

TORONTO NEIGHBORHOOD DEMOGRAPHICS AND THE POTENTIAL FOR RESTAURANT GROWTH

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PROJECT SUMMARY

- Combine Demographic data about the Neighborhoods of Toronto combined with Foursquare venue data to
 - Profile each neighborhood and
 - Allow users to study relevant demographic factors that determine whether a new restaurant will succeed in a given location.

PRE PROCESSING DEMOGRAPHIC DATA

Before:

Out[86]:

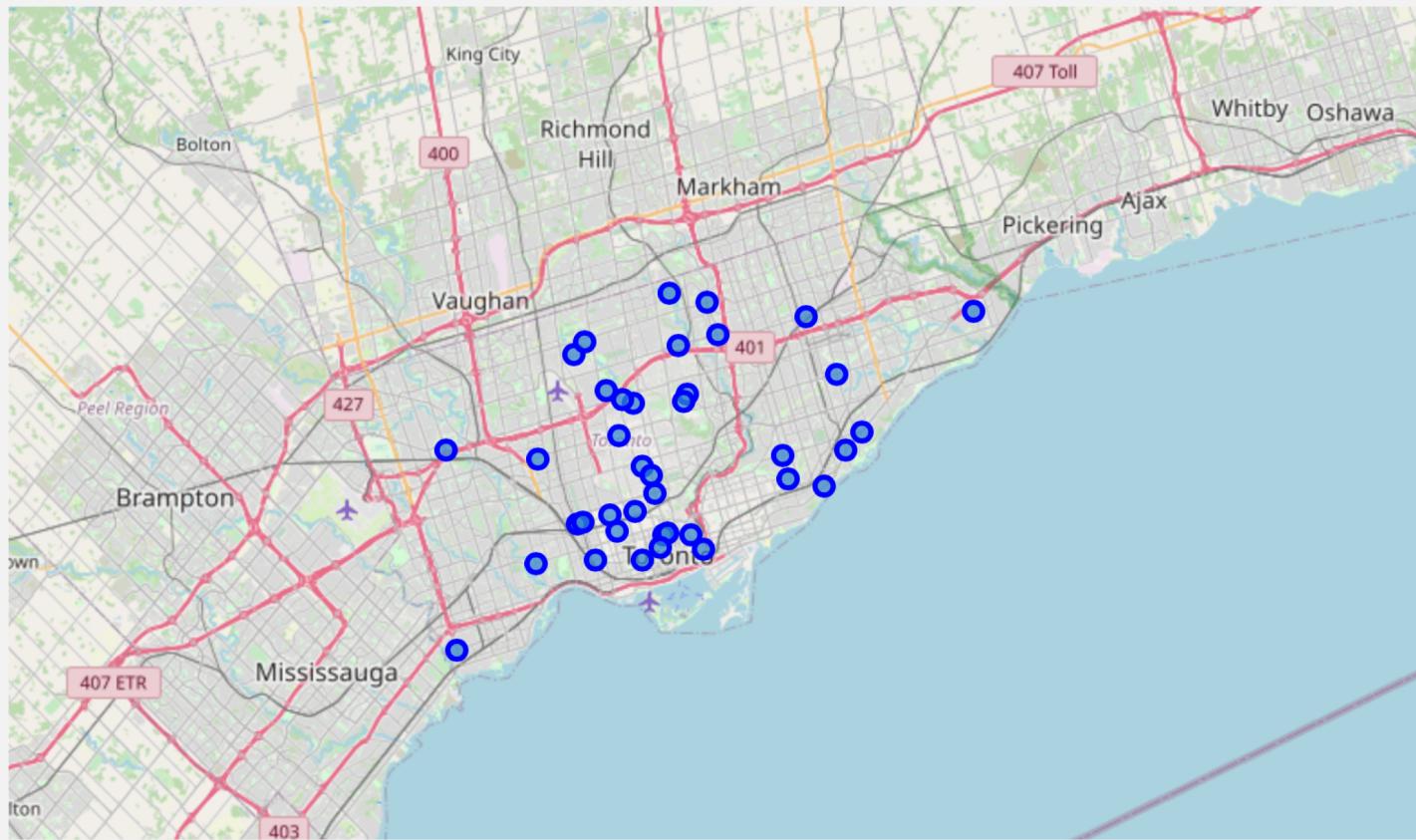
| | Name | FM | Census Tracts | Population | Land area (km2) | Density (people/km2) | % Change in Population since 2001 | Average Income | Transit Commuting % | % Renters | Second most common language (after English) by name | Second most common language (after English) by percentage | Map |
|---|---------------------|------|---|------------|-----------------|----------------------|-----------------------------------|----------------|---------------------|-----------|---|---|-----|
| 0 | Toronto CMA Average | NaN | All | 5113149 | 5903.63 | 866 | 9.0 | 40704 | 10.6 | 11.4 | NaN | NaN | NaN |
| 1 | Agincourt | S | 0377.01, 0377.02, 0377.03, 0377.04, 0378.02, 0... | 44577 | 12.45 | 3580 | 4.6 | 25750 | 11.1 | 5.9 | Cantonese (19.3%) | 19.3% Cantonese | NaN |
| 2 | Alderwood | E | 0211.00, 0212.00 | 11656 | 4.94 | 2360 | -4.0 | 35239 | 8.8 | 8.5 | Polish (6.2%) | 06.2% Polish | NaN |
| 3 | Alexandra Park | OCoT | 0039.00 | 4355 | 0.32 | 13609 | 0.0 | 19687 | 13.8 | 28.0 | Cantonese (17.9%) | 17.9% Cantonese | NaN |
| 4 | Allenby | OCoT | 0140.00 | 2513 | 0.58 | 4333 | -1.0 | 245592 | 5.2 | 3.4 | Russian (1.4%) | 01.4% Russian | NaN |

