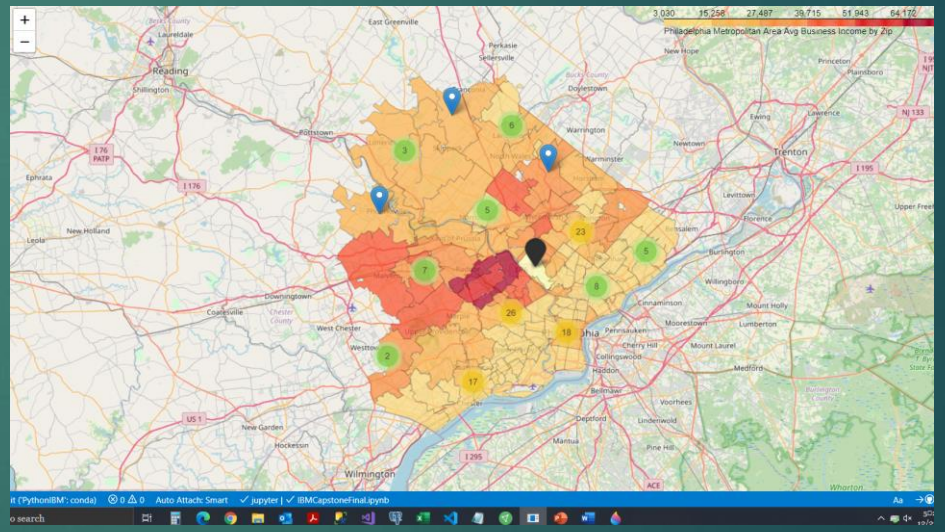


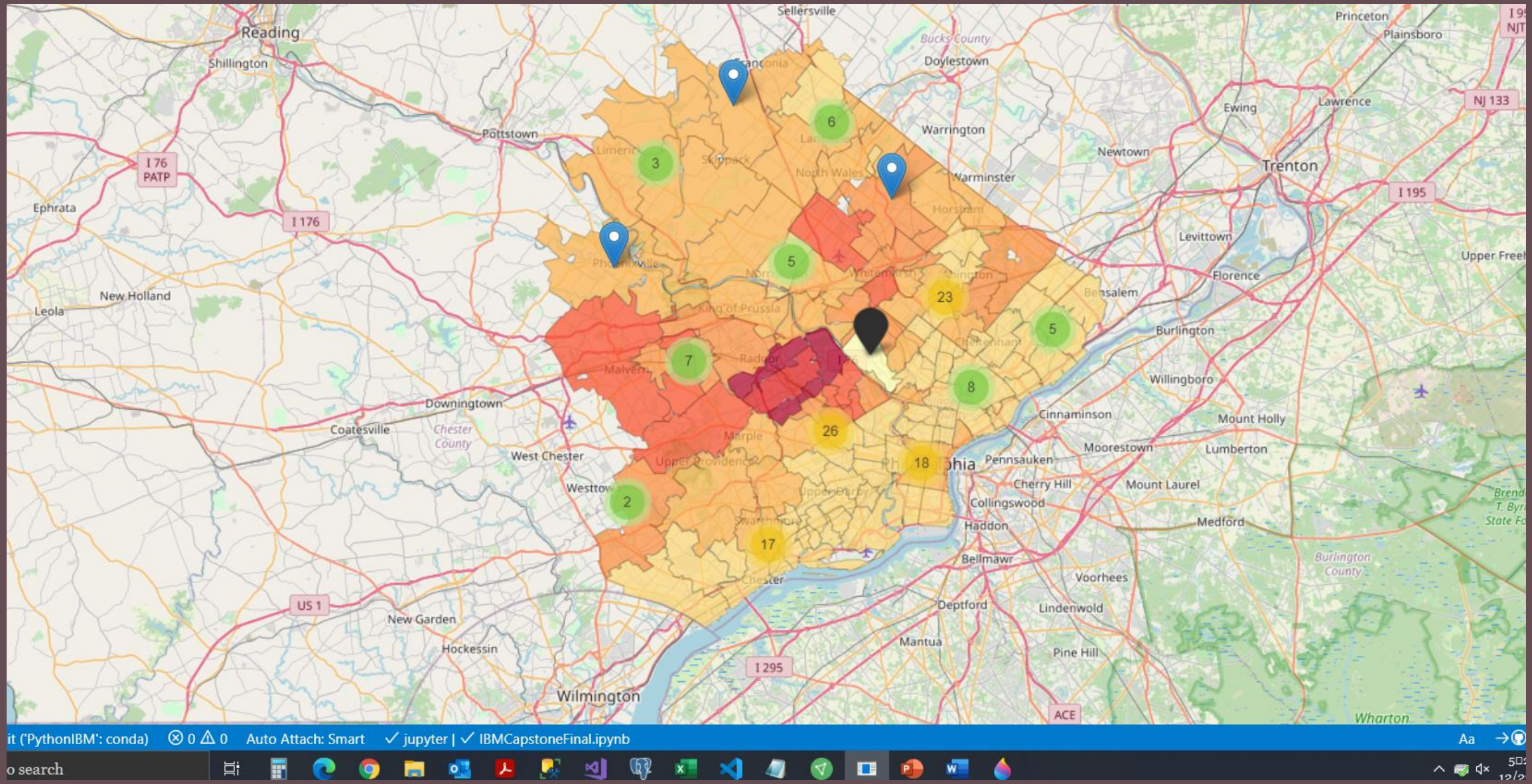
K Means Clustering

- Due to the nature of k-means clustering, each time it is run it will provide a different result
- I set up clustering for 4 clusters and 10 to 12 cycles. One thing I noticed is that either the 4 zip codes that make up center city Philadelphia are grouped into one cluster, or all of the wealthier zip codes get grouped
- The visualization while important does not add anything that can't be visualized on a map

Here are some visualizations

- This is the 20 mile radius within the 4 counties that I set up. You can already see the red horseshoe configuration that encompasses the wealthiest areas of the Greater Philadelphia Metropolitan area.
- The next few slides show:
  - A bigger version of this photo
  - Zoom of the central area
  - Zoom of Center city Philadelphia
  - Closeup of our Target Area

