# New Veterinarian

Toronto, ON, Canada

# Neighborhood Clustering

Objectives:

1. Find new location for veterinarian in Toronto
2. Use existing data to optimize choice of new location
3. Leverage ML techniques to obtain insight of current vet market

# Datasets

# Three different datasets

## NEEDS

- Publicly available
- Recent
- Contains population information
- Contains pet information
- Defined at neighborhood levels

## DATASETS

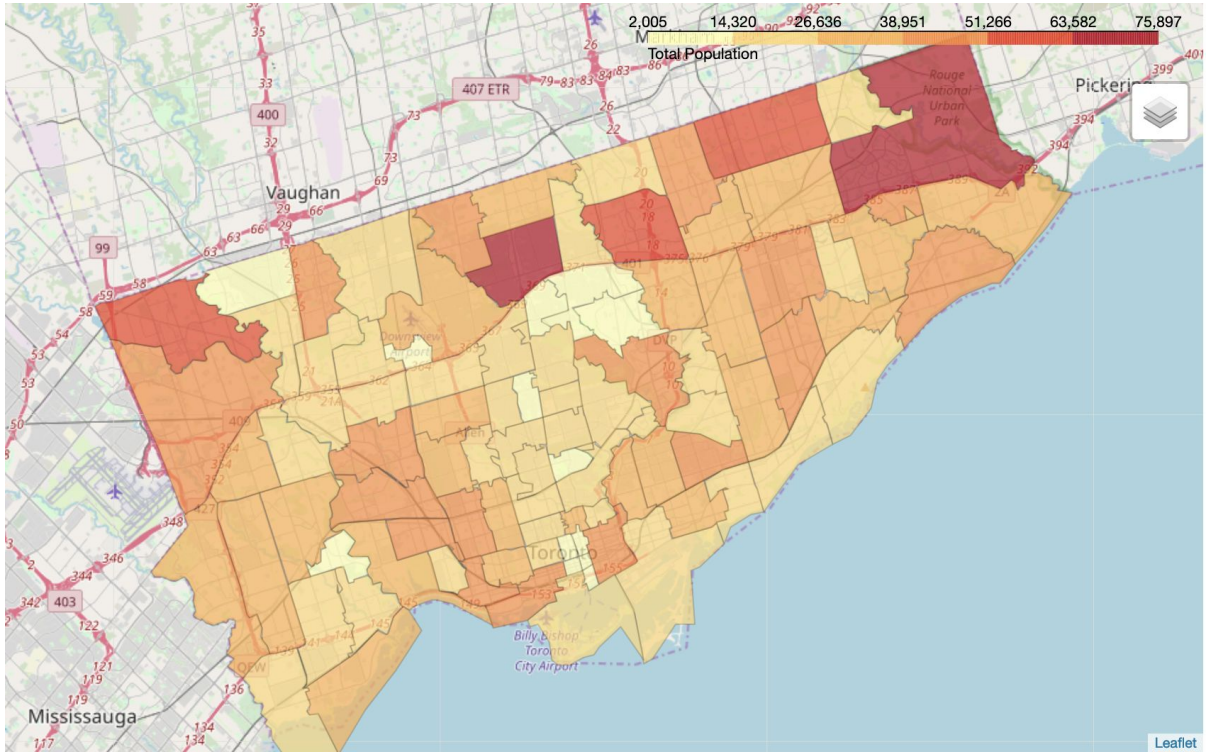
- Census data of 2016 (Gov.)
- Pet registry (2013 & 2017, city)
- Wikipedia article
  - Neighborhood
  - Postal codes
- Foursquare API
  - Existing veterinarians
- Geocoder

# Current Veterinarian Market

# Population

Findings:

