

**Exploring venues in
Toronto, Canada and the correlation with
Apartment Rental Price**

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1. Problem

This project purposed to find out what factors are affecting the rental price of g in Toronto and to analyse the rental price in a statistical approach. A quantitative model could be built by the finding and provide insight into the rental market In Toronto.

2. Introduction

2.1 Background

Toronto is the most populous city in Canada, with an urban agglomeration of over 9,000,000 people, it is home to the Toronto Stock Exchange, meanwhile economy is highly diversified in technology, design and financial services. With these highly developed natures and the huge size population, the demand for housing has never decreased. Analysis of the rental price in a statistical approach would benefit people who are looking for renting an apartment in Downtown Toronto with more completed information and helping them make a better decision.

2.2 Interested audience

The target audience for such a project is a person who would like to rent an apartment in Downtown Toronto, can use the research from this project to quickly select places that suit their budget and requirement. As well as the house owner who would like to lease their house would use this research to set their rental price for the apartment.

3. Data

3.1 Data Source

This report mainly used a Dataset ‘Toronto Apartment Rental Price’ by Raja CSP in Kaggle on 2018 for information of rental price and apartments, as well as a Python API ‘Foursquare’ for geography information, all data would be prepared and cleaned by the researcher. In this project, factors including room numbers, location and nearly facilities would be analysed, compared and segmented. Correlation between rental prices and factors would be calculated. At the end of the project, a quantitative model would be built to provide further insight.

From Foursquare API (<http://developer.foursquare.com/api>), researcher retrieved the following for each venue:

- Name: The name of the venue
- Location: The latitude and longitude of the venue
- Category: The category type of the venue

From ‘Toronto Apartment Rental Price’ data set (<https://www.kaggle.com/rajacsp/toronto-apartment-price>), research retrieved the following for each house:

- Address: Full address of the apartment
- Bedroom number: The number of bedroom/bedrooms the apartment has
- Bathroom number: The number of bathroom/bathrooms the apartment has
- Location: The latitude and longitude of the apartment
- Rental Price: The rental price for the apartment per month in CAD

3.2 Data Cleaning

Figure 1 is visually presenting the data of apartment for rent in Toronto, the researcher has removed 204 data which outside the area as shown in the figure, as well as 13 outlier data with extreme higher and lower price, the total number of the data set decreased from 1,124 to 907. As we can see, the apartment for rental is mostly located in the Downtown area of Toronto, therefore, in the following part, the researcher decided to retrieved venues around this area.



Figure 1: Apartment retrieved from ‘Toronto Apartment Rental Price’ data set

In figure 2, venues close to Downtown Toronto has retrieved and categorised by two main categories, Business and Tourist. The blue icons are representing business venues, and the green icons are representing tourist venues.



Figure 2: Venues retrieved from Foursquare API

The detail of the categories are as follow:

Business Venues:

- Food: Coffee shop, Café and Sandwich Place etc.
- Shop and Service: Mall, Plaza and Home Store etc.
- Travel and Transport: Airport, Train Station and Trail etc.

Tourist Venues:

- Arts & Entertainment: Art Gallery, Concert Hall and Performing Arts Venue etc.
- Nightlife Spot: Bar and Gastropub
- Outdoors & Recreation: Lake, Beach and Scenic Lookout etc.

To combine two data sets, the researcher calculates the number of nearby venues within one kilometre for each apartment, the final data set has 907 rows and have 8 columns as described in figure 3.

	Bedroom	Bathroom	Den	Address	Lat	Long	Price	Business Venue	Tourist Venue
1	1	1.0	1	361 Front St W, Toronto, ON M5V 3R5, Canada	43.643051	-79.391643	2150.0	11	121
2	1	1.0	0	89 McGill Street, Toronto, ON, M5B 0B1	43.660605	-79.378635	1950.0	1	45
3	2	2.0	0	10 York Street, Toronto, ON, M5J 0E1	43.641087	-79.381405	2900.0	28	19
4	1	1.0	0	80 St Patrick St, Toronto, ON M5T 2X6, Canada	43.652487	-79.389622	1800.0	21	105
5	1	1.0	0	87 Jameson Avenue, Toronto, ON, M6K 2W8	43.634890	-79.434654	1729.0	0	0

Figure 3: Final data aggregated from both data sets

Also, the two data set have combined visually on the map as shown in figure 4. For further analysis, the map is interacted in HTML format and can check the price and address for a rental apartment, also name and category for the venues.



