Most Dog Friendly Neighbourhoods in Toronto

Business Problem:

Having a dog is a serious responsibility and it definitely alters your lifestyle in order to provide the proper care for your pup. Even the smallest dogs should be going outside and it makes life easier for dog owners if their neighbourhood caters to that. They are as important as any other member of a family and keeping them happy and healthy is something all good dog owners strive to do. This translates into living in neighbourhoods that has a lot of parks and trails so your pup can get out and explore.

With this project we had to use Foursquare API to solve a problem and I wondered where in Toronto would be good place to live with a dog?For this analysis, I assumed that good target areas would have a large population, a large number of pets registered in the area and parks/ dog run places.

To do this analysis, we will use the following information:

- the number of pets in each area in Toronto (using Forward Sortatation Areas (FSAs)) (estimated by the number of new dog/cat licenses issued per FSA)
- the neighbourhood name of each FSA (retrieved from Wikipedia)
- the population of each each FSA from the 2016 census
- the foursquare api to retrieve the current number of pet stores/services and dog-runs per FSA

Data Sources:

- Population by FSA from Census 2016:
  https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/comprehensive.cfm
    - this information will be used to calculate the proportion of pet ownership per FSA
    - this data set has 3 columns of interest: FSA / Province / Population, 2016
    - We will filter this data set to only include the FSAs located in Toronto
- Toronto Open Data: Licensed Dogs and Cats Reports for 2013 and 2017
  https://www.toronto.ca/city-government/data-research-maps/open-data/open-data-catalogue/community-services/#a666d03a-bafe-943a-e256-3c2d14b07b10
    - this information includes the number of dog and cat licenses issued per FSA in 2017. Also planning ot look at same file for 2013 to look at which areas are experiencing growth in pet ownership
    - this data has four columns: FSA / # Cat Licenses Issued / # Dog Licenses Issued / Total Licenses
- FourSquare Api:
    - to get number of pet stores/services and Dog-Runs per FSA
    - specifically, this query will be filtered to look for only the following two categoryIds: 5032897c91d4c4b30a586d69=pet services , 4bf58dd8d48988d100951735= pet stores , 4bf58dd8d48988d1e5941735= dog-run
- geopy:

    - to get lat/long coordinates for each FSA, which is used when calling Foursquare API for each FSA
- Wikipedia: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
    - to get neighbourhood names for each FSA

Data Clean-up:

- Check datatypes and convert any fields with unsuitable format to correct format.
- Check and drop any null values.
- Drop any unnecessary columns in the dataset.

Neighbourhood Names:

- Pet licensing data came with FSA but no names assigned so merged all datasets together on FSA and dropped any null values.

Coordinates of Each Neighbourhood

- Used Geopy library to retrieve all lat/long for each FSA

Venues

- I used the foursquare api to retrieve the existing pet stores and services in each area. With 4sq api, you can pass in latitude/longitude coordinates, tell it how far to search around those coordinates (radius) and optionally specify category ids to target your search (i.e. for restaurants or pet stores in this case example). Foursquare will then return a list of the venues that match your criteria.

Outliers

- The only outlier was FSA:5MW which only had 15 people. This is very low when comparing with other FSAs and would skew the results.

Exploratory Data Analysis

Details of calculated new columns:

PropTotal_2017: proportion of the licenese granted in Toronto in 2017 that were granted to this FSA

PropDogs: of the licenses granted in this FSA, what percentage were granted for Dogs vs Cats?

PetChange: Total Pets 2017 - Total Pets 2013

PropTotal_2013: proportion of the liceneses granted in Toronto in 2017 that were granted to this FSA