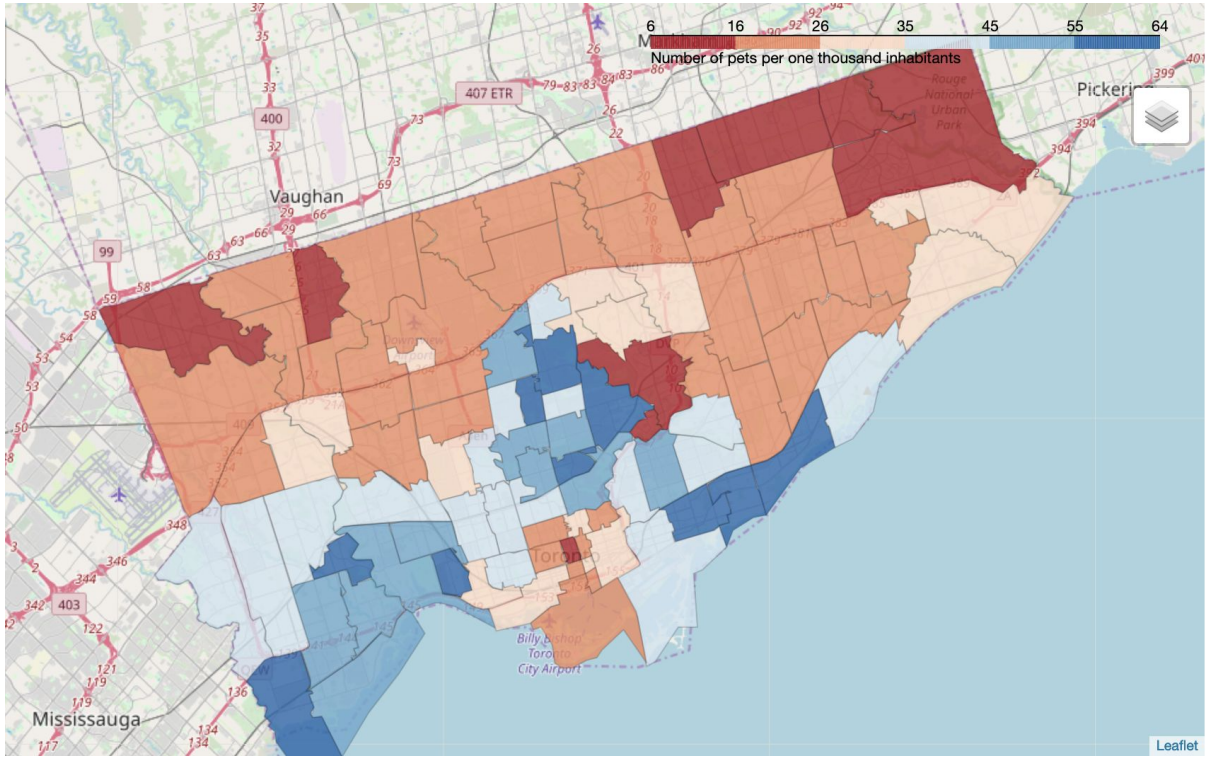
- Uneven distribution
- Concentrated in the North-East
- Wide range
  - Min: ~2,000
  - Max: ~76,000



# Pets / Inhab.

Findings:

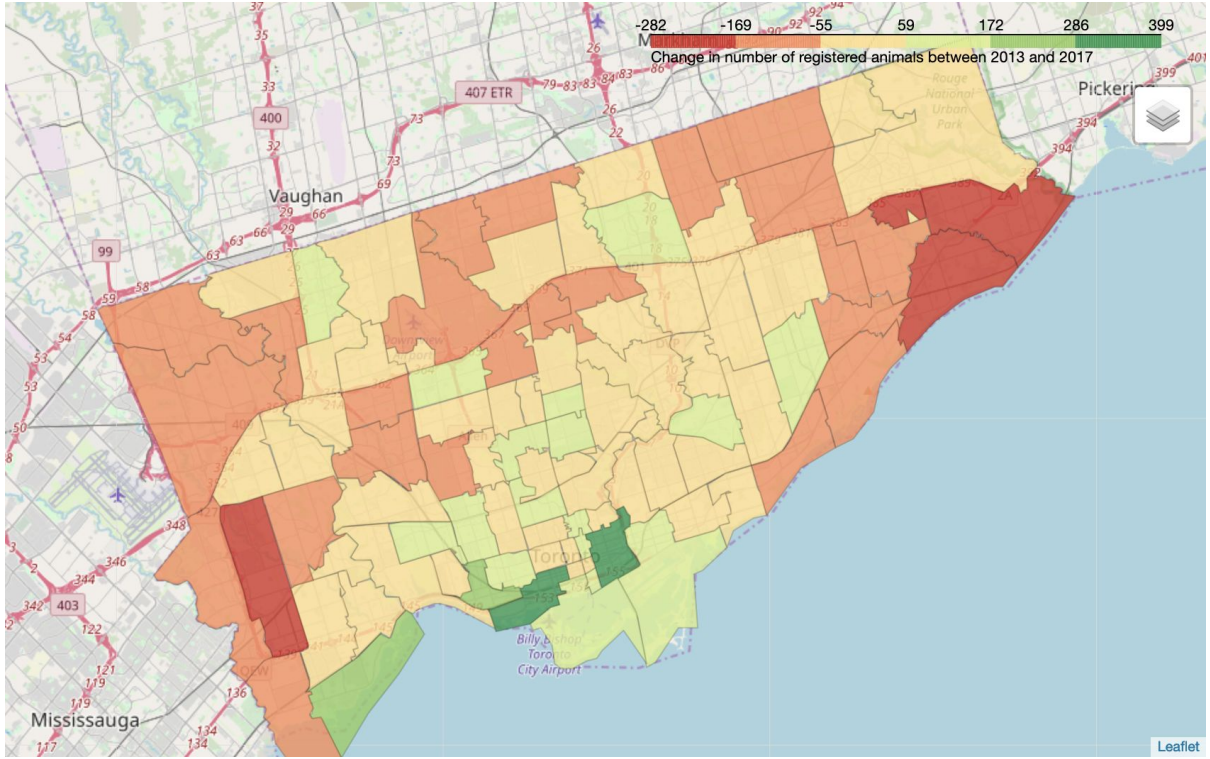
- Uneven distribution
- Concentration of pets:
  - South-west
  - Center
- Northern border depleted



