# **A Comparative Analysis of Venue Interest in Kobe City and Osaka City Japan Using Foursquare API Data**

## Introduction

## Background

Kobe is a cosmopolitan city that has historically been well known for maritime trade and is a popular business and tourist destination in the Kansai region. Although Osaka remains as the most populous city in the Kansai region with a population of over 2.5 million (World Population Review, 2021, Kobe University, 2016 & Public Information Division, Office of the Mayor, City of Osaka, 2020), Kobe remains as a highly recommended tourist location throughout the year – not just for the world renowned Kobe-beef, but for also its hot springs, mountain hikes and European style architecture that can be found throughout the city (Trip.com, n.d. & Audiger,S., n.d. ).

While Kobe, Osaka and other cities in the Kansai region were expected to be popular targets for attracting tourists in the weeks leading up to the 2020 Tokyo Olympics, the effect of the global pandemic has played an effect on each city’s economy.

A quick stroll through Kobe city alone shows the physical manifestation of the impact of CoVID-19 on the city where many of the shops which make up the once bustling shopping centers are much less crowded and/or out of business and iconic buildings such as the Tokyu Hands arts & crafts store had to close. The effect also extended to the city’s high street as well where high-end luxury brands such as Dior have also closed their flagship outlets. On the other hand, there are a number of construction projects going on in the city such as the relocation and expansion of the City hall along with the construction of high-rise residential apartments. Furthermore, with the focus on working remotely, there is a growing trend for companies to move their headquarters from Tokyo towards the hometowns of company founders.

Considering this, the use of spatial data could help to provide an insight to understanding present-day trends, which can become a basis for what to expect in terms of the demand and appeal of popular locations in a post-CoVID-19 world.

## Problem and Interest

The main objective of this study is to understand key venue categories and the top 10 venues within each category that remain popular despite the state of emergency declarations and restrictions placed on restaurants, shops, and other places of interest around the following major train stations

* Umeda Station, Osaka
* Sannomiya Station, Kobe

The author rationalizes that such a study could be of interest to the following key stakeholder groups in terms of making key strategic decisions

**The City Hall** which could leverage the data to identify potential areas of risk for the spread of infections during peak times where there is frequent movement of large groups of people or until a satisfactory target demographic has been vaccinated.

**Business owners and individuals** seeking to relocate their offices or set up a new business in terms of identifying a shift of key areas of commercial activity

**Real-estate and construction companies** to consider land value, demand, and the repurposing of existing buildings.

**Business owners and entrepreneurs** in terms of understanding which types of venues are popular to consider investing in or setting up new ventures.

## Data

## Data Analysis Aim and Hypothesis

This study will rely on the use of Foursquare’s API to extract data related to top venue categories around a 1km radius of both cities by using the most popular train station for each city as a focal point. This would help to understand where people are most likely to travel to within the most crowded/travelled part of each city, since major train stations are focal points for individuals when travelling / shopping.

Furthermore, the aim is to discern the most popular venues within each category to identify venues with

1. the highest possible risk of infection
2. resilient to the economic impact of a pandemic

along with any comparative patterns between the data from both cities using K-means clustering. The rationale is that venues that remain highly popular during the state of emergency are businesses that are stable, essential or have implemented means of remaining safe for individuals to visit.

## Data Sources

This study will rely on the Foursquare API to understand venues and the most popular venue categories within a fixed distance.

## Methodology

### 2.3.1 Stage 1 – Initial Data Extraction

In order to determine the key venue categories between each major city, the first stage will involve using data from Foursquare's API will be used to understand the following

- most popular venue categories

- 25 most popular venue within each category

within a 1000 meter (1km) radius from each station.

2.3.2 Stage 2 –Model Building and Comparison  
The second stage of this process would be to compare & contrast the results of the two cities which will be done in three stages:

- Step 1: A direct (manual) comparison and interpretation of the data based on the results of stage.

- Step 2: A machine learning based comparison of data using K-means clustering with the same results from stage 1 to generate the 10 most popular venues

### 2.3.3 Stage 3 - Model Execution

The final stage of the data analysis process would involve testing the k-means clustering model with a larger set of data by increasing following variables for two other cities (Tokyo and Sapporo)

- most popular venue categories

- most popular venue within each category

- a 1000 meter (1km) radius from each station for each venue

The results of this stage would again be compared with the initial results of the K-means Clustering Model to understand any patterns based on distance in relation to the most popular category

### 2.4 Analysis

Refer to the Jupyter Notebook.