Figure 4: A combined map for apartments (red-point) and venues(blue and green icon)

4. Methodology and Data Set Analysis

In the beginning, data was cleaned and prepared, the apartment data set was loaded and narrowed down to the downtown area of Toronto, also, outlier which having extreme higher and lowers rental price was removed. Second, the location data from the Foursquare API for all venue up to a distance of 4 kilometres from downtown Toronto was extracted, using this, the venue information including location, name and category was fetched.

After cleaning and preparing the data, the following steps were performed. Firstly, the researcher applied some basic exploratory analysis to both data set for the location of each apartment and borough on the map. And visually inspect some values in the data with charts. Thereafter, reduced the number of the data set and transform into data frame format. Finally, built the model by cluster analysis to find the result.

4.1 Rental Price

Next, the rental price for the apartment in Downtown Toronto was explored. As shown in figure 5, most rental prices are around 2,000 CAD. The range is from 550 - 4,900 CAD. The mean of the rental price is 2,236.39 CAD, with standard deviation in 661.51 CAD.

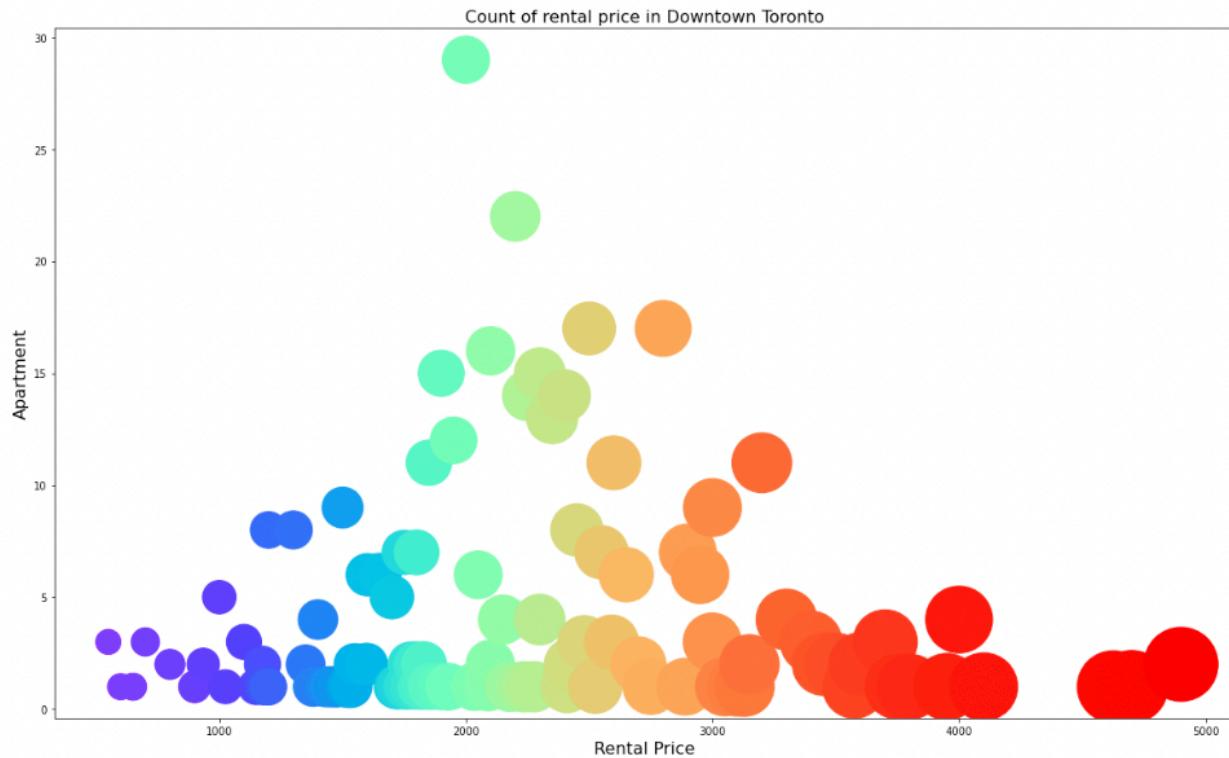


Figure 5: Count of the rental price in Downtown Toronto

4.2 Venue Categorie

From figure 6, the majority of venues in Downtown Toronto are Park. Followed by Coffee shops. Which shows that there are lots of green spaces in the area, as well as resting places for a cup of coffee.