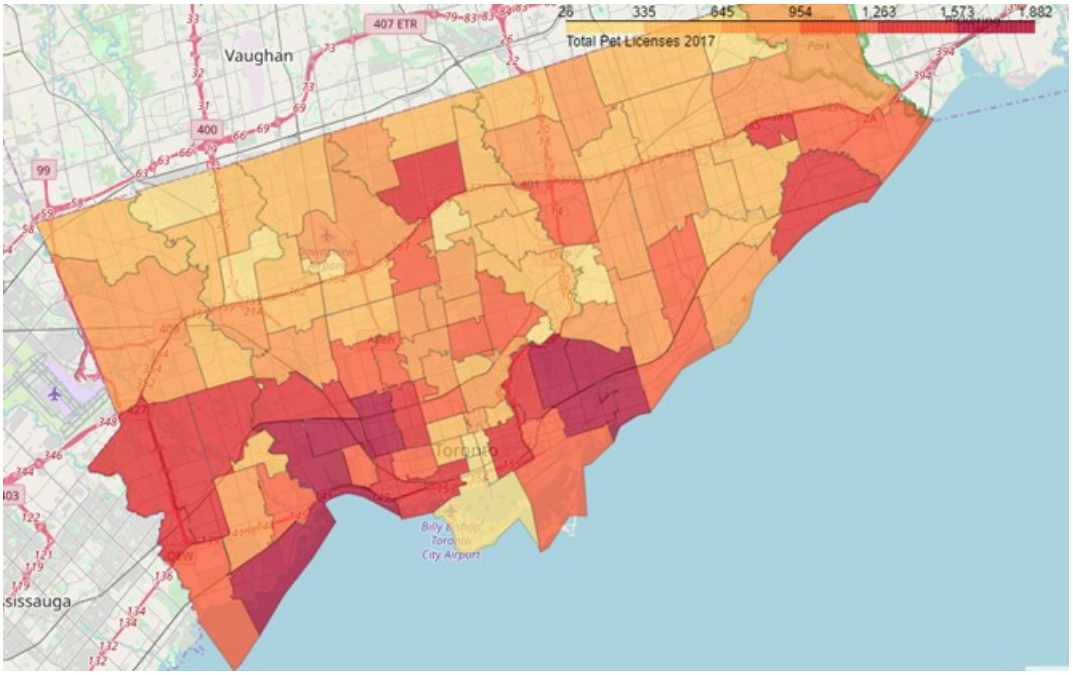
PetChange_Prop: PropTotal_2017 - PropTotal_2013 (change in proportion of pets belong to this FSA)

PerCapitaPetsTotal: pets/pop in FSA (number of new pets registered in FSA per person)

Venues: retrieved from 4sq API (total pet stores/services and Dog-Runs in FSA)

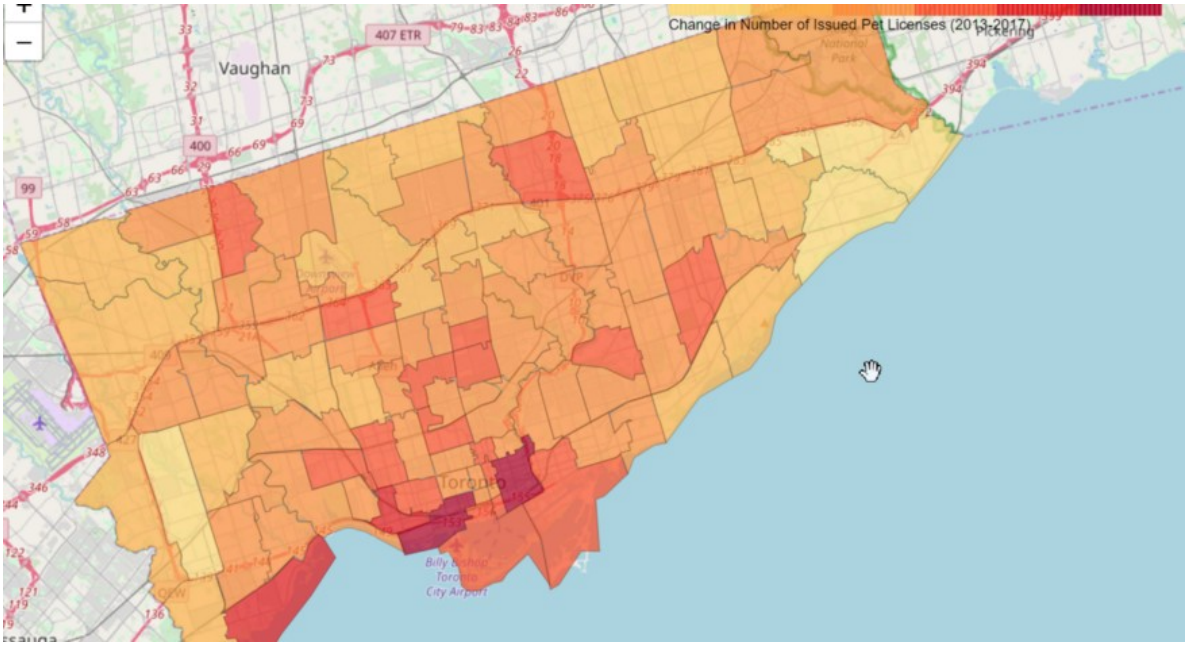
PetServicesPerPerCapitaPet: Venues/PerCapitaPetsTotal rough estimate of how many services exist per PerCapitapet