# Animal Registry

Findings:

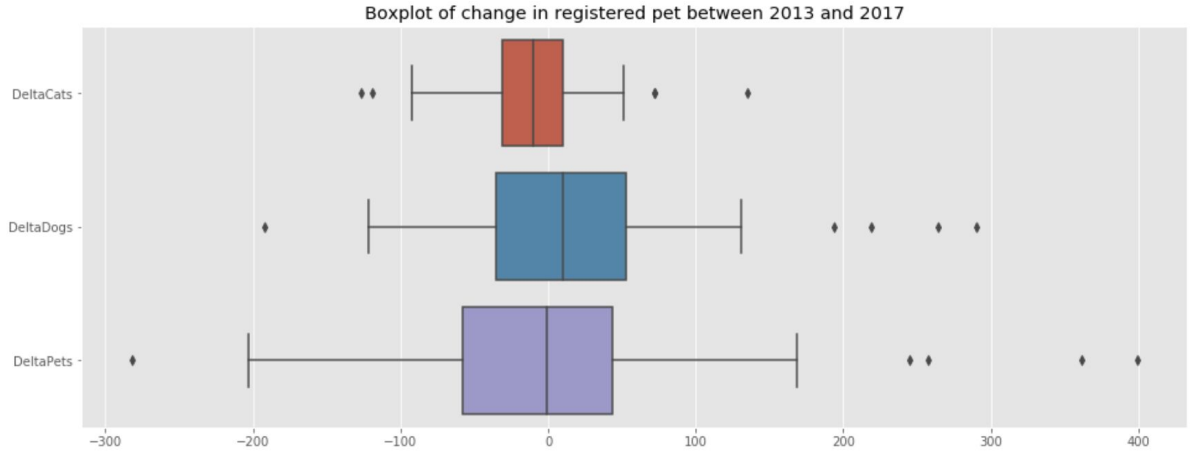
- Uneven trends
- Center of town is gaining pets
- Outer belt is losing pets



# Animal Registry

Findings:

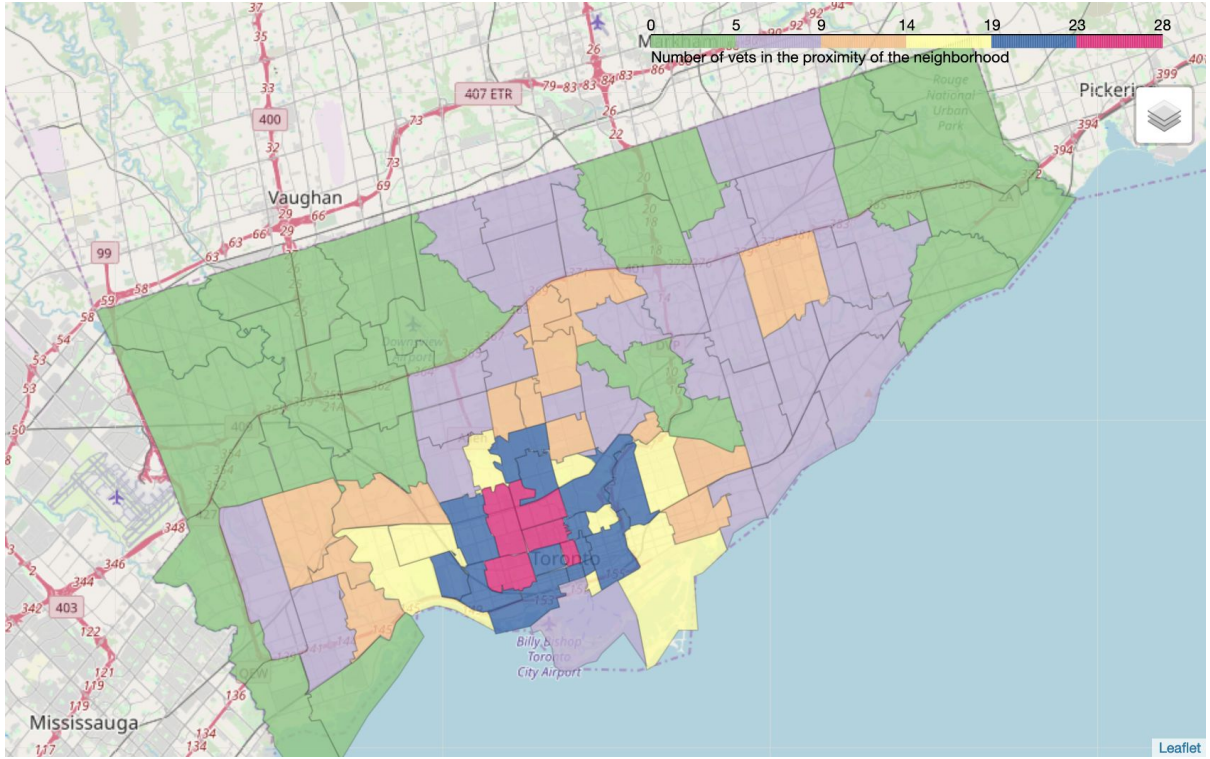
- More dogs
- Fewer cats
- Several outliers trends
- Overall average is ~0 (no change)



