Analysis of Neighborhoods
Offering Medical Services in Oahu, Hawaii

Introduction

We serve a client population of retirees who are looking to move to the beautiful island of Oahu, Hawaii. Being that the majority of our clients are over the age of 65, it is important that they relocate to a neighborhood with easy access to medical care. Areas with higher concentrations of hospitals and medical facilities are preferred. Secondary would be accessibility to alternative care and wellness/fitness centers.

Oahu is the third largest of eight major islands that make up Hawaii. It is also the location of the state capital, Honolulu, which is situated along the southeast coast of the island. Oahu is home to roughly one million people, comprising two-thirds of Hawaii's population.

We will use data science tools to scrape, organize, and visualize data for our clients. Our goal is to find them a most suitable home for their retirement.

Data

For this project we will need the following data:

- List of neighborhoods in Oahu, Hawaii to lay the groundwork of potential places to live.
- Coordinates of the neighborhoods for mapping and clustering nearby medical centers.
- List of healthcare and wellness facilities within Oahu, along with their coordinates. The facilities will be categorized and mapped, allowing clients to decide which area is optimal for their needs.

Methodology

1. Collect and scrub the necessary data.
2. Organize data in dataframes and visualize via mapping libraries.
3. Cluster and model data with k-means and bar graphs.
4. Determine best solutions based on our analysis.

We obtain a list of Oahu's neighborhoods via the Oahu Neighborhood Commission Office[1]. Coordinates for each neighborhood are generated using *geocoder*. The data is imported in a dataframe and mapped using *folium*.

	Neighborhood	Latitude	Longitude
0	Hawaii Kai	21.27767	-157.70357
1	Kuliouou/Kalani Iki	21.27910	-157.74813
2	Waialae/Kahala	21.27948	-157.78446
3	Kaimuki	21.27927	-157.79910
4	Diamond Head/Kapahulu/St. Louis Heights	21.27944	-157.81273
5	Palolo	21.29980	-157.79440
6	Manoa	21.30802	-157.81589
7	McCully/Moiliili	21.29470	-157.83022
8	Waikiki	21.28278	-157.82944

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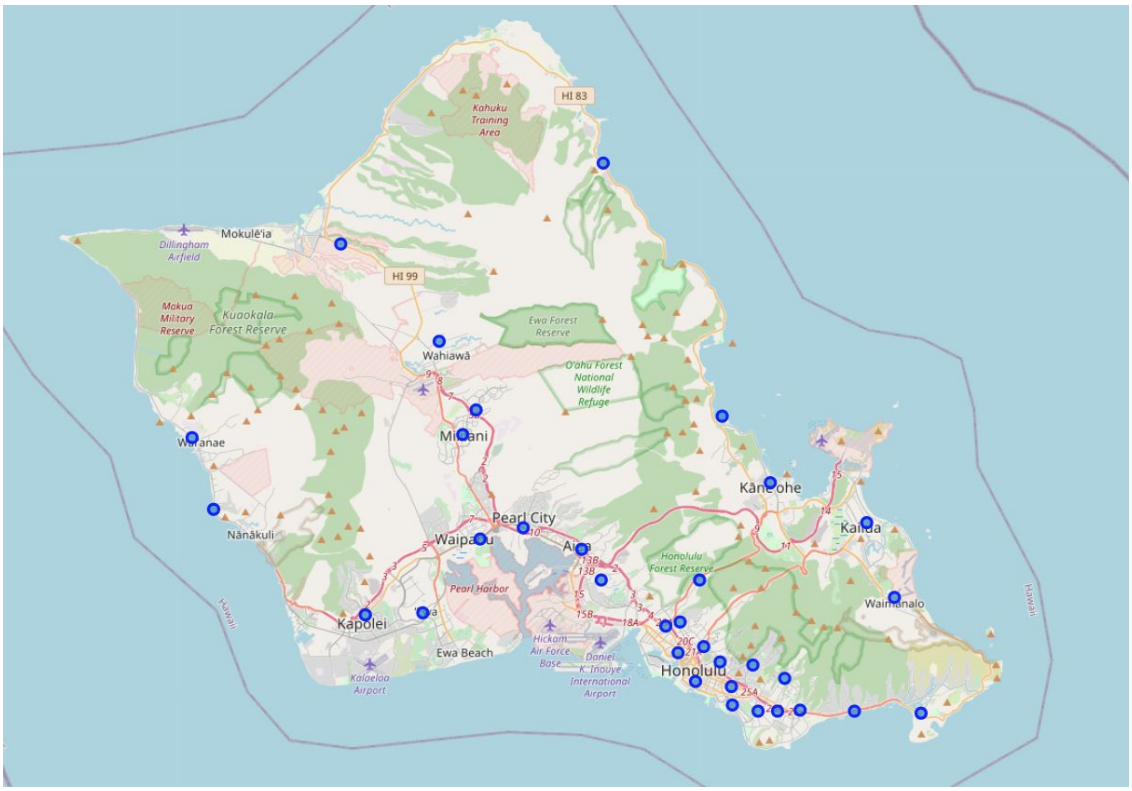