Total Pet Licenses Issued per FSA in 2017



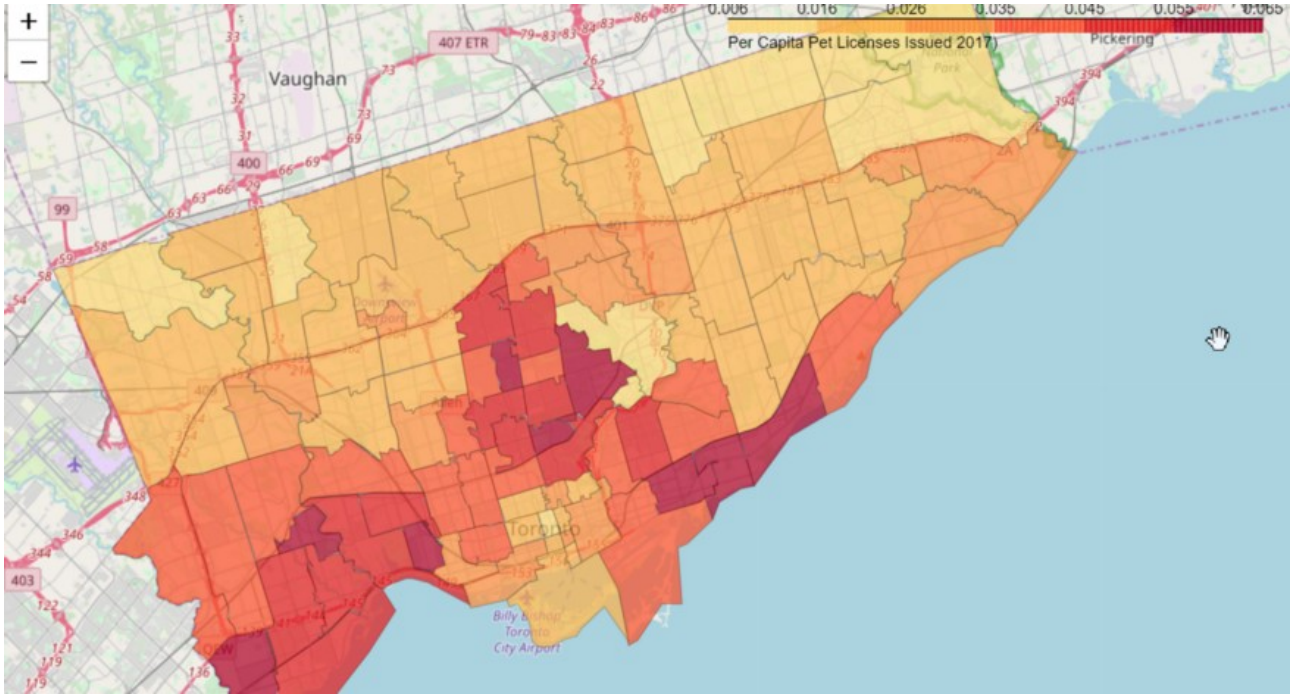
- **Highest number of licenses :** East York (M4C) and Etobicoke (M8V)
- **Lowest number of licenses :** M5C, M5H and M5W

Changes in Pet Licensing over the past 5 years (2013–2017)



