



# Virginia Hospital Escapes

**A COMPARISON OF THE VENUES SURROUNDING VIRGINIA HOSPITALS**

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December 3, 2019

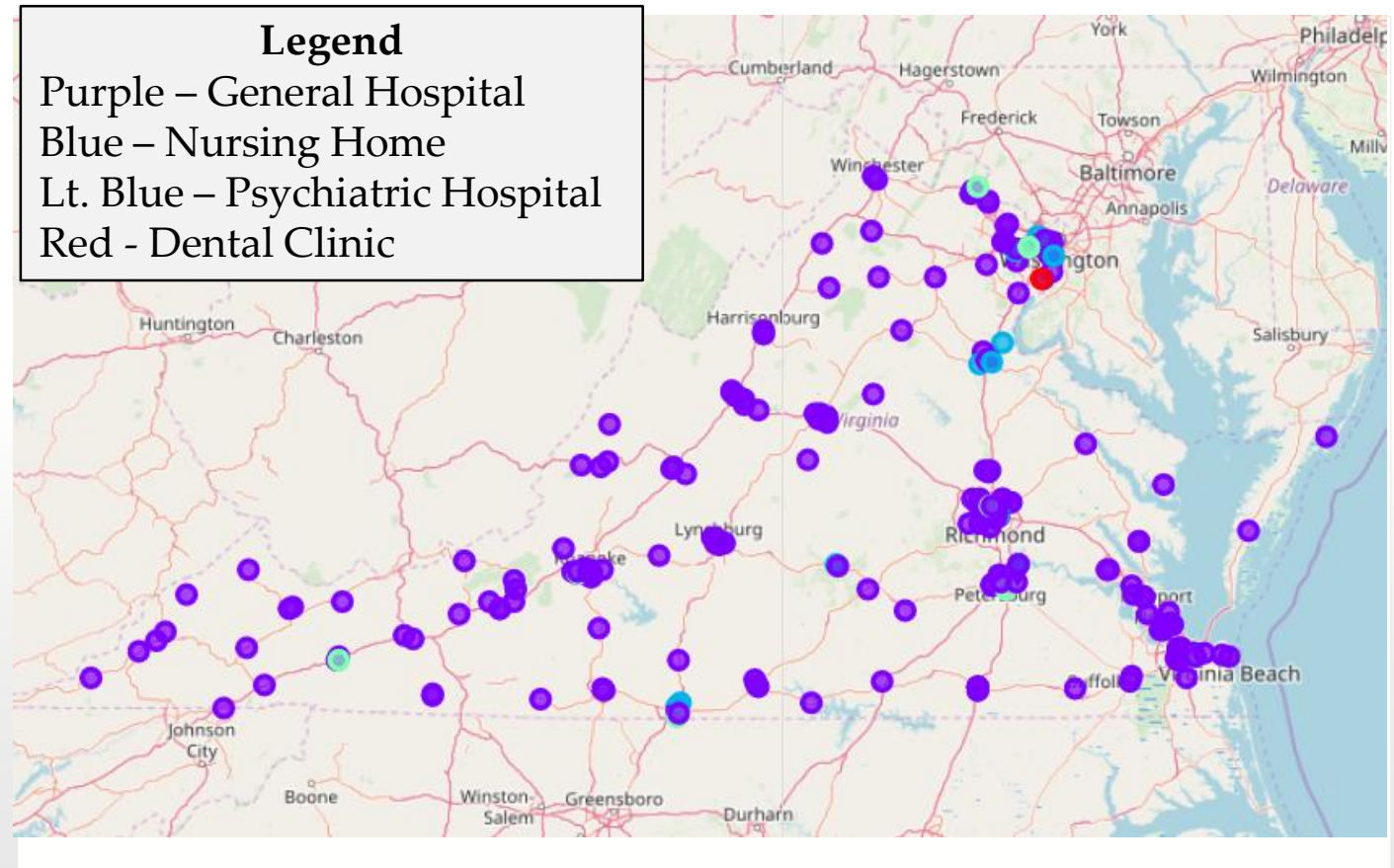
## Labeling Hospitals According to Types of Surrounding Venues Could be Useful to Hospital Staff and Visitors

- Hospital patrons and visitors appreciate having nearby alternatives to cafeteria food.
- Hospitals with a park or garden path nearby offer patrons, staff, and visitors an avenue to get some precious fresh air and exercise.
- Hospitals with convenience stores nearby offer patrons easy access to magazines, snacks, and other items of interest.

