

Capstone Project

The Battle of the Neighborhoods

Osaka vs Manhattan

Purpose

- This document provides the details of my final peer reviewed assignment for the IBM Data Science Professional Certificate program –Coursera Capstone. In this project, it is aimed to compare the neighborhoods of Osaka and Manhattan and determine how similar or dissimilar they are.

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Introduction: Business Problem

Osaka is one of the most famous cities in Japan. My friend is moving from **Manhattan**, NY to **Osaka** for a career change.

The topic assumed here is to help her to find a place living in Osaka where the environment is similar to her previous home in Manhattan. In this project, I will cluster the venues of all neighborhoods in both cities and make a comparison to understand the similarity and dissimilarity of them. I will also collect and provide a data driven recommendation about where to eat or visit in Osaka.

Data Acquisition

- Osaka neighborhoods names

Osaka districts names will be retrieved from Wikipedia: <https://en.wikipedia.org/wiki/Osaka>

- Osaka , Manhattan and their neighborhoods location

Data coordinates of Osaka and Manhattan's neighborhood will be retrieved using google API.

- Osaka top Venue recommendations

(Foursquare Category: <https://developer.foursquare.com/docs/resources/categories>)

Osaka and Mahattan's neighborhoods are explored using Foursquare API . The following information are retrieved.

Venue ID

Venue name

Coordinates: Latitude and Longitude

Category names

Venue ratings (Due to the Foursquare access limitation, only 2 types of ratings were retrieved in this project)

Methodology Analysis

- The website information will be retrieved using BeautifulSoup tool.
- Using Pandas for proper cleaning to create a dataframe.
- The locations are marked upon the map to obtain the co-ordinates of the places via the Geocoding API from Google. Combine with FourSquare API which provides venues in different categories of Osaka and Manhattan. The weighted matrix can be applied on 10 top categories with venues information to generate a ranking result.
- K-means clustering algorithm will be used to analyze the similarity or dissimilarity between two cities.
- For exploring the Osaka, Foursquare API were queried to get to most highest score food restaurant and so on.

Results and Discussion

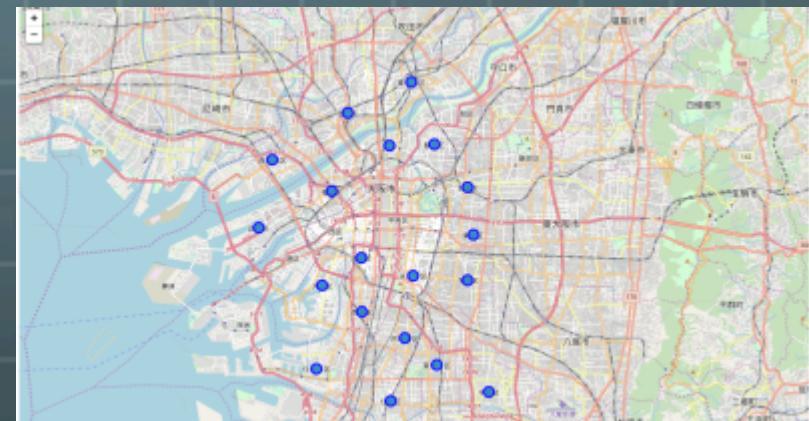
The diversity of neighborhoods in Osaka

For this analyze, I located 24 neighborhoods in Osaka search in google map. The coordinators are shown in the table. Only top 5 rows are shown here.

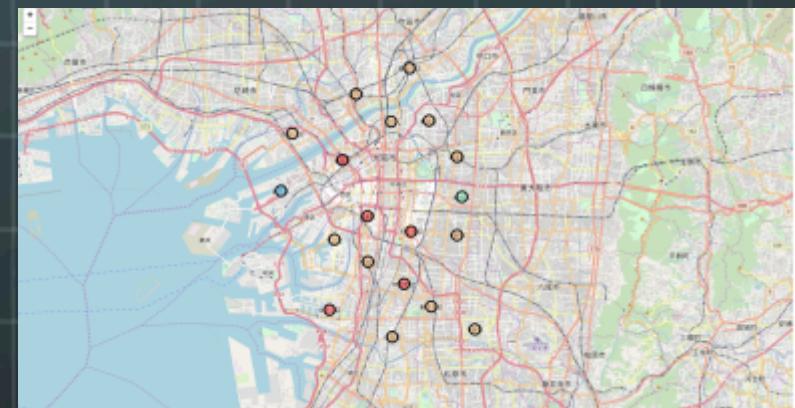
Then these neighborhoods are clustered using k-mean methods by analyzing venues counts and categories. The top 5 common venues in Red circles cluster will shown in the next slide.