### Results and Discussion

#### 3.1 Initial Foursquare Data Comparison (Osaka and Kobe)

|  |  |  |
| --- | --- | --- |
| **name** | **categories** | **distance** |
| Rilakkuma Store (リラックマストア) | Hobby Shop | 37 |
| Ueshima Coffee House (上島珈琲店) | Coffee Shop | 45 |
| Honmiyake (本みやけ) | Nabe Restaurant | 62 |
| Indian Curry (インデアンカレー) | Japanese Curry Restaurant | 79 |
| スヌーピータウンショップ 大阪梅田店 | Toy / Game Store | 97 |

Fig 1.1 Closest venues from the station, Osaka

|  |  |  |
| --- | --- | --- |
| **name** | **categories** | **distance** |
| Baskin-Robbins (サーティワン アイスクリーム 三宮フラワーロード店) | Ice Cream Shop | 132 |
| Kobe Kokusai Hall (こくさいホール) | Concert Hall | 137 |
| Kobe International House (神戸国際会館) | Convention Center | 140 |
| Hakata Motsunabe Yamaya (博多もつ鍋やまや JR三ノ宮店) | Japanese Restaurant | 150 |
| Boulangerie Comme Chinois (ブランジェリー コム シノワ) | Bakery | 169 |

Fig 1.2 Closest venues from the station, Kobe

Referring to the Fig 1.1 and 1.2, the results show that more than 50% of the top 5 closest venues are venues that offers food and beverages. Referring to the average distance for the venues in each city listed in Appendix 3, we see that average distance of venues in Osaka is relatively closer (200.6 m) than that of Kobe (242.5 m). Furthermore, when comparing the to 5 venues of both cities in terms of distance, we see that all the venues in Osaka fall under 100 meters from the main station. On the other hand, when we compare with Appendix 1 and 2 which arrange venues based on popularity, we see that not all the closest venues are the most popular in both cities. However, a deeper understanding between the relationship between this could possibly be explored using K-means.

A closer look at the results on Appendix 1 and 2 also show multiple null values (NaN) in the neighborhood column for both cities. Although the data itself is available in the formatted address column, this means that any neighborhood-based analysis would require further refining and formatting of the data before it can be analysed. It is also worth noting that since the selected locations for both cities are relatively specific, there is little variance in the neighborhood data.

#### 3.2 K-means results for Osaka and Kobe

Considering that the K-means model was designed to understand a relationship in terms of distance with respect to the popularity of top venue categories in each city, we see a difference compared to the initial Foursquare results.

By comparing the initial results of Appendix 1 and Appendix 4 for Osaka, we see the following categories are considered as the most popular:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Popularity | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
| Initial | Japanese Curry Restaurant | Japanese Curry Restaurant | Hobby Shop | Food Court | Nabe Restaurant | Café | Kushikatsu Restaurant | Takoyaki Place | Sri Lankan Restaurant | Electronics Store |
| K-means | Okonomiyaki Restaurant | Japanese Curry Restaurant | Kushikatsu Restaurant | Beer Bar | Bookstore | Takoyaki Place | Sri Lankan Restaurant | Record Shop | Nabe Restaurant | Movie Theater |

Fig 1.3 Comparison of Initial and K-means results for Osaka

Similarly, when comparing the initial results of Appendix 2 and Appendix 5 for Kobe, we see the following categories are considered as the most popular:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Popularity | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
| Initial | Coffee Shop | Donburi Restaurant | Bakery | Café | Concert Hall | Café | Yoshoku Restaurant | Thai Restaurant | Gastropub | Takoyaki Place |
| K-means | Bakery | Café | Ice Cream Shop | Thai Restaurant | Takoyaki Place | Steakhouse | Seafood Restaurant | Japanese Restaurant | Japanese Curry Restaurant | Hobby Shop |

Fig 1.4 Comparison of Initial and K-means results for Kobe

#### 3.3 Model execution comparison results for Sapporo and Shinagawa

In order to test the logic of the K-means model and its ability to identify venue popularity in terms of distance and category, the model has been run on two different cities (Shinagawa and Sapporo, Japan) with a radius of 2,000m (2km) the results are as follows.

The results show a similar pattern of variance between the initial data from Foursquare and the adjusted result using k-means when accounting for the relationship between distance and category.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Popularity | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
| Initial | Brazilian Restaurant | Sake Bar | Hotel | Coffee Shop | Mexican Restaurant | Beer Bar | Movie Theater | Okonomiyaki Restaurant | German Restaurant | Aquarium |
| K-means | Coffee Shop | Bakery | Aquarium | Japanese Curry Restaurant | Steakhouse | Seafood Restaurant | Sake Bar | Pie Shop | Okonomiyaki Restaurant | Movie Theater |

Fig 1.5 Comparison of Initial and K-means results for Shinagawa

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Popularity | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th |
| Initial | Scenic Lookout | Sushi Restaurant | Japanese Restaurant | Sake Bar | Bookstore | Donburi Restaurant | Bar | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House |
| K-means | Scenic Lookout | 136 | Sushi Restaurant | Bar | Café | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House | Shopping Mall | Scenic Lookout |

Fig 1.6 Comparison of Initial and K-means results for Sapporo

#### 3.4 Limitations and Drawbacks

Although the k-means model helped to give more context on the relationship between venue popularity based on distance and venue category compared to purely relying on the popularity of a venue based on existing metrics provided by Foursquare, the execution, code logic and architecture has some limitations.

One example of this is that the parameters to allow the code to be re-used for different cities and their subsequent focal point (e.g. station) is not set to be easily configured. Instead, the code needs to be changed extensively at each point to mention the target city of interest.

