A PIECE OF THE PIE

Created on 2020-03-31, by JG.

Introduction

Before I did a segmenting and clustering assignment , I was totally unaware of dumpling restaurants. I did not know that such thing exists. But there seems to be plenty of them in Toronto - so much so that it featured in a lot of neighborhood's top 10 lists when I did the K-Means analysis.

I like to see the big picture of everything - perhaps my analytical nature. So it would be contrary to my nature to just jump in and open an Italian restaurant- for instance.

So what other kinds of restaurants are there? Is the market not already saturated for a specific kind of restaurant, for instance dumpling restaurants.

My approach would be to first find out what categories of food-venues are available and a count of a specific category. Let us assume the count signifies market share and popularity.

The categories and count could be determined for a whole city under review, for instance Toronto. The data can then be segmented and clustered into neighborhoods in order to be useful to make decisions.

Business Problem / Who would find this useful?

This would be useful to an outsider of an area who wants to get involved in the food industry in a particular city, would like a bird's eye view of the city's food industry as well as who the competition will be (as everyone in the industry is competing for a piece of the pie…).

Data

The following data will be used;

VENUE data from FOURSQUARE.com

Luckily the data is available when accessing the VENUE information from FOURSQUARE.com using the RESTful API "https://api.foursquare.com/v2/venues/explore?" to extract the information in .JSON-format.

The following values will be of interest:

- within the Categories dictionary within the Venue dictionary of the .JSON input:
  - name (of the category) in order to group the food-establishment to count them, for instance

    ```
    'categories': [{'id': '4bf58dd8d48988d110941735',
    'name': 'Italian Restaurant',
    ```

- the value following the "categories_v2" in the prefix-value in the icon dictionary – in order to extract the "food" value so that only the food establishments will be extracted :

  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/italian_',

- within the Venue dictionary of the .JSON input:

  - the latitude and longitude values – in order to map the establishment to the particular neighborhood.

    ```
    location': {'address': '2885\xa0Dundas\xa0St.\xa0West',
    'lat': 43.665303321627505,
    'lng': -79.46562068004896,
    ```

  - The name of the establishment

    ```
    'venue': {'id': '540f2951498e7516839a7126',
    'name': 'nodo',
    ```

Data used to define the neighborhoods from Wikipedia

- The following Wikipedia-web page provided the Post codes, Neighborhood and Burrough information:

  'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M'

  These values are used to:
  - superimpose the neighborhoods onto the map of Toronto, and
  - to extract the venue information from FOURSQUARE using the RESTful API "https://api.foursquare.com/v2/venues/explore?"

METHODOLOGY

When the venues are extracted from Foursquare.com, all the venues are returned within a radius according to the limit you specify.

A category is returned, but it is one level down from the level I want it to be, for instance "Italian restaurant" or "dumpling restaurant" - and also "trail" and "park".

I am only interested in those venues related to the food industry.

Therefore, my methodology was only to work with the venues related to the food industry, to count the number of establishments and to do a K-means clustering for it.

In order to do that I looked for that "higher level category".

By looking at the JSON-output returned by FOURSQUARE.com, I saw that the one part of a path in the prefix column of the Icon contains the "higher level category", I required "food".

I proceeded to extract that value following the "categories_v2" in the prefix-value in the icon dictionary in order to extract the "food" value so that only the food venues will be selected.

The following code is used to extract data from the JSON object in the form of dataframe:

```
json_normalize(venues) # flatten JSON
```

The flattening of the JSON-output completely ignored that column. (The one function found during my search on the internet provided the value – but all the output was in one row. That was too flat.)

I extracted the value by traversing the JSON-output myself. The JSON-output consist of list and dictionaries. It can be navigated with Python with the following piece of code:

```
results = requests.get(url).json()["response"]['groups'][0]['items']

# Get to the relevant part in the JSON-data returned from FOURSQUARE.com
venues = results

N = len(venues)
for i in range(N):
    icon_prefix = venues[i]['venue']['categories'][0]['icon']['prefix']
    category_group=icon_prefix.split('/')[5]
    if category_group == 'food'
            ….
```

This returned "food" in the case of a venue related to the food industry which enabled me to analyse only the food industry.