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Trenton
Newtown
Warminster
Horsham
I 195
Levittown
Florence
Bensalem
Burlington
Willingboro
Mount Holly
Cinnaminson
Moorestown
Lumberton
Pennsauken
Cherry Hill
Mount Laurel
Collingswood
Haddon
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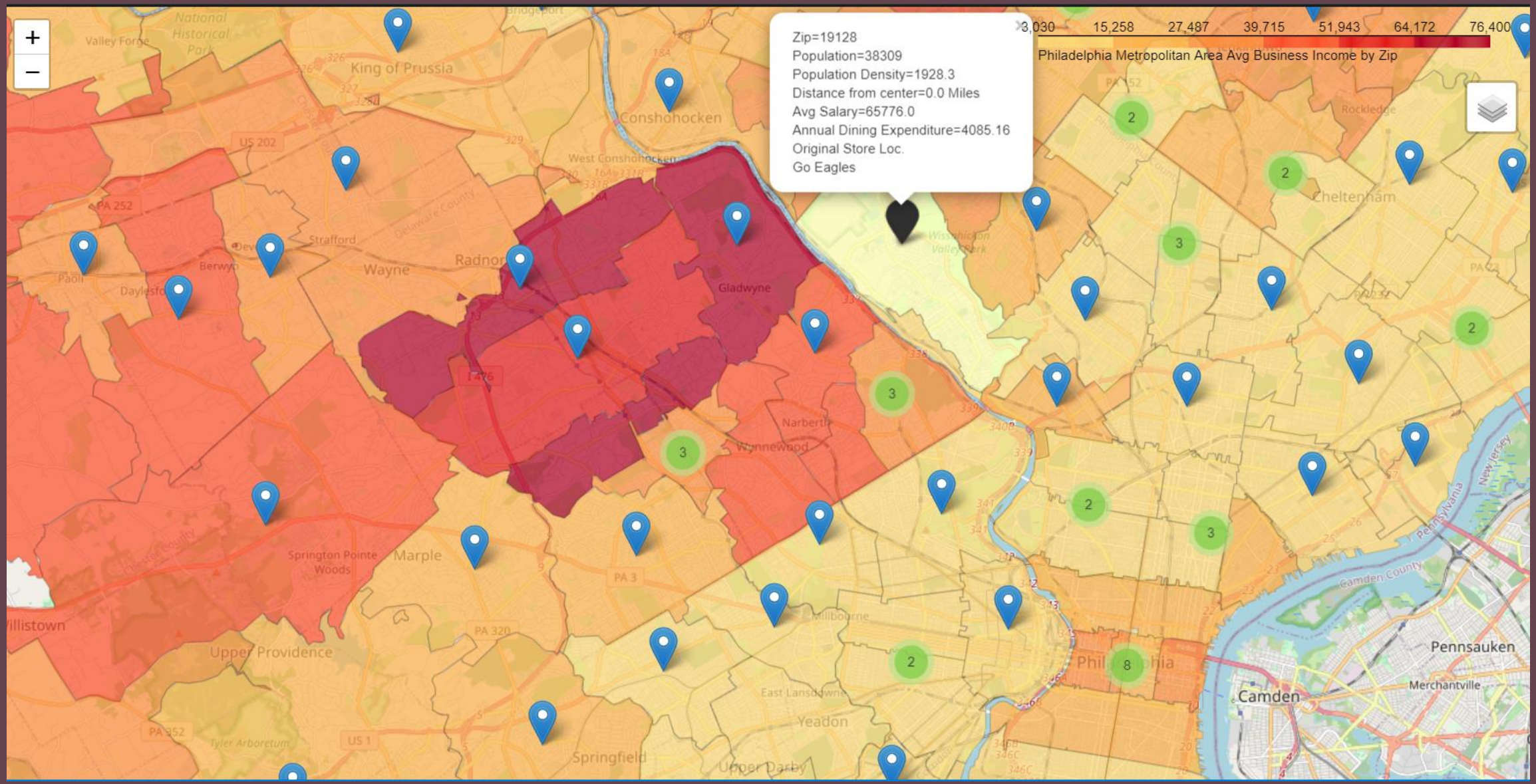
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Population Density=1928.3
Distance from center=0.0 Miles
Avg Salary=65776.0
Annual Dining Expenditure=4085.16