In terms of the accuracy of the k-means model, the following factors influence its overall accuracy

1. The relatively high level of specificity in terms of the target location, which reduces the quantity of data that can be analyzed
2. The limited number of clusters used in the code to generate results which limits the ability to fully utilize the K-means clustering methodology

Considering this, it would be worth re-architecting the code to address finding patterns between cities using a wider parameter such as the neighborhood.

### Conclusion

Despite the limitations of the K-means model, the insights from this report would provide useful information in terms of understanding the popularity of venues for its intended target audience, since it shows that

1. Venue popularity is not based on closest location
2. Accounting for category and distance impacts the popularity of a venue
3. Restaurants and cafes would be a primary point of interest to consider within a relatively close proximity of a train station and worth focusing on for
   1. Preventing the spread of COVID-19
   2. Considering for real-estate development
   3. Setting up a new business

## Appendix

Appendix 1. Osaka Initial Foursquare Data

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance (M)** | **neighborhood** | **formattedAddress** |
| 1 | Indian Curry (インデアンカレー) | Japanese Curry Restaurant | 79 | 梅田 | [北区芝田1-3 (阪急三番街 南館 B2F), 大阪市, 大阪府, 530-0012, 日本] |
| 2 | Kyu Yam Tetsudou (旧ヤム鐵道) | Japanese Curry Restaurant | 210 | NaN | [北区梅田3-1-3 (LUCUA B2F), 大阪市, 大阪府, 530-8217, 日本] |
| 3 | Rilakkuma Store (リラックマストア) | Hobby Shop | 37 | NaN | [北区芝田1-1-3 (阪急三番街 北館 1F), 大阪市, 大阪府, 530-0012, 日本] |
| 4 | Shin-Umeda Shokudogai (新梅田食道街) | Food Court | 171 | NaN | [北区角田町9-26, 大阪市, 大阪府, 530-0017, 日本] |
| 5 | Honmiyake (本みやけ) | Nabe Restaurant | 62 | 梅田 | [北区芝田1-1-3 (阪急三番街 南館 B2F), 大阪市, 大阪府, 530-0012,... |
| 6 | Y・C 梅田店 | Café | 166 | 梅田 | [北区角田町9-21 (新梅田食道街 1F), 大阪市, 大阪府, 530-0017, 日本] |
| 7 | Kushikatsu Matsuba (串かつ松葉 総本店) | Kushikatsu Restaurant | 172 | NaN | [北区角田町9-20 (新梅田食道街 1F), 大阪市, 大阪府, 530-0017, 日本] |
| 8 | Hanadako (はなだこ) | Takoyaki Place | 272 | NaN | [北区角田町9-16 (新梅田食道街 1F), 大阪市, 大阪府, 530-0017, 日本] |
| 9 | ポンガラカレー | Sri Lankan Restaurant | 236 | NaN | [北区角田町8-47 (阪急サン広場 B1F), 大阪市, 大阪府, 530-0017, 日本] |
| 10 | Yodobashi-Umeda (ヨドバシカメラ マルチメディア梅田) | Electronics Store | 190 | 北区 | [北区大深町1-1, 大阪市, 大阪府, 530-0011, 日本] |
| 11 | スヌーピータウンショップ 大阪梅田店 | Toy / Game Store | 97 | 梅田 | [北区芝田1-1-3 (阪急三番街 北館 B1F), 大阪市, 大阪府, 530-0012,... |
| 12 | Maruzen & Junkudo (MARUZEN&ジュンク堂書店) | Bookstore | 299 | NaN | [北区茶屋町7-20 (チャスカ茶屋町 B1F-7F), 大阪市, 大阪府, 530-001... |
| 13 | Qu'il fait bon (キルフェボン) | Dessert Shop | 302 | NaN | [北区大深町4-20 (グランフロント大阪 南館 2F), 大阪市, 大阪府, 530-00... |
| 14 | Kushikatsu Yoneya (串かつ ヨネヤ) | Kushikatsu Restaurant | 309 | NaN | [北区角田町梅田地下街2-5 (ホワイティうめだノースモール1), 大阪市, 大阪府, 53... |
| 15 | Ueshima Coffee House (上島珈琲店) | Coffee Shop | 45 | NaN | [北区芝田1-1-3 (阪急三番街 南館 B1F), 大阪市, 大阪府, 530-0012,... |
| 16 | Negiyaki Yamamoto (ねぎ焼やまもと) | Okonomiyaki Restaurant | 298 | NaN | [北区角田町2-4 (EST イーストエリア), 大阪市, 大阪府, 530-0017, 日本] |
| 17 | Okonomiyaki Kiji (きじ) | Okonomiyaki Restaurant | 180 | 梅田 | [北区角田町9-20 (新梅田食堂街), 大阪市, 大阪府, 日本] |
| 18 | カレーハウスK2 | Japanese Curry Restaurant | 220 | NaN | [北区芝田1-7-9 (芝田商店街), 大阪市, 大阪府, 530-0012, 日本] |
| 19 | Yukari (ゆかり) | Okonomiyaki Restaurant | 233 | 梅田 | [北区角田町梅田地下街2-5 (ホワイティうめだ ノースモール1), 大阪市, 大阪府, 日本] |
| 20 | Hankyu Department Store (阪急うめだ本店) | Department Store | 280 | 梅田 | [北区角田町8-7, 大阪市, 大阪府, 530-8350, 日本] |
| 21 | InterContinental Osaka (インターコンチネンタルホテル大阪) | Hotel | 357 | NaN | [北区大深町3-60, 大阪市, 大阪府, 530-0011, 日本] |
| 22 | TOWER RECORDS | Record Shop | 210 | NaN | [北区茶屋町10-12 (NU Chayamachi 6F), 大阪市, 大阪府, 530-... |
| 23 | Theatre Umeda (テアトル梅田) | Movie Theater | 331 | 梅田 | [北区茶屋町16-7 (梅田ロフト B1F), 大阪市, 大阪府, 530-0013, 日本] |
| 24 | Daiso (ダイソー 大阪梅田店) | Discount Store | 151 | 梅田 | [北区茶屋町1-27 (ABC-MART梅田ビル B2F), 大阪市, 大阪府, 530-0... |
| 25 | ベルジャンビアプラス ドルフィンズ umeda | Beer Bar | 107 | NaN | [北区芝田1-5-2 (大和ビル1F), 大阪市, 大阪府, 530-0012, 日本] |