After: some useful information about the size and affluence of neighborhood. Also, we keep the ethnic information.

Out[89]:

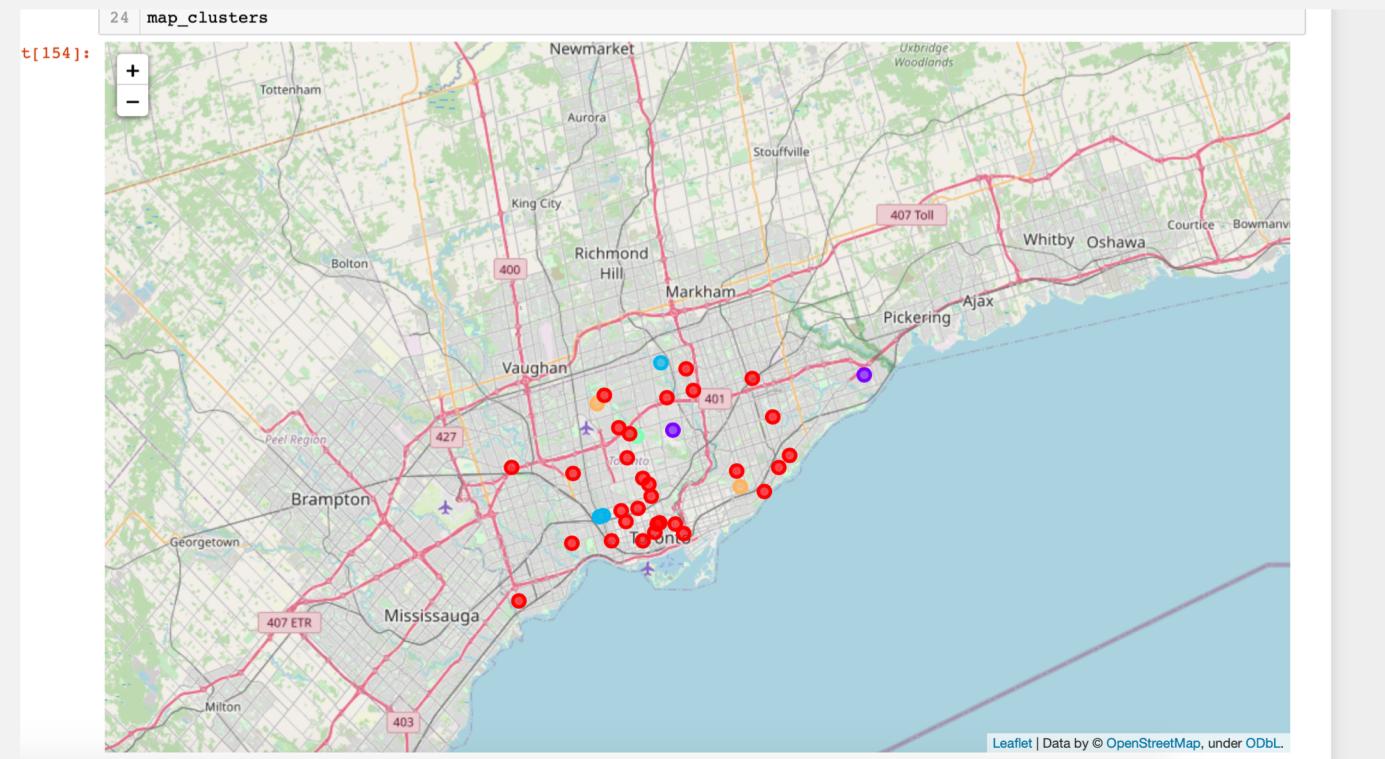
| | Name | Population | Average Income | Transit Commuting % | % Renters | 2nd language |
|---|----------------|------------|----------------|---------------------|-----------|-------------------|
| 1 | Agincourt | 44577 | 25750 | 11.1 | 5.9 | Cantonese (19.3%) |
| 2 | Alderwood | 11656 | 35239 | 8.8 | 8.5 | Polish (6.2%) |
| 3 | Alexandra Park | 4355 | 19687 | 13.8 | 28.0 | Cantonese (17.9%) |
| 4 | Allenby | 2513 | 245592 | 5.2 | 3.4 | Russian (1.4%) |
| 5 | Amesbury | 17318 | 27546 | 16.4 | 19.7 | Spanish (6.1%) |

