

IBM Data Science Professional Certificate Capstone Project

MTR Station Clustering Based on Foursquare Data

Please also view the associated [Jupyter Notebook](#)

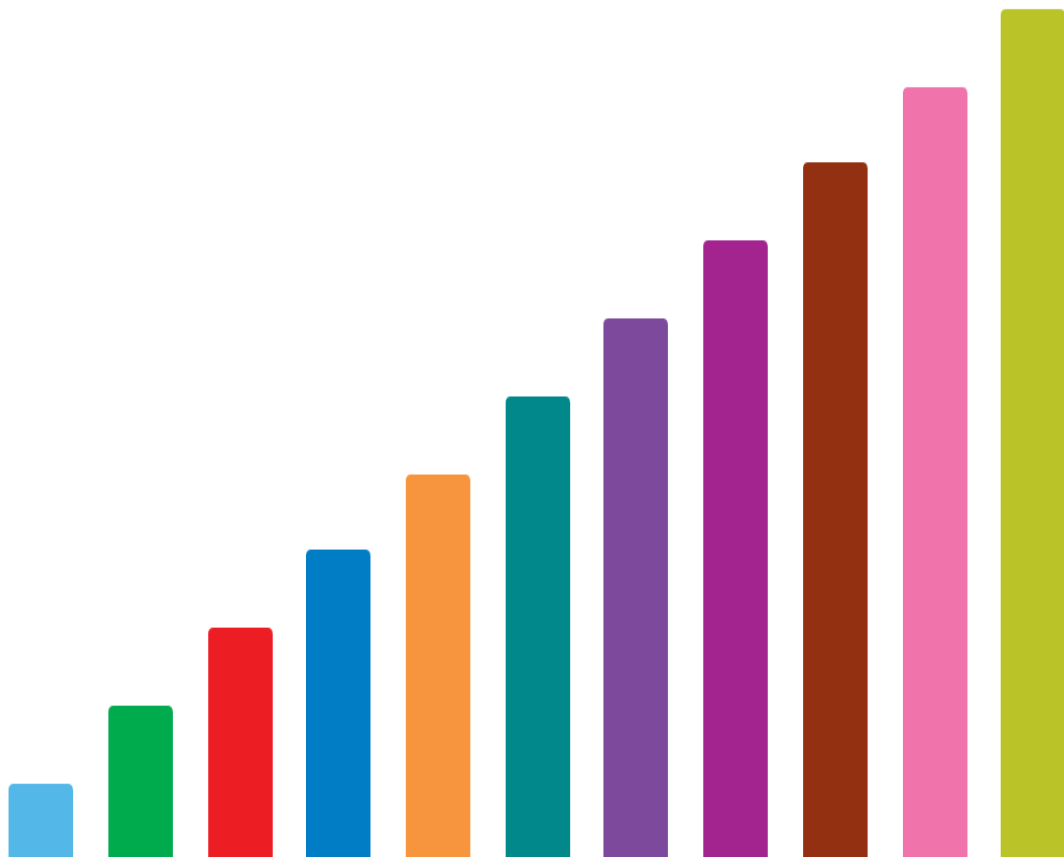


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Introduction

This project is an exploration into how to cluster a city's subway network based on a certain set of data. The test case was based on the [Hong Kong MTR network](#) and the data used was based on the Foursquare location data. The resulting clusters may be interesting for the following people:

- Those living in HK or tourists asking themselves which area they want to explore and if the areas are similar or not
- The MTR corporation in terms of marketing their stations, pricing, zone grouping, estimating the types of people going through the stations, the station amenities/services, etc.
- Other data scientists that want to further explore the clustering by including other different types of data.

This is only an exploration based on Foursquare data, and the clustering can be further refined by including other data (such as population density, housing prices, etc.) depending on the end goal of the exploration.

Data

The data collection mostly contained 3 sources:

- [Overpass Turbo](#) to export the Geojson files to get the coordinates of the stations and their routes (for visualization purposes). It is a web version of the overpass API which pulls data from openstreetmap.
- [Wikipedia](#) to cross reference the station names and to be a backup in case other data collection methods did not work.
- The [Foursquare API](#) to collect venue data surrounding each station.

Station Coordinates

The first attempt at collecting station coordinates was using reverse geocoding based on [Geopy \(Nominatim\)](#). However, the resulting coordinates were not very accurate for some of the stations. In the end, the [overpass API](#) was used to pull data from openstreetmap which included the stations and their routes. Some time was taken to learn the Overpass query language (nodes, ways, relations), and in using the [Overpy module](#). The overpy module was not used in the end as the resulting data was not easy to manipulate and was hard to visualize if the query was successful. In the end the Overpass Turbo website was used as one can run a query and see the query results instantly. Then the query can be exported as a geojson file. After collecting the stations, line, line color and coordinates from Overpass Turbo and Wikipedia, the resulting Pandas dataframe looked like the one below:

Station	Line	Line Color	Latitude	Longitude
Lo Wu	East Rail line	#53B7E8	22.528200	114.113140
Lok Ma Chau	East Rail line	#53B7E8	22.514448	114.065791
Sheung Shui	East Rail line	#53B7E8	22.501124	114.128050
Fanling	East Rail line	#53B7E8	22.492042	114.138666
Tai Wo	East Rail line	#53B7E8	22.450966	114.161201
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Table 1: List of MTR Stations and their Coordinates

The [Folium](#) package was used to visualize the stations and geojson information of their routes:

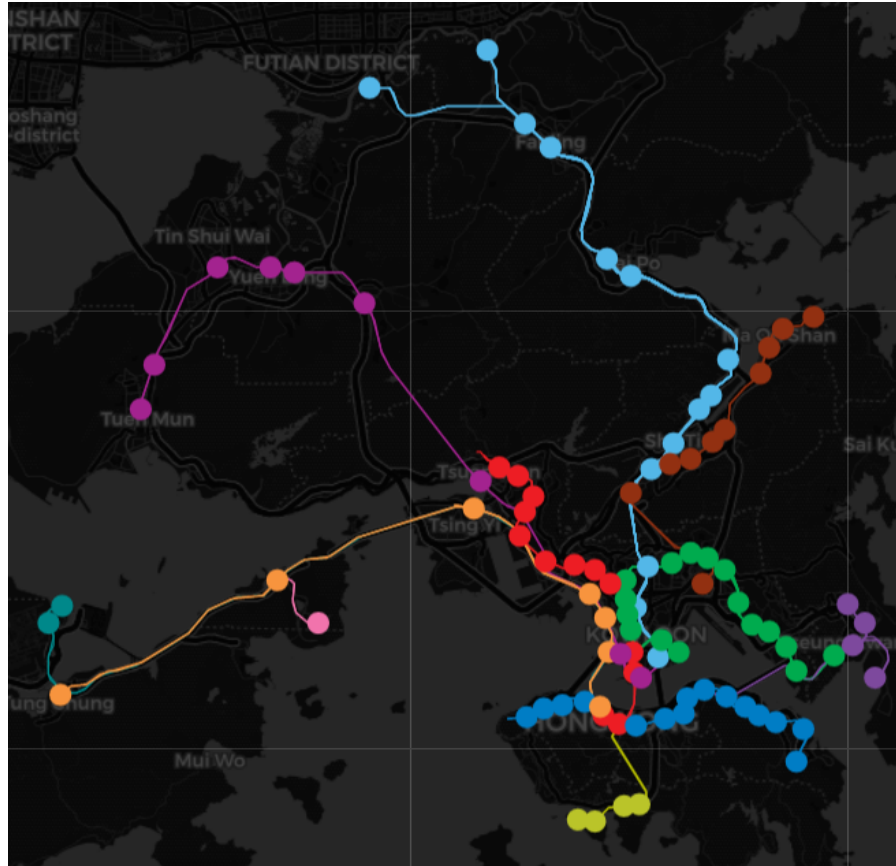


Image 1: Folium Map of HK with MTR Station and Routes

Foursquare API

The Foursquare API was used to collect data. One would need to sign up for their services and pass credentials in the API call. The explore venues option is called which will search around a coordinate for a given radius. In this case the MTR station coordinates were passed and the venues in a 500m radius were collected. A zoomed in Folium map visualizing the Foursquare search radius of 500m is shown below:

