

## **Introduction**

Persian Kebab (Kobideh) is one of the most popular meal between Iranian. It is also getting popular between Canadian. Kobideh is a mixture of meat, onion, and salt that is grilled on a coal-based oven. There are lots of Iranian who are living in Toronto. As of 2016 a total of 97,110 Iranians reside in the Greater Toronto Area [1], and this number is increasing day by day. Therefore, the need of Persian Kebab or Persian Grill restaurants is demanding.

This project is for who is planning to open a Persian Grill restaurant in Toronto. This project suggests the best locations for Persian Grill restaurant in Toronto. This project explores which neighborhoods of Toronto have the most as well as the best Persian restaurant. Also, this project answers the questions “Where should I open a Persian Restaurant?”

## **Data**

- District of Toronto are obtained from

[https://en.wikipedia.org/w/index.php?title=List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M&oldid=942655364](https://en.wikipedia.org/w/index.php?title=List_of_postal_codes_of_Canada:_M&oldid=942655364)

- Latitude and Longitude values are obtained by using "geocoder".
- All data related to locations are obtained by using Foursquare API and Python Libraries. [2]

## **Methodology**

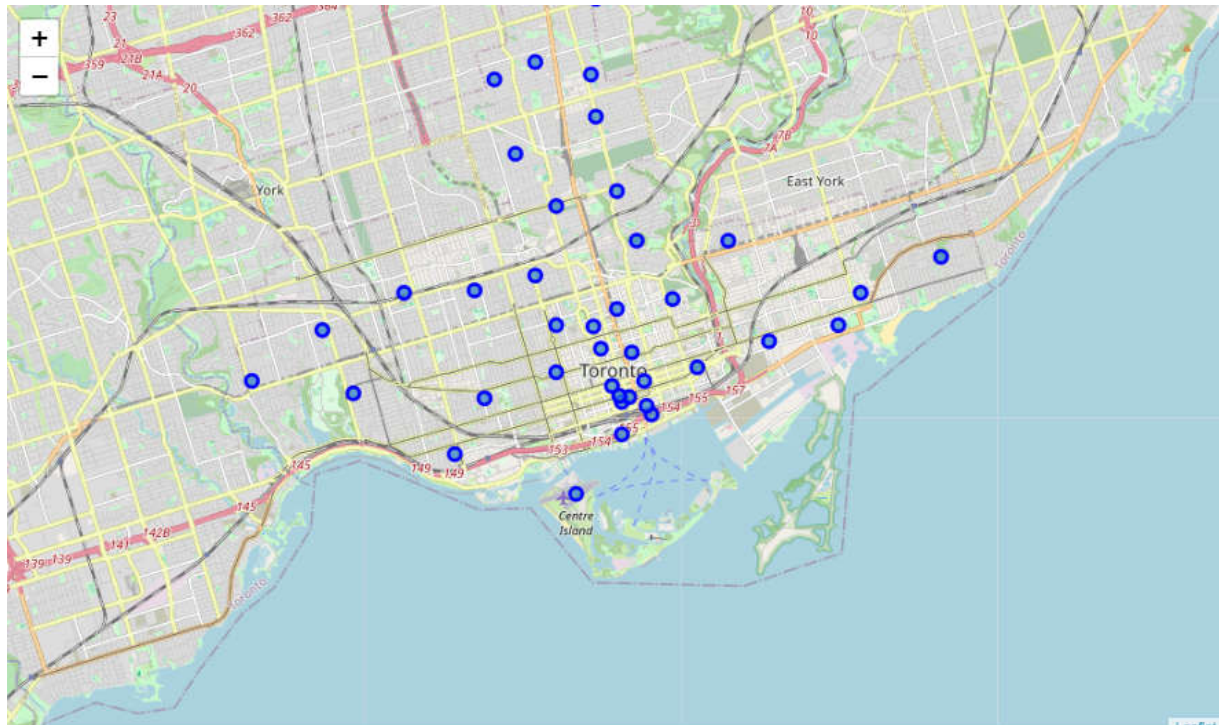
Fetching data which includes “PostalCode”, “Borough” and “Neighborhood” information of the city of Toronto. Python Folium library is used to visualize map of Toronto and its districts. In order to get Latitude and Longitudes of Toronto, geopy and geocoder are used.