Original Store Loc.
Go Eagles
3,030
15,258
27,487
39,715
51,943
64,172
76,400
Philadelphia Metropolitan Area Avg Business Income by Zip
King of Prussia
Conshohocken
West Conshohocken
Wayne
Radnor
Gladwyne
Narberth
Wynnewood
Cheltenham
Rockledge
Marple
Springton Pointe Woods
Upper Providence
Springfield
Upper Darby
Yeadon
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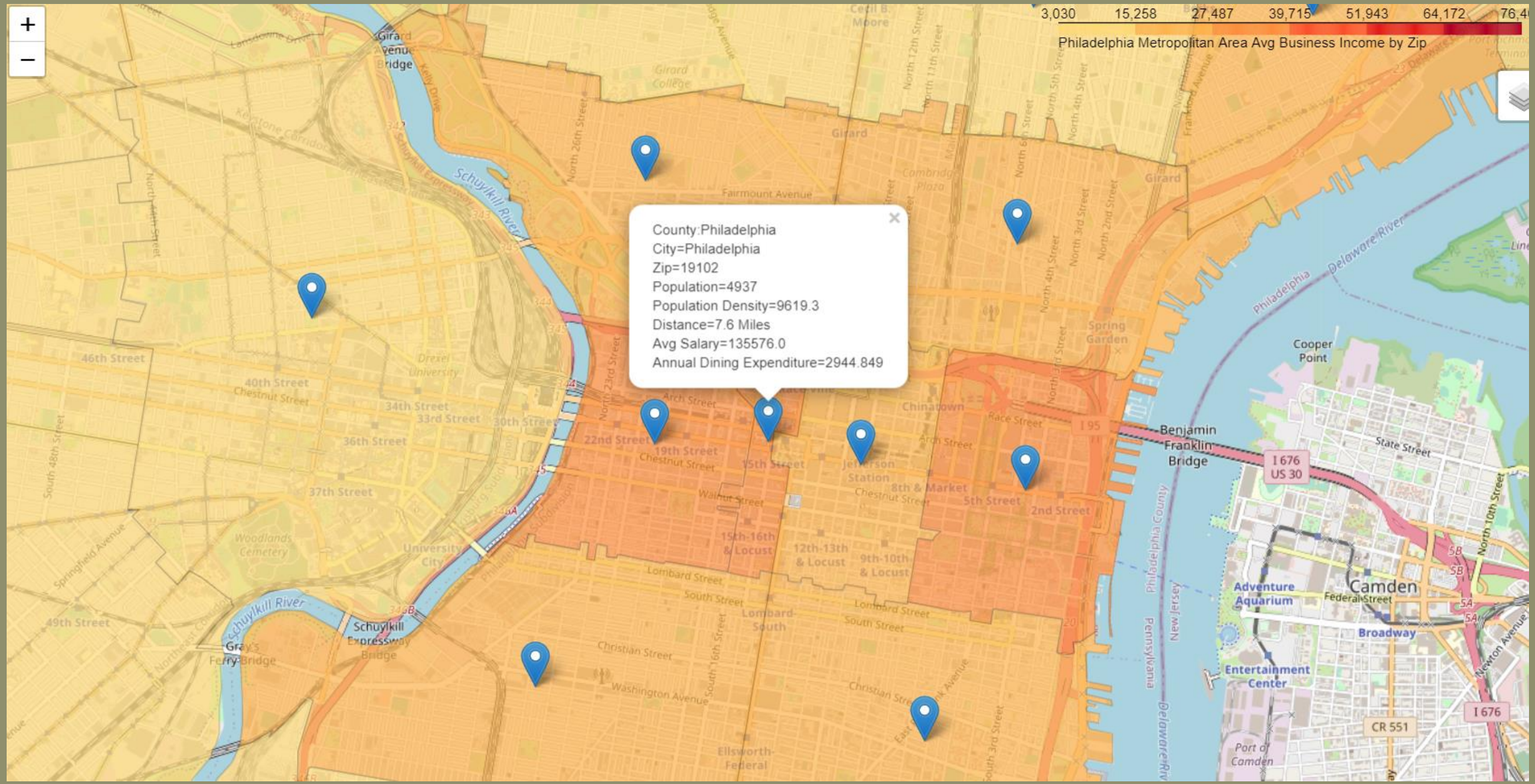
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27,487
39,715