Appendix 2. Initial Foursquare Data Kobe

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance (M)** | **neighborhood** | **formattedAddress** |
| 1 | Nishimura's Coffee (にしむら珈琲店 三宮店) | Coffee Shop | 207 | NaN | [中央区琴ノ緒町5-3-5 (グリーンシャポービル 1F-2F), 神戸市, 兵庫県, 65... |
| 2 | Juban (十番 三ノ宮店) | Donburi Restaurant | 288 | NaN | [中央区琴ノ緒町4-1-396 (高架下), 神戸市, 兵庫県, 651-0094, 日本] |
| 3 | ビゴの店 | Bakery | 185 | NaN | [中央区御幸通8-1-6 (神戸国際会館 B2F), 神戸市, 兵庫県, 651-0087,... |
| 4 | CAFE KESHiPEARL | Café | 238 | NaN | [中央区御幸通6-1-25 (もものき三宮ビル 2F), 神戸市, 兵庫県, 651-008... |
| 5 | Kobe Kokusai Hall (こくさいホール) | Concert Hall | 137 | NaN | [中央区御幸通8-1-6 (神戸国際会館 2F), 神戸市, 兵庫県, 651-0087, 日本] |
| 6 | モロゾフ 神戸本店 | Café | 227 | NaN | [中央区三宮町1-8-1, 神戸市, 兵庫県, 650-0021, 日本] |
| 7 | グリル一平 三宮店 | Yoshoku Restaurant | 288 | NaN | [中央区琴ノ緒町5-5-26, 神戸市, 兵庫県, 651-0094, 日本] |
| 8 | Baan Thai (バーンタイ) | Thai Restaurant | 314 | NaN | [中央区北長狭通1-8-8 (しんせい堂ビル 1F), 神戸市, 兵庫県, 650-0012... |
| 9 | スタンドGONTA | Gastropub | 265 | NaN | [中央区北長狭通1-31-26, 神戸市, 兵庫県, 650-0012, 日本] |
| 10 | たこ焼たちばな さんプラザ店 | Takoyaki Place | 264 | 三宮 | [中央区三宮町1-8-1, 神戸市, 兵庫県, 日本] |
| 11 | Boulangerie Comme Chinois (ブランジェリー コム シノワ) | Bakery | 169 | NaN | [中央区御幸通7-1-16 (三宮ビル南館 B1F), 神戸市, 兵庫県, 651-0087... |
| 12 | Isuzu Bakery (イスズベーカリー 北野坂店) | Bakery | 316 | Chuo | [中央区中山手通1-8-18 (三宮互陽ビル 1F), 神戸市, 兵庫県, 650-0004... |
| 13 | Cascade カスカード さんプラザ本店 | Bakery | 204 | 三宮 | [中央区三宮町1丁目8-1 (さんプラザ B1F), 神戸市, 兵庫県, 650-0021,... |
| 14 | Burger King (バーガーキング) | Fast Food Restaurant | 208 | NaN | [中央区北長狭通1-2-4 (KKサンキタビル), 神戸市, 兵庫県, 650-0012, 日本] |
| 15 | Baskin-Robbins (サーティワン アイスクリーム 三宮フラワーロード店) | Ice Cream Shop | 132 | NaN | [中央区御幸通8-1-14 (フラワーロード、そごう新館 1F), 神戸市, 兵庫県, 65... |
| 16 | Savoy (サヴォイ) | Japanese Curry Restaurant | 267 | 三宮 | [中央区三宮町1-9-1 (三宮センタープラザ東館 B1F), 神戸市, 兵庫県, 651-... |
| 17 | トミーズ 三宮東店 | Bakery | 307 | NaN | [中央区琴ノ緒町4-1-5, 神戸市, 兵庫県, 日本] |
| 18 | 神戸珈琲物語 | Café | 187 | 中央区 | [中央区三宮町1-10-1 (三宮地下街703), 神戸市, 兵庫県, 日本] |
| 19 | スタンドGONTA２ | Bar | 282 | NaN | [中央区琴ノ緒町5-4-23 (サンデンビル B1F), 神戸市, 兵庫県, 日本] |
| 20 | Lashinbang (らしんばん) | Hobby Shop | 288 | NaN | [中央区三宮町1-9-1 (センタープラザ東館203号), 神戸市, 兵庫県, 650-00... |
| 21 | Red Rock 本店 | Steakhouse | 316 | NaN | [中央区北長狭通1-31-33 (三宮阪急西口商店街), 神戸市, 兵庫県, 650-001... |
| 22 | 土佐清水ワールド | Seafood Restaurant | 332 | NaN | [中央区雲井通5-3-1 (サンパル 1F), 神戸市, 兵庫県, 651-0096, 日本] |
| 23 | Kobe International House (神戸国際会館) | Convention Center | 140 | NaN | [中央区御幸通8-1-6, 神戸市, 兵庫県, 651-0087, 日本] |
| 24 | イスズベーカリー 生田ロード店 | Bakery | 352 | NaN | [中央区北長狭通2-1-14 (玉広ビル1F), 神戸市, 兵庫県, 650-0012, 日本] |
| 25 | Hakata Motsunabe Yamaya (博多もつ鍋やまや JR三ノ宮店) | Japanese Restaurant | 150 | NaN | [中央区布引町4-1-1 (JR三ノ宮駅構内ダイニングロード2F), 神戸市, 兵庫県, 6... |