MAP OF TORONTO NEIGHBORHOODS USING FOURSQUARE AGENT AND FOLIUM LIBRARY

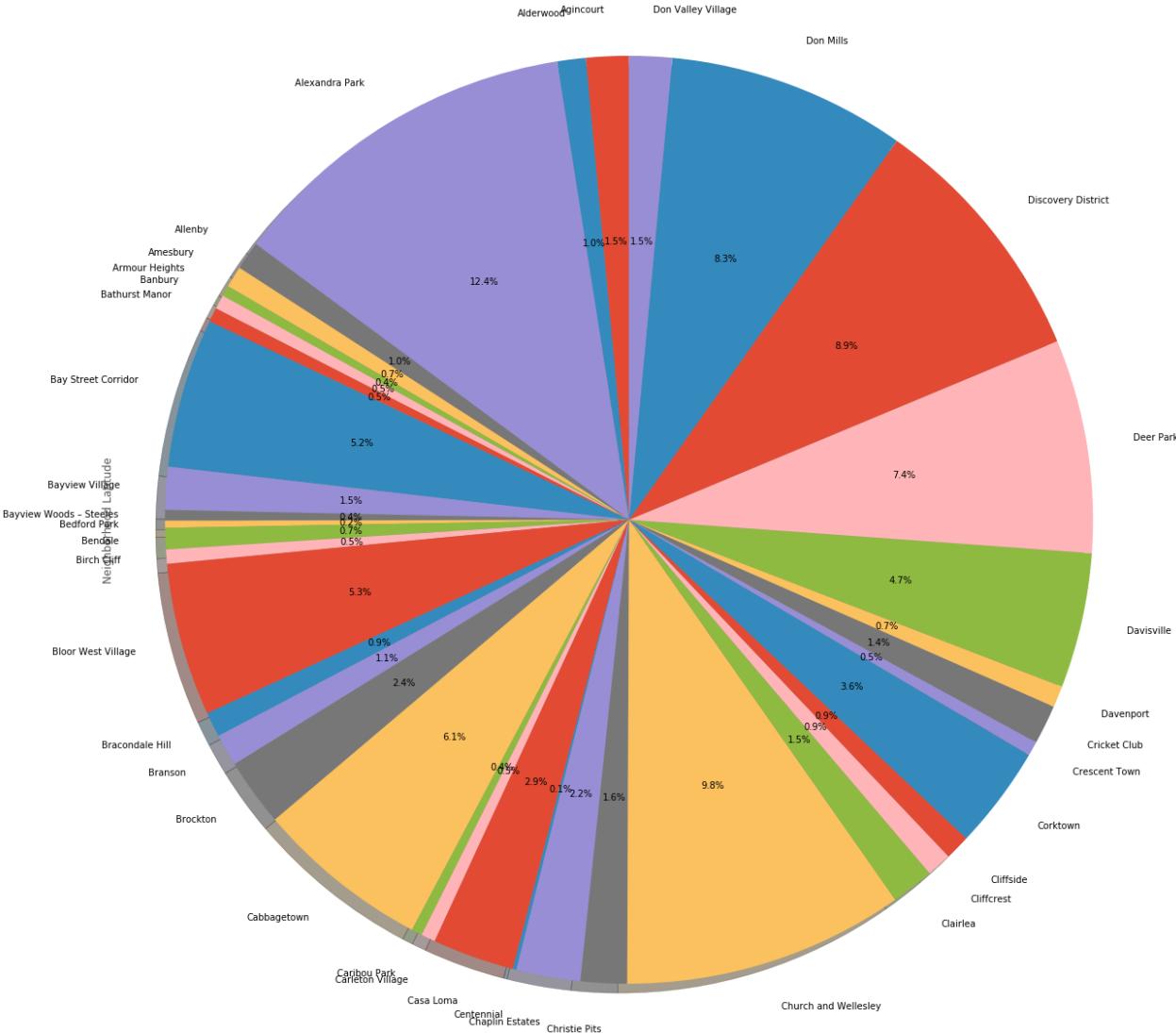


K-MEANS CLUSTERING ON VENUE DATA. THE MAP IDENTIFYING THE CLUSTERS THAT RESULTS

Similar to the work done in class for New York, we generated 5 clusters based on the venue profiles using k-means. Here's the resulting map of clusters.



GETTING NEIGHBORHOOD VENUE DATA FROM FOURSQUARE



Using the methods from class, we generated a data frame of all the venues of Toronto. Then we clustered them, counted them for each neighborhood, and generated a pie chart of all the neighborhoods and the % of venues that appear in the neighborhood.

K-MEANS CLUSTERING OF NEIGHBORHOOD VENUE PROFILE

Again using the same methods we used in class for New York, we applied k-means cluster to try to identify neighborhoods with a similar venue profile. Here is the resulting dataframe.

| Name | Population | Average Income | Transit Commuting % | % Renters | 2nd language | lat | long | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|---------------------|------------|----------------|---------------------|-----------|---------------------|-----------|------------|----------------|-----------------------|------------------------|-----------------------|--------------------------|-----------------------|
| Agincourt | 44577 | 25750 | 11.1 | 5.9 | Cantonese | 43.785353 | -79.278549 | 0 | Chinese Restaurant | Coffee Shop | Korean Restaurant | Shopping Mall | Cantonese Restaurant |