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64,172
Philadelphia Metropolitan Area Avg Business Income by Zip
County:Philadelphia
City=Philadelphia
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Population=4937
Population Density=9619.3
Distance=7.6 Miles
Avg Salary=135576.0
Annual Dining Expenditure=2944.849
Schuylkill River
Delaware River
Benjamin Franklin Bridge
I 676
US 30
Camden
Cooper Point
Adventure Aquarium
Entertainment Center
Broadway
Federal Street
State Street
Spring Garden
Chinatown
Girard
Fairmount Avenue
Arch Street
Race Street
Chestnut Street
Walnut Street
Lombard Street
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University City
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Ellsworth-Federal
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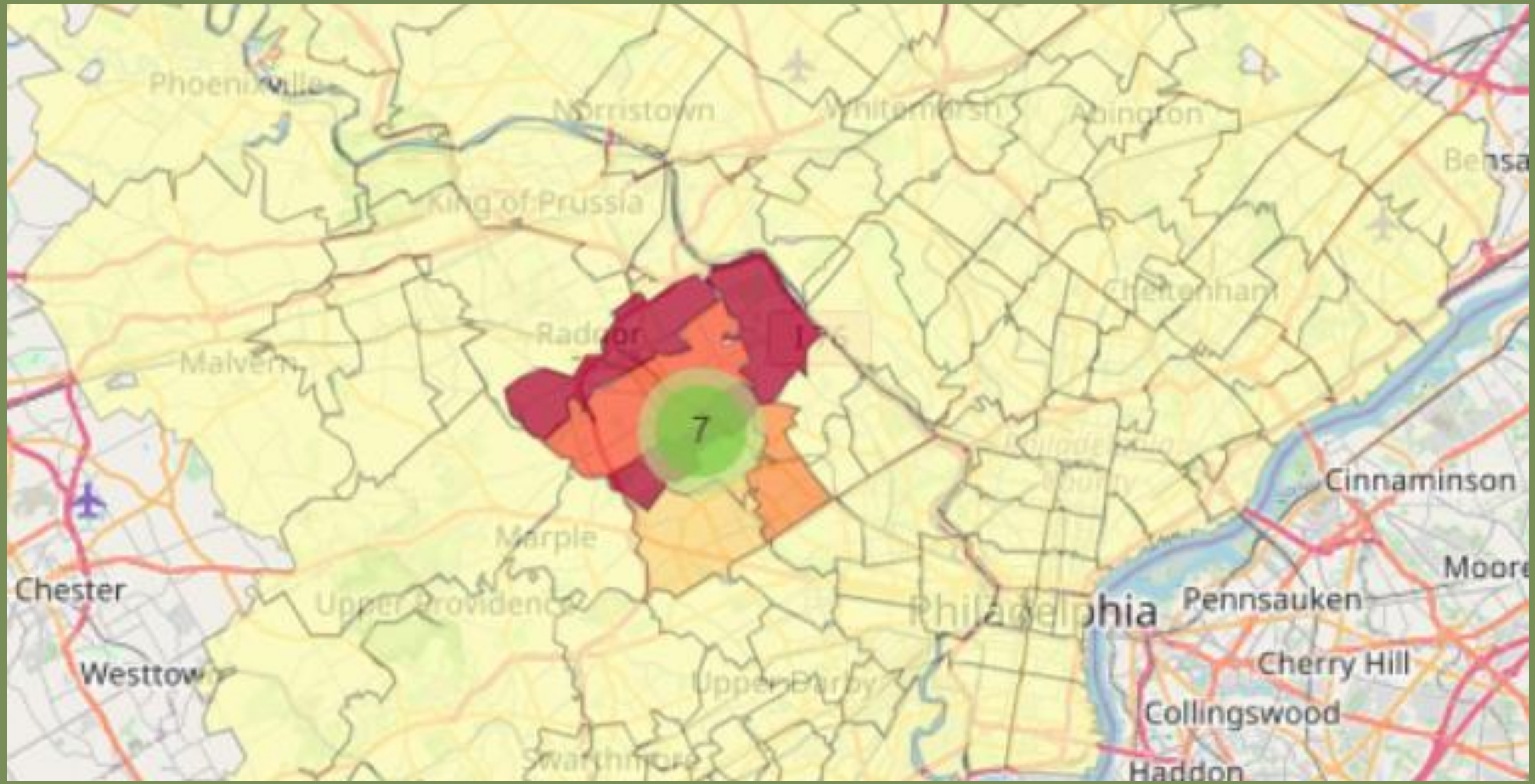
CR 551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Cinnaminson
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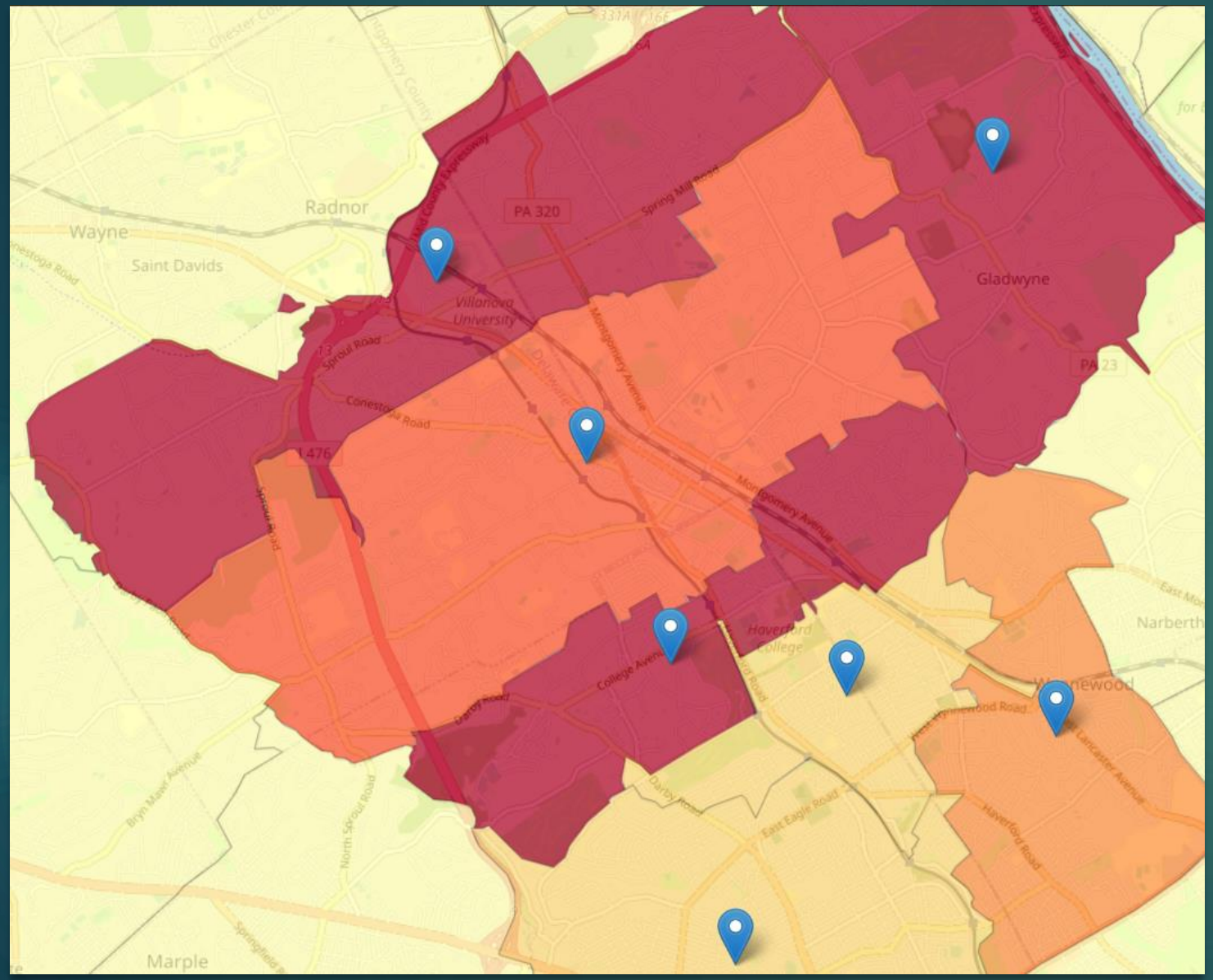
Cherry Hill
Collingswood
Haddon