# Data Sources and Cleaning

- Hospital names, cities, and geocoordinates for 271 hospitals were obtained from <http://www.lat-long.com/>
- Venue names, geocoordinates, type, and distance from the hospital for 23,867 venues were obtained from Foursquare.com
- First dropped historical hospitals, resulting in 247 hospitals
- Then filtered out psychiatric and mental hospitals, nursing homes, a dental clinic, and a veterinary hospital, resulting in 219 general hospitals
- Dropped venues with missing, obscure, or irrelevant venue types, resulting in 19,956 venues belonging to 472 venue types

# Exploratory Analysis - Plotting all 247 Hospitals by Type





# Reducing the Geographical Area

- Hospitals in Virginia are very spread out, with most hospitals clustered around areas of dense population.
- I redefined my area of interest to northern Virginia and set the following boundaries:
  - east\_limit = -78.00000 longitude
  - west\_limit = -76.80000 longitude
  - north\_limit = 39.00000 latitude
  - south\_limit = 38.50000 latitude
- I also reduced the distance to venues to a 300 meter radius – easy walking distance
- This left 24 hospitals and 194 venue categories in the northern Virginia dataset

## Top 10 Most Frequent Venue Types for Two Hospitals in Northern Virginia

Notice that Burke Medical Center has more than twice as many Banks as Fast Food Restaurants nearby, and that there are twice as many Fast Food Restaurants as Grocery Stores.

Circle Terrace Hospital has four types of venues nearby, with an equal number of each type.

----Burke Medical Center----		
	venue	freq
0	Bank	0.09
1	School	0.05
2	Fast Food Restaurant	0.04
3	Camera Store	0.04
4	Salon / Barbershop	0.04
5	Gas Station	0.04
6	Grocery Store	0.02
7	Recycling Facility	0.02
8	Shopping Mall	0.02
9	Car Wash	0.02

----Circle Terrace Hospital----		
	venue	freq
0	Music School	0.25
1	Housing Development	0.25
2	Pool	0.25
3	Elementary School	0.25
4	American Restaurant	0.00
5	Office	0.00
6	Mosque	0.00
7	Music Store	0.00
8	Music Venue	0.00
9	Nail Salon	0.00

# Exploratory Analysis – Comparing the closest venues by Category

The distance here represents the distance to the closest venue in the associated category. For example, the closest type of venue to Access Emergency Hospital is a Bank, and it is 97 meters away. The next closest venue type is a Paper / Office Supplies Store.

	Hospital	Category	Meters from Hospital
0	Access Emergency Hospital	Bank	97
1	Access Emergency Hospital	Paper / Office Supplies Store	128
2	Access Emergency Hospital	Bar	130
3	Access Emergency Hospital	Building	136
4	Access Emergency Hospital	Government Venue	136
5	Access Emergency Hospital	Hardware Store	138
6	Access Emergency Hospital	Mobile Phone Shop	141
7	Access Emergency Hospital	Salon	142
8	Access Emergency Hospital	Spa	142
9	Access Emergency Hospital	Government Building	144

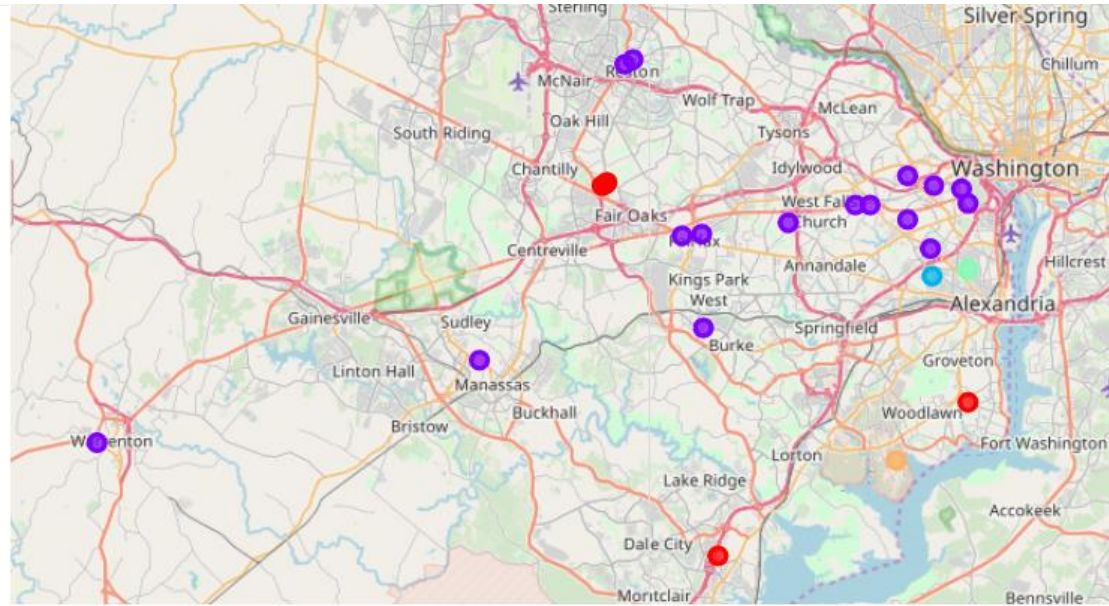
Clustering Hospitals based on frequency of venue type and on distance of nearest venue of each type, using K-Means.