Next we access *Foursquare API* to collect a list of all medical centers within each neighborhood by running a search on the relevant venue[2]. Facility names, coordinates, and categories are added to our existing dataframe, and a heat map is created to visualize where medical centers are most concentrated on the island.

	Neighborhood	Latitude	Longitude	Facility	Facility Latitude	Facility Longitude	Category
0	Hawaii Kai	21.27767	-157.70357	Straub Hawaii Kai Family Health	21.277962	-157.704301	Doctor's Office
1	Hawaii Kai	21.27767	-157.70357	Nelson Hatanaka, D.D.S.	21.278428	-157.703432	Dentist's Office
2	Hawaii Kai	21.27767	-157.70357	Eye Doctors Hawaii	21.283996	-157.717334	Eye Doctor
3	Hawaii Kai	21.27767	-157.70357	Diagnostic Laboratory Services - Kahala	21.278634	-157.783407	Medical Center
4	Hawaii Kai	21.27767	-157.70357	john morioka dds	21.278783	-157.754493	Dentist's Office
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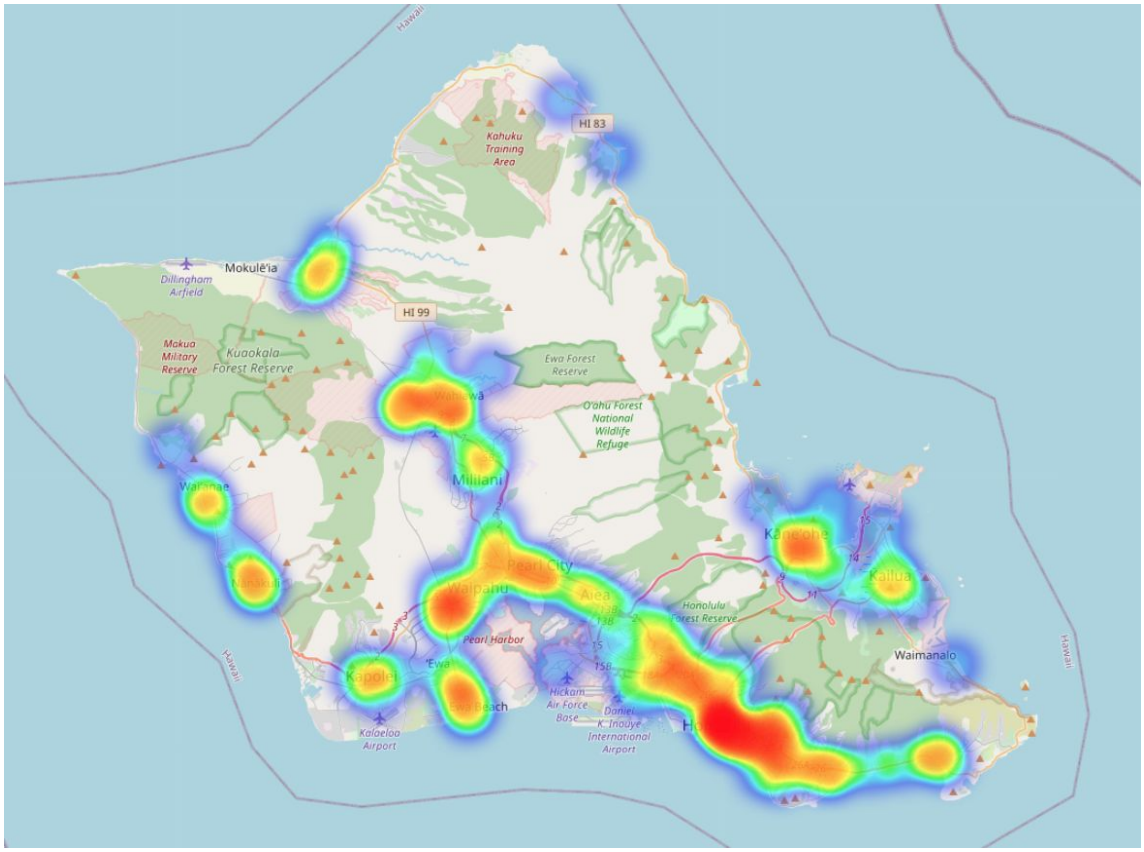