| Alderwood | 11656 | 35239 | 8.8 | 8.5 | Polish | 43.601717 | -79.545232 | 0 | Pizza Place | Dance Studio | Pub | Pharmacy | Coffee Shop |
| Alexandra Park | 4355 | 19687 | 13.8 | 28.0 | Cantonese | 43.650758 | -79.404308 | 0 | Bar | Furniture / Home Store | Caribbean Restaurant | Arts & Crafts Store | Coffee Shop |
| Allenby | 2513 | 245592 | 5.2 | 3.4 | Russian | 43.711351 | -79.553424 | 0 | African Restaurant | Bookstore | Restaurant | Big Box Store | Fish Chip Shop |
| Amesbury | 17318 | 27546 | 16.4 | 19.7 | Spanish | 43.706162 | -79.483492 | 0 | Bank | Gas Station | Coffee Shop | Intersection | PA |
| Armour Heights | 4384 | 116651 | 10.8 | 16.1 | Russian | 43.743944 | -79.430851 | 0 | Deli / Bodega | Market | Pharmacy | Yoga Studio | Electronic Store |
| Banbury | 6641 | 92319 | 6.1 | 4.8 | Unspecified Chinese | 43.742796 | -79.369957 | 1 | Park | Auto Garage | Tennis Court | Yoga Studio | Flow Shop |
| Bathurst Manor | 14945 | 34169 | 13.4 | 18.6 | Russian | 43.763893 | -79.456367 | 4 | Convenience Store | Playground | Park | Baseball Field | Yoga Studio |
| Bay Street Corridor | 4787 | 40598 | 17.1 | 49.3 | Mandarin | 43.665272 | -79.387531 | 0 | Sushi Restaurant | Japanese Restaurant | Bubble Tea Shop | Mediterranean Restaurant | Yoga Studio |
| Bayview Village | 12280 | 46752 | 14.4 | 15.6 | Cantonese | 43.769197 | -79.376662 | 0 | Bank | Pizza Place | Sandwich Place | Sporting Goods Shop | Fast Food Restaura |