On the other hand, the similarities (showing the same color) and dissimilarities (showing the different color) are also displayed here.

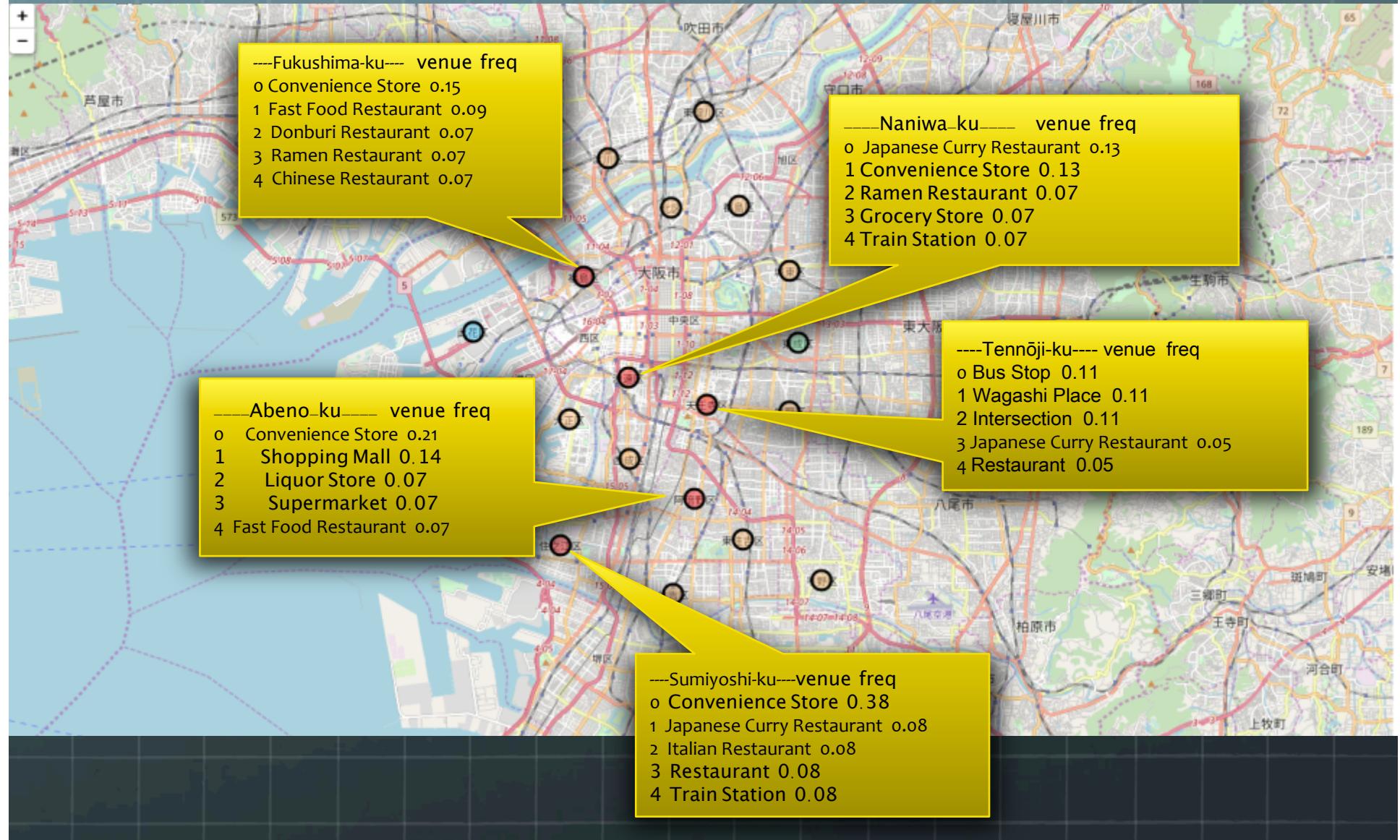
index	Neighborhood	Neighborhood (Kanji)	Latitude	Longitude
1	Abeno-ku	阿倍野区	34.627501	135.514095
2	Asahi-ku	旭区	35.476018	139.531920
3	Chūō-ku	中央区	35.666255	139.775565
4	Fukushima-ku	福島区	34.692104	135.474812
5	Higashinari-ku	東成区	34.672912	135.550567