Clusters Based on Frequency		
Cluster ID	Number of Hospitals	Names of Clusters
0	16	Mostly Office Buildings
1	1	Food Court, Coffee Shop, Beer Garden
2	1	Elem. School and Pool
3	1	Entertainment and Playground
4	6	Cafés and Buildings

Clusters Based on Distance Bin		
Cluster ID	Number of Hospitals	Names of Clusters
0	2	Variety Mid Dist
1	5	Variety Farther Dist
2	1	Variety and Leisure Close
3	14	Pharm with Farther Variety
4	3	Café, Pharm, and Med



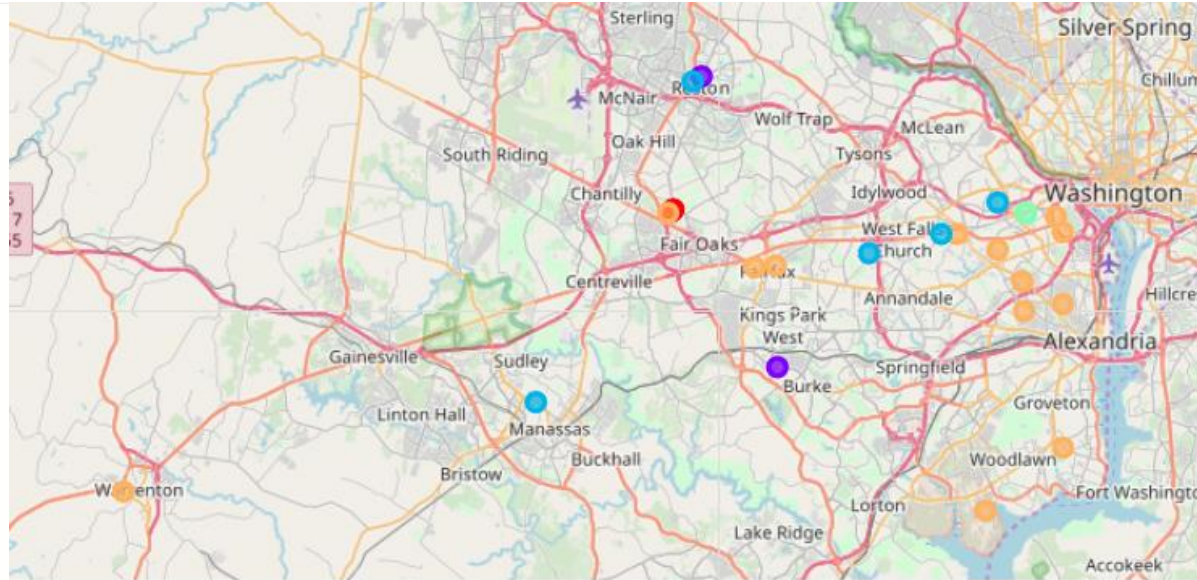
# Results Plot – clusters based on frequency



## Legend

- Purple - Mostly Office Buildings
- Lt Blue - Food Court, Coffee Shop, Beer Garden
- Aqua Grn - Elem. School and Pool
- Orange - Entertainment and Playground
- Red - Cafes and Buildings

## Results Plot - clusters based on distance



### Legend

- Purple - Variety Mid Dist
- Lt Blue - Variety Farther Distance
- Aqua Grn - Variety and Leisure Close
- Orange - Pharm with Farther Variety
- Red - Cafe, Pharm and Med