	PostalCode	Borough	Neighborhood
0	M3A	North York	Parkwoods
1	M4A	North York	Victoria Village
2	M5A	Downtown Toronto	Harbourfront
3	M6A	North York	Lawrence Heights
4	M6A	North York	Lawrence Manor
5	M7A	Downtown Toronto	Queen's Park
6	M9A	Etobicoke	Islington
7	M1B	Scarborough	Rouge
8	M1B	Scarborough	Malvern
9	M3B	North York	Don Mills North
10	M4B	East York	Woodbine Gardens
11	M4B	East York	Parkview Hill
12	M5B	Downtown Toronto	Ryerson
13	M5B	Downtown Toronto	Garden District
14	M6B	North York	Glencairn
15	M9B	Etobicoke	Cloverdale
16	M9B	Etobicoke	Islington
17	M9B	Etobicoke	Martin Grove
18	M9B	Etobicoke	Princess Gardens
19	M9B	Etobicoke	West Deane Park
20	M1C	Scarborough	Highland Creek

Then joining coordinates data with neighborhoods data

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M3A	North York	Parkwoods\n	43.753259	-79.329656
1	M4A	North York	Victoria Village\n	43.725882	-79.315572
2	M5A	Downtown Toronto	Harbourfront\n	43.654260	-79.360636
3	M6A	North York	Lawrence Heights\n	43.718518	-79.464763
4	M6A	North York	Lawrence Manor\n	43.718518	-79.464763
5	M7A	Downtown Toronto	Queen's Park\n	43.662301	-79.389494
6	M9A	Etobicoke	Islington\n	43.667856	-79.532242
7	M1B	Scarborough	Rouge\n	43.806686	-79.194353
8	M1B	Scarborough	Malvern\n	43.806686	-79.194353
9	M3B	North York	Don Mills North\n	43.745906	-79.352188
10	M4B	East York	Woodbine Gardens\n	43.706397	-79.309937
11	M4B	East York	Parkview Hill\n	43.706397	-79.309937
12	M5B	Downtown Toronto	Ryerson\n	43.657162	-79.378937
13	M5B	Downtown Toronto	Garden District\n	43.657162	-79.378937
14	M6B	North York	Glencairn\n	43.709577	-79.445073
15	M9B	Etobicoke	Cloverdale\n	43.650943	-79.554724
16	M9B	Etobicoke	Islington\n	43.650943	-79.554724
17	M9B	Etobicoke	Martin Grove\n	43.650943	-79.554724
18	M9B	Etobicoke	Princess Gardens\n	43.650943	-79.554724
19	M9B	Etobicoke	West Deane Park\n	43.650943	-79.554724

Now, locate all neighbors from Toronto and plot the map



In order to explore and categorize places Foursquare API was used. Limit is set to 100 and Radius was set to 500. Here is the head of data frame.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	The Beaches	43.676357	-79.293031	Glen Manor Ravine	43.676821	-79.293942	Trail
1	The Beaches	43.676357	-79.293031	The Big Carrot Natural Food Market	43.678879	-79.297734	Health Food Store
2	The Beaches	43.676357	-79.293031	Grover Pub and Grub	43.679181	-79.297215	Pub
3	The Beaches	43.676357	-79.293031	Upper Beaches	43.680563	-79.292869	Neighborhood
4	The Danforth West, Riverdale	43.679557	-79.352188	MenEssentials	43.677820	-79.351265	Cosmetics Shop

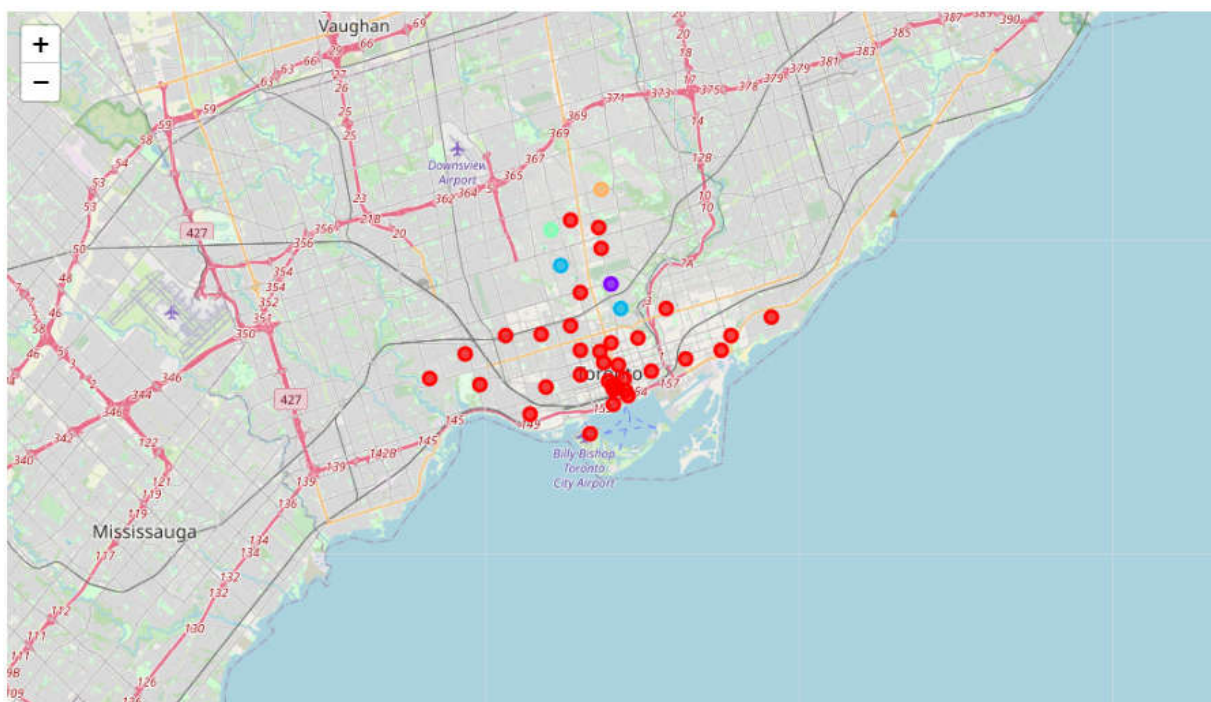
The table below shows the top 10 venue categories for each district.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Adelaide, King, Richmond	Coffee Shop	Café	Restaurant	Deli / Bodega	Clothing Store	Gym	Thai Restaurant	Cosmetics Shop	Bookstore	Concert Hall
1	Berczy Park	Coffee Shop	Cocktail Bar	Seafood Restaurant	Bakery	Beer Bar	Pharmacy	Cheese Shop	Restaurant	Farmers Market	Grocery Store
2	Brockton, Exhibition Place, Parkdale Village	Café	Breakfast Spot	Coffee Shop	Grocery Store	Bakery	Stadium	Burrito Place	Restaurant	Climbing Gym	Pet Store
3	Business Reply Mail Processing Centre 969 Eastern	Yoga Studio	Pizza Place	Brewery	Skate Park	Smoke Shop	Burrito Place	Farmers Market	Fast Food Restaurant	Restaurant	Recording Studio
4	CN Tower, Bathurst Quay, Island airport, Harbo...	Airport Service	Airport Lounge	Airport Terminal	Sculpture Garden	Harbor / Marina	Bar	Rental Car Location	Plane	Coffee Shop	Boat or Ferry

