The Best special wards of Tokyo to open a new restaurant

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July 21, 2011

Introduction

- Tokyo is the biggest city of Japan.
- As of 2021, Tokyo has an estimated population of 13,960,236.
- In addition, Tokyo is the political and economic center of Japan.
- In the coronavirus crisis, Many Japanese can’t eat out. Also, quite a few restaurants have closed.
- But, after calming down this crisis, it is expected that people return to downtown to eat out.

Business Problem

Business Problem is to open a restaurant in Tokyo after after calming down the coronavirus crisis. The special wards(There are 23.) are the most crowded in Tokyo. Tokyo special wards are most likely to give a good business.

Data acquisition and cleaning -Data sources-

- To get data of special wards of Tokyo, I used the following Wikipedia page.

  https://en.wikipedia.org/wiki/Special_wards_of_Tokyo

- Next, I got Latitude and Longitude of each ward using Geopy library.
- Finally, I got venue data in Tokyo from Foursquare using Foursquare API.

```
In [63]: html = urlopen("https://en.wikipedia.org/wiki/Special_wards_of_Tokyo")
         html_parser = BeautifulSoup(html, "html.parser")
```

Data acquisition and cleaning
-Data cleaning-

I did web scraping to wikipedia page by Beautiful Soup. To get the wards table from the wikipedia page, I found the name of table class, and extracted the elements between “td' and “'th”.

```
In [65]: table = html_parser.findAll("table", {"class":"wikitable sortable"})[0]
         rows = table.findAll("tr")

         with open("tokyo.csv", "w", encoding='utf-8') as file:
             writer = csv.writer(file)
             for row in rows:
                 csvRow = []
                 for cell in row.findAll(['td', 'th']):
                     csvRow.append(cell.get_text())
                 writer.writerow(csvRow)
```

Feature selection

Next, I did data processing and tabulation by pandas Like below.

- Tabulation the elements of the table of wikipedia page
- Getting latitude and longitude of each ward by geocoder
- Plotting of each ward by Folium
- Getting venu information of each ward by Foursquare API
- Making CSV file from the table.

	Neighbourhood	Latitude	Longitude
0	Chiyoda	35.693930	139.753711
1	Chūō	35.670572	139.771988
2	Minato	35.658017	139.751546
3	Shinjuku	35.693798	139.703440
4	Bunkyō	35.707595	139.752210

Exploratory Data Analysis

Then, I did data analysis by pandas Like below.

- Making the Top 10 of the venue categories to each ward.
- Making tables of each ward include top 10 of the venue categories.

At this point, I found that there must be some area with many restaurants.

	Neighbourhood	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
0	Adachi	Convenience Store	Supermarket	Discount Store	Drugstore	Grocery Store	BBQ Joint	Noodle House	Ramen Restaurant	Furniture / Home Store	Pizza Place
1	Arakawa	Ramen Restaurant	Park	BBQ Joint	Supermarket	Japanese Restaurant	Grocery Store	Drugstore	Sandwich Place	Discount Store	Deli / Bodega
2	Bunkyō	Hotel	Baseball Stadium	Martial Arts School	Supermarket	Café	Seafood Restaurant	Pastry Shop	Chinese Restaurant	History Museum	Ramen Restaurant
3	Chiyoda	Café	Ramen Restaurant	Japanese Curry Restaurant	BBQ Joint	Sushi Restaurant	Tea Room	Coffee Shop	Comedy Club	Historic Site	Sake Bar
4	Chūō	Ramen Restaurant	Soba Restaurant	Italian Restaurant	Tonkatsu Restaurant	Sushi Restaurant	Coffee Shop	Yoshoku Restaurant	Juice Bar	Steakhouse	Burger Joint

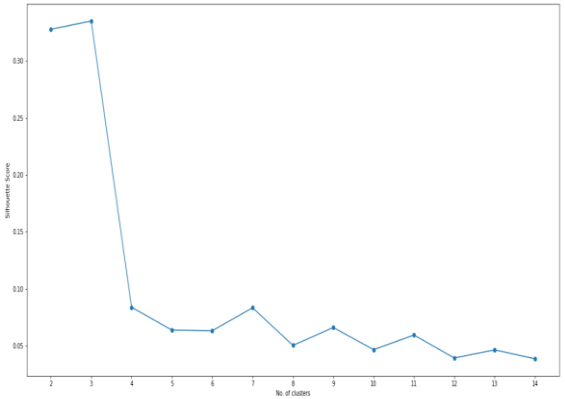
Predictive Modeling

I selected “Clustering by K-Means” as “Unsupervised Learning Model”.

Result of the elbow method , I found that the suitable number of clusters is 4.

Then, I Vidualized of the clusters by Folium.

And I did One hot encoding by get dummies.



	Neighbourhood	African Restaurant	American Restaurant	Arcade	Art Museum	Asian Restaurant	Athletics & Sports	BBQ Joint	Bakery	Bar	Baseball Stadium	Bath House	Bed & Breakfast	Beer Bar	Beer Garden	Bistro	Boarding House	Bookstore
0	Chiyoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Chiyoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Chiyoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Chiyoda	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Chiyoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Discussion

Closely examining the contents(Top 10 categories of the restaurant business) of each cluster, it is clear between clusters that a big difference exists.

Then I found that Cluster 4 is thought to be the most appropriate place to open the restaurant business because there are many restaurant categories in the ward.

Especially, Chuo and Shinjuku, These wards are populous areas in Cluster 4, look like good locations for open a new restaurant.

Conclusion

- Web Scraping by Beautiful Soup is very helpful to gather data for data analysis.
- Web API such as Foursquare is very valuable for data scientist. It is very easy and effective to extract data that they have.
- Also, data analysys and machine learning by python can be very helpful in determining solutions of certain business problems.
- I had a hard time to solve errors by the version difference of libraries. I felt the need of performing enough preparations including the learning about the necessary library before programming.