The "driver" for the whole process was the post codes of Toronto obtained from the Wikipedia-page:

'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M'

which provided the Post codes and the Neighborhood names. This information was transformed into the correct format and used to loop through all the neighborhoods of Toronto to extract the necessary information to create a Pandas dataframe that contains the following columns: 'Neighborhood', 'Neighborhood Latitude', 'Neighborhood Longitude', 'Venue', 'Venue Latitude', 'Venue Longitude', 'Venue Category'.

RESULTS

In the introduction, we set out to do the following two things:

- Firstly, to find out what categories of food venues are available and a count of a specific category. Let us assume the count signifies market share and popularity

- Secondly, segment and cluster the data into neighborhoods to be useful to make decisions.

The Categories of food-establishments

There were 81 unique categories in the data returned by FOURSQUARE.COM.

Here are the top categories for the food:

Venue Category	Count
Coffee Shop	157
Cafe	89
Restaurant	64
Italian Restaurant	42
Bakery	33
Japanese Restaurant	33
Pizza Place	29
Seafood Restaurant	25
American Restaurant	23
Gastropub	23
Sandwich Place	23
Thai Restaurant	23
Sushi Restaurant	21
Diner	19
Vegetarian / Vegan Restaurant	18
Breakfast Spot	17
Dessert Shop	15
Greek Restaurant	15
Ice Cream Shop	15
Burger Joint	13
Steakhouse	13
Brewery	12
Deli / Bodega	12
Mexican Restaurant	12

Asian Restaurant	11
Chinese Restaurant	10
French Restaurant	10
Fried Chicken Joint	10
Tea Room	10
Wine Bar	10
Bubble Tea Shop	9

And some of the establishments of which there are only a few counted:

Dumpling Restaurant	3
Donut Shop	2

(I thought with all the other types of venues out of the way, there would be a clear cut winner: that the dumpling restaurants would be victorious! However, this was not the case.)

Please refer to Addendum A for all 81 Categories.

Venue data Segmented and clustered into neighborhoods
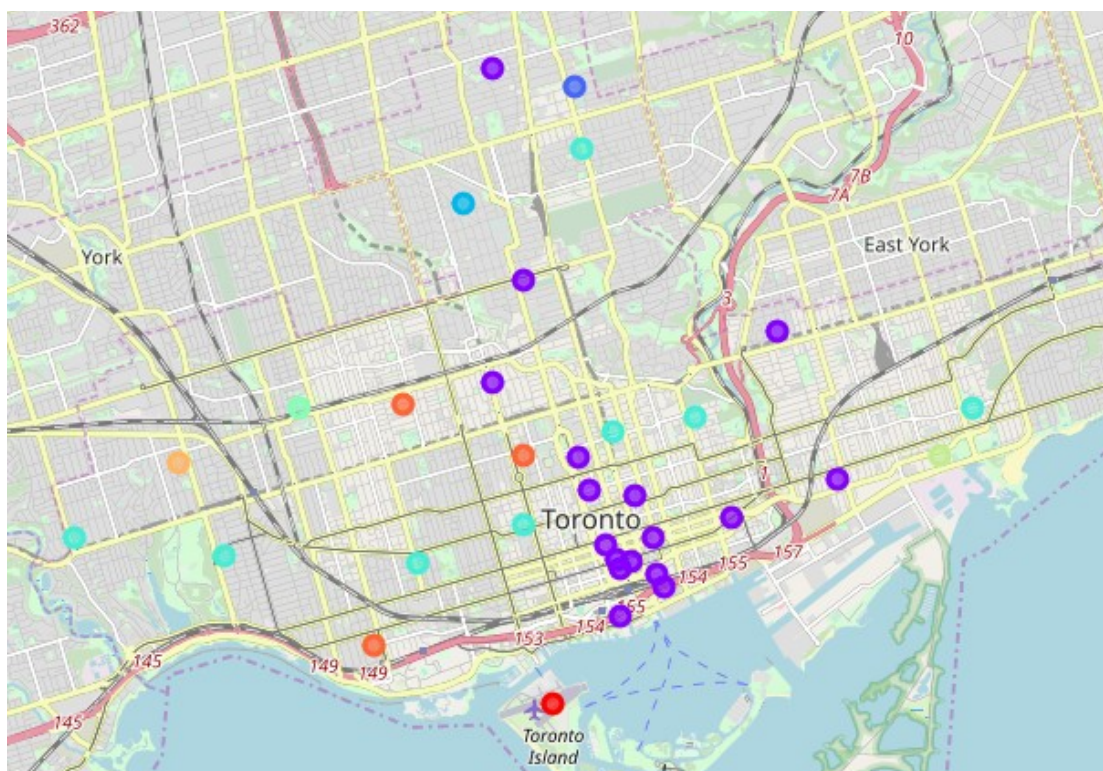
The north to south grouping of purple-colored Neighborhood – Cluster 2 . it is also the city centre