After clustering



The top 5 common venues of Red circles clustered neighborhoods in Osaka



Results and Discussion

The diversity of neighborhoods in Manhattan

For this analyze, I located 24 neighborhoods in Manhattan in google map. (fig 1)

By using k-mean method, similar neighborhoods are categorized in the same color. The clusters showed us Manhattan is a very diverse city. (fig2)

The top 5 common venues samples are also displayed here only for our reference. (tab1)

tab.1

Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1 Chinatown	Chinese Restaurant	Cocktail Bar	Dim Sum Restaurant	American Restaurant	Vietnamese Restaurant
2 Upper East Side	Italian Restaurant	Exhibit	Coffee Shop	Juice Bar	Bakery
3 Yorkville	Italian Restaurant	Coffee Shop	Bar	Gym	Pizza Place
4 Lenox Hill	Italian Restaurant	Coffee Shop	Sushi Restaurant	Pizza Place	Gym / Fitness Center
12 Upper West Side	Italian Restaurant	Bar	Coffee Shop	Indian Restaurant	Wine Bar
5 Murray Hill	Coffee Shop	Japanese Restaurant	Hotel	French Restaurant	Sandwich Place
17 Chelsea	Coffee Shop	Italian Restaurant	Ice Cream Shop	Bakery	American Restaurant
19 East Village	Bar	Ice Cream Shop	Wine Bar	Mexican Restaurant	Pizza Place
20 Lower East Side	Cafe	Coffee Shop	Art Gallery	Banana Restaurant	Park
22 Little Italy	Bakery	Cafe	Chinese Restaurant	Seafood Restaurant	Sandwich Place
26 Manhattan Valley	Pizza Place	Coffee Shop	Indian Restaurant	Yoga Studio	Thai Restaurant
27 Gramercy	Italian Restaurant	Thrift / Vintage Store	Cocktail Bar	Bagel Shop	Pizza Place
30 Carnegie Hill	Pizza Place	Cafe	Coffee Shop	Bar	Cosmetics Shop
31 NoHo	Italian Restaurant	French Restaurant	Cocktail Bar	Bookstore	Pizza Place
34 Sutton Place	Gym / Fitness Center	Italian Restaurant	Furniture / Home Store	Indian Restaurant	American Restaurant