# Veterinarians

Findings

- Center of town well served
- Outer city belt does not have many options for vets
- Number of vets follows trends of change in registered pets



# Clustering

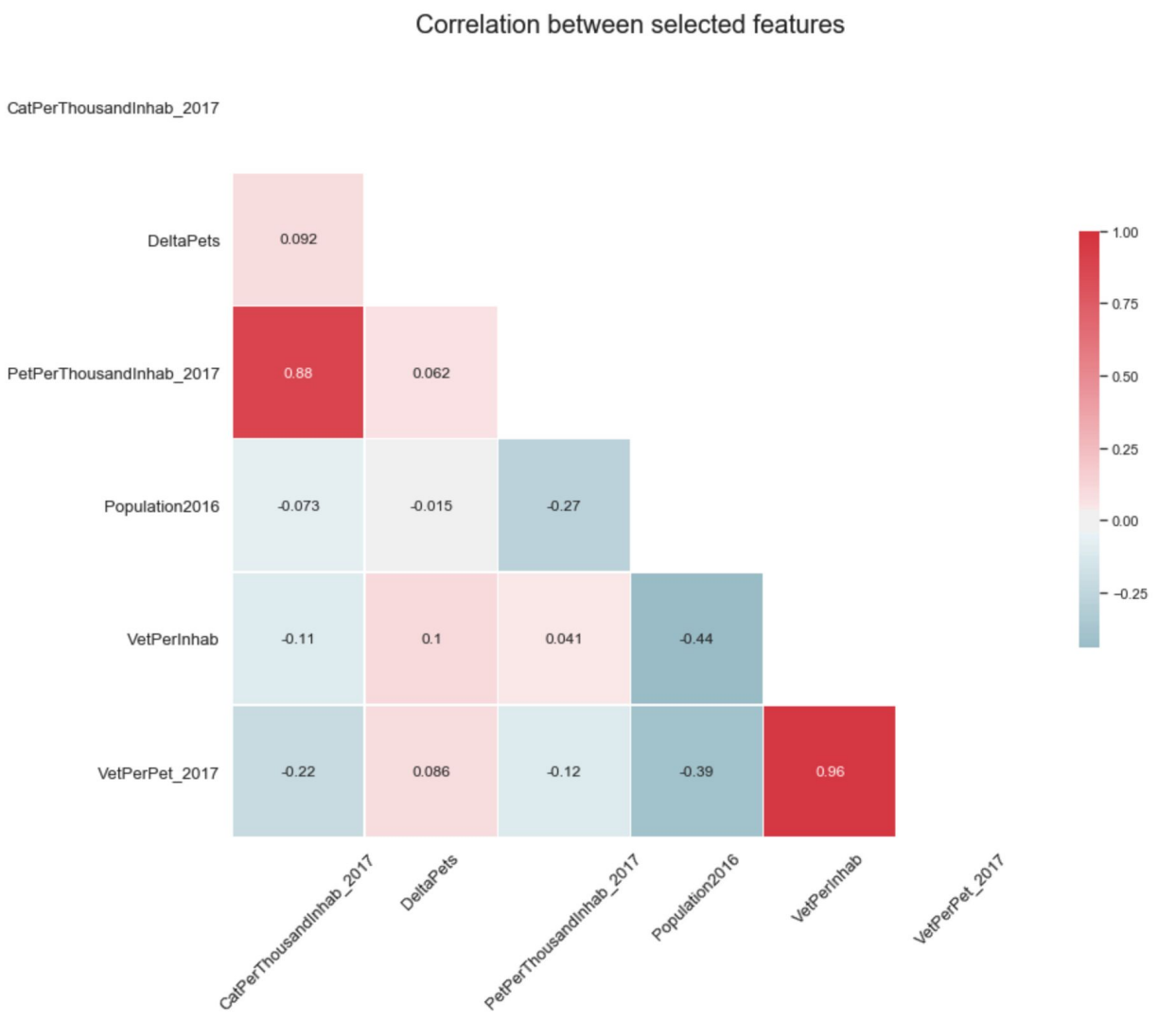
# Selected Features

Findings

- Center of town well served
- Outer city belt does not have many options for vets
- Number of vets follows trends of change in registered pets