APPLYING THE MERGED DATA: WHAT NEIGHBORHOODS MIGHT BE ABLE TO SUPPORT A NEW CANTONESE RESTAURANT?

```
In [175]: 1 toronto_merged.loc[toronto_merged['2nd language'] == 'Cantonese ']
2 #toronto_merged['2nd language']
```

Out[175]:

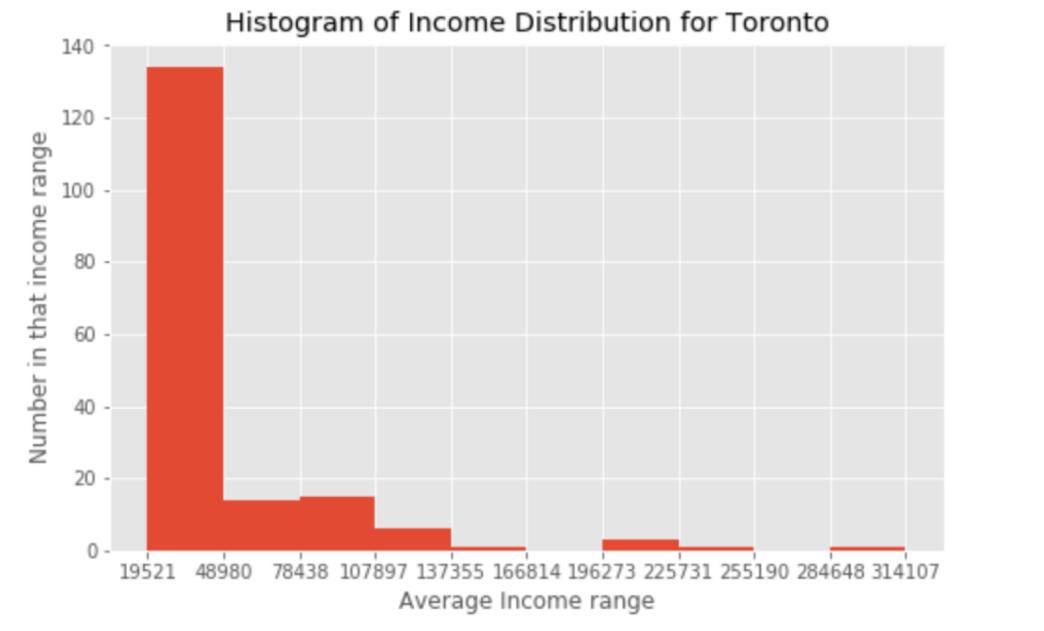
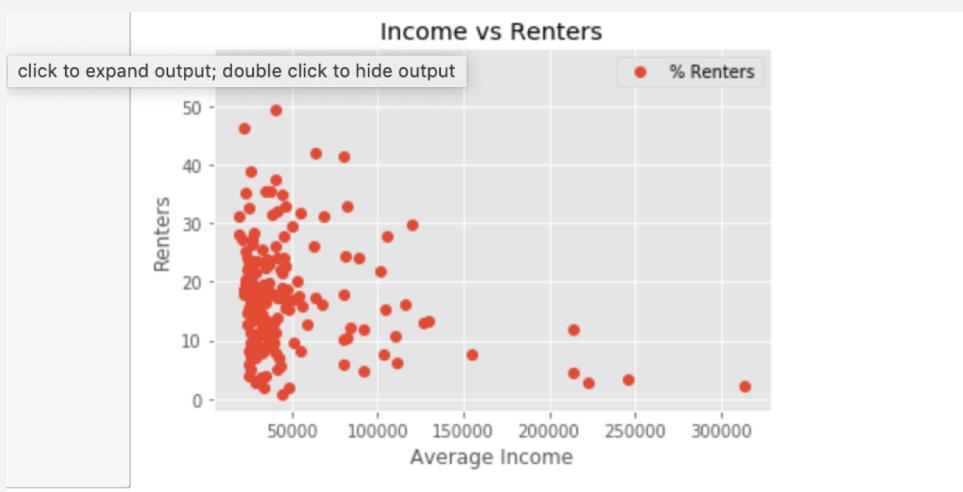
| | Name | Population | Average Income | Transit Commuting % | % Renters | 2nd language | lat | long | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|----|-------------------------|------------|----------------|---------------------|-----------|--------------|-----------|------------|----------------|-----------------------|------------------------|-----------------------|-----------------------------|-----------------------|
| 0 | Agincourt | 44577 | 25750 | 11.1 | 5.9 | Cantonese | 43.785353 | -79.278549 | 0 | Chinese Restaurant | Coffee Shop | Korean Restaurant | Shopping Mall | Cantonese Restaurant |