Appendix 3. Average distance between station and venues

|  |  |
| --- | --- |
| **City** | **Average Distance of Venue from Station (m)** |
| Osaka | 200.6 meters |
| Kobe | 242.5 meters |

Appendix 4. Osaka K-means cluster data

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **categories** | **distance (M)** | **1st Most Popular Venue** | **2nd Most Popular Venue** | **3rd Most Popular Venue** | **4th Most Popular Venue** | **5th Most Popular Venue** | **6th Most Popular Venue** | **7th Most Popular Venue** | **8th Most Popular Venue** | **9th Most Popular Venue** | **10th Most Popular Venue** |
| Japanese Curry Restaurant | 79 | Okonomiyaki Restaurant | Japanese Curry Restaurant | Kushikatsu Restaurant | Beer Bar | Bookstore | Takoyaki Place | Sri Lankan Restaurant | Record Shop | Nabe Restaurant | Movie Theater |
| Japanese Curry Restaurant | 210 | Okonomiyaki Restaurant | Japanese Curry Restaurant | Kushikatsu Restaurant | Beer Bar | Bookstore | Takoyaki Place | Sri Lankan Restaurant | Record Shop | Nabe Restaurant | Movie Theater |
| Hobby Shop | 37 | Okonomiyaki Restaurant | Japanese Curry Restaurant | Kushikatsu Restaurant | Beer Bar | Bookstore | Takoyaki Place | Sri Lankan Restaurant | Record Shop | Nabe Restaurant | Movie Theater |
| Food Court | 171 | Okonomiyaki Restaurant | Japanese Curry Restaurant | Kushikatsu Restaurant | Beer Bar | Bookstore | Takoyaki Place | Sri Lankan Restaurant | Record Shop | Nabe Restaurant | Movie Theater |
| Nabe Restaurant | 62 | Okonomiyaki Restaurant | Japanese Curry Restaurant | Kushikatsu Restaurant | Beer Bar | Bookstore | Takoyaki Place | Sri Lankan Restaurant | Record Shop | Nabe Restaurant | Movie Theater |

Appendix 5. Kobe K-means cluster data

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance** | **1st Most Popular Venue** | **2nd Most Popular Venue** | **3rd Most Popular Venue** | **4th Most Popular Venue** | **5th Most Popular Venue** | **6th Most Popular Venue** | **7th Most Popular Venue** | **8th Most Popular Venue** | **9th Most Popular Venue** | **10th Most Popular Venue** |
| 1 | Nishimura's Coffee (にしむら珈琲店 三宮店) | Coffee Shop | 207 | Bakery | Café | Ice Cream Shop | Thai Restaurant | Takoyaki Place | Steakhouse | Seafood Restaurant | Japanese Restaurant | Japanese Curry Restaurant | Hobby Shop |
| 2 | Juban (十番 三ノ宮店) | Donburi Restaurant | 288 | Bakery | Café | Ice Cream Shop | Thai Restaurant | Takoyaki Place | Steakhouse | Seafood Restaurant | Japanese Restaurant | Japanese Curry Restaurant | Hobby Shop |
| 3 | ビゴの店 | Bakery | 185 | Bakery | Café | Ice Cream Shop | Thai Restaurant | Takoyaki Place | Steakhouse | Seafood Restaurant | Japanese Restaurant | Japanese Curry Restaurant | Hobby Shop |
| 4 | CAFE KESHiPEARL | Café | 238 | Bakery | Café | Ice Cream Shop | Thai Restaurant | Takoyaki Place | Steakhouse | Seafood Restaurant | Japanese Restaurant | Japanese Curry Restaurant | Hobby Shop |
| 5 | Kobe Kokusai Hall (こくさいホール) | Concert Hall | 137 | Bakery | Café | Ice Cream Shop | Thai Restaurant | Takoyaki Place | Steakhouse | Seafood Restaurant | Japanese Restaurant | Japanese Curry Restaurant | Hobby Shop |