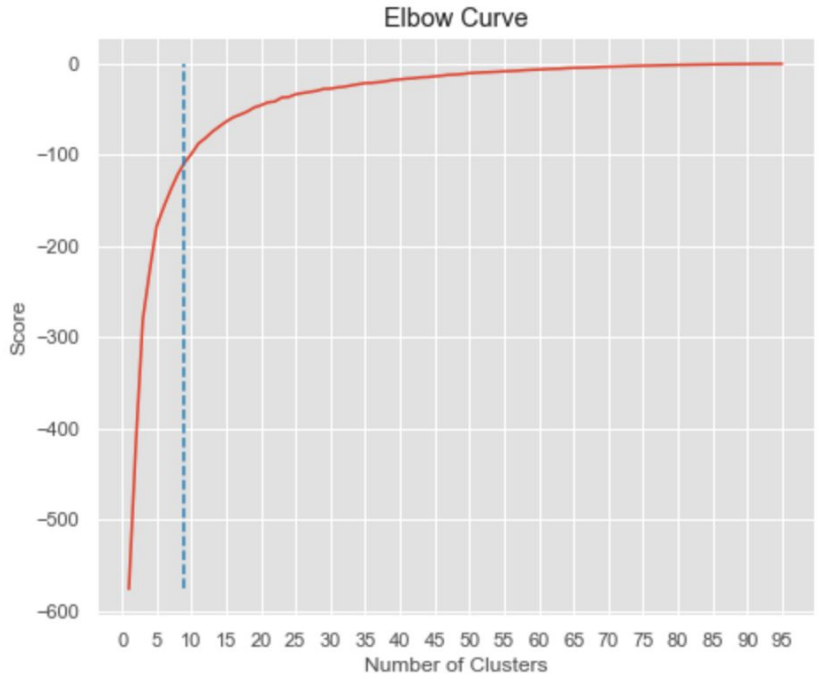
Model

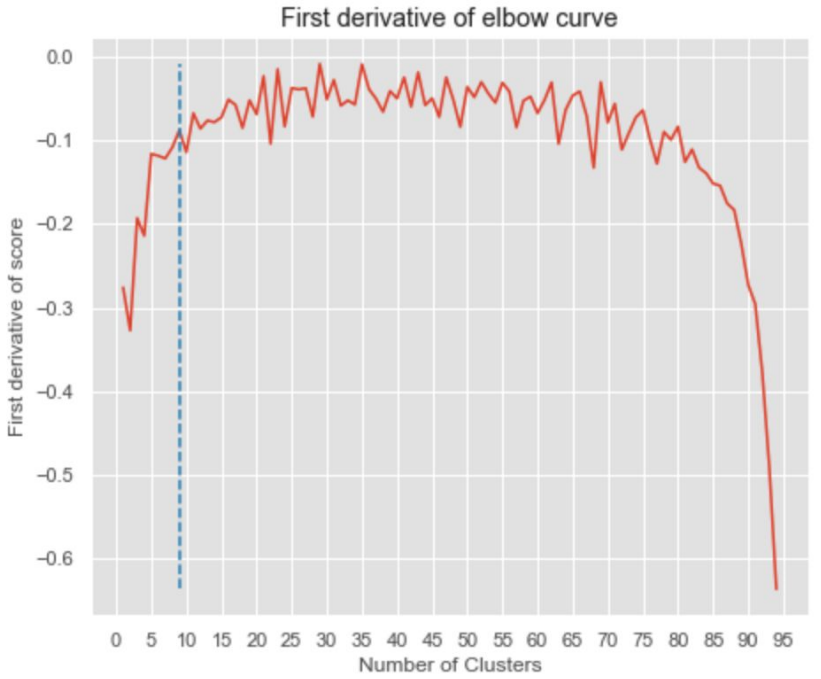
- K-Mean Clustering

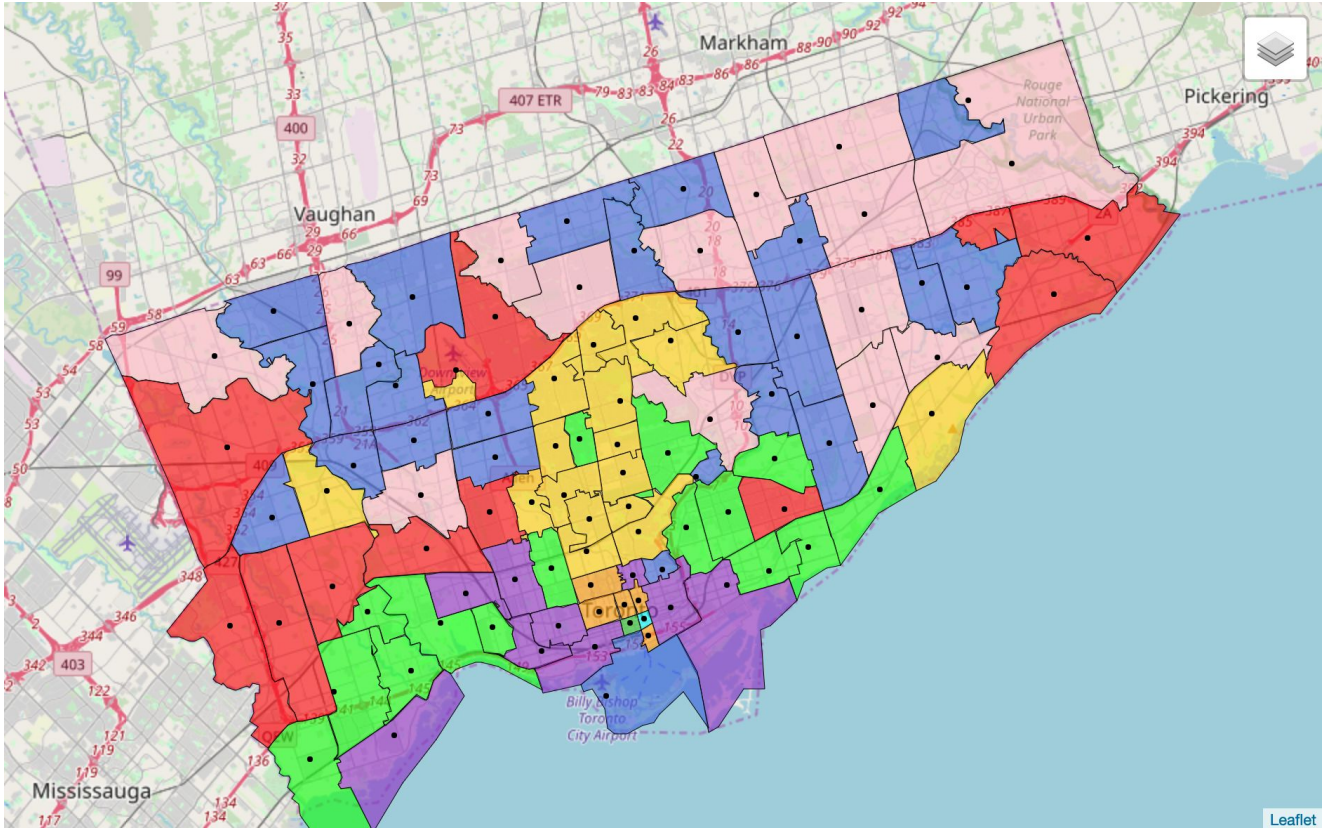