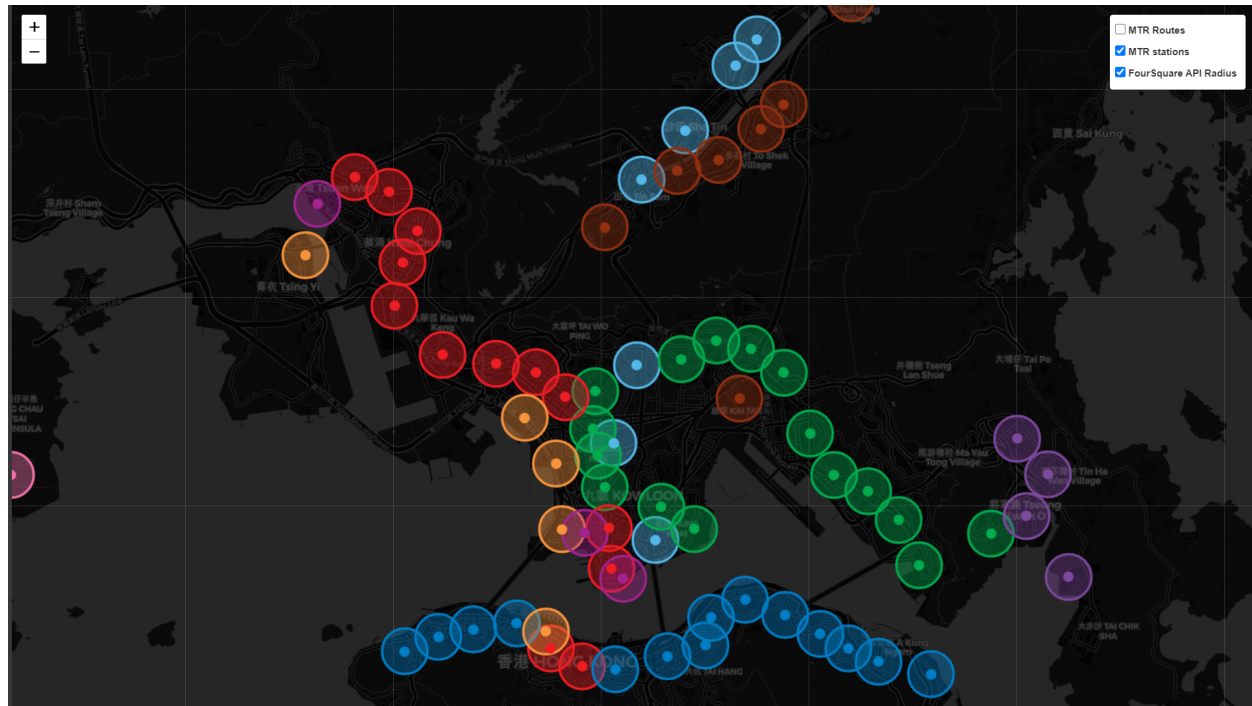


Image 2: Folium Map of MTR stations and search radius

The raw results from Foursquare were in JSON format. The relevant data was extracted and stored in a dataframe like below where it is a list of all the venues returned:

Station	Station Latitude	Station Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Lo Wu	22.5282	114.11314	星巴克	22.529067	114.113027	Coffee Shop
Lo Wu	22.5282	114.11314	KFC (肯德基)	22.532081	114.113630	Fast Food Restaurant
Lo Wu	22.5282	114.11314	Lo Wu Control Point (羅湖出入境管制站)	22.529425	114.113456	Border Crossing
Lo Wu	22.5282	114.11314	MTR Lo Wu Station Platform 1 (港鐵羅湖站1號月台)	22.527801	114.113192	Platform
Lo Wu	22.5282	114.11314	Hong Kong Delight	22.529049	114.113241	Chinese Restaurant

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Table 2: List of venues Foursquare API result

It was found that there was a varying amount of venues returned for the stations. Some stations received 100 or more venues (API return limit was set at 100) and some stations returned less than 10 venues. The histogram below shows the distribution of venues results:

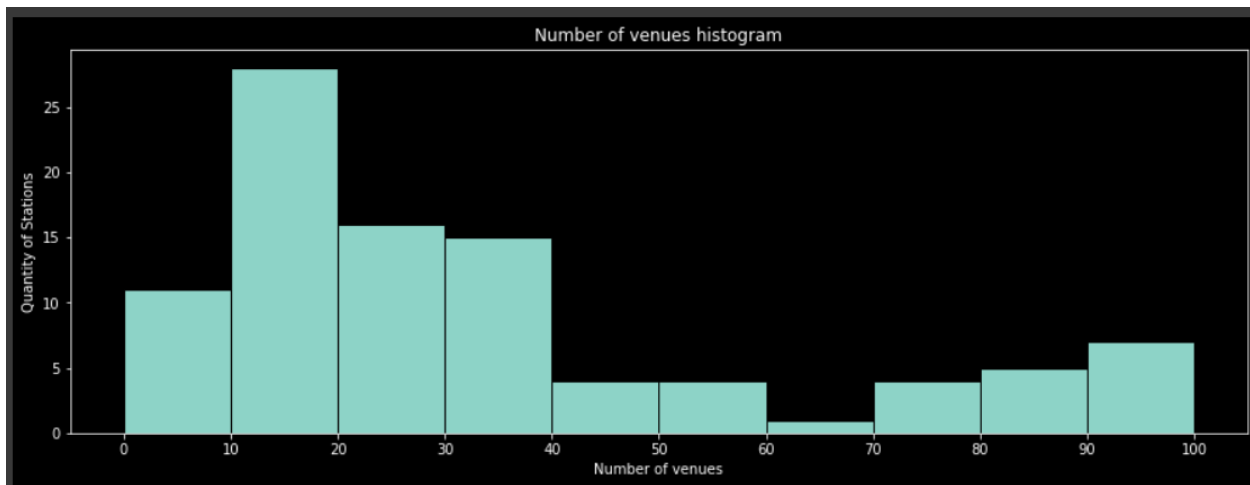


Image 3: Histogram of Number of Venues Returned

It can be shown above that the majority of stations received a sufficient number of venues. However, there are some stations that have less than 10 venues. Another thing to note is that each run of the API call may have returned different results. As of the last code run that this report is based on, the number of stations with less than 10 venues is 11. This created a problem where finding the top 10 venues the missing venues were almost random (it was a result of an alphabetical sort). In this case, there were some solutions to this by either removing those stations entirely from the algorithm, replacing the missing venues with the mean venues, or randomly selecting venues.

After one hot encoding, and normalizing the results, the list below shows the top 10 types of venues of the whole dataset:

1. Chinese Restaurant
2. Coffee Shop
3. Café
4. Fast Food Restaurant
5. Japanese Restaurant
6. Hotel
7. Cha Chaan Teng
8. Cantonese Restaurant
9. Noodle House
10. Shopping Mall

For the stations with less than 10 venues, and in combinations with the list above, the missing venues were replaced with their respective mean venues. For example if a station has 9 venues, the 10th venue is replaced with the venue “Shopping Mall” from above. With this in mind, the data set was grouped by station and the top 10 types of venues for each is listed like this:

Station	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
Admiralty	Café	Italian Restaurant	Hotel	Burger Joint	Clothing Store	Steakhouse	Bakery	Seafood Restaurant	Cantonese Restaurant	Tea Room
Airport	Airport Lounge	Coffee Shop	Japanese Restaurant	Bakery	Gift Shop	Deli / Bodega	Chinese Restaurant	Chocolate Shop	Clothing Store	Cocktail Bar
AsiaWorld-Expo	Coffee Shop	Restaurant	Chinese Restaurant	Metro Station	Middle Eastern Restaurant	Gym	Bistro	Boat or Ferry	Bus Station	Bus Stop
Austin	Chinese Restaurant	Dessert Shop	Café	Indian Restaurant	Cha Chaan Teng	Seafood Restaurant	Coffee Shop	Hotpot Restaurant	Noodle House	Dim Sum Restaurant
Causeway Bay	Japanese Restaurant	Coffee Shop	Hotel	Seafood Restaurant	Sushi Restaurant	Clothing Store	Cha Chaan Teng	Dessert Shop	Noodle House	Gift Shop
~	~	~	~	~	~	~	~	~	~	~

Table 3: List of Stations and Top 10 Types Of Venue

Methodology

After getting the top 10 most common venues for each station, the machine learning algorithm, K-means clustering was used to cluster the stations based on the venues. The main hyper parameter that will need to be optimized is k or the number of clusters that the algorithm will attempt to make. There were two different k means models based on two different values for k:

- One was chosen based on measuring the silhouette score for a range of k, and then chose the k with the best score. This model will be referred to as K Best
- The other was based on the number of MTR train lines as the k. In this case, k=11. This is an experiment in what a different MTR network would look like based on this data. This model will be referred to as K Line.

K Best Model

For the K Best model, the silhouette score was plotted against each iteration of K to show which K seems to be the best:

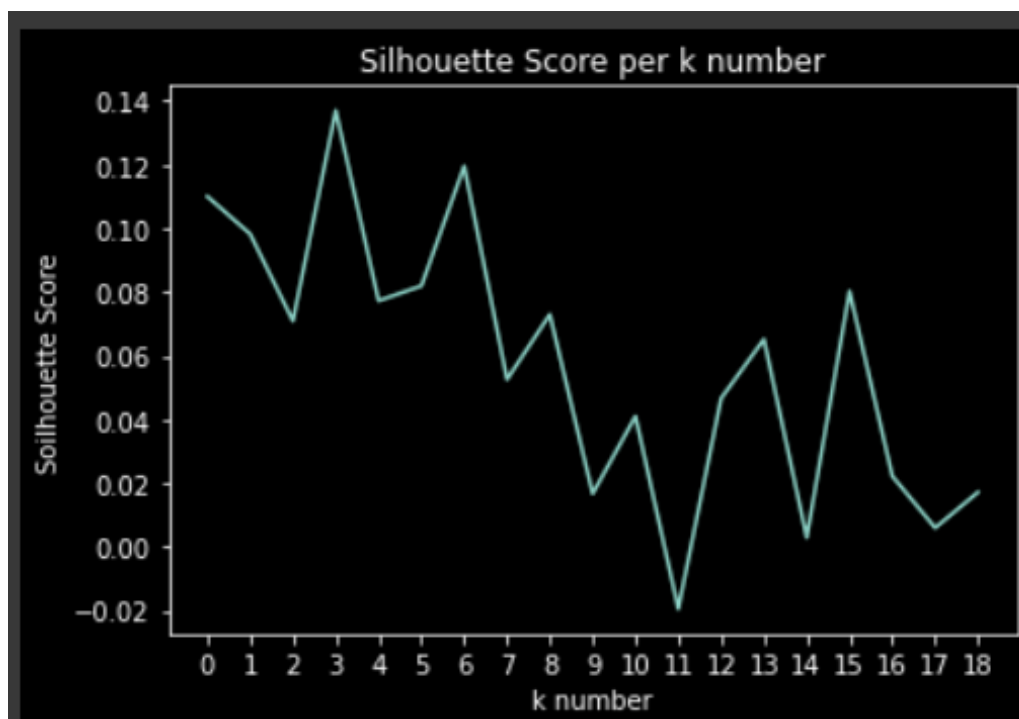


Image 4: Silhouette Score Vs K

As each call of the Foursquare API may yield different results, each loop of finding the best K may also yield different results. For the last run of the code, it can be shown from the graph that a K of 3 yields the highest score. A K Best model was then created using **K=3**.