Appendix 6 – Initial Foursquare Data Shinagawa

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance (M)** | **neighborhood** | **formattedAddress** |
| 1 | Barbacoa | Brazilian Restaurant | 229 | 高輪, 東京, 東京都 | [高輪4-10-18 (ウィング高輪WEST 3F), 港区, 東京都, 108-0074,... |
| 2 | Rojiura (路地裏) | Sake Bar | 279 | NaN | [港南2-2-4, 港区, 東京都, 108-0075, 日本] |
| 3 | Strings by InterContinental Tokyo (ストリングスホテル東京... | Hotel | 209 | NaN | [港南2-16-1 (品川イーストワンタワー 26F-32F), 港区, 東京都, 108-... |
| 4 | Saza Coffee (サザコーヒー) | Coffee Shop | 101 | NaN | [高輪3-26-27 (ecute品川 1F), 港区, 東京都, 108-0074, 日本] |
| 5 | El Caliente | Mexican Restaurant | 129 | NaN | [港南2-18-1 (アトレ品川 4F), 港区, 東京都, 108-0075, 日本] |
| 6 | Antenna America | Beer Bar | 127 | NaN | [港南2-18-1 (アトレ品川 3F), 港区, 東京都, 108-0075, 日本] |
| 7 | T・ジョイPRINCE品川 IMAXシアター | Movie Theater | 368 | 港区 | [高輪4-10-30 (品川プリンスホテル アネックスタワー 6F), 港区, 東京都, 1... |
| 8 | Okonomiyaki Kiji (お好み焼 きじ) | Okonomiyaki Restaurant | 452 | NaN | [港南2-3-13 (品川フロントビル 2F), 港区, 東京都, 108-0075, 日本] |
| 9 | Tsubame Grill (つばめグリル) | German Restaurant | 254 | 五反田 | [高輪4-10-26, 港区, 東京都, 108-8474, 日本] |
| 10 | Maxell Aqua Park Shinagawa (マクセル アクアパーク品川) | Aquarium | 415 | 高輪 | [高輪4-10-30 (品川プリンスホテル内), 港区, 東京都, 108-8611, 日本] |
| 11 | Salma Tikka & Biryani | Indian Restaurant | 423 | NaN | [高輪4-22-11 (ヴィラージュ高輪 1F), 港区, 東京都, 108-0074, 日本] |
| 12 | 魚介ビストロ sasaya BYO | Gastropub | 133 | NaN | [高輪3-26-33 (パル品川 2F 品川魚貝センター), 港区, 東京都, 108-00... |
| 13 | Outback Steakhouse | Steakhouse | 359 | NaN | [高輪4-10-8 (京急EXイン高輪 B1F), 港区, 東京都, 108-0074, 日本] |
| 14 | The Prince Sakura Tower Tokyo (ザ・プリンスさくらタワー東京) | Hotel | 385 | 高輪 | [3-13-1, 港区, 東京都, 108-8612, 日本] |
| 15 | Grand Central Oyster Bar & Restaurant | Seafood Restaurant | 146 | NaN | [港南2-18-1 (アトレ品川 4F), 港区, 東京都, 108-0075, 日本] |
| 16 | カレーハウス キラリ | Japanese Curry Restaurant | 262 | NaN | [港南2-14-10 (品川駅前港南ビル 2F), 港区, 東京都, 108-0075, 日本] |
| 17 | Harvesterrace | Café | 485 | NaN | [高輪4-8-4 (モンベル高輪ビル B1F), 港区, 東京都, 108-0074, 日本] |
| 18 | Luxe Dining Hapuna (リュクス ダイニング ハプナ) | Buffet | 271 | NaN | [高輪4-10-30 (品川プリンスホテル メインタワー 1F), 港区, 東京都, 108... |
| 19 | Uogashi Nihon-Ichi (魚がし日本一) | Sushi Restaurant | 167 | NaN | [高輪3-26-27 (エキュート品川サウス), 港区, 東京都, 108-0074, 日本] |
| 20 | Ajidokoro Yu (味どころ 遊) | Japanese Restaurant | 248 | NaN | [港南2-2-16 (谷田企画ビル 3F), 港区, 東京都, 108-0075, 日本] |
| 21 | Boulangerie Asanoya (ブランジェ浅野屋) | Bakery | 128 | NaN | [港南2-18-1 (アトレ品川 3F Food&Time Isetan), 港区, 東京都... |
| 22 | Starbucks | Coffee Shop | 78 | 品川 | [港南2-1-78 (品川駅 改札外/JR東海品川駅店), 港区, 東京都, 108-007... |
| 23 | Anna Miller's (アンナミラーズ) | Pie Shop | 206 | NaN | [高輪4-10-18 (ウィング高輪WEST 2F), 港区, 東京都, 108-0074,... |
| 24 | breadworks | Bakery | 87 | NaN | [高輪3-26-27 (ecute品川 1F Variety Market), 港区, 東京... |
| 25 | DEAN & DELUCA | Grocery Store | 169 | NaN | [港南2-18-1 (アトレ品川 2F), 港区, 東京都, 108-0075, 日本] |