Here we find an abundance of Coffee shops and Cafe's.

	Neighborhood	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
41	The Danforth West,Riverdale	1	Greek Restaurant	Coffee Shop	Italian Restaurant	Ice Cream Shop	Bubble Tea Shop	Diner	Juice Bar	Pizza Place	Caribbean Restaurant	Café
43	Studio District	1	Café	Coffee Shop	American Restaurant	Bakery	Gastropub	Brewery	Sandwich Place	Comfort Food Restaurant	Middle Eastern Restaurant	Italian Restaurant
46	North Toronto West	1	Coffee Shop	Diner	Chinese Restaurant	Fast Food Restaurant	Mexican Restaurant	Café	Restaurant	Dessert Shop	Cuban Restaurant	Cupcake Shop
49	Deer Park,Forest Hill SE,Rathnelly,South Hill,...	1	Coffee Shop	Sushi Restaurant	Pizza Place	Burger Joint	Restaurant	Fried Chicken Joint	Vietnamese Restaurant	American Restaurant	Falafel Restaurant	Ethiopian Restaurant
53	Harbourfront	1	Coffee Shop	Mexican Restaurant	Breakfast Spot	Café	Restaurant	Bakery	Dessert Shop	Ice Cream Shop	French Restaurant	Asian Restaurant
54	Ryerson,Garden District	1	Coffee Shop	Middle Eastern Restaurant	Bubble Tea Shop	Japanese Restaurant	Café	Pizza Place	Ramen Restaurant	Restaurant	Fast Food Restaurant	Diner
55	St. James Town	1	Coffee Shop	Café	Restaurant	Italian Restaurant	Bakery	Diner	Breakfast Spot	Creperie	American Restaurant	Japanese Restaurant
56	Berczy Park	1	Coffee Shop	Restaurant	Seafood Restaurant	Café	Bakery	Comfort Food Restaurant	Japanese Restaurant	Diner	Greek Restaurant	Eastern European Restaurant
57	Central Bay Street	1	Coffee Shop	Italian Restaurant	Burger Joint	Sandwich Place	Japanese Restaurant	Thai Restaurant	Bubble Tea Shop	Café	Salad Place	Ice Cream Shop
58	Adelaide,King,Richmond	1	Coffee Shop	Restaurant	Café	Thai Restaurant	Bakery	Steakhouse	Salad Place	Breakfast Spot	Sushi Restaurant	Gastropub
59	Harbourfront East,Toronto Islands,Union Station	1	Coffee Shop	Italian Restaurant	Café	Restaurant	Brewery	Fried Chicken Joint	Pizza Place	Tea Room	Ice Cream Shop	Indian Restaurant
60	Design Exchange,Toronto Dominion Centre	1	Coffee Shop	Café	Restaurant	Italian Restaurant	Seafood Restaurant	Gastropub	Japanese Restaurant	American Restaurant	Tea Room	Pizza Place
61	Commerce Court,Victoria Hotel	1	Coffee Shop	Restaurant	Café	American Restaurant	Gastropub	Italian Restaurant	Japanese Restaurant	Seafood Restaurant	Deli / Bodega	Bakery
65	The Annex,North Midtown,Yorkville	1	Sandwich Place	Café	Coffee Shop	Donut Shop	American Restaurant	Vegetarian / Vegan Restaurant	Middle Eastern Restaurant	BBQ Joint	Pizza Place	Indian Restaurant
69	Stn A PO Boxes 25 The Esplanade	1	Coffee Shop	Café	Seafood Restaurant	Restaurant	Japanese Restaurant	Creperie	Italian Restaurant	Bakery	Poke Place	Comfort Food Restaurant
70	First Canadian Place,Underground city	1	Coffee Shop	Café	Restaurant	Gastropub	Steakhouse	Seafood Restaurant	Japanese Restaurant	Asian Restaurant	American Restaurant	Deli / Bodega
85	Queen's Park	1	Coffee Shop	Wings Joint	Sandwich Place	Burger Joint	Burrito Place	Café	Creperie	Diner	Indian Restaurant	Italian Restaurant