There are common venues in districts, so unsupervised K-means algorithm is used to cluster districts. K-Means cluster is set to 5 clusters, to reach optimum accuracy. Then clustering labels added to the data frame.

	PostalCode	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
0	M4E	East Toronto	The Beaches	43.676357	-79.293031	0	Trail	Health Food Store	Pub	Wings Joint	Department Store	Escape Room	Electronics Store	Electronics Store
1	M4K	East Toronto	The Danforth West, Riverdale	43.679557	-79.352188	0	Greek Restaurant	Italian Restaurant	Coffee Shop	Restaurant	Bookstore	Ice Cream Shop	Furniture / Home Store	Vegetarian Restaurant
2	M4L	East Toronto	The Beaches West, India Bazaar	43.668999	-79.315572	0	Sandwich Place	Fast Food Restaurant	Sushi Restaurant	Playground	Liquor Store	Restaurant	Italian Restaurant	Ice Cream Shop
3	M4M	East Toronto	Studio District	43.659526	-79.340923	0	Coffee Shop	Gastropub	Bakery	Brewery	Café	American Restaurant	Yoga Studio	Convenience Store
4	M4N	Central Toronto	Lawrence Park	43.728020	-79.388790	4	Park	Bus Line	Swim School	Falafel Restaurant	Ethiopian Restaurant	Escape Room	Electronics Store	Electronics Store

Then create map with neighborhoods which are clustered by color



## Result

After carefully observing each cluster, it is crystal clear that the central Toronto (Cluster 3) is the best place to open a Persian restaurant, since it is the most crowded place in Toronto and in addition it has the most restaurant in Toronto.

### Cluster 4

```
In [34]: toronto_denc_merged.loc[toronto_denc_merged['Cluster Labels'] == 3, toronto_denc_merged.columns[[1] + list(range(5, toronto_denc_merged.columns.get_loc('Cluster Labels') + 1))]]
```

	Borough	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
22	Central Toronto	3	Fast Food Restaurant	Home Service	Garden	Dessert Shop	Ethiopian Restaurant	Escape Room	Electronics Store	Eastern European Restaurant	Dumpling Restaurant	Donut Shop

## Discussion and Conclusion

Kmeans algorithm is used as part of this clustering project. The value of K is set to 5 to get a optimum result. For more detailed and accurate guidance, the data set can be expanded, and the details of the neighborhood or street can also be drilled.

It is obvious that Cluster 4 is the most viable cluster to open a new Persian restaurant. Especially Cluster 3 (Central Toronto district) has the most common venues as restaurant. So it is a hot spot for ordering and eating meal for people in Toronto.

## Reference

- [1] Canada, Government of Canada, Statistics. "[Census Profile, 2016 Census - Toronto \[Census metropolitan area\], Ontario and Ontario \[Province\]](http://www12.statcan.gc.ca)". [www12.statcan.gc.ca](http://www12.statcan.gc.ca). Retrieved 2018-03-13.
- [2] <https://developer.foursquare.com/>