From the map we could easily see that medical centers have the highest density in the southeast region of Honolulu county. Other good contenders include Kaneohe, Waipahu, and Wahiawa.

To get an idea of what types of medical or wellness facilities exist in each neighborhood, we further break down the data by executing *one hot encoding* and then take the sum of occurrence for each category.

	Neighborhood	Alternative Healer	Assisted Living	Chiropractor	Dentist's Office	Doctor's Office	Emergency Room	Eye Doctor	Gym / Fitness Center	Hospital	Massage Studio	Medical Center	Mental Health Office	Physical Therapist	Rehab Center	Urgent Care Center	Weight Loss Center
0	Aiea	1	0	2	6	9	1	2	0	7	1	10	0	1	0	2	1
1	Ala Moana/Kakaako	1	0	2	4	15	1	0	0	9	0	9	0	0	0	3	0
2	Aliamanu/Salt Lake/Foster Village	3	0	2	5	8	0	2	0	9	1	10	0	1	0	1	0
3	Diamond Head/Kapahulu/St. Louis Heights	1	0	2	5	17	1	0	0	9	0	5	0	0	0	3	0
4	Downtown-Chinatown	1	0	1	2	13	1	1	0	13	0	9	0	0	0	3	0
5	Ewa	0	0	1	7	13	0	0	0	0	0	10	1	5	0	1	0

There are varying frequencies of categories that exist in each neighborhood. For this reason we will run *k-means* to separate the neighborhoods into five clusters and map the distribution.

Cluster Labels	Alternative Healer	Assisted Living	Chiropractor	Dentist's Office	Doctor's Office	Emergency Room	Eye Doctor	Gym / Fitness Center	Hospital	Massage Studio	Medical Center	Mental Health Office	Physical Therapist	Rehab Center	Urgent Care Center	Weight Loss Center
0	0	0	0	2	12	0	0	0	4	0	6	2	0	1	0	0
1	1	0	6	26	62	0	0	1	2	0	42	5	13	0	2	0
2	7	2	18	42	147	9	0	0	80	0	58	0	0	0	27	0
3	8	0	9	22	88	6	9	0	79	2	67	0	3	0	11	1
4	2	0	20	92	127	4	17	5	17	2	55	2	16	0	13	2

