Capstone Project

1. Introduction

Background

In the past decade, the lifestyle of urban people has changed with the trends and habits of drinking coffee. Coffee, which was ancient, is identical to drinks commonly used by older men, now women and men of all ages are accustomed to drinking coffee. And not just enjoying coffee, but many people are looking for a place to drink coffee. The coffee shop has finally become a cool hangout with an internet connection while enjoying a variety of steeping coffee beans.

This coffee drinking trend will become a big business opportunity. The business world is starting to work on places that serve specialty coffee. With this trend in Hong Kong, it is possible for a coffee shop to get a good profit. However, getting into the business world is not as easy as one might imagine, especially for Hong Kong, where coffee shop is very common.

If you already have the capital to open a coffee shop, then you must have the courage, start designing strategies and seeing the market. If you have long been in love with coffee and a hobby of drinking coffee, it means you can start a business with the right passion. Therefore, I try to practice my learning at Coursera to answer relevant questions, namely designing strategies to determine which areas are suitable for opening coffee shops.

Problem

Finding data about the area in Hong Kong is a challenge that must be resolved as Hong Kong does not divide area into neighbourhood like some countries. Therefore, this project will use the list of districts in Wikipedia to define the area. The price of renting a place to determine the exact location of a coffee shop is also one of the problems that must be resolved.

Interest

I believe this is a relevant challenge with a valid question for anyone who wants to open a coffee shop and determine the right location. The same methodology can be applied according to demands as applicable. This case also applies to anyone interested in exploring starting or finding new business in any city. Finally, this can also serve as a good practical exercise for developing Data Science skills.

2. Data Acquisition and Cleaning

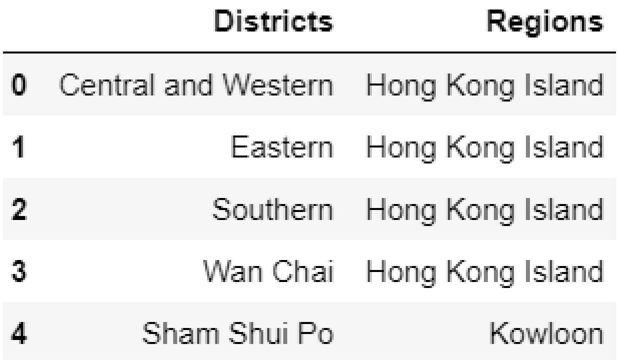
Data Acquisition

The data acquired for this project is a combination of data from two sources. The first data source of data is scraped from a wikipedia page that contains the list of districts in Hong Kong ---> https://en.wikipedia.org/wiki/Districts_of_Hong_Kong.
The following are the columns:
District : Name of the district
Region: Name of the region

The Second data source is the list of Longitude & Latitude from website latlong.net, the following are columns:
District : Name of the district Latitude : Latitude of the town
Longitude : Longitude of the town.

Data Cleaning

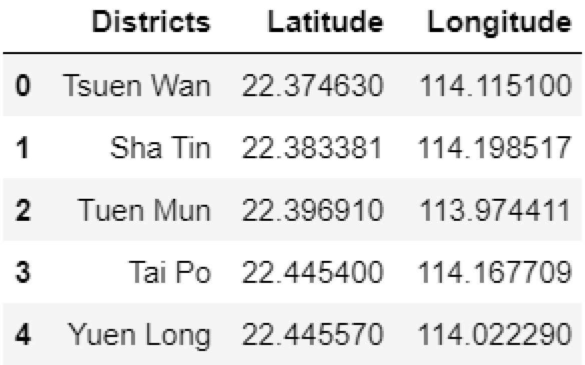
The data is preprocessed separately. The Districts information of Hong Kong is scraped from Wikipedia using the Beautiful Soup library in Python. This library can help us extract data in the tabular format on the website. After extracting data, a panda dataframe(as shown in Fig 2.1) is created using string manipulation