# Hyperparameters Tuning

Elbow method yields to K = 9.





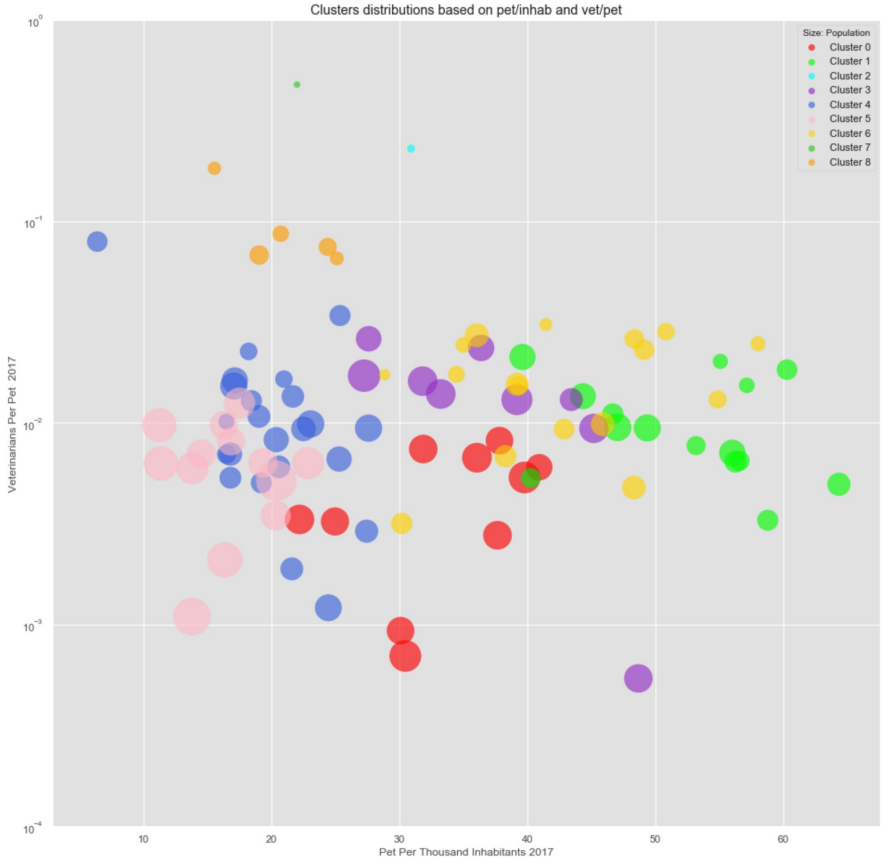

Result of Clustering (K=9)