| 2 | Alexandra Park | 4355 | 19687 | 13.8 | 28.0 | Cantonese | 43.650758 | -79.404308 | 0 | Bar | Furniture / Home Store | Caribbean Restaurant | Arts & Crafts Store | Coffee Shop |
| 9 | Bayview Village | 12280 | 46752 | 14.4 | 15.6 | Cantonese | 43.769197 | -79.376662 | 0 | Bank | Pizza Place | Sandwich Place | Sporting Goods Shop | Fast Food Restaurant |
| 10 | Bayview Woods – Steeles | 13298 | 41485 | 11.2 | 13.9 | Cantonese | 43.798127 | -79.382973 | 2 | Dog Run | Park | Trail | Eastern European Restaurant | Flower Shop |
| 30 | Cliffside | 9386 | 32701 | 14.8 | 11.4 | Cantonese | 43.711170 | -79.248177 | 0 | Pizza Place | Pub | Coffee Shop | Grocery Store | Park |

```
In [154]: 1 import matplotlib.cm as cm
```

Here are the neighborhoods that identify Cantonese as their second most spoken languages, taken from the demographic data, merged with the Foursquare venue data. From this query, one might conclude that neighborhoods other than Agincourt might be better suited to support a new Cantonese restaurant, because they don't include Chinese restaurants in their list of most common venues.