	Districts	Regions
0	Central and Western	Hong Kong Island
1	Eastern	Hong Kong Island
2	Southern	Hong Kong Island
3	Wan Chai	Hong Kong Island
4	Sham Shui Po	Kowloon

Fig 2.1 Hong Kong 18-District Data after preprocessing

The second data is a list of coordinates for the 18 districts which we get the data from latlong.net and store them in a csv file. A panda dataframe(as shown in Fig 2.2) is then created in order to store the data

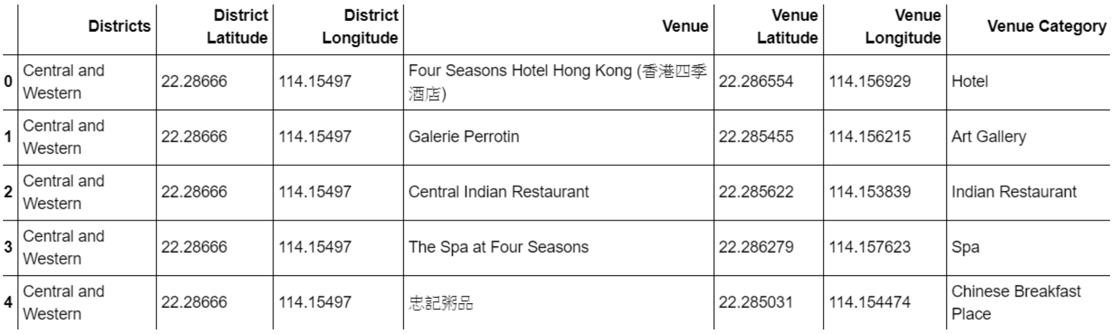


	Districts	Latitude	Longitude
0	Tsuen Wan	22.374630	114.115100
1	Sha Tin	22.383381	114.198517
2	Tuen Mun	22.396910	113.974411
3	Tai Po	22.445400	114.167709
4	Yuen Long	22.445570	114.022290

Fig 2.2 Coordinates for the 18 districts in Hong Kong

3. Methodology

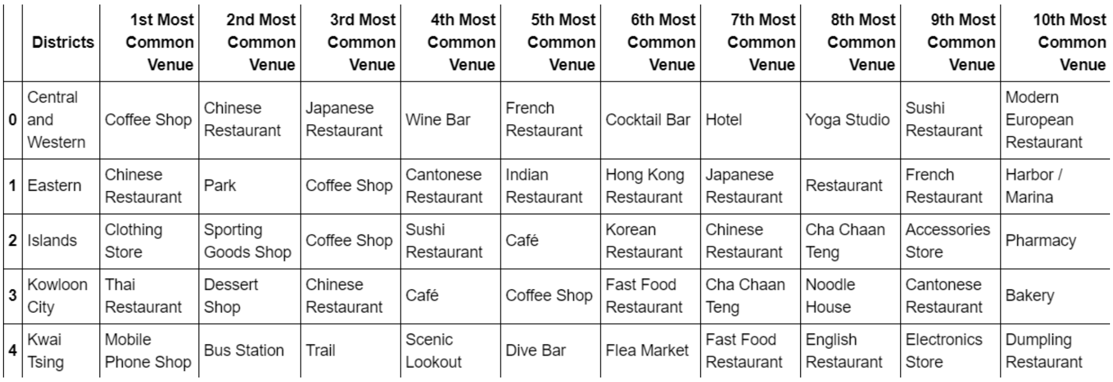
After creating a dataframe storing the data of 18 districts and their coordinates, by using the Foursquare API, we can find different venues for different districts within a 500-meter radius. It then return a JSON file which turn into a dataframe containing venues within districts(as shown in Fig 3.1) with further processes.