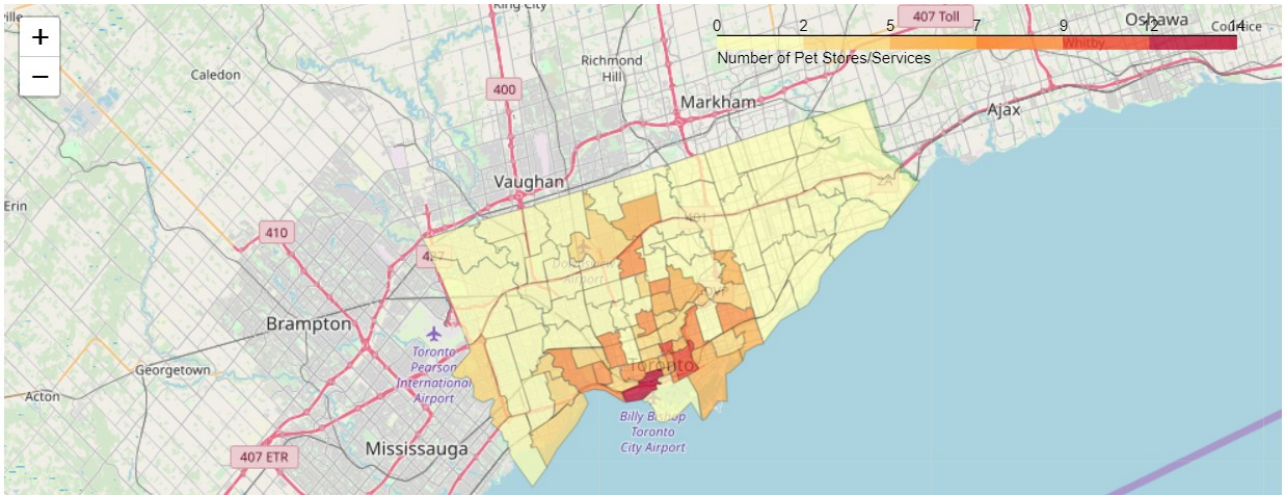
- **Largest pet Growth:** M5A and M5V
- **Biggest decrease in pet licensing :** M1C and M9B