STATISTICS FROM THE DEMOGRAPHIC DATA: HISTOGRAMS

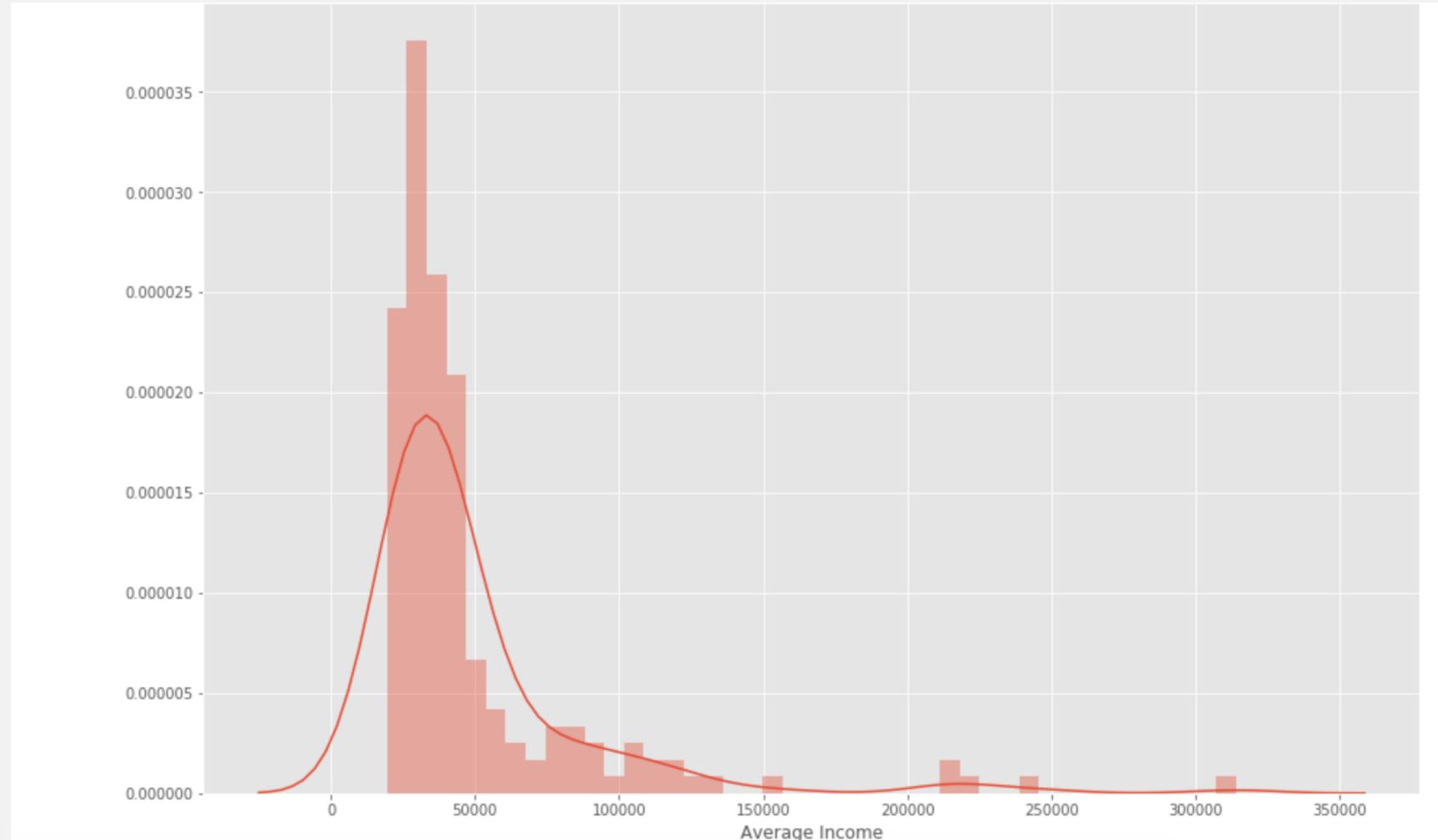
Income Distribution



Correlating Income with whether a Toronto resident rents.