	Districts	District Latitude	District Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Central and Western	22.28666	114.15497	Four Seasons Hotel Hong Kong (香港四季酒店)	22.286554	114.156929	Hotel
1	Central and Western	22.28666	114.15497	Galerie Perrotin	22.285455	114.156215	Art Gallery
2	Central and Western	22.28666	114.15497	Central Indian Restaurant	22.285622	114.153839	Indian Restaurant
3	Central and Western	22.28666	114.15497	The Spa at Four Seasons	22.286279	114.157623	Spa
4	Central and Western	22.28666	114.15497	忠記粥品	22.285031	114.154474	Chinese Breakfast Place

Fig 3.1 Dataframe containing all venues for different districts

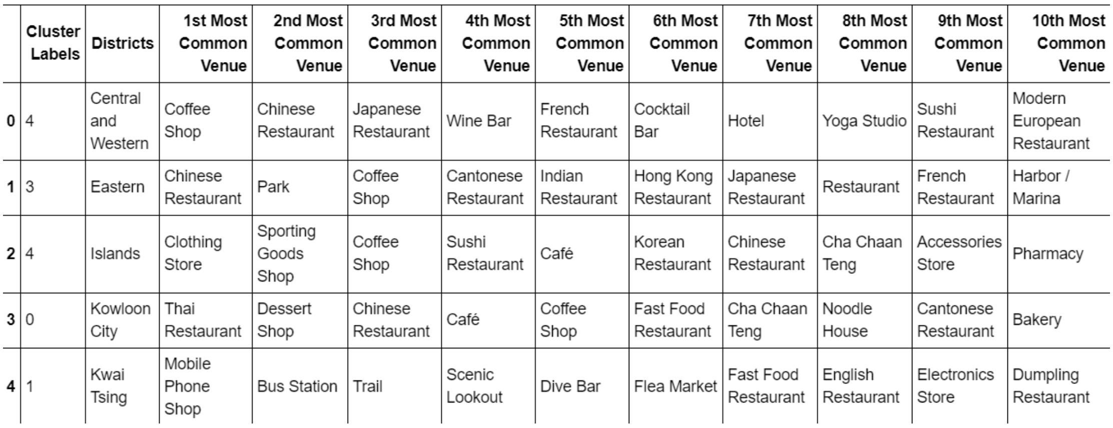
The data is further processed using one hot encoding(one hot encoding is commonly used to turn categorial data to numerical data in order to help the machine do a better job in prediction when we provide it to ML algorithm). The venue data is then grouped by districts and then the mean for each category is calculated. Therefore, we can find the most common category of venues for each district(as shown in Fig 3.2).



	Districts	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	Central and Western	Coffee Shop	Chinese Restaurant	Japanese Restaurant	Wine Bar	French Restaurant	Cocktail Bar	Hotel	Yoga Studio	Sushi Restaurant	Modern European Restaurant
1	Eastern	Chinese Restaurant	Park	Coffee Shop	Cantonese Restaurant	Indian Restaurant	Hong Kong Restaurant	Japanese Restaurant	Restaurant	French Restaurant	Harbor / Marina
2	Islands	Clothing Store	Sporting Goods Shop	Coffee Shop	Sushi Restaurant	Café	Korean Restaurant	Chinese Restaurant	Cha Chaan Teng	Accessories Store	Pharmacy
3	Kowloon City	Thai Restaurant	Dessert Shop	Chinese Restaurant	Café	Coffee Shop	Fast Food Restaurant	Cha Chaan Teng	Noodle House	Cantonese Restaurant	Bakery
4	Kwai Tsing	Mobile Phone Shop	Bus Station	Trail	Scenic Lookout	Dive Bar	Flea Market	Fast Food Restaurant	English Restaurant	Electronics Store	Dumpling Restaurant

Fig 3.2 The most common category of venues for each district

After getting the top 10 categories of venues for each district, we cluster the districts into 5 clusters using k-means clustering which is a form of unsupervised machine learning algorithm that clusters data to predefined cluster size. In this project, we will cluster the districts into 5 group(as shown in Fig 3.3). The reason for using k-means clustering is to group districts with similar venues so that people can shortlist the area of their interest based on the venues for each district.