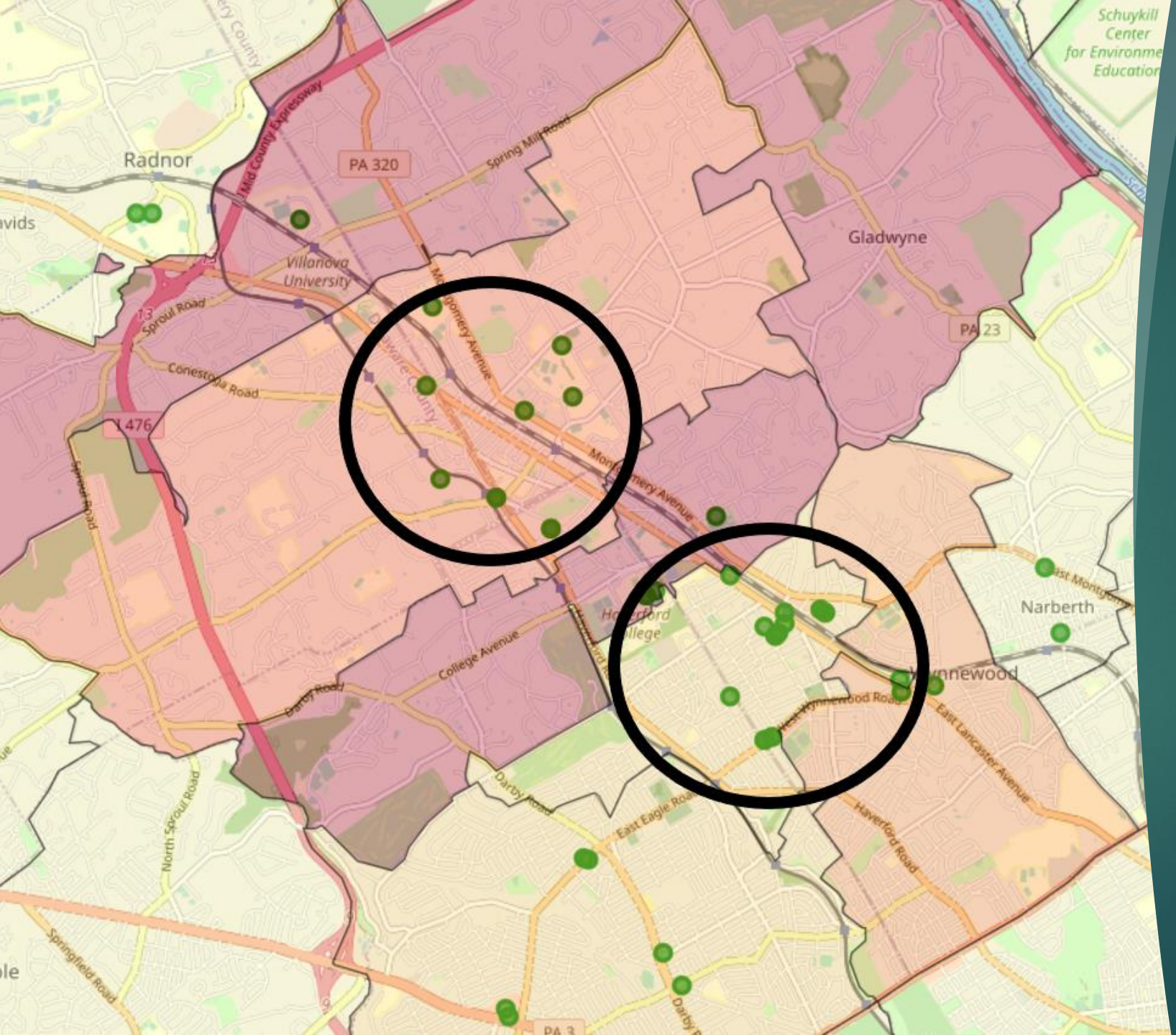
Seven Zip codes in our concentrated location

These are Villanova, Gladwyne, Bryn Mawr, Haverford, Ardmore, Wynnewood, and Havertown.

The 3 counties with the most wealth are Villanova, Gladwyne and Haverford

Two areas of interest are Ardmore which is light yellow and Bryn Mawr which is orange.
Both are close to wealthier neighborhoods but are not themselves.

Both also have higher population densities



The lower circle is our ideal location. This is next to an affluent location, can support more food establishments, and will probably generate profits.

The next location is similarly located. Bryn Mawr is slightly more affluent, but it is surrounded on 3 sides by the wealthiest areas of Philadelphia.

The choice would depend on rental costs and availablility