Speaking of Cafe's...

The Cafe-club – cluster 8 (light brown)

	Neighborhood	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
66	Harbord,University of Toronto	8	Café	Japanese Restaurant	Bakery	Restaurant	Chinese Restaurant	Comfort Food Restaurant	Noodle House	Dessert Shop	Italian Restaurant	Sandwich Place
75	Christie	8	Café	Coffee Shop	Restaurant	Diner	Italian Restaurant	Donut Shop	Cuban Restaurant	Cupcake Shop	Deli / Bodega	Dessert Shop
78	Brockton,Exhibition Place,Parkdale Village	8	Café	Coffee Shop	Breakfast Spot	Bakery	Burrito Place	Restaurant	Italian Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant

These three neighborhoods form a triangle to the west of Toronto with "Brocton,Exihition Place, Parkdale Village" to the far South-West.

This seems right, taking into account that one of the neighborhoods is most probably a student community.

Dumplings, donuts and doner Clusters

Then there are 2 clusters with all-together 3 Neighborhoods – Clusters 3 and 4. that contains Dumpling Restaurants, Doner and Donut Shop.

Cluster 3 - Davisville North

(Medium blue, North on the map) Northern Suburb - with Dumpling Restaurant, Doner and Donut Shop .

	Neighborhood	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
45	Davisville North	2	Breakfast Spot	Sandwich Place	Dumpling Restaurant	Cuban Restaurant	Cupcake Shop	Deli / Bodega	Dessert Shop	Diner	Doner Restaurant	Donut Shop

Cluster 4 – Forest Hill North, Forest Hill West

(Light blue, in the middle of the map.) Northern Suburb - with Dumpling Restaurant, Doner and Donut Shop . This was the "standard neighborhood" with a previous analysis with all venues.

	Neighborhood	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
64	Forest Hill North,Forest Hill West	3	Sushi Restaurant	Wings Joint	Dumpling Restaurant	Creperie	Cuban Restaurant	Cupcake Shop	Deli / Bodega	Dessert Shop	Diner	Doner Restaurant

Cluster 8 - High Park, The Junction South - The restaurant cluster

(Faded Orange - to the West of the city) – These neighborhoods have 4 "proper" categories of restaurants Mexican, Thai, Cajun/Creole and Italian.

	Neighborhood	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
82	High Park,The Junction South	7	Mexican Restaurant	Thai Restaurant	Café	Fried Chicken Joint	Fast Food Restaurant	Gastropub	Bakery	Cajun / Creole Restaurant	Italian Restaurant	Diner

Cluster 6 - Dowercourt Village, Dufferin - The baker and the Brewer

(Light Turqouise, North West of the city) These neighborhoods have a bakery and a brewery as the star attractions.

	Neighborhood	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
76	Dovercourt Village,Dufferin	5	Bakery	Brewery	Coffee Shop	Café	Middle Eastern Restaurant	Fast Food Restaurant	Doner Restaurant	Cupcake Shop	Food	Deli / Bodega

Cluster 1 - CN Tower, Bathurst Quay, Island Ariport, harbour - Harbourlights

(Reddish in the South) 4 "neighborhood" with airport, harbour.