Cluster 0 = red

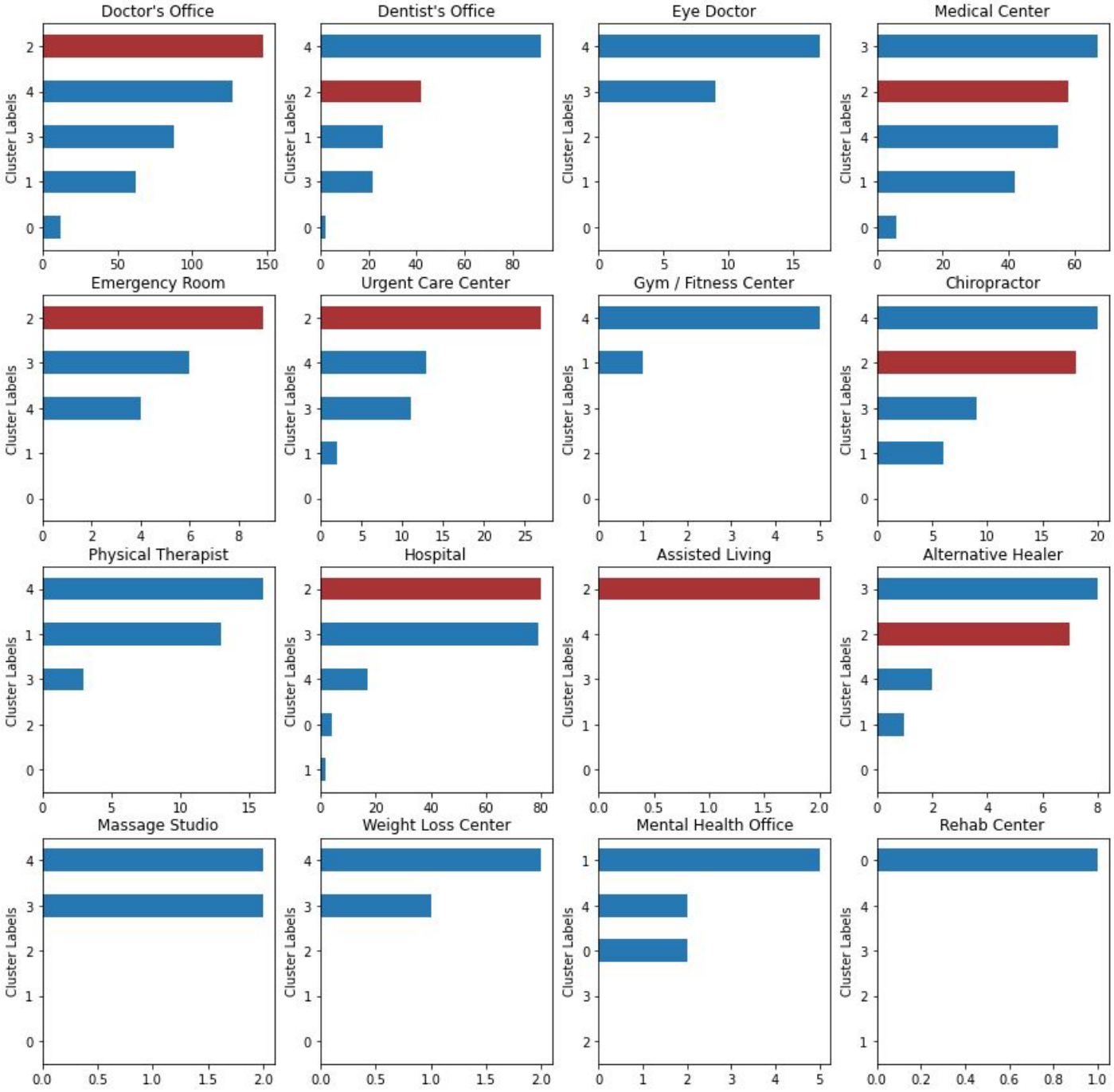
Cluster 1 = purple

Cluster 2 = blue

Cluster 3 = teal

Cluster 4 = peach

The following bar charts allow us to compare the clusters and their sum of respective categories. We highlight Cluster 2 because it falls in the area with the highest density of medical facilities (as per the heat map).



Results and Discussion

Based on our analysis, neighborhoods in Cluster 2 have higher concentrations of hospitals, urgent care, emergency rooms, and doctor's offices. These neighborhoods will be good candidates for clients that need to be near facilities that offer emergency care services, or that can manage more serious health concerns. Therefore, the southeastern region of Honolulu county would be most ideal.

Neighborhoods in Cluster 4 would be preferable for clients who still want easy access to doctor's offices, in addition to options for ambulatory or preventative care services, such as fitness centers, chiropractic, physical therapy, and weight management. For these clients we recommend neighborhoods within the cities of Kaneohe, Waipahu, and Mililani.

Conclusion

The purpose of this project was to identify the best neighborhoods in Oahu for our clients to retire based on their medical needs. After collecting, analyzing, and visualizing our data, we concluded that clients who need access to more doctors, hospitals, and urgent care centers should look to reside in the southeast regions of Honolulu. Clients who do not have serious health conditions to manage, and who instead prioritize ambulatory care services, can expand their options to cities such as Kaneohe, Waipahu, and Mililani.

Further research will have to be made for clients who request for specific specialists, such as cardiologists, oncologists, or endocrinologists. Final decisions will also be influenced by individual preferences for attributes inherent to each city/neighborhood, including population density, venues, and distance to beaches or mountains.

Limitations to consider for this report are that the accuracy of data relies solely on that which was provided by Foursquare Labs, Inc.

References

[1] https://www.honolulu.gov/rep/site/nco/nco_docs/2017-06_Guidebook_FINAL.pdf
[2] https://developer.foursquare.com/docs/build-with-foursquare/categories/