# Best Candidate

# Vet per Pet vs. Pet per Inhabitants

Findings:

- 4 Clusters have the most promising ratios:
  - Cluster 0 (red)
  - Cluster 1 (green)
  - Cluster 3 (purple)
  - Cluster 8 (orange)

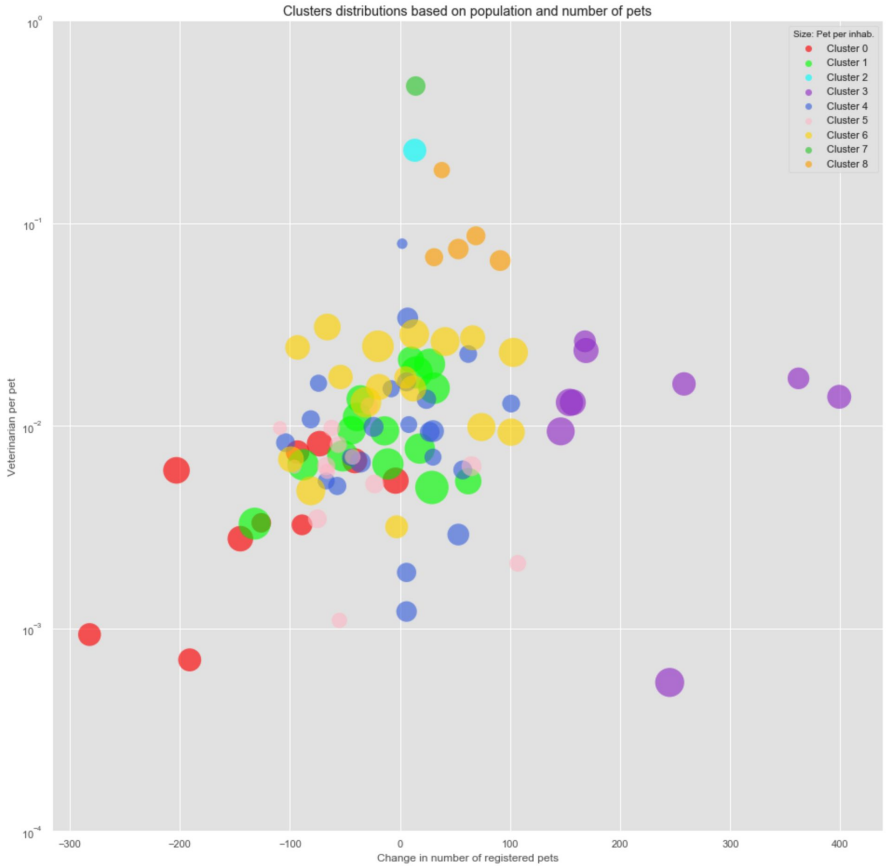


# Change in registration number vs. Vet per pet

Cluster 3 (purple)

- Low vert per pet ratio
- Increase in number of registrations between 2013 and 2017