	Neighborhood	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
68	CN Tower,Bathurst Quay,Island airport,Harbourf...	0	Coffee Shop	Comfort Food Restaurant	Creperie	Cuban Restaurant	Cupcake Shop	Deli / Bodega	Dessert Shop	Diner	Doner Restaurant	Donut Shop

Cluster 7 - Business Reply Centre – Beer and Pizza

	Neighborhood	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
87	Business Reply Mail Processing Centre 969 Eastern	6	Brewery	Pizza Place	Fast Food Restaurant	Burrito Place	Restaurant	Doner Restaurant	Cuban Restaurant	Cupcake Shop	Deli / Bodega	Dessert Shop

The "wave" of turquoise-colored neighborhood running East to West – Cluster 5

	Neighborhood	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
42	The Beaches West,India Bazaar	4	Ice Cream Shop	Fast Food Restaurant	Fish & Chips Shop	Sushi Restaurant	Steakhouse	Pizza Place	Burrito Place	Sandwich Place	Italian Restaurant	Restaurant
47	Davisville	4	Sandwich Place	Dessert Shop	Sushi Restaurant	Coffee Shop	Café	Italian Restaurant	Pizza Place	Seafood Restaurant	Greek Restaurant	Restaurant
51	Cabbagetown,St. James Town	4	Restaurant	Coffee Shop	Italian Restaurant	Chinese Restaurant	Café	Bakery	Pizza Place	Gastropub	Caribbean Restaurant	Indian Restaurant
52	Church and Wellesley	4	Japanese Restaurant	Coffee Shop	Restaurant	Sushi Restaurant	Mediterranean Restaurant	Café	Gastropub	Juice Bar	Italian Restaurant	Indian Restaurant
67	Chinatown,Grange Park,Kensington Market	4	Vietnamese Restaurant	Café	Vegetarian / Vegan Restaurant	Coffee Shop	Dumpling Restaurant	Mexican Restaurant	Dessert Shop	Burger Joint	Chinese Restaurant	Bakery
77	Little Portugal,Trinity	4	Asian Restaurant	Coffee Shop	Restaurant	Vietnamese Restaurant	Pizza Place	Café	Deli / Bodega	Mac & Cheese Joint	Japanese Restaurant	Italian Restaurant
83	Parkdale,Roncesvalles	4	Coffee Shop	Eastern European Restaurant	Cuban Restaurant	Dessert Shop	Restaurant	Italian Restaurant	Breakfast Spot	Empanada Restaurant	Ethiopian Restaurant	Falafel Restaurant
84	Runnymede,Swansea	4	Coffee Shop	Café	Sushi Restaurant	Pizza Place	Italian Restaurant	Restaurant	Gastropub	Juice Bar	Falafel Restaurant	Burrito Place

There are 8 Neighborhoods in a wave pattern parallel and close to the sea. Here is a good mix of everything.

DISCUSSIONS

We will discuss the categories and the clusters together - where possible.

- **Coffee shops**

From the list of unique categories and their respective counts, coffee shops are at the top of the list with 157 occurrences.

This corresponds with the North to South grouping of purple-colored neighborhoods with 18 neighborhoods (cluster 2) where "coffee shop" is Number 1 in 14 neighborhoods , Number 2 in 2 neighborhoods and Number 3 in 1 neighborhood.

- **Cafe's**

Cafe's are second on the list with just a little bit more than half of the count of coffee shops at 89. Again there are plenty in the North South Cluster.

This is not surprising – because the North-South Cluster is in the City Centre.

We named one of the clusters, the "Cafe-club", because Cafe's feature at #1 in all three of the neighborhoods. This is probably due to these neighborhoods being around the University.

- **Dumplings, Donuts and Doners**

In a previous analysis, where all categories of venues were clustered (incl parks, trails,etc.), it was found that many of the neighborhoods contained dumpling restaurants[1], donut shops and doner restaurants[2]. There are 2 clusters with all-together 3 neighborhoods – Clusters 3 and 4. These neighborhoods display those characteristics. It was surprising to discover that the count for these categories were 3, 2, 1 respectively.

- **Restaurants**

There are 64 restaurants in the category "restaurants", followed by 42 "Italian restaurants".