K Lines Model

The number of MTR lines in service is 11. Interestingly, according to the silhouette score, clustering by the number of MTR lines sometimes yields the lowest score. But it will be attempted anyways for experimentation and visualization purposes. The K Lines model was then created using **K=11**.

Results

K Best Model

The Folium map showing the resulting K Best Clustering:

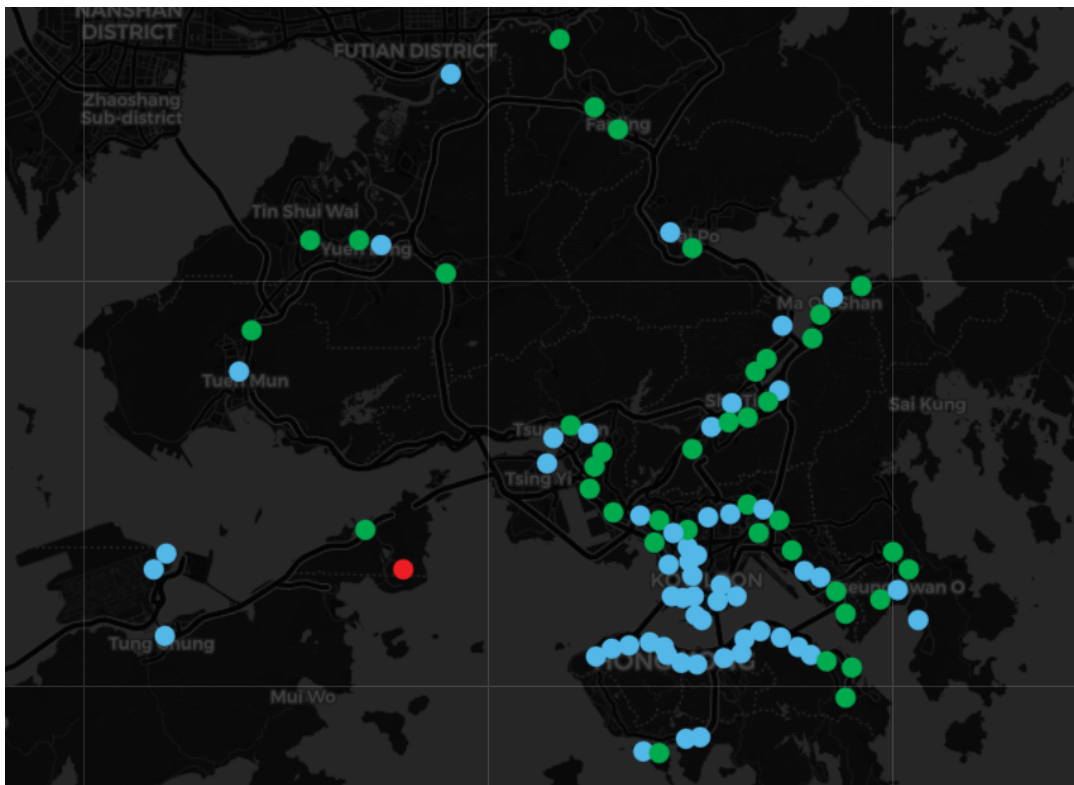
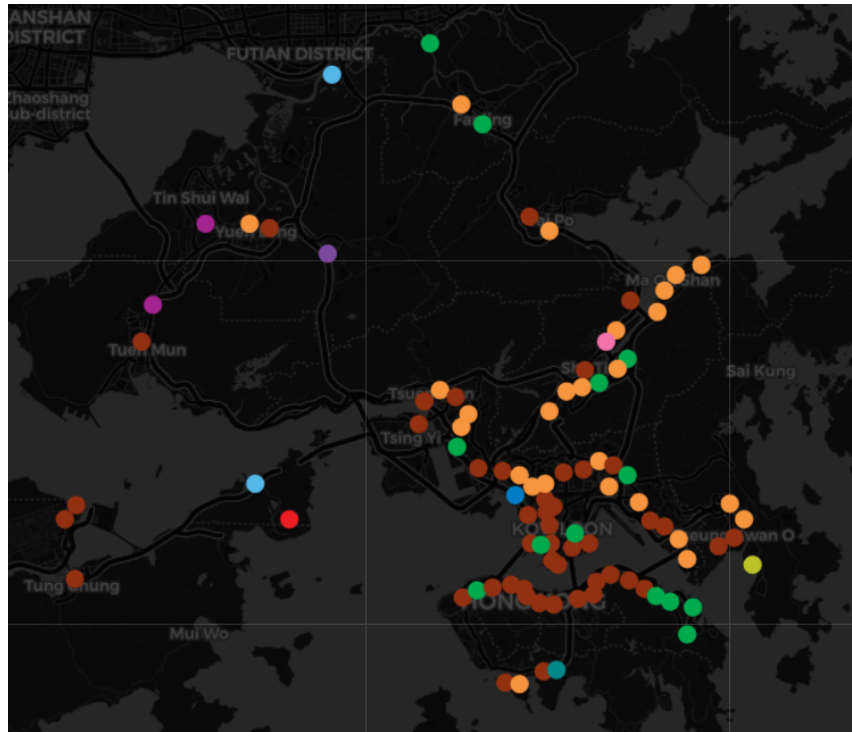


Image 5: K Best Clustering

K Lines Model

The Folium map showing the resulting K Lines Clustering:

*Image 6: Map of K Lines Clustering*

Discussion

K Best Model

A list of which stations belonging to each cluster can be shown in [Appendix Table 1](#). The stations listed in red refer to those that had less than 10 venues. [Appendix Tables 3](#) shows for each cluster the stations and their respective top 10 venues. As shown above, the algorithm has created 3 clusters. Some insights can be made about these clusters:

- Cluster 0 seems to concentrate on entertainment and some F&B venues. This also represents the types of venues considered in "central" Hong Kong.

- Cluster 1 seems to concentrate heavily on F&B related venues. It also just happens to relate to venues outside of what is considered "central" Hong Kong.
- Cluster 2 is just one station- The Disneyland resort station. One can see how much different this one is to other stations. However, it is interesting that another station, Ocean Park is not also clustered together with this station considering they are both amusement parks.

K Lines Model

It is interesting to note how the algorithm when forced to create the 11 clusters, it put some of the stations with less than 10 venues in their own cluster. There must be some key venues that distinguish those stations from the rest. This can be seen in [Appendix Table 2](#) where the stations in red were the ones with less than 10 venues. In order to see the distinguishing venues, [Appendix Tables Groups 4](#) shows the full list of stations and their top 10 venues. Not much useful insight can be made with the 11 clusters considering it has a low silhouette score. However, some insights could be found such as:

- Cluster 8 seems to be the biggest cluster which includes almost all "central" HK stations. Most of the venues seemed to be F&B with some shopping related venues. Most of the top 1st venues seemed to be divided between F&B and shopping venues however.
- Cluster 4 is the second largest cluster, with the top majority being "fast food" and other F&B venues.
- Cluster 1 is the third largest and most comprised of "Chinese/Cantonese" restaurants. With the bottom venues being mostly transportation and shopping venues.

The other clusters could be regarded as outliers as they are in their own cluster due to them being vastly different from the others. However, due to the low silhouette score, some of them may even be "forced" into the wrong cluster just due to how the model requires $K=11$.

It is still interesting nonetheless as this is what an alternate MTR network would look like solely based on the Foursquare data.

Conclusion

After collecting Foursquare data for each MTR station, the power of machine learning was utilized to cluster these stations. Two k means clustering algorithms were utilized for clustering. Based on the best silhouette score, the best number of clusters with the latest search results is 3. It was shown which stations belong to each of the 3 clusters. The other clustering model was created using the number of MTR lines-11. This just so happens to have a very low silhouette score which means the clustering may give high errors. It was utilized just for experimenting with what an alternate MTR network would look like. Using this data, one may know which stations are most similar/dissimilar to each other. The unique density of Hong Kong leads to some interesting results with the clustering. Hong Kong has some very densely populated districts and others are much more sparse. This will need to be taken into consideration in this current model and in future models.