fig.1

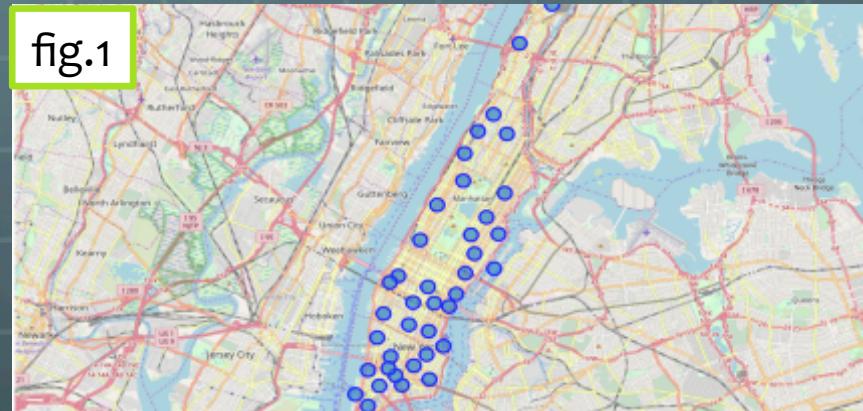
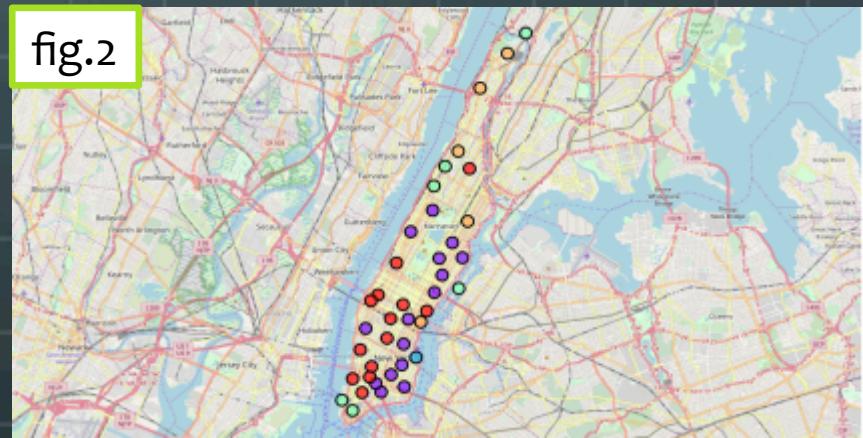


fig.2



Results and Discussion

Osaka vs Manhattan

After both Osaka and Manhattan places information were merged together, the cities were categorized again. I got a very interesting result.

Cluster classification both were changed for each city. Compared to Osaka neighborhoods, Manhattan neighborhoods showed much more similarity (clustered to one category- red circles)

In Osaka neighborhoods, Tennoji-ku and Sumiyoshi-ku showed the most similarity to Manhattan. Other three neighborhoods which were in the same cluster with Tennoji-ku and Sumiyoshi-ku in the previous slide were categorized differently at this time.



Results and Discussion

-Explore Osaka-

Top 3 recommended restaurants in Osaka

	Town	Town Latitude	Town Longitude	VenueID	VenueName	score	category	catID	latitude	longitude
10	Abeno-ku	34.627501	135.514095	4c2748b95c5ca593b48047fe	CoCo Ichibanya (CoCo壱番屋 阿倍野昭和町店)	6.2	Japanese Curry Restaurants	55a59bace4b013909087cb30	34.631800	135.514095
25	Abeno-ku	34.627501	135.514095	4bcae59c68f976b0a1206083	なか卯 西田辺店	5.7	Donburi Restaurants	55a59bace4b013909087cb0c	34.621780	135.514095
28	Abeno-ku	34.627501	135.514095	4bf4d2db98ac0f47db7964a8	餃子の王将 西田辺店	6.3	Chinese Restaurants	4bf58dd8d48988d145941735	34.622100	135.514095

The best three restaurants are all located in Abeno-Ku.

(I researches several categories (such as food, ART, museum, cinema et al.) using Foursquare API in order to make a recommendation list. Due to the limitation of accesses to Foursquare API, I only showed the food restaurants results here.)

Results and Discussion

-Explore Osaka-

Top 10 neighborhoods with restaurants numbers

	Town	Japanese Restaurant counts
158	Naniwa-ku	26
57	Higashisumiyoshi-ku	17
144	Miyakojima-ku	17
210	Sumiyoshi-ku	17
243	Yodogawa-ku	17
5	Abeno-ku	15
128	Minato-ku	15
183	Nishinari-ku	14
36	Fukushima-ku	13
71	Higashiyodogawa-ku	12

I listed the top 10 neighborhoods in Osaka with Japanese restaurants numbers.

I am very glad to see that one of my recommended city – Sumiyoshi-ku ranked in Number 4!!

Conclusion



The stakeholder's problem is resolved. This project was aimed to help my friend to find the best place which neighborhood is similar to where she lived before. Compared to Manhattan, Osaka city showed much more diversities of its neighborhoods. Tennōji-ku and Sumiyoshi-ku in Osaka showed the most similarity with Manhattan.