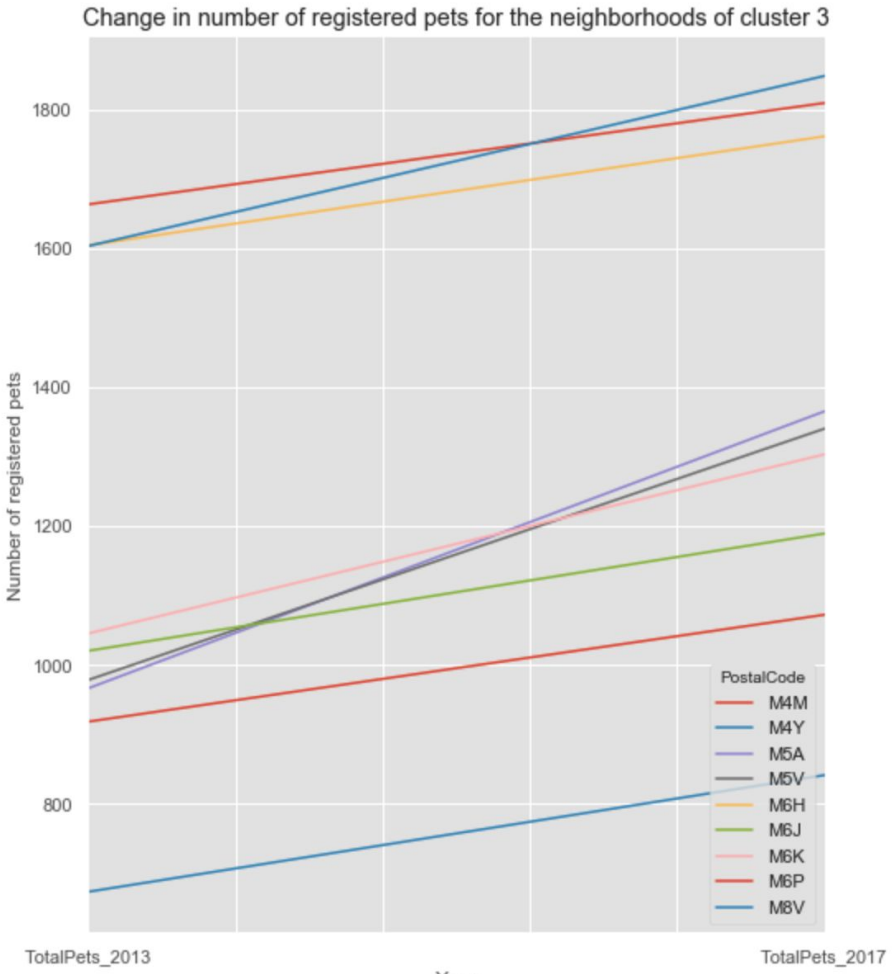
**→Cluster 3 is selected.**



# Final Selection

Based on the vet per pet ratio and the change in number of registered pets:

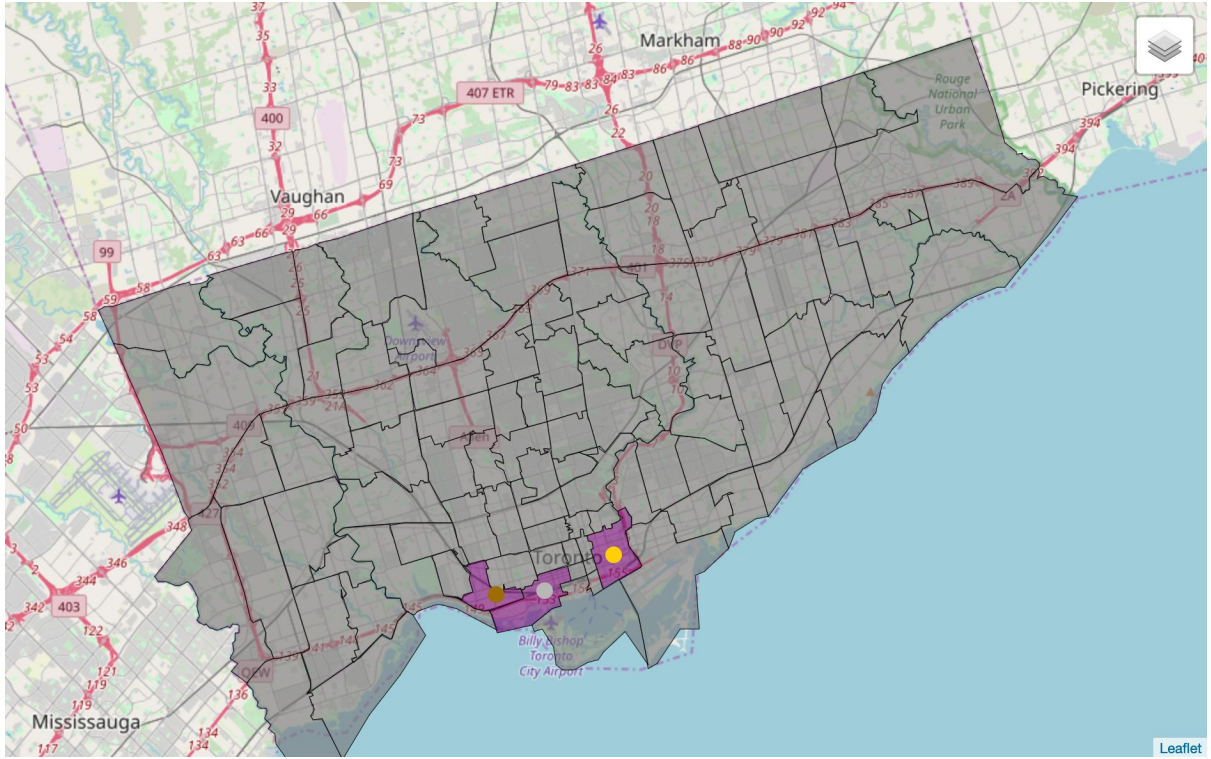
- Three neighborhoods are selected:
  - M5A (5th vet per pet, 1st delta pet)
  - M5V (3rd vet per pet, 2nd delta pet)
  - M6K (4th vet per pet, 3rd delta pet)



# Conclusion

# Selection

- Three neighborhoods identified as best options.
- All located on the south shore of Toronto.




*Note: the results of these analysis are based on assumptions on the available data. In order to make a final decision regarding the location, additional research needs to be performed.*