Future Recommendations

There are a number of future improvements/experimentations following this project:

- Utilizing additional data wherever available such as district population density, surrounding property prices, ethnic/nationality breakdown, etc.
- Possibly using another main source of venue information, such as the Google Map API as the Foursquare data was sparse for some areas and may be outdated.
- Either manually or creating an optimization routine to determine the best radius for each search point. Many of the stations had overlapping search radiuses, and some may need larger radiuses due to their location. More research may be needed to determine if this will impact the model negatively.
- Experimenting with the top N venues with increasing the number of venues included in the algorithm. This depends if sufficient data points are available.

Appendix

Appendix Table 1: List of Stations in Respective Cluster (K Best)

Cluster 0	Cluster 1	Cluster 2
Admiralty	Chai Wan	Disneyland Resort
Airport	Che Kung Temple	
AsiaWorld-Expo	Cheung Sha Wan	
Austin	Choi Hung	
Causeway Bay	City One	
Central	Fanling	
Diamond Hill	Fo Tan	
East Tsim Sha Tsui	Hang Hau	
Fortress Hill	Heng Fa Chuen	
HKU	Heng On	
Ho Man Tin	Hin Keng	
Hong Kong	Kai Tak	
Hung Hom	Kam Sheung Road	
Jordan	Kowloon Bay	
Kennedy Town	Kwai Fong	
Kowloon	Kwai Hing	
Kowloon Tong	Lai King	
Kwun Tong	Lam Tin	
LOHAS Park	Lei Tung	
Lai Chi Kok	Lo Wu	
Lok Fu	Long Ping	
Lok Ma Chau	Mei Foo	
Ma On Shan	Nam Cheong	
Mong Kok	Po Lam	
Mong Kok East	Racecourse	
Ngau Tau Kok	Sha Tin Wai	

North Point	Shau Kei Wan	
Ocean Park	Shek Kip Mei	
Olympic	Sheung Shui	
Prince Edward	Siu Hong	
Quarry Bay	Sunny Bay	
Sai Wan Ho	Tai Po Market	
Sai Ying Pun	Tai Shui Hang	
Sha Tin	Tin Shui Wai	
Sham Shui Po	Tiu Keng Leng	
Shek Mun	Tsuen Wan	
Sheung Wan	Wong Tai Sin	
South Horizons	Wu Kai Sha	
Tai Koo	Yau Tong	
Tai Wai		
Tai Wo		
Tai Wo Hau		
Tin Hau		
Tseung Kwan O		
Tsim Sha Tsui		
Tsing Yi		
Tsuen Wan West		
Tuen Mun		
Tung Chung		
University		
Wan Chai		
Whampoa		
Wong Chuk Hang		
Yau Ma Tei		
Yuen Long		

Appendix Table 2: List of Stations in Respective Cluster (K Lines)

Cluster 0	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Cluster 9	Cluster 10
Lok Ma Chau	Austin	Disneyland Resort	Nam Cheong	Che Kung Temple	Ocean Park	Kam Sheung Road	Siu Hong	Admiralty	Fo Tan	LOHAS Park
Sunny Bay	Chai Wan			Cheung Sha Wan			Tin Shui Wai	Airport		
	Choi Hung			City One				AsiaWorld-Expo		
	Fanling			Hang Hau				Causeway Bay		
	HKU			Heng On				Central		
	Heng Fa Chuen			Hin Keng				Diamond Hill		
	Ho Man Tin			Kai Tak				East Tsim Sha Tsui		
	Lai King			Kowloon Bay				Fortress Hill		
	Lo Wu			Kwai Fong				Hong Kong		
	Sai Wan Ho			Kwai Hing				Hung Hom		
	Sha Tin Wai			Lam Tin				Jordan		
	Shau Kei Wan			Lei Tung				Kennedy Town		
	Shek Mun			Long Ping				Kowloon		
				Ma On Shan				Kowloon Tong		
				Po Lam				Kwun Tong		
				Racecourse				Lai Chi Kok		
				Sham Shui Po				Lok Fu		
				Shek Kip Mei				Mei Foo		
				Sheung Shui				Mong Kok		

				Tai Po Market				Mong Kok East		
				Tai Shui Hang				Ngau Tau Kok		
				Tai Wai				North Point		
				Tsuen Wan				Olympic		
				Wong Tai Sin				Prince Edward		
				Wu Kai Sha				Quarry Bay		
				Yau Tong				Sai Ying Pun		
								Sha Tin		
								Sheung Wan		
								South Horizons		
								Tai Koo		
								Tai Wo		
								Tai Wo Hau		
								Tin Hau		
								Tiu Keng Leng		
								Tseung Kwan O		
								Tsim Sha Tsui		
								Tsing Yi		
								Tsuen Wan West		
								Tuen Mun		
								Tung Chung		
								University		

								Wan Chai		
								Whampoa		
								Wong Chuk Hang		
								Yau Ma Tei		
								Yuen Long		

Appendix Tables 3: List of Stations with Top 10 venues per Cluster (K Best)

Table 3.0: Cluster 0

Station	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
Lok Ma Chau	Train Station	Bus Station	Border Crossing	Convenience Store	Platform	Spa	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall
Tai Wo	Japanese Restaurant	Coffee Shop	Bus Station	Fast Food Restaurant	Snack Place	Cantonese Restaurant	History Museum	Train Station	Athletics & Sports	Wine Bar
University	Café	Bakery	Indoor Play Area	College Cafeteria	Spa	Bus Station	Tea Room	Gym	Fast Food Restaurant	Gym Pool
Sha Tin	Shopping Mall	Chinese Restaurant	Café	Italian Restaurant	Coffee Shop	Cantonese Restaurant	Dessert Shop	Fast Food Restaurant	Clothing Store	Japanese Restaurant
Tai Wai	Chinese Restaurant	Café	Hong Kong Restaurant	Ramen Restaurant	Fast Food Restaurant	Bus Stop	Cha Chaan Teng	Cantonese Restaurant	Japanese Restaurant	Bus Station
Kowloon Tong	Café	Chinese Restaurant	Bistro	Dessert Shop	Japanese Restaurant	Clothing Store	Sushi Restaurant	Coffee Shop	Cantonese Restaurant	Cha Chaan Teng
Mong Kok East	Coffee Shop	Cha Chaan Teng	Noodle House	Beer Bar	Chinese Restaurant	Market	Flower Shop	Snack Place	Sporting Goods Shop	Hong Kong Restaurant
Hung Hom	Hotel	Chinese Restaurant	Coffee Shop	Buffet	Cocktail Bar	French Restaurant	Burger Joint	Café	Fast Food Restaurant	Cantonese Restaurant
Whampoa	Coffee Shop	Fast Food Restaurant	Japanese Restaurant	Chinese Restaurant	Café	Hotel	Cha Chaan Teng	Dessert Shop	Sushi Restaurant	Thai Restaurant
Ho Man Tin	Dessert Shop	Hotel	Japanese Restaurant	Bus Stop	Fast Food Restaurant	Athletics & Sports	Movie Theater	Snack Place	Hotpot Restaurant	Dumpling Restaurant
Yau Ma Tei	Toy / Game Store	Noodle House	Café	Snack Place	Coffee Shop	Vegetarian / Vegan Restaurant	Shanghai Restaurant	Cha Chaan Teng	Farmers Market	Athletics & Sports
Mong Kok	Noodle House	Cha Chaan	Sporting	Hotel	Coffee Shop	Chinese	Vegetarian /	Dessert Shop	Hong Kong	Toy / Game