	Cluster Labels	Districts	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	4	Central and Western	Coffee Shop	Chinese Restaurant	Japanese Restaurant	Wine Bar	French Restaurant	Cocktail Bar	Hotel	Yoga Studio	Sushi Restaurant	Modern European Restaurant
1	3	Eastern	Chinese Restaurant	Park	Coffee Shop	Cantonese Restaurant	Indian Restaurant	Hong Kong Restaurant	Japanese Restaurant	Restaurant	French Restaurant	Harbor / Marina
2	4	Islands	Clothing Store	Sporting Goods Shop	Coffee Shop	Sushi Restaurant	Café	Korean Restaurant	Chinese Restaurant	Cha Chaan Teng	Accessories Store	Pharmacy
3	0	Kowloon City	Thai Restaurant	Dessert Shop	Chinese Restaurant	Café	Coffee Shop	Fast Food Restaurant	Cha Chaan Teng	Noodle House	Cantonese Restaurant	Bakery
4	1	Kwai Tsing	Mobile Phone Shop	Bus Station	Trail	Scenic Lookout	Dive Bar	Flea Market	Fast Food Restaurant	English Restaurant	Electronics Store	Dumpling Restaurant

Fig 3.3 Districts with their cluster labels

Plotting the clusters on the map of Hong Kong using Folium can better visualize the clusters(as shown in Fig 3.4)

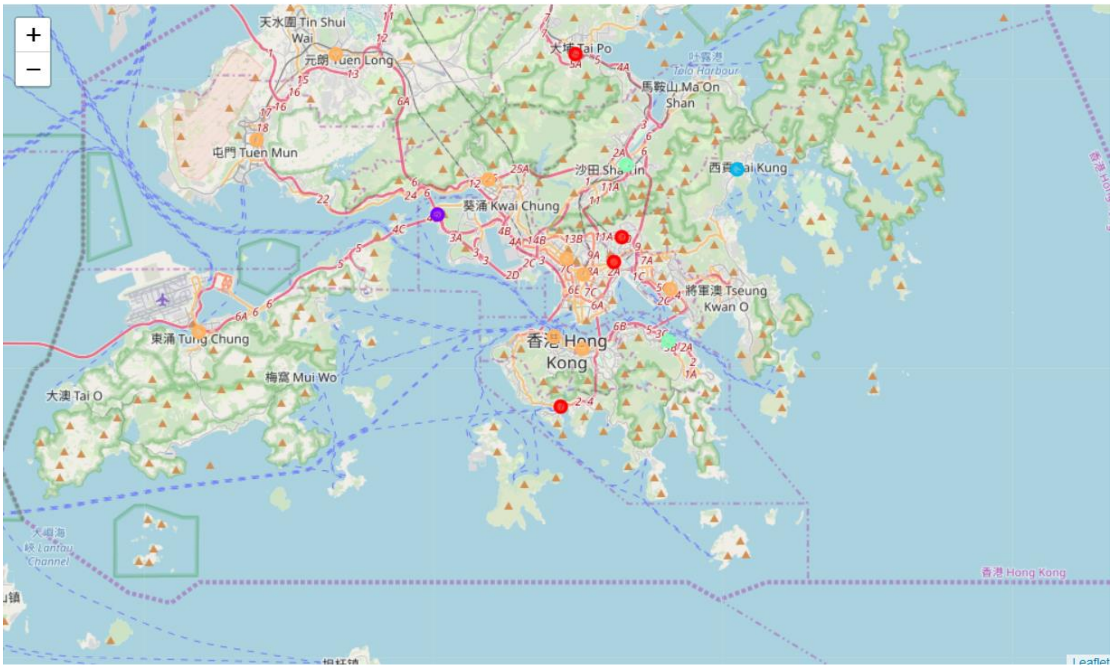
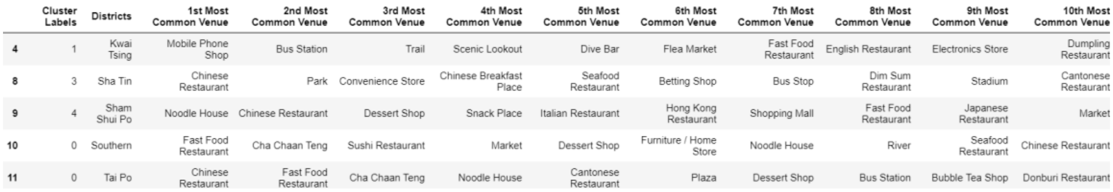