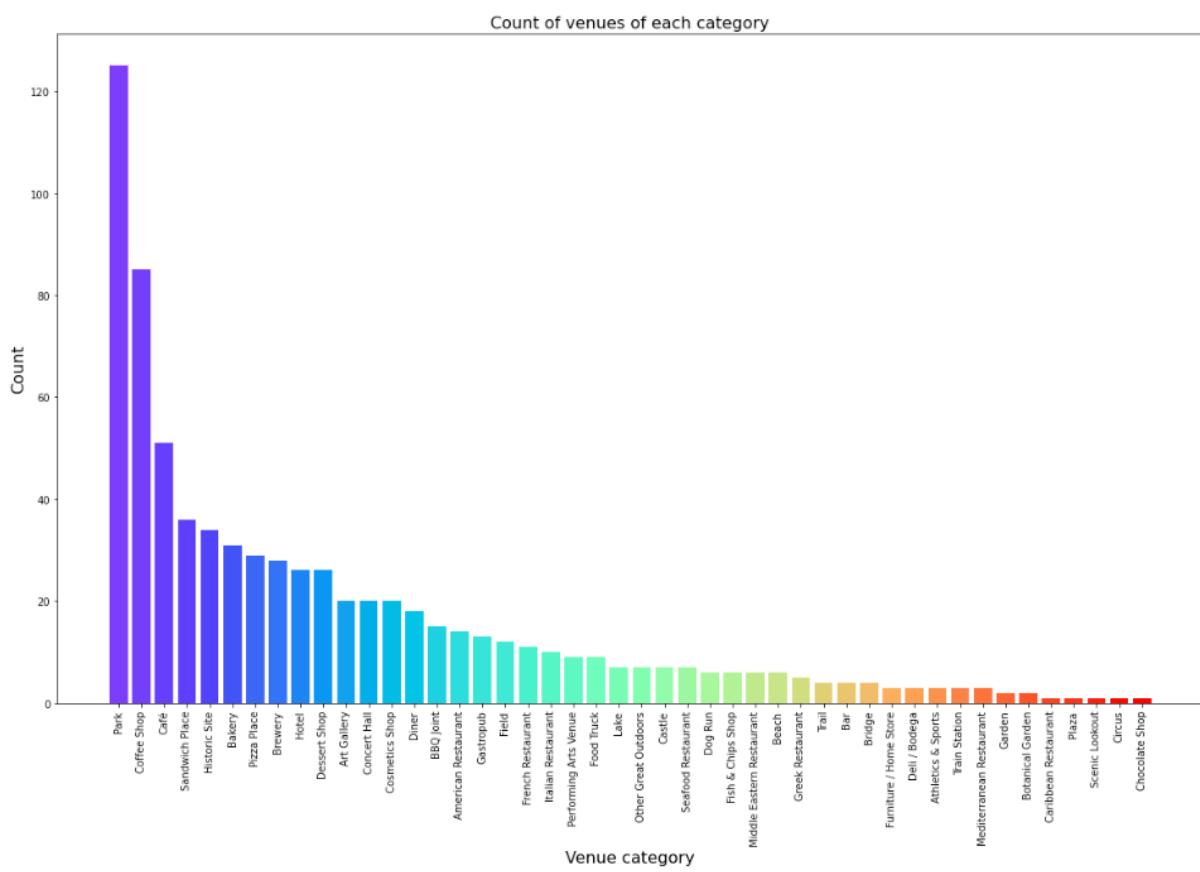


Figure 6: Count of venues of each category

4.3. Correlation between difference feature and apartment rental price

To create a better model, the correlation between price and features includes the number of bedrooms, the number of bathrooms, having den or not, the number of nearby business venues and number of nearby tourist venues are calculated, the result is described at figure 7.