		Teng	Goods Shop			Restaurant	Vegan Restaurant		Restaurant	Store
Prince Edward	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Steakhouse	Noodle House	Café	Bakery	Market	Cha Chaan Teng	Bar
Lok Fu	Coffee Shop	Dim Sum Restaurant	Park	Shopping Mall	Hong Kong Restaurant	Pool	Restaurant	Department Store	Noodle House	Shopping Mall
Diamond Hill	Fast Food Restaurant	Park	Japanese Restaurant	Garden	Chinese Restaurant	Cantonese Restaurant	Tea Room	Shabu-Shabu Restaurant	Shopping Mall	Taiwanese Restaurant
Ngau Tau Kok	Chinese Restaurant	Coffee Shop	Café	Hong Kong Restaurant	Cantonese Restaurant	Fast Food Restaurant	Indonesian Restaurant	Japanese Restaurant	Noodle House	Athletics & Sports
Kwun Tong	Cha Chaan Teng	Chinese Restaurant	Coffee Shop	Café	Japanese Restaurant	Fast Food Restaurant	Department Store	Clothing Store	Restaurant	Noodle House
Tai Wo Hau	Cantonese Restaurant	Hotel	Dessert Shop	Shopping Mall	Chinese Restaurant	Park	Café	Gas Station	Department Store	Burger Joint
Lai Chi Kok	Coffee Shop	Cha Chaan Teng	Fast Food Restaurant	Japanese Restaurant	Chinese Restaurant	Cantonese Restaurant	Convenience Store	Taiwanese Restaurant	Bookstore	Noodle House
Sham Shui Po	Noodle House	Shopping Mall	Chinese Restaurant	Dessert Shop	Cha Chaan Teng	Snack Place	Dumpling Restaurant	Hong Kong Restaurant	Ramen Restaurant	Italian Restaurant
Jordan	Cantonese Restaurant	Café	Cha Chaan Teng	Hotel Bar	Chinese Restaurant	Bar	Camera Store	Coffee Shop	Seafood Restaurant	Flea Market
Tsim Sha Tsui	Hotel	Japanese Restaurant	Hotel Bar	Shopping Mall	Coffee Shop	French Restaurant	Korean Restaurant	Cosmetics Shop	Steakhouse	Hostel
Admiralty	Café	Italian Restaurant	Hotel	Burger Joint	Clothing Store	Steakhouse	Bakery	Seafood Restaurant	Cantonese Restaurant	Tea Room
Central	Japanese Restaurant	Cocktail Bar	Italian Restaurant	Bar	Hotel	French Restaurant	Social Club	Coffee Shop	Steakhouse	Sushi Restaurant
Kennedy Town	Japanese Restaurant	Coffee Shop	Vietnamese Restaurant	Chinese Restaurant	Mexican Restaurant	Café	Cantonese Restaurant	Fish & Chips Shop	Pizza Place	French Restaurant
HKU	Chinese Restaurant	Noodle House	Malay Restaurant	Hong Kong Restaurant	Middle Eastern Restaurant	Café	BBQ Joint	English Restaurant	Trail	Athletics & Sports
Sai Ying Pun	Coffee Shop	Thai Restaurant	Restaurant	French Restaurant	Chinese Restaurant	Cha Chaan Teng	Hotel	Japanese Restaurant	Mexican Restaurant	Dessert Shop
Sheung Wan	Café	Japanese Restaurant	Coffee Shop	Bar	French Restaurant	Cocktail Bar	Wine Bar	Thai Restaurant	Italian Restaurant	Ramen Restaurant
Wan Chai	Japanese Restaurant	Italian Restaurant	Hong Kong Restaurant	Cantonese Restaurant	Café	Hotel	Coffee Shop	Bakery	Cha Chaan Teng	Bar
Causeway Bay	Japanese Restaurant	Coffee Shop	Hotel	Seafood Restaurant	Sushi Restaurant	Clothing Store	Cha Chaan Teng	Dessert Shop	Noodle House	Gift Shop
Tin Hau	Noodle House	Chinese Restaurant	Hotel	Coffee Shop	Café	Japanese Restaurant	Vietnamese Restaurant	Sushi Restaurant	Cha Chaan Teng	Cantonese Restaurant
Fortress Hill	Coffee Shop	Hotel	Dessert Shop	Gym	Hotel Bar	Hong Kong Restaurant	Cantonese Restaurant	Bakery	Sushi Restaurant	Thai Restaurant

North Point	Noodle House	Burger Joint	Hotpot Restaurant	Sushi Restaurant	Hong Kong Restaurant	Restaurant	Tibetan Restaurant	Massage Studio	Café	Gastropub
Quarry Bay	Café	Japanese Restaurant	Chinese Restaurant	Coffee Shop	Cha Chaan Teng	New American Restaurant	Art Gallery	Burger Joint	Sushi Restaurant	Taiwanese Restaurant
Tai Koo	Japanese Restaurant	Café	Cantonese Restaurant	Coffee Shop	Thai Restaurant	Department Store	Chinese Restaurant	Bus Stop	Multiplex	Food Court
Sai Wan Ho	Chinese Restaurant	Japanese Restaurant	Hainan Restaurant	Indian Restaurant	French Restaurant	Dessert Shop	Park	Cantonese Restaurant	Hong Kong Restaurant	Shopping Mall
Tung Chung	Coffee Shop	Sporting Goods Shop	Pharmacy	Bus Stop	Supermarket	Café	Cantonese Restaurant	Chinese Restaurant	Taiwanese Restaurant	Clothing Store
Tsing Yi	Bakery	Clothing Store	Chinese Restaurant	Shopping Mall	Japanese Restaurant	Coffee Shop	Athletics & Sports	Malay Restaurant	Market	Department Store
Olympic	Coffee Shop	Noodle House	Hotel	Japanese Restaurant	Vietnamese Restaurant	Chinese Restaurant	Clothing Store	Dim Sum Restaurant	Café	Hong Kong Restaurant
Kowloon	Cantonese Restaurant	Japanese Restaurant	Spa	Coffee Shop	Italian Restaurant	Café	Hotel Bar	Hotel	Chinese Restaurant	Scenic Lookout
Hong Kong	French Restaurant	Coffee Shop	Cantonese Restaurant	Italian Restaurant	Bar	Hotel	Chinese Restaurant	Lounge	Café	Cocktail Bar
AsiaWorld-Expo	Coffee Shop	Restaurant	Chinese Restaurant	Metro Station	Middle Eastern Restaurant	Gym	Bistro	Boat or Ferry	Bus Station	Bus Stop
Airport	Airport Lounge	Coffee Shop	Japanese Restaurant	Bakery	Gift Shop	Deli / Bodega	Chinese Restaurant	Chocolate Shop	Clothing Store	Cocktail Bar
LOHAS Park	Chinese Restaurant	Burger Joint	Hong Kong Restaurant	Platform	Vietnamese Restaurant	Cantonese Restaurant	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall
Tseung Kwan O	Shopping Mall	Chinese Restaurant	Café	Fast Food Restaurant	Italian Restaurant	Grocery Store	Shanghai Restaurant	Hotel	Malay Restaurant	Cha Chaan Teng
Tuen Mun	Shopping Mall	Dessert Shop	Coffee Shop	Light Rail Station	Multiplex	Cantonese Restaurant	Clothing Store	Athletics & Sports	Market	BBQ Joint
Yuen Long	Dessert Shop	Chinese Restaurant	Restaurant	Café	Sushi Restaurant	Multiplex	Supermarket	Portuguese Restaurant	Food Court	Bubble Tea Shop
Tsuen Wan West	Shopping Mall	Japanese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Department Store	Sushi Restaurant	Italian Restaurant	Coffee Shop	Udon Restaurant	Shanghai Restaurant
Austin	Chinese Restaurant	Dessert Shop	Café	Indian Restaurant	Cha Chaan Teng	Seafood Restaurant	Coffee Shop	Hotpot Restaurant	Noodle House	Dim Sum Restaurant
East Tsim Sha Tsui	Hotel	Hotel Bar	Steakhouse	Japanese Restaurant	Cosmetics Shop	Chinese Restaurant	Korean Restaurant	Coffee Shop	Hostel	Buffet
Ma On Shan	Chinese Restaurant	Shopping Mall	Hotel	Fried Chicken Joint	Noodle House	Park	Gym / Fitness Center	Train Station	Shanghai Restaurant	Coffee Shop
Shek Mun	Chinese Restaurant	Hotel	Gym	Buffet	Café	Cantonese Restaurant	Fast Food Restaurant	Cantonese Restaurant	Noodle House	Shopping Mall
South	Park	Metro Station	Burger Joint	Chinese	Health Food	Shanghai	Coffee Shop	Harbor /	Wine Shop	Sushi

Horizons				Restaurant	Store	Restaurant		Marina		Restaurant
Wong Chuk Hang	Bus Stop	Restaurant	Café	Hong Kong Restaurant	Hotel	Jewelry Store	Chinese Restaurant	Coffee Shop	Food Court	Mediterranean Restaurant
Ocean Park	Theme Park Ride / Attraction	Exhibit	Aquarium	Theme Park	Bakery	Athletics & Sports	Zoo Exhibit	Public Art	Noodle House	Shopping Mall

Table 3.1: Cluster 1

Station	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
Lo Wu	Chinese Restaurant	Platform	Noodle House	Convenience Store	Metro Station	Coffee Shop	Fast Food Restaurant	Duty-free Shop	Border Crossing	Bakery
Sheung Shui	Fast Food Restaurant	Sushi Restaurant	Coffee Shop	Noodle House	Food Court	Chinese Restaurant	Seafood Restaurant	Vietnamese Restaurant	Shopping Mall	Steakhouse
Fanling	Fast Food Restaurant	Playground	Cha Chaan Teng	Platform	American Restaurant	Cantonese Restaurant	Bakery	Mountain	Coffee Shop	Sushi Restaurant
Tai Po Market	Chinese Restaurant	Fast Food Restaurant	Dessert Shop	Cha Chaan Teng	Noodle House	Hong Kong Restaurant	Bus Station	Shopping Mall	Athletics & Sports	Train Station
Racecourse	Fast Food Restaurant	Racetrack	Coffee Shop	Ramen Restaurant	Racecourse	Cantonese Restaurant	Grocery Store	Supermarket	Train Station	Shopping Mall
Fo Tan	Fast Food Restaurant	Pharmacy	Chinese Restaurant	Hong Kong Restaurant	Motorcycle Shop	Food Court	Cantonese Restaurant	Cantonese Restaurant	Noodle House	Shopping Mall
Shek Kip Mei	Fast Food Restaurant	Chinese Restaurant	Coffee Shop	Café	Noodle House	Market	Pharmacy	Supermarket	Park	Grocery Store
Wong Tai Sin	Fast Food Restaurant	Coffee Shop	Park	Chinese Restaurant	Szechuan Restaurant	Burger Joint	Temple	Café	Cha Chaan Teng	Astrologer
Choi Hung	Cha Chaan Teng	Fast Food Restaurant	Cantonese Restaurant	Metro Station	Bus Stop	Chinese Restaurant	Athletics & Sports	Snack Place	Concert Hall	Playground
Kowloon Bay	Chinese Restaurant	Fast Food Restaurant	Dessert Shop	Sushi Restaurant	Coffee Shop	Shopping Mall	Supermarket	Café	Cantonese Restaurant	Shanghai Restaurant
Lam Tin	Dumpling Restaurant	Fast Food Restaurant	Cha Chaan Teng	Market	Noodle House	Metro Station	Shopping Mall	Donburi Restaurant	Hong Kong Restaurant	Bus Stop
Yau Tong	Hong Kong Restaurant	Dessert Shop	Dim Sum Restaurant	Fast Food Restaurant	Café	Bakery	Japanese Restaurant	Donburi Restaurant	Convenience Store	Shopping Mall
Tiu Keng Leng	Coffee Shop	Chinese Restaurant	ATM	Gym	Thai Restaurant	Fast Food Restaurant	Farmers Market	Pharmacy	Athletics & Sports	Sushi Restaurant
Tsuen Wan	Dessert Shop	Noodle House	Fast Food Restaurant	Chinese Restaurant	Shopping Mall	Ramen Restaurant	Hong Kong Restaurant	Café	Sushi Restaurant	Burger Joint
Kwai Hing	Fast Food Restaurant	Coffee Shop	Metro Station	Café	Dance Studio	Cha Chaan Teng	Japanese Restaurant	Athletics & Sports	Sandwich Place	Convenience Store
Kwai Fong	Café	Chinese	Fast Food	Bakery	Multiplex	Furniture /	Shopping Mall	Athletics &	Asian	Grocery Store