Cluster 8 (High Park, The Junction South, West of the city) have 4 "proper" categories of restaurants – Mexican, Thai, Cajun/Creole and Italian.

- **Bakeries**

There are 33 Bakeries in Toronto.

Of interest, Cluster 6 (Dowercourt Village, Dufferin) has a bakery and a brewery as the star attractions.

- **Harbourlights**

At the very South, in the harbour, Cluster 1 consisted of the neighborhoods: CN Tower, Bathurst Quay, Island Ariport, harbour.

- **Beer and Pizza**

To the very East, we find one "neighborhood" "Business Reply Centre" in Cluster 7. It is a post code used for mass-mailing. However, in the vicinity of the location, we find venues where you can find "on the run-food" - Pizza, Buritos, cupcakes, Delis, Dessert shops.

- **A bit of everything**

Last but not least: the "wave" of 8 turquoise-colored neighborhoods running East to West (Cluster 5) with a good mixture of food venues.

CONCLUSIONS

We have counted all the categories of food venues and thereafter clustered and segmented them into neighborhoods.

In conclusion, ones does not have to go far to get a coffee shop in the North-South grouping of neighborhoods. Is it a case of too many coffee shops? Or do these people really love their coffee?

Cafe's are also everywhere to be found.

Restaurants range from 42 Italian Restaurants to 1 "Molecular Gastronomy Restaurant"[3] with 64 only classified as "restaurant".

The "wave" of torquoise-colored neighborhoods might be a good environment to open a food venue as there are a great variety of food venues in the 8 neighborhoods from East to West.

Hopefully, you now have a better understanding of Toronto's food establishments.

1 https://en.wikipedia.org/wiki/Dumpling

2 https://en.wikipedia.org/wiki/Doner_kebab

3 https://en.wikipedia.org/wiki/Molecular_gastronomy

ADDENDUM A. Unique "food"-categories.

Venue Category	Count
Coffee Shop	157
Cafe	89
Restaurant	64
Italian Restaurant	42
Bakery	33
Japanese Restaurant	33
Pizza Place	29
Seafood Restaurant	25
American Restaurant	23
Gastropub	23
Sandwich Place	23
Thai Restaurant	23
Sushi Restaurant	21
Diner	19
Vegetarian / Vegan Restaurant	18
Breakfast Spot	17
Dessert Shop	15
Greek Restaurant	15
Ice Cream Shop	15
Burger Joint	13
Steakhouse	13
Brewery	12
Deli / Bodega	12
Mexican Restaurant	12
Asian Restaurant	11
Chinese Restaurant	10
French Restaurant	10
Fried Chicken Joint	10
Tea Room	10
Wine Bar	10
Bubble Tea Shop	9
Burrito Place	9

Fast Food Restaurant	9
Juice Bar	9
Middle Eastern Restaurant	9
Salad Place	9
Vietnamese Restaurant	9
Comfort Food Restaurant	7
Creperie	7
Indian Restaurant	7
New American Restaurant	7
Ramen Restaurant	6
BBQ Joint	5
Latin American Restaurant	5
Poke Place	5
Bistro	4
Caribbean Restaurant	4
Mediterranean Restaurant	4
Noodle House	4
Bagel Shop	3
Dumpling Restaurant	3
Eastern European Restaurant	3
Fish & Chips Shop	3
Food Truck	3
Gluten-free Restaurant	3
Korean Restaurant	3
Brazilian Restaurant	2
Colombian Restaurant	2
Cuban Restaurant	2
Donut Shop	2
Ethiopian Restaurant	2
Falafel Restaurant	2
Modern European Restaurant	2
Poutine Place	2
Wings Joint	2
Afghan Restaurant	1
Belgian Restaurant	1

Cajun / Creole Restaurant	1
Cupcake Shop	1
Doner Restaurant	1
Empanada Restaurant	1
Filipino Restaurant	1
Food	1
Frozen Yogurt Shop	1
German Restaurant	1
Mac & Cheese Joint	1
Molecular Gastronomy Restaurant	1
Polish Restaurant	1
Snack Place	1
Taiwanese Restaurant	1
Theme Restaurant	1