Per Capita Pet Licensing



- **Highest per capita licensing :** M4E **,** M6R **,** M8W

Existing Venues

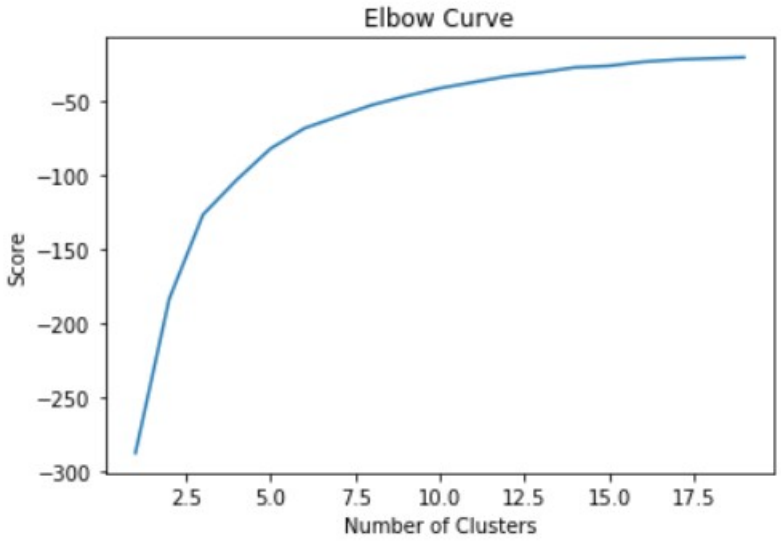


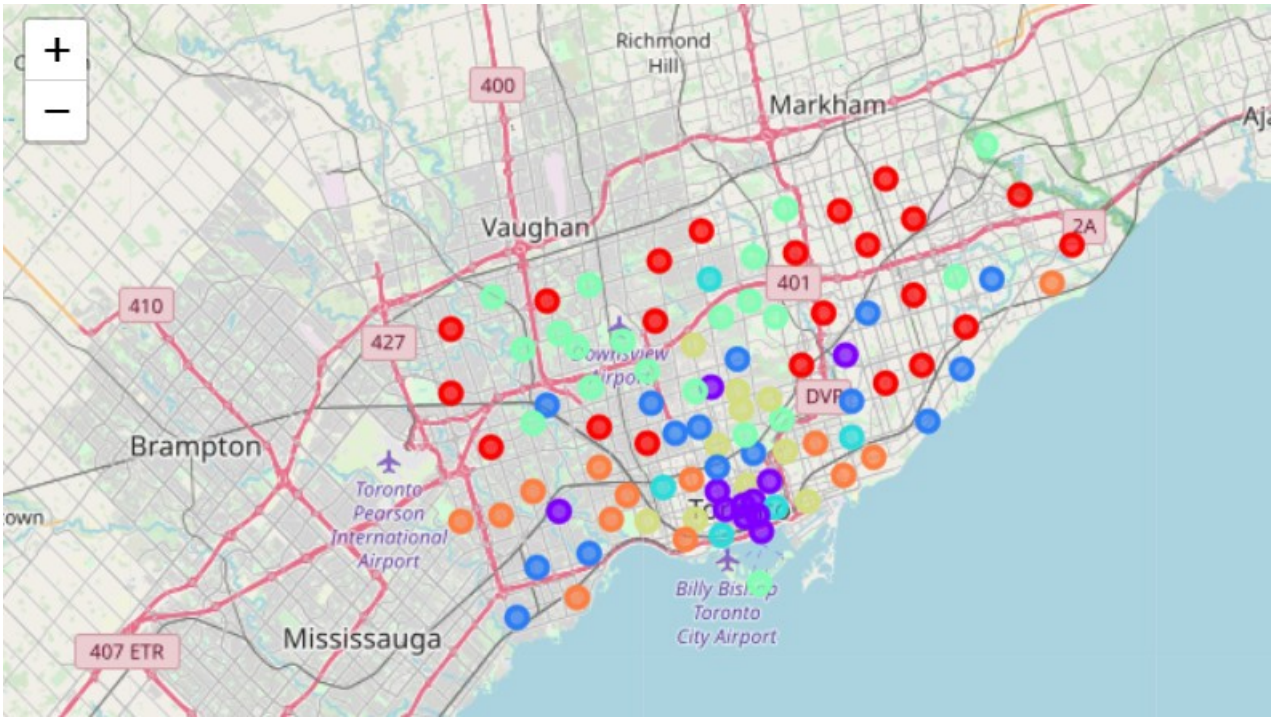
- **Highest existing Venues :** M1B (14) , M1C(11) , M1E(11)