Appendix 7 – Initial Foursquare Data Sapporo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance** | **neighborhood** | **formattedAddress** |
| 1 | JR Tower Observatory T38 (JRタワー展望室 タワー・スリーエイト) | Scenic Lookout | 136 | 中央区 | [中央区北5条西2-5 (JRタワー 38F), 札幌市, 北海道, 060-8503, 日本] |
| 2 | Nemuro Hanamaru (回転寿司 根室花まる) | Sushi Restaurant | 79 | NaN | [中央区北5条西2-5 (札幌ステラプレイス 6F), 札幌市, 北海道, 060-0005... |
| 3 | Rikyu (牛たん炭焼 利久) | Japanese Restaurant | 99 | NaN | [北区北6条西2-1-7 (札幌パセオ WEST B1F), 札幌市, 北海道, 060-0... |
| 4 | 味百仙 | Sake Bar | 185 | NaN | [北区北7条西4 (宮澤興業ビル B1F), 札幌市, 北海道, 060-0807, 日本] |
| 5 | Books Kinokuniya (紀伊國屋書店) | Bookstore | 237 | 札幌市 | [中央区北5条西5-7 (sapporo55 1F-2F), 札幌市, 北海道, 060-0... |
| 6 | Tokachi Butadon Ippin (十勝豚丼 いっぴん) | Donburi Restaurant | 77 | NaN | [中央区北5条西2-5 (札幌ステラプレイス 6F), 札幌市, 北海道, 060-0005... |
| 7 | SKY J | Bar | 142 | NaN | [中央区北5条西2-5 (JRタワーホテル日航札幌 35F), 札幌市, 北海道, 060-... |
| 8 | Tonkatsu Tamafuji (とんかつ玉藤) | Tonkatsu Restaurant | 201 | NaN | [中央区北5条西2-1 (札幌エスタ 10F), 札幌市, 北海道, 060-0005, 日本] |
| 9 | Curry House Colombo (カリーハウス コロンボ) | Japanese Curry Restaurant | 290 | 中央区 | [中央区北4条西4 (札幌国際ビル B1F), 札幌市, 北海道, 060-0003, 日本] |
| 10 | 175°DENO〜担担麺〜札幌駅北口店 | Noodle House | 122 | NaN | [中央区北7条西4-1-1 (東カン札幌ビル 1F), 札幌市, 北海道, 060-0007... |
| 11 | Rokkatei Café (六花亭 喫茶室) | Café | 446 | NaN | [中央区北4条西6-3-3 (六花亭 2F), 札幌市, 北海道, 060-0004, 日本] |
| 12 | Yodobashi Camera (ヨドバシカメラ マルチメディア札幌) | Electronics Store | 236 | 北区 | [北区北6条西5-1-22, 札幌市, 北海道, 060-0806, 日本] |
| 13 | Yotsuba White Cosy (よつ葉ホワイトコージ) | Café | 187 | NaN | [北区北6条西4丁目 (札幌パセオ WEST B1F), 札幌市, 北海道, 060-080... |
| 14 | Rokkatei (六花亭) | Pastry Shop | 451 | NaN | [中央区北4条西6-3-3, 札幌市, 北海道, 060-0004, 日本] |
| 15 | Sapporo Cinema Frontier (札幌シネマフロンティア) | Multiplex | 82 | 中央区 | [中央区北5条西2-5 (札幌ステラプレイス 7F), 札幌市, 北海道, 060-0005... |
| 16 | YEBISU BAR 札幌アピア店 | Bar | 230 | NaN | [中央区北5条西4丁目 (APIA), 札幌市, 北海道, 060-0005, 日本] |
| 17 | Okushiba Shoten (スープカリー奥芝商店 駅前創成寺) | Japanese Curry Restaurant | 307 | NaN | [中央区北4条西1-1-3 (ホクレンビル B1F), 札幌市, 北海道, 060-0004... |
| 18 | KINOTOYA BAKE | Dessert Shop | 48 | NaN | [北区北6条西3 (JR札幌駅 サツエキ イート内), 札幌市, 北海道, 060-0806... |
| 19 | Shiki Hanamaru (町のすし家 四季花まる) | Sushi Restaurant | 192 | 北区 | [北区北6条西2-1-7 (PASEOウエスト B1F), 札幌市, 北海道, 060-08... |
| 20 | JR Tower Hotel Nikko Sapporo (JRタワーホテル日航札幌) | Hotel | 213 | 中央区 | [中央区北5条西2-5, 札幌市, 北海道, 060-8788, 日本] |
| 21 | 寿司と炉端焼 四季花まる | Sushi Restaurant | 241 | NaN | [北区北7条西1丁目2-6 (NCO札幌 B1F), 札幌市, 北海道, 001-0017,... |
| 22 | Sapporo Stellar Place (札幌ステラプレイス) | Shopping Mall | 68 | NaN | [中央区北5条西2-5 (JRタワー B1F-9F), 札幌市, 北海道, 060-0005... |
| 23 | Tonkatsu Wako (とんかつ和幸) | Tonkatsu Restaurant | 87 | NaN | [北区北6条西4-3-1 (パセオ B1F), 札幌市, 北海道, 060-0806, 日本] |
| 24 | Sapporo Station (札幌駅) | Train Station | 7 | NaN | [北区北6条西4-1-1, 札幌市, 北海道, 001-0006, 日本] |
| 25 | 佐藤水産本店 | Gourmet Shop | 225 | NaN | [中央区北4条西3丁目 (交洋ビル1~2F), 札幌市, 北海道, 060-0004, 日本] |