		Restaurant	Restaurant			Home Store		Sports	Restaurant	
Lai King	Chinese Restaurant	Metro Station	Fast Food Restaurant	Restaurant	Indian Restaurant	Shopping Mall	Cha Chaan Teng	Athletics & Sports	Convenience Store	Bus Stop
Mei Foo	Coffee Shop	Cha Chaan Teng	Bus Station	Fast Food Restaurant	Shopping Mall	Tennis Court	Noodle House	Bakery	Noodle House	Shopping Mall
Cheung Sha Wan	Fast Food Restaurant	Cha Chaan Teng	Hong Kong Restaurant	Dessert Shop	Shopping Mall	Chinese Restaurant	Asian Restaurant	Imported Food Shop	Restaurant	Athletics & Sports
Shau Kei Wan	Noodle House	Fast Food Restaurant	Cha Chaan Teng	Tram Station	Park	Snack Place	Chinese Restaurant	Italian Restaurant	Asian Restaurant	Grocery Store
Heng Fa Chuen	Cantonese Restaurant	Bakery	Fast Food Restaurant	Sandwich Place	Supermarket	Farmers Market	Taiwanese Restaurant	Paper / Office Supplies Store	Shopping Mall	Tea Room
Chai Wan	Chinese Restaurant	Fast Food Restaurant	Bus Stop	Vietnamese Restaurant	Bakery	Cha Chaan Teng	Cantonese Restaurant	Athletics & Sports	Seafood Restaurant	Coffee Shop
Sunny Bay	Platform	Bus Station	Metro Station	Dim Sum Restaurant	Construction & Landscaping	Hotel	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall
Nam Cheong	Fast Food Restaurant	Coffee Shop	Taiwanese Restaurant	Bus Stop	Park	Hotel	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall
Po Lam	Chinese Restaurant	Shopping Mall	Clothing Store	Multiplex	Music Store	Cha Chaan Teng	Hong Kong Restaurant	Park	Fast Food Restaurant	Dessert Shop
Hang Hau	Fast Food Restaurant	Café	Coffee Shop	Shopping Mall	Park	Hong Kong Restaurant	Athletics & Sports	Shabu-Shabu Restaurant	Shanghai Restaurant	Cha Chaan Teng
Siu Hong	Shopping Mall	Light Rail Station	Restaurant	Train Station	Convenience Store	Fast Food Restaurant	Burger Joint	Grocery Store	Noodle House	Shopping Mall
Tin Shui Wai	Fast Food Restaurant	Light Rail Station	Trail	Bus Stop	Train Station	Historic Site	Sandwich Place	Monument / Landmark	Noodle House	Shopping Mall
Long Ping	Noodle House	Japanese Restaurant	Fast Food Restaurant	Coffee Shop	Café	Supermarket	Shopping Mall	Halal Restaurant	Thai Restaurant	Chinese Restaurant
Kam Sheung Road	Farm	Convenience Store	Chinese Restaurant	Flea Market	Market	Train Station	Bus Station	Cantonese Restaurant	Noodle House	Shopping Mall
Wu Kai Sha	Shopping Mall	Café	Hong Kong Restaurant	Market	Fast Food Restaurant	Chinese Restaurant	Train Station	Bus Stop	Coffee Shop	Diner
Heng On	Chinese Restaurant	Bus Stop	Fast Food Restaurant	Hong Kong Restaurant	Bus Station	Cha Chaan Teng	Athletics & Sports	Bistro	Market	Track Stadium
Tai Shui Hang	Fast Food Restaurant	Café	Chinese Restaurant	Bike Trail	Cha Chaan Teng	Train Station	Asian Restaurant	Hong Kong Restaurant	Thai Restaurant	Park
City One	Fast Food Restaurant	Café	Chinese Restaurant	Convenience Store	Coffee Shop	Noodle House	Vietnamese Restaurant	Shanghai Restaurant	Dumpling Restaurant	Train Station
Sha Tin Wai	Seafood Restaurant	Betting Shop	Cantonese Restaurant	Train Station	Chinese Restaurant	Thai Restaurant	Pizza Place	Movie Theater	Fast Food Restaurant	Dessert Shop
Che Kung Temple	Bus Station	Park	Temple	History Museum	Chinese Restaurant	Café	Fast Food Restaurant	Cantonese Restaurant	Noodle House	Shopping Mall

Hin Keng	Hong Kong Restaurant	Fast Food Restaurant	Soup Place	Train Station	Dessert Shop	Asian Restaurant	Gym	Bus Station	Pool	Tunnel
Kai Tak	Fast Food Restaurant	Metro Station	Coffee Shop	Sushi Restaurant	Chinese Restaurant	Udon Restaurant	Climbing Gym	Supermarket	Noodle House	Shopping Mall
Lei Tung	Seafood Restaurant	Chinese Restaurant	Fast Food Restaurant	Furniture / Home Store	Supermarket	Clothing Store	Shopping Mall	Market	Pet Store	Paper / Office Supplies Store

Table 3.2: Cluster 2

Station	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
Disneyland Resort	Theme Park Ride / Attraction	Cantonese Restaurant	Fountain	Souvenir Shop	Parade	American Restaurant	Bakery	Cantonese Restaurant	Noodle House	Shopping Mall

Appendix Tables 4: List of Stations with Top 10 venues per Cluster (K Lines)

Table 4.0: Cluster 0

Station	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
Lok Ma Chau	Train Station	Bus Station	Border Crossing	Convenience Store	Platform	Spa	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall
Sunny Bay	Platform	Bus Station	Metro Station	Dim Sum Restaurant	Construction & Landscaping	Hotel	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall

Table 4.1: Cluster 1

Station	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
Lo Wu	Chinese Restaurant	Platform	Noodle House	Convenience Store	Metro Station	Coffee Shop	Fast Food Restaurant	Duty-free Shop	Border Crossing	Bakery

Fanling	Fast Food Restaurant	Playground	Cha Chaan Teng	Platform	American Restaurant	Cantonese Restaurant	Bakery	Mountain	Coffee Shop	Sushi Restaurant
Ho Man Tin	Dessert Shop	Hotel	Japanese Restaurant	Bus Stop	Fast Food Restaurant	Athletics & Sports	Movie Theater	Snack Place	Hotpot Restaurant	Dumpling Restaurant
Choi Hung	Cha Chaan Teng	Fast Food Restaurant	Cantonese Restaurant	Metro Station	Bus Stop	Chinese Restaurant	Athletics & Sports	Snack Place	Concert Hall	Playground
Lai King	Chinese Restaurant	Metro Station	Fast Food Restaurant	Restaurant	Indian Restaurant	Shopping Mall	Cha Chaan Teng	Athletics & Sports	Convenience Store	Bus Stop
HKU	Chinese Restaurant	Noodle House	Malay Restaurant	Hong Kong Restaurant	Middle Eastern Restaurant	Café	BBQ Joint	English Restaurant	Trail	Athletics & Sports
Sai Wan Ho	Chinese Restaurant	Japanese Restaurant	Hainan Restaurant	Indian Restaurant	French Restaurant	Dessert Shop	Park	Cantonese Restaurant	Hong Kong Restaurant	Shopping Mall
Shau Kei Wan	Noodle House	Fast Food Restaurant	Cha Chaan Teng	Tram Station	Park	Snack Place	Chinese Restaurant	Italian Restaurant	Asian Restaurant	Grocery Store
Heng Fa Chuen	Cantonese Restaurant	Bakery	Fast Food Restaurant	Sandwich Place	Supermarket	Farmers Market	Taiwanese Restaurant	Paper / Office Supplies Store	Shopping Mall	Tea Room
Chai Wan	Chinese Restaurant	Fast Food Restaurant	Bus Stop	Vietnamese Restaurant	Bakery	Cha Chaan Teng	Cantonese Restaurant	Athletics & Sports	Seafood Restaurant	Coffee Shop
Austin	Chinese Restaurant	Dessert Shop	Café	Indian Restaurant	Cha Chaan Teng	Seafood Restaurant	Coffee Shop	Hotpot Restaurant	Noodle House	Dim Sum Restaurant