Fig 3.4 Cluster result on a map with red = cluster 0, purple = cluster 1, blue = cluster 2, green = cluster 3, orange = cluster 4

4. Results

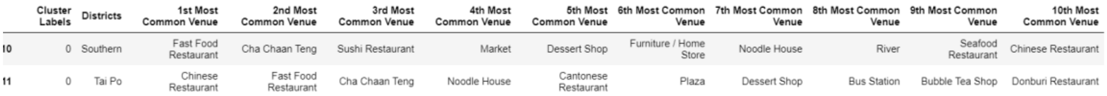
As in this project, the objective is to find a proper district to run a coffee shop, in this case, we want to lower our risk by choosing districts with fewer competitors. Therefore, we drop the districts with café being the top 10 most common venues(as shown in Fig 4.1).



	Cluster Labels	Districts	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
4	1	Kwai Tsing	Mobile Phone Shop	Bus Station	Trail	Scenic Lookout	Dive Bar	Flea Market	Fast Food Restaurant	English Restaurant	Electronics Store	Dumpling Restaurant
8	3	Sha Tin	Chinese Restaurant	Park	Convenience Store	Chinese Breakfast Place	Seafood Restaurant	Betting Shop	Bus Stop	Dim Sum Restaurant	Stadium	Cantonese Restaurant
9	4	Sham Shui Po	Noodle House	Chinese Restaurant	Dessert Shop	Snack Place	Italian Restaurant	Hong Kong Restaurant	Shopping Mall	Fast Food Restaurant	Japanese Restaurant	Market
10	0	Southern	Fast Food Restaurant	Cha Chaan Teng	Sushi Restaurant	Market	Dessert Shop	Furniture / Home Store	Noodle House	River	Seafood Restaurant	Chinese Restaurant
11	0	Tai Po	Chinese Restaurant	Fast Food Restaurant	Cha Chaan Teng	Noodle House	Cantonese Restaurant	Plaza	Dessert Shop	Bus Station	Bubble Tea Shop	Donburi Restaurant

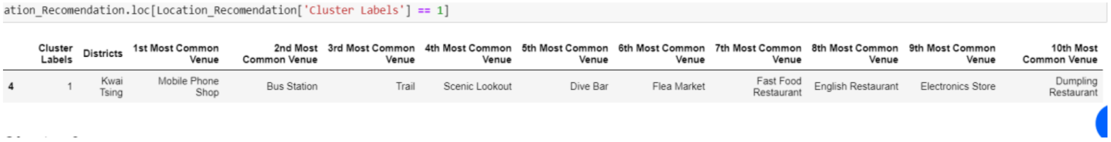
Fig 4.1 Districts without café being the top 10 most common venue

We then separate it by cluster label



	Cluster Labels	Districts	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
10	0	Southern	Fast Food Restaurant	Cha Chaan Teng	Sushi Restaurant	Market	Dessert Shop	Furniture / Home Store	Noodle House	River	Seafood Restaurant	Chinese Restaurant
11	0	Tai Po	Chinese Restaurant	Fast Food Restaurant	Cha Chaan Teng	Noodle House	Cantonese Restaurant	Plaza	Dessert Shop	Bus Station	Bubble Tea Shop	Donburi Restaurant