The data showed that Abeno-ku owned the best 3 food restaurants in Osaka. Sumiyoshi-ku ranked in number 4 neighborhoods with Japanese restaurants numbers. As the ranking algorithms was developed, I can quickly ranked every category as I want to recommend to my friend.

The top 5 in man

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1	Chinatown	Chinese Restaurant	Cocktail Bar	Dim Sum Restaurant	American Restaurant	Vietnamese Restaurant
8	Upper East Side	Italian Restaurant	Exhibit	Coffee Shop	Juice Bar	Bakery
9	Yorkville	Italian Restaurant	Coffee Shop	Bar	Gym	Pizza Place
10	Lenox Hill	Italian Restaurant	Coffee Shop	Sushi Restaurant	Pizza Place	Gym / Fitness Center
12	Upper West Side	Italian Restaurant	Bar	Coffee Shop	Indian Restaurant	Wine Bar
16	Murray Hill	Coffee Shop	Japanese Restaurant	Hotel	French Restaurant	Sandwich Place
17	Chelsea	Coffee Shop	Italian Restaurant	Ice Cream Shop	Bakery	American Restaurant
19	East Village	Bar	Ice Cream Shop	Wine Bar	Mexican Restaurant	Pizza Place
20	Lower East Side	Café	Coffee Shop	Art Gallery	Ramen Restaurant	Park
22	Little Italy	Bakery	Café	Chinese Restaurant	Seafood Restaurant	Sandwich Place
25	Manhattan Valley	Pizza Place	Coffee Shop	Indian Restaurant	Yoga Studio	Thai Restaurant
27	Gramercy	Italian Restaurant	Thrift / Vintage Store	Cocktail Bar	Bagel Shop	Pizza Place
30	Carnegie Hill	Pizza Place	Café	Coffee Shop	Bar	Cosmetics Shop
31	Noho	Italian Restaurant	French Restaurant	Cocktail Bar	Bookstore	Pizza Place
34	Sutton Place	Gym / Fitness Center	Italian Restaurant	Furniture / Home Store	Indian Restaurant	American Restaurant

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Abeno-ku	Convenience Store	Shopping Mall	Steakhouse	Liquor Store	Art Gallery
1	Asahi-ku	Golf Course	Playground	Baseball Field	Park	Yakitori Restaurant
2	Chūō-ku	Sushi Restaurant	Japanese Restaurant	Convenience Store	Coffee Shop	Soba Restaurant
3	Fukushima-ku	Convenience Store	Fast Food Restaurant	Donburi Restaurant	Chinese Restaurant	Ramen Restaurant
4	Higashinari-ku	Café	Shopping Mall	Grocery Store	Yakitori Restaurant	Dumpling Restaurant
5	Higashiyamashi-ku	Convenience Store	Pharmacy	Japanese Curry Restaurant	Szechuan Restaurant	Donut Shop
6	Higashiyodogawa-ku	Convenience Store	Japanese Restaurant	Chinese Restaurant	Ramen Restaurant	Sake Bar
7	Hirano-ku	Japanese Restaurant	Convenience Store	Liquor Store	Gourmet Shop	Electronics Store
8	Ikuno-ku	Convenience Store	Supermarket	Tempura Restaurant	Italian Restaurant	Diner
9	Jōtō-ku	Convenience Store	Japanese Restaurant	Metro Station	Sake Bar	Fast Food Restaurant
10	Kita-ku	Convenience Store	Café	Japanese Restaurant	Ramen Restaurant	Noodle House
11	Konohana-ku	Convenience Store	Bus Stop	Yakitori Restaurant	Electronics Store	Farmers Market
12	Minato-ku	Convenience Store	Coffee Shop	Indian Restaurant	Grocery Store	Soba Restaurant
13	Miyakojima-ku	Convenience Store	Bakery	Supermarket	Japanese Restaurant	Clothing Store
14	Naniwa-ku	Japanese Curry Restaurant	Convenience Store	Park	Ramen Restaurant	Intersection
15	Nishi-ku	Convenience Store	Japanese Restaurant	Ramen Restaurant	Sporting Goods Shop	Café
16	Nishinari-ku	Convenience Store	Noodle House	Intersection	Donburi Restaurant	Grocery Store
17	Nishiyodogawa-ku	Convenience Store	Donburi Restaurant	Ice Cream Shop	Fast Food Restaurant	Halal Restaurant
18	Suminoe-ku	Sporting Goods Shop	Japanese Restaurant	Athletics & Sports	History Museum	Hot Spring
19	Sumiyoshi-ku	Convenience Store	Supermarket	Train Station	Platform	Noodle House
20	Taishō-ku	Convenience Store	Donburi Restaurant	Bus Stop	Chinese Restaurant	Café
21	Tennōji-ku	Bus Stop	Wagashi Place	Intersection	Restaurant	Ramen Restaurant
22	Tsurumi-ku	Bus Stop	Harbor / Marina	Café	Yakitori Restaurant	Electronics Store
23	Yodogawa-ku	Convenience Store	Supermarket	Bus Stop	Park	Noodle House