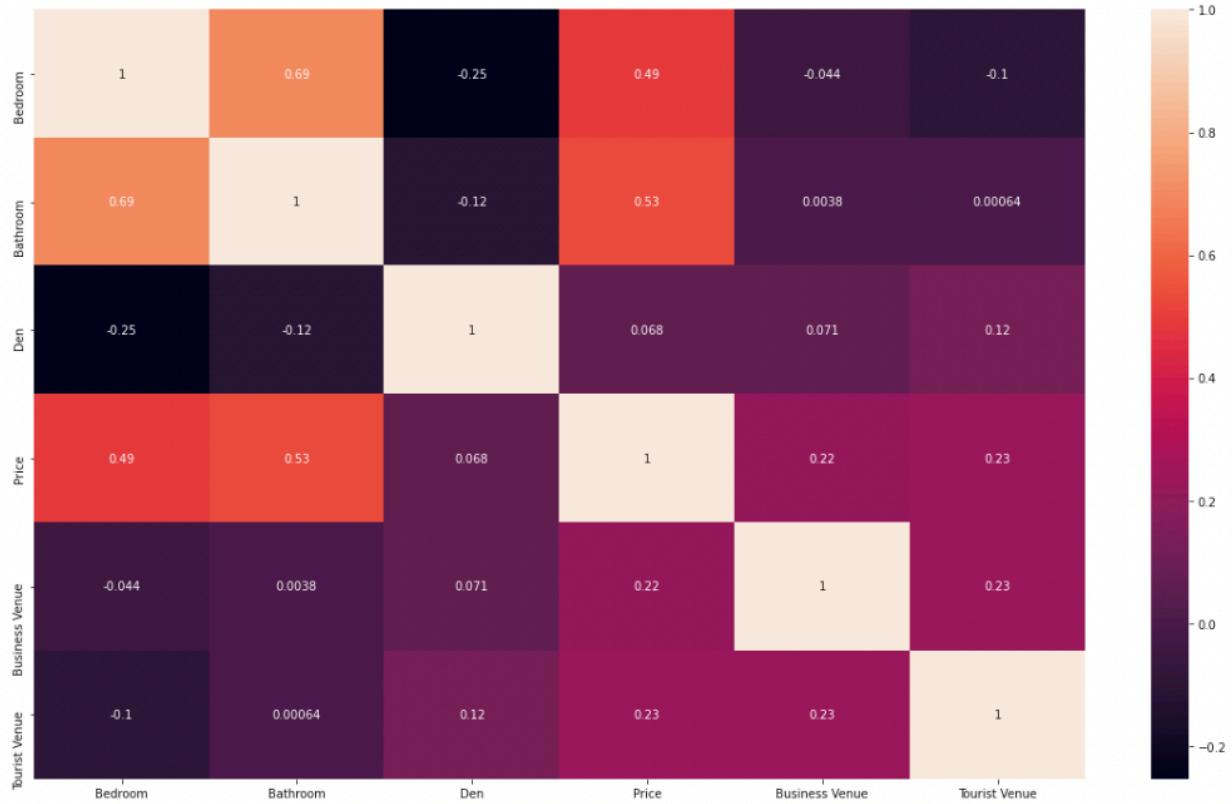


Figure 7: Heat-map for correlation between the rental price and each functor.

5. Clustering for analysis

Finally, the researcher clustered all apartment based on their features to identify the relationship amongst them. K-Means clustering is used and separated into three groups.

5.1 Cluster 0

The first cluster had 177 counts, with a mean price in 3,229 CAD, around 2 rooms and 2 bathrooms, around 14 nearby business Venues and 55 nearby tourist venues.

Cluster 0										
	cluster_labels	Bedroom	Bathroom	Den	Lat	Long	Price	Business Venue	Tourist Venue	
count	177.0	177.000000	177.000000	177.000000	177.000000	177.000000	177.000000	177.000000	177.000000	177.000000
mean	0.0	1.909605	1.748588	0.062147	43.650359	-79.385902	3229.169492	14.203390	54.598870	

Figure 8: Statistical data from cluster 0

5.2 Cluster 1

The second cluster had 510 counts, also had the largest numbers of the cluster, with a mean price in 2,231 CAD, 1 bedroom and 1 bathroom, around 12 nearby business venues and 55 nearby tourist venues.

Cluster 1										
	cluster_labels	Bedroom	Bathroom	Den	Lat	Long	Price	Business Venue	Tourist Venue	
count	510.0	510.000000	510.000000	510.000000	510.000000	510.000000	510.000000	510.000000	510.000000	510.000000
mean	1.0	1.180392	1.109804	0.229412	43.654234	-79.398373	2231.072549	12.019608	54.913725	

Figure 9: Statistical data from cluster 1

5.3 Cluster 2

The third cluster had 220 counts, with a mean price in 1,449, 1 bedroom and 1 bathroom, around 7 nearby business venues and 27 nearby tourist venues.

Cluster 2										
	cluster_labels	Bedroom	Bathroom	Den	Lat	Long	Price	Business Venue	Tourist Venue	
count	220.0	220.000000	220.000000	220.000000	220.000000	220.000000	220.000000	220.000000	220.000000	220.000000
mean	2.0	1.136364	1.047727	0.045455	43.666635	-79.433541	1449.990909	7.445455	27.113636	

Figure 10: Statistical data from cluster 2

7. Results and Discussion

After collecting data from the Foursquare API and the Kaggle dataset, a list of 907 apartments for rent in downtown Toronto and the nearby venues have been recorded, the researcher had received enough data to inspect their values for analysis pricing along with features like nearby facility and number of different room types.