Shek Mun	Chinese Restaurant	Hotel	Gym	Buffet	Café	Cantonese Restaurant	Fast Food Restaurant	Cantonese Restaurant	Noodle House	Shopping Mall
Sha Tin Wai	Seafood Restaurant	Betting Shop	Cantonese Restaurant	Train Station	Chinese Restaurant	Thai Restaurant	Pizza Place	Movie Theater	Fast Food Restaurant	Dessert Shop

Table 4.2: Cluster 2

Station	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
Disneyland Resort	Theme Park Ride / Attraction	Cantonese Restaurant	Fountain	Souvenir Shop	Parade	American Restaurant	Bakery	Cantonese Restaurant	Noodle House	Shopping Mall

Table 4.3: Cluster 3

Station	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
Nam Cheong	Fast Food Restaurant	Coffee Shop	Taiwanese Restaurant	Bus Stop	Park	Hotel	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall

Table 4.4: Cluster 4

Station	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

Sheung Shui	Fast Food Restaurant	Sushi Restaurant	Coffee Shop	Noodle House	Food Court	Chinese Restaurant	Seafood Restaurant	Vietnamese Restaurant	Shopping Mall	Steakhouse
Tai Po Market	Chinese Restaurant	Fast Food Restaurant	Dessert Shop	Cha Chaan Teng	Noodle House	Hong Kong Restaurant	Bus Station	Shopping Mall	Athletics & Sports	Train Station
Racecourse	Fast Food Restaurant	Racetrack	Coffee Shop	Ramen Restaurant	Racecourse	Cantonese Restaurant	Grocery Store	Supermarket	Train Station	Shopping Mall
Tai Wai	Chinese Restaurant	Café	Hong Kong Restaurant	Ramen Restaurant	Fast Food Restaurant	Bus Stop	Cha Chaan Teng	Cantonese Restaurant	Japanese Restaurant	Bus Station
Shek Kip Mei	Fast Food Restaurant	Chinese Restaurant	Coffee Shop	Café	Noodle House	Market	Pharmacy	Supermarket	Park	Grocery Store
Wong Tai Sin	Fast Food Restaurant	Coffee Shop	Park	Chinese Restaurant	Szechuan Restaurant	Burger Joint	Temple	Café	Cha Chaan Teng	Astrologer
Kowloon Bay	Chinese Restaurant	Fast Food Restaurant	Dessert Shop	Sushi Restaurant	Coffee Shop	Shopping Mall	Supermarket	Café	Cantonese Restaurant	Shanghai Restaurant
Lam Tin	Dumpling Restaurant	Fast Food Restaurant	Cha Chaan Teng	Market	Noodle House	Metro Station	Shopping Mall	Donburi Restaurant	Hong Kong Restaurant	Bus Stop
Yau Tong	Hong Kong Restaurant	Dessert Shop	Dim Sum Restaurant	Fast Food Restaurant	Café	Bakery	Japanese Restaurant	Donburi Restaurant	Convenience Store	Shopping Mall
Tsuen Wan	Dessert Shop	Noodle House	Fast Food Restaurant	Chinese Restaurant	Shopping Mall	Ramen Restaurant	Hong Kong Restaurant	Café	Sushi Restaurant	Burger Joint
Kwai Hing	Fast Food Restaurant	Coffee Shop	Metro Station	Café	Dance Studio	Cha Chaan Teng	Japanese Restaurant	Athletics & Sports	Sandwich Place	Convenience Store

Kwai Fong	Café	Chinese Restaurant	Fast Food Restaurant	Bakery	Multiplex	Furniture / Home Store	Shopping Mall	Athletics & Sports	Asian Restaurant	Grocery Store
Cheung Sha Wan	Fast Food Restaurant	Cha Chaan Teng	Hong Kong Restaurant	Dessert Shop	Shopping Mall	Chinese Restaurant	Asian Restaurant	Imported Food Shop	Restaurant	Athletics & Sports
Sham Shui Po	Noodle House	Shopping Mall	Chinese Restaurant	Dessert Shop	Cha Chaan Teng	Snack Place	Dumpling Restaurant	Hong Kong Restaurant	Ramen Restaurant	Italian Restaurant
Po Lam	Chinese Restaurant	Shopping Mall	Clothing Store	Multiplex	Music Store	Cha Chaan Teng	Hong Kong Restaurant	Park	Fast Food Restaurant	Dessert Shop
Hang Hau	Fast Food Restaurant	Café	Coffee Shop	Shopping Mall	Park	Hong Kong Restaurant	Athletics & Sports	Shabu-Shabu Restaurant	Shanghai Restaurant	Cha Chaan Teng
Long Ping	Noodle House	Japanese Restaurant	Fast Food Restaurant	Coffee Shop	Café	Supermarket	Shopping Mall	Halal Restaurant	Thai Restaurant	Chinese Restaurant
Wu Kai Sha	Shopping Mall	Café	Hong Kong Restaurant	Market	Fast Food Restaurant	Chinese Restaurant	Train Station	Bus Stop	Coffee Shop	Diner
Ma On Shan	Chinese Restaurant	Shopping Mall	Hotel	Fried Chicken Joint	Noodle House	Park	Gym / Fitness Center	Train Station	Shanghai Restaurant	Coffee Shop
Heng On	Chinese Restaurant	Bus Stop	Fast Food Restaurant	Hong Kong Restaurant	Bus Station	Cha Chaan Teng	Athletics & Sports	Bistro	Market	Track Stadium
Tai Shui Hang	Fast Food Restaurant	Café	Chinese Restaurant	Bike Trail	Cha Chaan Teng	Train Station	Asian Restaurant	Hong Kong Restaurant	Thai Restaurant	Park
City One	Fast Food Restaurant	Café	Chinese Restaurant	Convenience Store	Coffee Shop	Noodle House	Vietnamese Restaurant	Shanghai Restaurant	Dumpling Restaurant	Train Station

Che Kung Temple	Bus Station	Park	Temple	History Museum	Chinese Restaurant	Café	Fast Food Restaurant	Cantonese Restaurant	Noodle House	Shopping Mall
Hin Keng	Hong Kong Restaurant	Fast Food Restaurant	Soup Place	Train Station	Dessert Shop	Asian Restaurant	Gym	Bus Station	Pool	Tunnel
Kai Tak	Fast Food Restaurant	Metro Station	Coffee Shop	Sushi Restaurant	Chinese Restaurant	Udon Restaurant	Climbing Gym	Supermarket	Noodle House	Shopping Mall
Lei Tung	Seafood Restaurant	Chinese Restaurant	Fast Food Restaurant	Furniture / Home Store	Supermarket	Clothing Store	Shopping Mall	Market	Pet Store	Paper / Office Supplies Store

Table 4.5: Cluster 5

Station	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
Ocean Park	Theme Park Ride / Attraction	Exhibit	Aquarium	Theme Park	Bakery	Athletics & Sports	Zoo Exhibit	Public Art	Noodle House	Shopping Mall

Table 4.6: Cluster 6

Station	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
Kam Sheung Road	Farm	Convenience Store	Chinese Restaurant	Flea Market	Market	Train Station	Bus Station	Cantonese Restaurant	Noodle House	Shopping Mall

Table 4.7: Cluster 7

Station	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
Siu Hong	Shopping Mall	Light Rail Station	Restaurant	Train Station	Convenience Store	Fast Food Restaurant	Burger Joint	Grocery Store	Noodle House	Shopping Mall
Tin Shui Wai	Fast Food Restaurant	Light Rail Station	Trail	Bus Stop	Train Station	Historic Site	Sandwich Place	Monument / Landmark	Noodle House	Shopping Mall

Table 4.8: Cluster 8

Station	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
Tai Wo	Japanese Restaurant	Coffee Shop	Bus Station	Fast Food Restaurant	Snack Place	Cantonese Restaurant	History Museum	Train Station	Athletics & Sports	Wine Bar
University	Café	Bakery	Indoor Play Area	College Cafeteria	Spa	Bus Station	Tea Room	Gym	Fast Food Restaurant	Gym Pool
Sha Tin	Shopping Mall	Chinese Restaurant	Café	Italian Restaurant	Coffee Shop	Cantonese Restaurant	Dessert Shop	Fast Food Restaurant	Clothing Store	Japanese Restaurant
Kowloon Tong	Café	Chinese Restaurant	Bistro	Dessert Shop	Japanese Restaurant	Clothing Store	Sushi Restaurant	Coffee Shop	Cantonese Restaurant	Cha Chaan Teng
Mong Kok East	Coffee Shop	Cha Chaan Teng	Noodle House	Beer Bar	Chinese Restaurant	Market	Flower Shop	Snack Place	Sporting Goods Shop	Hong Kong Restaurant