Fig 4.2 Cluster 0 with districts without café being the top 10 most common venue



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ation_Recomendation.loc[Location_Recomendation['Cluster Labels'] == 1]
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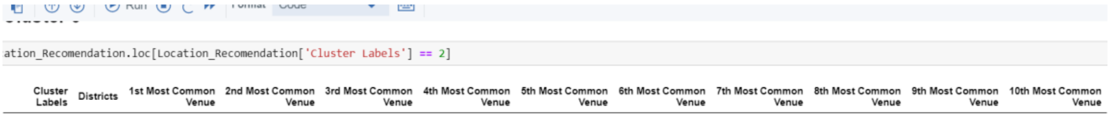
	Cluster Labels	Districts	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
4	1	Kwai Tsing	Mobile Phone Shop	Bus Station	Trail	Scenic Lookout	Dive Bar	Flea Market	Fast Food Restaurant	English Restaurant	Electronics Store	Dumpling Restaurant

Fig 4.3 Cluster 1 with districts without café being the top 10 most common venue



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ation_Recomendation.loc[Location_Recomendation['Cluster Labels'] == 2]
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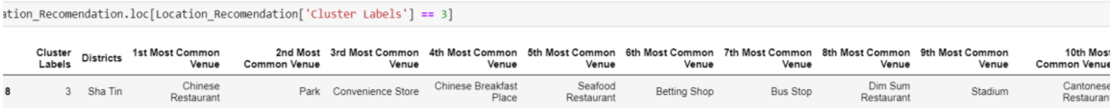
	Cluster Labels	Districts	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue

Fig 4.4 Cluster 2 with districts without café being the top 10 most common venue



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ation_Recomendation.loc[Location_Recomendation['Cluster Labels'] == 3]
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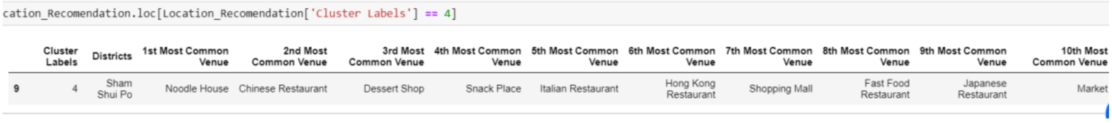
	Cluster Labels	Districts	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
8	3	Sha Tin	Chinese Restaurant	Park	Convenience Store	Chinese Breakfast Place	Seafood Restaurant	Betting Shop	Bus Stop	Dim Sum Restaurant	Stadium	Cantonese Restauran

Fig 4.5 Cluster 3 with districts without café being the top 10 most common venue



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cation_Recomendation.loc[Location_Recomendation['Cluster Labels'] == 4]
```

	Cluster Labels	Districts	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
9	4	Sham Shui Po	Noodle House	Chinese Restaurant	Dessert Shop	Snack Place	Italian Restaurant	Hong Kong Restaurant	Shopping Mall	Fast Food Restaurant	Japanese Restaurant	Market

Fig 4.6 Cluster 4 with districts without café being the top 10 most common venue

From the result, we see that there are actually a large competition in Hong Kong, we see that out of the 18 districts in Hong Kong, we only have 5 districts where coffee shop is not in the top 10 common venue. Therefore, running a coffee shop in Hong Kong now may not be the best option. In case you really want to run a coffee shop, area in Cluster 0 may be the best option you have as there are some indirect competition in the area of other Cluster, like Dessert Shop, Bubble Tea Shop etc.

5. Conclusion

This project helps one get a better understanding of the environment in relation to the most suitable place to open coffee shops. The future of this project includes considering other factors such as the cost of renting a place, the price of land to open a new coffee shop or even the work and salaries of each person in the area to be able to more accurately determine the price of coffee to be sold.