Moreover, as figure 11 shown, the location seems dose does not have much impact on the rental price, but the numbers of room and numbers of nearby venue did have an impact. However, the correlation is not significant to create a statistical useful model, to increase the proof for statistical usage, more data are required for further investigation.

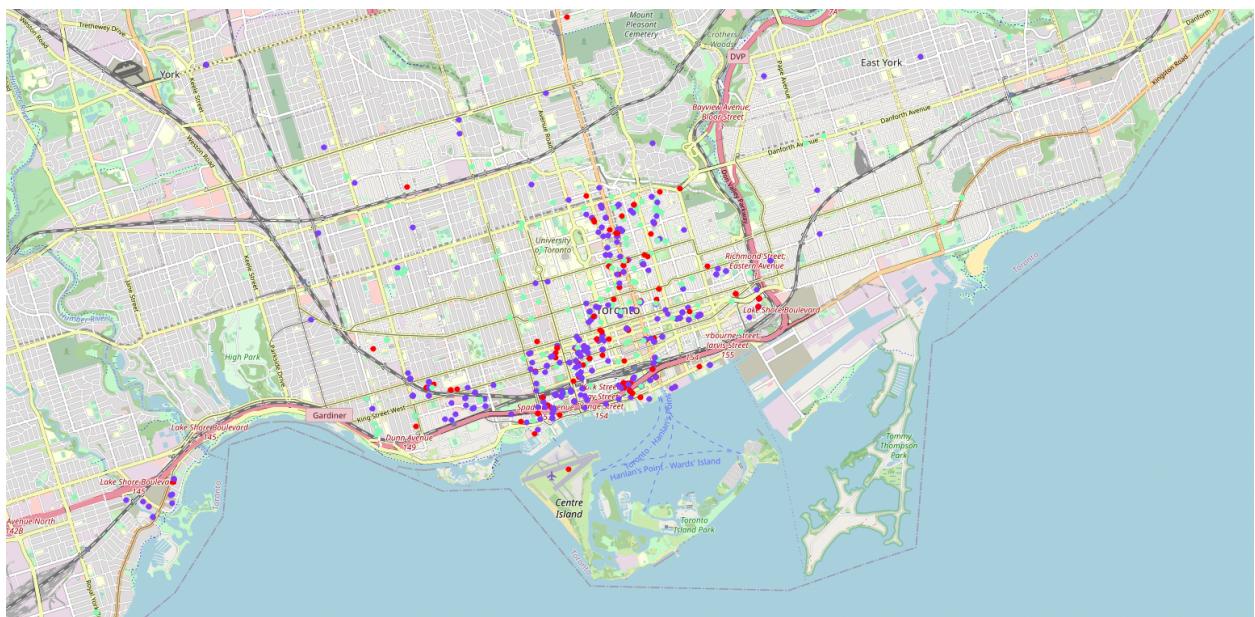


Figure 11: Clustering map

To sum up all findings, Downtown Toronto has a great among of nature places, as the most popular venues are Park. However, if we categorised all food types together, food will become the most popular venues. We can conclude that Downtown Toronto has a balance between city and nature, also is convince for grabbing some food.

7.1 Key Finding

- For tenant and apartment owner, by the results, we can see the majority of the apartment for rent in Downtown Toronto priced around 2,200 CAD, and most of them have 1 bedroom and 1 bathroom, with near 12 nearby business venues and 55 nearby tourist venues.
- If a tenant in Toronto wants a lower rental price apartment, he/she is expected to have less nearby venues but can have a rental price close to 1,449 CAD, while remaining the same 1 bedroom and 1 bathroom configuration.
- In the same case, if the tenant wants a 2 bedroom and 2 bathroom apartment, the rental price is expected to rises to around 3,299 CAD, and still having lots of nearby facility in Downtown Toronto.

8. Conclusion

The purpose of this project was to explore the rental price and feature for an apartment in Downtown Toronto. The nearby venues have been identified using Foursquare API and the information for the rental apartment is collected from a Kaggle dataset, all data have been plotted on the map and analysis in a statistical approach. The findings show three range of rental apartment price came along with their features, the tenant can reference the rental price with their needs and owner of the apartment can also reference the rental price they could offer with the features of their apartment.