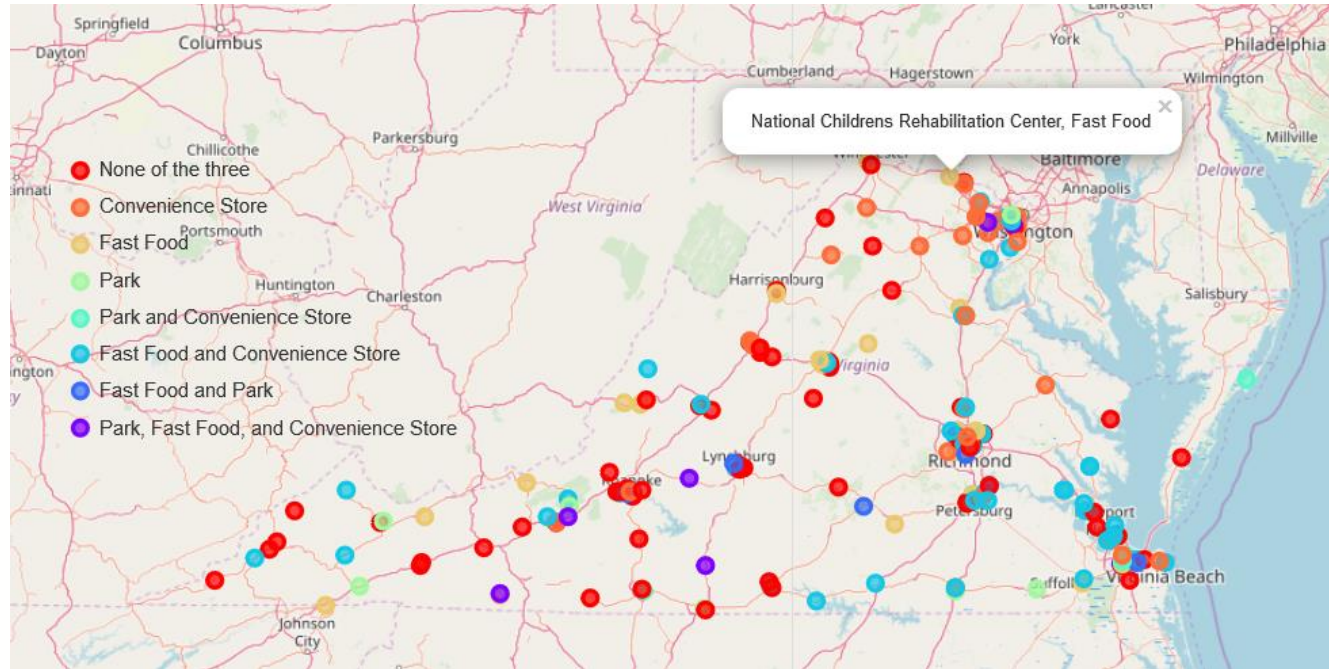
# A New Approach

- The two groups of clusters did not capture information helpful to hospital visitors or staff
- This time, rather than use K-Means or another machine learning algorithm, I cluster the hospitals based on the venue types that *I* think are most valued. Too bad I'm not a SME!
- I grouped all 218 general hospitals in Virginia based on the following venue types within 500 meters:
  - Pharmacy
  - Fast Food Restaurant
  - Sandwich Place
  - Pizza Place
  - Grocery Store
  - Burger Joint
  - Convenience Store
  - Organic Grocery
  - Park



## Results Plot - clusters based on presence of valued venue types

Notice that I can use the plot  
to quickly identify hospitals  
in Virginia that have or lack  
nearby venues that I value.





# Discussion

- The manually created clusters are much more useful than the ones generated by machine learning
- These results, however fascinating, are limited in their accuracy and usefulness
  - This study does not take into account gift shops or floral shops, which may also be valued by hospital patrons
  - The results do not account for walking trails or garden paths around or near the hospitals, which may be more desirable, and likely more common, than parks
  - The results are only as accurate as the Foursquare data is complete and accurate
- It is possible that while cleaning the data I removed venues that could have changed the results
- This study could be revised to compare the venues surrounding other hospital types, such as psychiatric hospitals or nursing homes.
- In case there is a subject matter expert out there, the algorithms used in this study could be adapted to finding more valuable venue types by changing the keyword searches and filters.

Happy hospital hopping!