---Abeno_ku---	
venue freq	
0	Convenience Store 0.21
1	Shopping Mall 0.14
2	Liquor Store 0.07
3	Supermarket 0.07
4	Fast Food Restaurant 0.07

---Fukushima-ku---	
venue freq	
0	Convenience Store 0.15
1	Fast Food Restaurant 0.09
2	Donburi Restaurant 0.07
3	Ramen Restaurant 0.07
4	Chinese Restaurant 0.07

---Hirano_ku---	
venue freq	
0	Japanese Restaurant 0.33
1	Liquor Store 0.33
2	Convenience Store 0.33
3	Pet Store 0.00
4	Sake Bar 0.00

---Konohana_ku---	
venue freq	
0	Convenience Store 0.67
1	Bus Stop 0.33
2	Sandwich Place 0.00
3	Rock Club 0.00
4	Restaurant 0.00

---Nishinari_ku---	
venue freq	
0	Convenience Store 0.55
1	Chinese Restaurant 0.09
2	Donburi Restaurant 0.09
3	Intersection 0.09
4	Noodle House 0.09

---Asahi_ku---	
venue freq	
0	Park 0.25
1	Playground 0.25
2	Baseball Field 0.25
3	Golf Course 0.25
4	Arcade 0.00

---Higashinari_ku---	
venue freq	
0	Grocery Store 0.33
1	Shopping Mall 0.33
2	Café 0.33
3	Sake Bar 0.00
4	Restaurant 0.00

---Ikuno_ku---	
venue freq	
0	Convenience Store 0.27
1	Drugstore 0.09
2	Tempura Restaurant 0.09
3	Diner 0.09
4	Supermarket 0.09

---Minato_ku---	
venue freq	
0	Convenience Store 0.18
1	Coffee Shop 0.09
2	Soba Restaurant 0.06
3	Indian Restaurant 0.06
4	Grocery Store 0.06

---Nishiyodogawa_ku---	
venue freq	
0	Convenience Store 0.42
1	Supermarket 0.08
2	Fast Food Restaurant 0.08
3	Donburi Restaurant 0.08
4	Ice Cream Shop 0.08

---Chūō_ku---	
venue freq	
0	Sushi Restaurant 0.19
1	Japanese Restaurant 0.14
2	Convenience Store 0.09
3	Coffee Shop 0.05
4	Soba Restaurant 0.04

---Higashimiyoshi-ku---	
venue freq	
0	Convenience Store 0.25
1	Pharmacy 0.12
2	Japanese Curry Restaurant 0.06
3	Bookstore 0.06
4	Electronics Store 0.06

---Jōtō_ku---	
venue freq	
0	Convenience Store 0.33
1	Café 0.07
2	Metro Station 0.07
3	Platform 0.07
4	Dessert Shop 0.07

---Miyakojima_ku---	
venue freq	
0	Convenience Store 0.28
1	Bakery 0.10
2	Supermarket 0.08
3	Japanese Restaurant 0.05
4	Clothing Store 0.05

---Suminoe_ku---	
venue freq	
0	Sporting Goods Shop 0.15
1	Arcade 0.08
2	History Museum 0.08
3	Soccer Field 0.08
4	Restaurant 0.08