Appendix 8 – K-means Cluster Data Shinagawa

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance 8M)** | **1st Most Popular Venue** | **2nd Most Popular Venue** | **3rd Most Popular Venue** | **4th Most Popular Venue** | **5th Most Popular Venue** | **6th Most Popular Venue** | **7th Most Popular Venue** | **8th Most Popular Venue** | **9th Most Popular Venue** | **10th Most Popular Venue** |
| 1 | Barbacoa | Brazilian Restaurant | 229 | Coffee Shop | Bakery | Aquarium | Japanese Curry Restaurant | Steakhouse | Seafood Restaurant | Sake Bar | Pie Shop | Okonomiyaki Restaurant | Movie Theater |
| 2 | Rojiura (路地裏) | Sake Bar | 279 | Coffee Shop | Bakery | Aquarium | Japanese Curry Restaurant | Steakhouse | Seafood Restaurant | Sake Bar | Pie Shop | Okonomiyaki Restaurant | Movie Theater |
| 3 | Strings by InterContinental Tokyo (ストリングスホテル東京... | Hotel | 209 | Hotel | Aquarium | Japanese Curry Restaurant | Steakhouse | Seafood Restaurant | Sake Bar | Pie Shop | Okonomiyaki Restaurant | Movie Theater | Mexican Restaurant |
| 4 | Saza Coffee (サザコーヒー) | Coffee Shop | 101 | Coffee Shop | Bakery | Aquarium | Japanese Curry Restaurant | Steakhouse | Seafood Restaurant | Sake Bar | Pie Shop | Okonomiyaki Restaurant | Movie Theater |
| 5 | El Caliente | Mexican Restaurant | 129 | Coffee Shop | Bakery | Aquarium | Japanese Curry Restaurant | Steakhouse | Seafood Restaurant | Sake Bar | Pie Shop | Okonomiyaki Restaurant | Movie Theater |

Appendix 9 – K-means Cluster Data Sapporo

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **列1** | **name** | **categories** | **distance (M)** | **1st Most Popular Venue** | **2nd Most Popular Venue** | **3rd Most Popular Venue** | **4th Most Popular Venue** | **5th Most Popular Venue** | **6th Most Popular Venue** | **7th Most Popular Venue** | **8th Most Popular Venue** | **9th Most Popular Venue** | **10th Most Popular Venue** |
| 1 | JR Tower Observatory T38 (JRタワー展望室 タワー・スリーエイト) | Scenic Lookout | 136 | Sushi Restaurant | Bar | Café | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House | Shopping Mall | Scenic Lookout | Sake Bar | Pastry Shop |
| 2 | Nemuro Hanamaru (回転寿司 根室花まる) | Sushi Restaurant | 79 | Sushi Restaurant | Bar | Café | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House | Shopping Mall | Scenic Lookout | Sake Bar | Pastry Shop |
| 3 | Rikyu (牛たん炭焼 利久) | Japanese Restaurant | 99 | Sushi Restaurant | Bar | Café | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House | Shopping Mall | Scenic Lookout | Sake Bar | Pastry Shop |
| 4 | 味百仙 | Sake Bar | 185 | Sushi Restaurant | Bar | Café | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House | Shopping Mall | Scenic Lookout | Sake Bar | Pastry Shop |
| 5 | Books Kinokuniya (紀伊國屋書店) | Bookstore | 237 | Sushi Restaurant | Bar | Café | Tonkatsu Restaurant | Japanese Curry Restaurant | Noodle House | Shopping Mall | Scenic Lookout | Sake Bar | Pastry Shop |

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