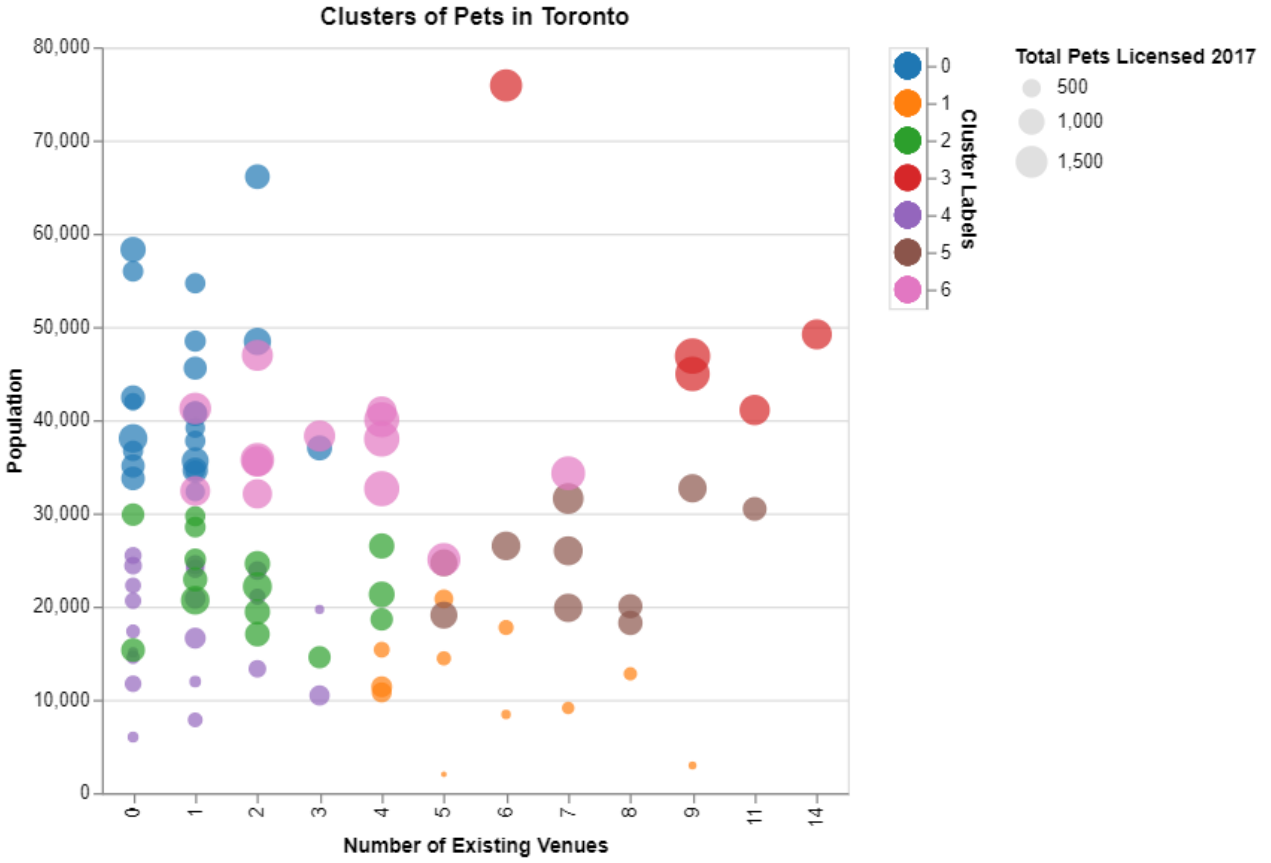
Cluster Analysis

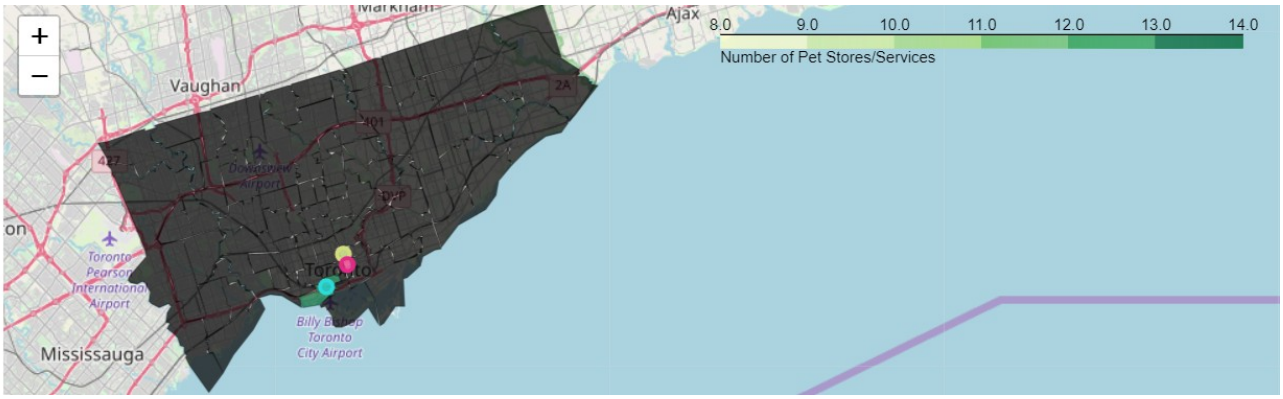
- I used the KMeans algorithm to attempt to cluster FSA areas based on three factors:
    - Population
    - Total Pets registered in 2017
    - Number of Existing Venues

I used Elbow Curve to find the number of clusters and found that 7 clusters looked to be correct for this problem.






Clusters of Pets in Toronto
Population
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
0
1
2
3
4
5
6
7
8
9
11
14
Number of Existing Venues
Cluster Labels
0
1
2
3
4
5
6
Total Pets Licensed 2017
500
1,000
1,500


Vaughan
Ajax
Mississauga
Toronto
Toronto Pearson International Airport
Billy Bishop Toronto City Airport
8.0
9.0
10.0
11.0
12.0
13.0
14.0
Number of Pet Stores/Services

Recommended Neighbourhoods for Dog Lovers

Examing with charts and maps possible candidates are:

- Cluster#1 : M5B
- Cluster#3 : M5V
- Cluster#5 : M4Y

	FSA	Borough	Neighborhood	Pop	Total_2017	PropTotal_2017	PerCapitaPets	Neighborhood Latitude	Neighborhood Longitude	Venue	PetServicesPerPerCapitaPet
0	M5V	Downtown Toronto	CN Tower, Bathurst Quay, Island airport, Harbo...	49195.0	1340.0	1.66	0.0272	43.640816	-79.399536	14	514.705882
2	M4Y	Downtown Toronto	Church and Wellesley	30472.0	841.0	1.04	0.0276	43.666336	-79.381195	11	398.550725
3	M5B	Downtown Toronto	Ryerson, Garden District	12785.0	265.0	0.33	0.0207	43.657467	-79.377708	8	386.473430