Hung Hom	Hotel	Chinese Restaurant	Coffee Shop	Buffet	Cocktail Bar	French Restaurant	Burger Joint	Café	Fast Food Restaurant	Cantonese Restaurant
Whampoa	Coffee Shop	Fast Food Restaurant	Japanese Restaurant	Chinese Restaurant	Café	Hotel	Cha Chaan Teng	Dessert Shop	Sushi Restaurant	Thai Restaurant
Yau Ma Tei	Toy / Game Store	Noodle House	Café	Snack Place	Coffee Shop	Vegetarian / Vegan Restaurant	Shanghai Restaurant	Cha Chaan Teng	Farmers Market	Athletics & Sports
Mong Kok	Noodle House	Cha Chaan Teng	Sporting Goods Shop	Hotel	Coffee Shop	Chinese Restaurant	Vegetarian / Vegan Restaurant	Dessert Shop	Hong Kong Restaurant	Toy / Game Store
Prince Edward	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Steakhouse	Noodle House	Café	Bakery	Market	Cha Chaan Teng	Bar
Lok Fu	Coffee Shop	Dim Sum Restaurant	Park	Shopping Mall	Hong Kong Restaurant	Pool	Restaurant	Department Store	Noodle House	Shopping Mall
Diamond Hill	Fast Food Restaurant	Park	Japanese Restaurant	Garden	Chinese Restaurant	Cantonese Restaurant	Tea Room	Shabu-Shabu Restaurant	Shopping Mall	Taiwanese Restaurant
Ngau Tau Kok	Chinese Restaurant	Coffee Shop	Café	Hong Kong Restaurant	Cantonese Restaurant	Fast Food Restaurant	Indonesian Restaurant	Japanese Restaurant	Noodle House	Athletics & Sports
Kwun Tong	Cha Chaan Teng	Chinese Restaurant	Coffee Shop	Café	Japanese Restaurant	Fast Food Restaurant	Department Store	Clothing Store	Restaurant	Noodle House
Tiu Keng Leng	Coffee Shop	Chinese Restaurant	ATM	Gym	Thai Restaurant	Fast Food Restaurant	Farmers Market	Pharmacy	Athletics & Sports	Sushi Restaurant

Tai Wo Hau	Cantonese Restaurant	Hotel	Dessert Shop	Shopping Mall	Chinese Restaurant	Park	Café	Gas Station	Department Store	Burger Joint
Mei Foo	Coffee Shop	Cha Chaan Teng	Bus Station	Fast Food Restaurant	Shopping Mall	Tennis Court	Noodle House	Bakery	Noodle House	Shopping Mall
Lai Chi Kok	Coffee Shop	Cha Chaan Teng	Fast Food Restaurant	Japanese Restaurant	Chinese Restaurant	Cantonese Restaurant	Convenience Store	Taiwanese Restaurant	Bookstore	Noodle House
Jordan	Cantonese Restaurant	Café	Cha Chaan Teng	Hotel Bar	Chinese Restaurant	Bar	Camera Store	Coffee Shop	Seafood Restaurant	Flea Market
Tsim Sha Tsui	Hotel	Japanese Restaurant	Hotel Bar	Shopping Mall	Coffee Shop	French Restaurant	Korean Restaurant	Cosmetics Shop	Steakhouse	Hostel
Admiralty	Café	Italian Restaurant	Hotel	Burger Joint	Clothing Store	Steakhouse	Bakery	Seafood Restaurant	Cantonese Restaurant	Tea Room
Central	Japanese Restaurant	Cocktail Bar	Italian Restaurant	Bar	Hotel	French Restaurant	Social Club	Coffee Shop	Steakhouse	Sushi Restaurant
Kennedy Town	Japanese Restaurant	Coffee Shop	Vietnamese Restaurant	Chinese Restaurant	Mexican Restaurant	Café	Cantonese Restaurant	Fish & Chips Shop	Pizza Place	French Restaurant
Sai Ying Pun	Coffee Shop	Thai Restaurant	Restaurant	French Restaurant	Chinese Restaurant	Cha Chaan Teng	Hotel	Japanese Restaurant	Mexican Restaurant	Dessert Shop
Sheung Wan	Café	Japanese Restaurant	Coffee Shop	Bar	French Restaurant	Cocktail Bar	Wine Bar	Thai Restaurant	Italian Restaurant	Ramen Restaurant
Wan Chai	Japanese Restaurant	Italian Restaurant	Hong Kong Restaurant	Cantonese Restaurant	Café	Hotel	Coffee Shop	Bakery	Cha Chaan Teng	Bar

Causeway Bay	Japanese Restaurant	Coffee Shop	Hotel	Seafood Restaurant	Sushi Restaurant	Clothing Store	Cha Chaan Teng	Dessert Shop	Noodle House	Gift Shop
Tin Hau	Noodle House	Chinese Restaurant	Hotel	Coffee Shop	Café	Japanese Restaurant	Vietnamese Restaurant	Sushi Restaurant	Cha Chaan Teng	Cantonese Restaurant
Fortress Hill	Coffee Shop	Hotel	Dessert Shop	Gym	Hotel Bar	Hong Kong Restaurant	Cantonese Restaurant	Bakery	Sushi Restaurant	Thai Restaurant
North Point	Noodle House	Burger Joint	Hotpot Restaurant	Sushi Restaurant	Hong Kong Restaurant	Restaurant	Tibetan Restaurant	Massage Studio	Café	Gastropub
Quarry Bay	Café	Japanese Restaurant	Chinese Restaurant	Coffee Shop	Cha Chaan Teng	New American Restaurant	Art Gallery	Burger Joint	Sushi Restaurant	Taiwanese Restaurant
Tai Koo	Japanese Restaurant	Café	Cantonese Restaurant	Coffee Shop	Thai Restaurant	Department Store	Chinese Restaurant	Bus Stop	Multiplex	Food Court
Tung Chung	Coffee Shop	Sporting Goods Shop	Pharmacy	Bus Stop	Supermarket	Café	Cantonese Restaurant	Chinese Restaurant	Taiwanese Restaurant	Clothing Store
Tsing Yi	Bakery	Clothing Store	Chinese Restaurant	Shopping Mall	Japanese Restaurant	Coffee Shop	Athletics & Sports	Malay Restaurant	Market	Department Store
Olympic	Coffee Shop	Noodle House	Hotel	Japanese Restaurant	Vietnamese Restaurant	Chinese Restaurant	Clothing Store	Dim Sum Restaurant	Café	Hong Kong Restaurant
Kowloon	Cantonese Restaurant	Japanese Restaurant	Spa	Coffee Shop	Italian Restaurant	Café	Hotel Bar	Hotel	Chinese Restaurant	Scenic Lookout
Hong Kong	French Restaurant	Coffee Shop	Cantonese Restaurant	Italian Restaurant	Bar	Hotel	Chinese Restaurant	Lounge	Café	Cocktail Bar

AsiaWorld-Expo	Coffee Shop	Restaurant	Chinese Restaurant	Metro Station	Middle Eastern Restaurant	Gym	Bistro	Boat or Ferry	Bus Station	Bus Stop
Airport	Airport Lounge	Coffee Shop	Japanese Restaurant	Bakery	Gift Shop	Deli / Bodega	Chinese Restaurant	Chocolate Shop	Clothing Store	Cocktail Bar
Tseung Kwan O	Shopping Mall	Chinese Restaurant	Café	Fast Food Restaurant	Italian Restaurant	Grocery Store	Shanghai Restaurant	Hotel	Malay Restaurant	Cha Chaan Teng
Tuen Mun	Shopping Mall	Dessert Shop	Coffee Shop	Light Rail Station	Multiplex	Cantonese Restaurant	Clothing Store	Athletics & Sports	Market	BBQ Joint
Yuen Long	Dessert Shop	Chinese Restaurant	Restaurant	Café	Sushi Restaurant	Multiplex	Supermarket	Portuguese Restaurant	Food Court	Bubble Tea Shop
Tsuen Wan West	Shopping Mall	Japanese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Department Store	Sushi Restaurant	Italian Restaurant	Coffee Shop	Udon Restaurant	Shanghai Restaurant
East Tsim Sha Tsui	Hotel	Hotel Bar	Steakhouse	Japanese Restaurant	Cosmetics Shop	Chinese Restaurant	Korean Restaurant	Coffee Shop	Hostel	Buffet
South Horizons	Park	Metro Station	Burger Joint	Chinese Restaurant	Health Food Store	Shanghai Restaurant	Coffee Shop	Harbor / Marina	Wine Shop	Sushi Restaurant
Wong Chuk Hang	Bus Stop	Restaurant	Café	Hong Kong Restaurant	Hotel	Jewelry Store	Chinese Restaurant	Coffee Shop	Food Court	Mediterranean Restaurant

Table 4.9: Cluster 9

Station	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
Fo Tan	Fast Food Restaurant	Pharmacy	Chinese Restaurant	Hong Kong Restaurant	Motorcycle Shop	Food Court	Cantonese Restaurant	Cantonese Restaurant	Noodle House	Shopping Mall

Table 4.10: Cluster 10

Station	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
LOHAS Park	Chinese Restaurant	Burger Joint	Hong Kong Restaurant	Platform	Vietnamese Restaurant	Cantonese Restaurant	Cha Chaan Teng	Cantonese Restaurant	Noodle House	Shopping Mall