---Higashiyodogawa_ku---	
venue freq	
0	Convenience Store 0.28
1	Japanese Restaurant 0.14
2	Chinese Restaurant 0.10
3	Sake Bar 0.07
4	Ramen Restaurant 0.07

---Kita_ku---	
venue freq	
0	Convenience Store 0.24
1	Café 0.09
2	Ramen Restaurant 0.06
3	Japanese Restaurant 0.06
4	Noodle House 0.04

---Naniwa_ku---	
venue freq	
0	Japanese Curry Restaurant 0.13
1	Convenience Store 0.13
2	Ramen Restaurant 0.07
3	Grocery Store 0.07
4	Train Station 0.07

---Taishō_ku---	
venue freq	
0	Convenience Store 0.27
1	Donburi Restaurant 0.13
2	Fast Food Restaurant 0.07
3	Athletics & Sports 0.07
4	Donut Shop 0.07

___Tennōji-ku___

venue freq

0	Bus Stop	0.11
1	Wagashi Place	0.11
2	Intersection	0.11
3	Japanese Curry Restaurant	0.05
4	Restaurant	0.05

___Tsurumi-ku___

venue freq

0	Bus Stop	0.33
1	Café	0.33
2	Harbor / Marina	0.33
3	Rock Club	0.00
4	Restaurant	0.00

___Yodogawa-ku___

venue freq

0	Convenience Store	0.31
1	Supermarket	0.15
2	Park	0.08
3	Intersection	0.08
4	Ramen Restaurant	0.08

The top5 common venues of each wards in Osaka

Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Abeno-ku	Convenience Store	Shopping Mall	Steakhouse	Liquor Store
1	Asahi-ku	Golf Course	Playground	Baseball Field	Park
2	Chūō-ku	Sushi Restaurant	Japanese Restaurant	Convenience Store	Coffee Shop
3	Fukushima-ku	Convenience Store	Fast Food Restaurant	Donburi Restaurant	Chinese Restaurant
4	Higashinari-ku	Café	Shopping Mall	Grocery Store	Yakitori Restaurant
5	Higashisumiyoshi-ku	Convenience Store	Pharmacy	Donburi Restaurant	Szechuan Restaurant
6	Higashiyodogawa-ku	Convenience Store	Japanese Restaurant	Chinese Restaurant	Ramen Restaurant
7	Hirano-ku	Japanese Restaurant	Convenience Store	Liquor Store	Gourmet Shop
8	Ikuno-ku	Convenience Store	Supermarket	Tempura Restaurant	Italian Restaurant
9	Jōtō-ku	Convenience Store	Japanese Restaurant	Metro Station	Sake Bar
10	Kita-ku	Convenience Store	Café	Ramen Restaurant	Japanese Restaurant
11	Konohana-ku	Convenience Store	Bus Stop	Drugstore	Electronics Store
12	Minato-ku	Convenience Store	Coffee Shop	Indian Restaurant	Grocery Store
13	Miyakojima-ku	Convenience Store	Bakery	Supermarket	Japanese Restaurant
14	Naniwa-ku	Japanese Curry Restaurant	Convenience Store	Park	Intersection
15	Nishi-ku	Convenience Store	Japanese Restaurant	Ramen Restaurant	Sporting Goods Shop
16	Nishinari-ku	Convenience Store	Noodle House	Intersection	Donburi Restaurant
17	Nishiyodogawa-ku	Convenience Store	Donburi Restaurant	Ice Cream Shop	Fast Food Restaurant
18	Suminoe-ku	Sporting Goods Shop	Japanese Restaurant	Athletics & Sports	History Museum
19	Sumiyoshi-ku	Convenience Store	Italian Restaurant	Train Station	Platform
20	Taishō-ku	Convenience Store	Donburi Restaurant	Café	Stadium
21	Tennōji-ku	Intersection	Wagashi Place	Bus Stop	Buddhist Temple
22	Tsurumi-ku	Bus Stop	Café	Harbor / Marina	Electronics Store
23	Yodogawa-ku	Convenience Store	Supermarket	Steakhouse	Ramen Restaurant