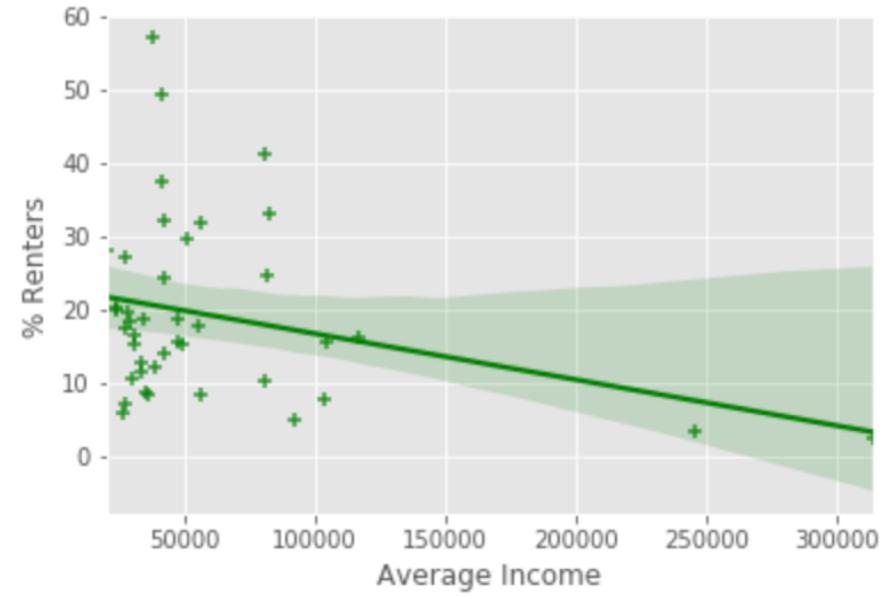
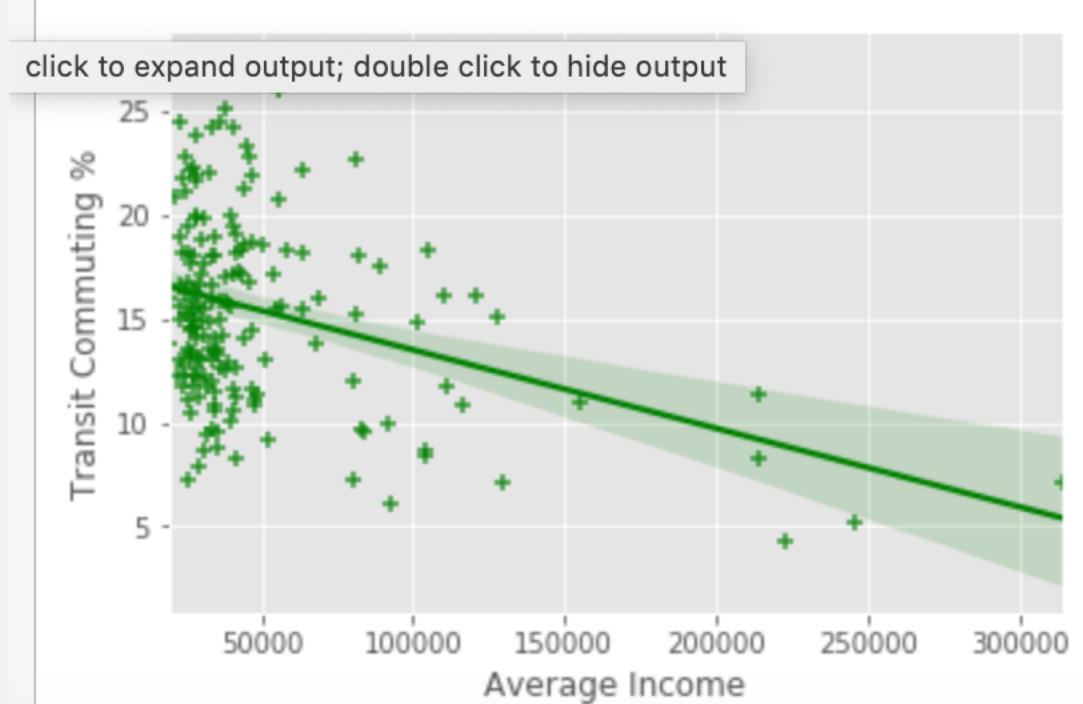
INCOME DISTRIBUTION: SHOULD I OPEN AN UPSCALE RESTAURANT IN TORONTO?

Using `seabornInstance.distplot` on average income to look at income distribution in Toronto.



LINEAR REGRESSION MODELS BASED ON DEMOGRAPHICS

There's a slight negative correlation between income and whether a Toronto resident rents.



There's a slight negative correlation between income and whether a Toronto resident uses public transportation to get around.

SUMMARY

- Merging Toronto neighborhood demographic data with Foursquare venue data allows one to study how a neighborhood's income and ethnic profile is related to the restaurants in the neighborhood.
- Gaps between the ethnic profile and the list of venues might indicate whether a restaurant of a given ethnic type and price range can be supported by a neighborhood.
- Much more work should be done to isolate the most important factors and build predictive models of Toronto neighborhoods.