

The Battle of Neighborhoods

Subhra Misra

➤ Problem description and background:

"Find out a suitable location in Hong Kong to open a Bollywood themed restaurant"

A very famous restaurant chain in India is interested to expand their global footprint and is interested to open a Bollywood themed restaurant across different cities of South East Asia. They want to open such a restaurant in Hong Kong as Hong Kong has a very high number of People of Indian Origin (POI) and Indian cinema is very popular there. They have hired my team to do neighborhood analysis and suggest the best possible location for the restaurant.

This restaurant chain is famous not only for the quality of the cuisine but also for the quirky yet classy Bollywood themed interiors they use. The interior design involves movie cutouts, posters, quirky movie dialogues on table decoration etc. which are very big crowd puller. They also invite movie stars on special occasions. As part of promotional activity, they give out movie tickets or movie hall food coupons etc. to lucky customers during festive season.

After multiple discussions with stakeholders we figured out the below list of requirements for the suitable location:

- Movie going crowd are the primary target customers.
- As the theme of the restaurant is cinema centric so there should be one or more favorite cinemas nearby.
- Having shopping places, amusement parks or other places of interest are a plus as that will ensure more visibility.
- Good public transport is a must. Public transport facilities within 5-minute walking distance is preferable.

The stakeholders emphasized that rental price is not a concern, but the location should be selected based on nearby environment. **Also, they want the restaurant to be setup near one of the favorite cinemas of Hong Kong. The list of cinemas was provided by the stakeholders.**

Based on the requirement we conducted some market analysis and came up with **five possible locations** for the restaurant.

Now our challenge is to suggest one among the five possible locations and we will try to find out the same in the rest of this assignment.

➤ Data

As per the requirement the following data are needed for analysis:

1. Location of Hong Kong Cinemas

As the stakeholders clearly mentioned that the restaurant needs to be setup in the locality of a famous cinema hence, we need the list of Hong Kong cinemas and their geographic coordinates. The data is readily available on the website <https://hkmovie6.com/cinema>. We downloaded the data and converted into dataframe for analysis. The first five entries are given below:

Name	ChiName	Address	Latitude	Longitude
Emperor Cinemas - Entertainment Building	英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
The Coronet @ Emperor Cinemas - Entertainment ...	The Coronet @ 英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
Emperor Cinemas - Tuen Mun	英皇戲院 - 屯門新都商場	3/F, New Town Commercial Arcade, 2 Tuen Lee St...	22.390776	113.975983
Broadway Circuit - CYBERPORT	百老匯戲院 - 數碼港	Shop L1 - 3, Level 1, The Arcade, 100 Cyberpor...	22.261067	114.129825
Cinema City VICTORIA (Causeway Bay)	Cinema City VICTORIA (銅鑼灣)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
Diamond Suite VIP House @ Cinema City VICTORIA...	Diamond Suite VIP House @ Cinema City VICTORIA...	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
PALACE ifc	PALACE ifc	Podium L1, IFC Mall, 8 Finance Street, Central	22.285545	114.157979
Broadway Cinematheque	百老匯電影中心	Prosperous Garden, 3 Public Square Street, Yau...	22.310524	114.168977
Broadway Circuit - HOLLYWOOD	百老匯戲院 - 荷里活	Level 3 Plaza Hollywood, 3 Lung Poon Street, D...	22.340513	114.202127
Broadway Circuit - MONGKOK	百老匯戲院 - 旺角	6-12 Sai Yeung Choi Street, Mongkok, Kowloon	22.317077	114.170662

2. Geographic coordinates of five cinema addresses

After getting requirement from the stakeholders our team conducted some market study and came up with five possible locations for opening up the restaurant. Google Map API is used to find geo coordinates of five possible cinemas.

Location	Address	Latitude	Longitude
L1	Sau Mau Ping Shopping Centre, Sau Mau Ping	22.319503	114.232187
L2	Tuen Mun Ferry, Tuen Mun	22.371780	113.966039
L3	Un Chau Shopping Centre, Cheung Sha Wan	22.337280	114.156457
L4	Prosperity Millennia Plaza, North Point	22.291698	114.208168
L5	Tsuen Fung Centre Shopping Arcade, Tsuen Wan	22.372112	114.119317

3. Favorite cinema list provided by stakeholders

The below is the list of the favorite cinemas provided by the stakeholders which will be used to profile the best location for the restaurant. The cinemas are ranked in a scale of 1 to 5 where 1 is least favorite and 5 is most favorite. We added address and geo coordinates to the list for better processing.

Name	Rating	Address	Latitude	Longitude
Broadway Circuit - MONGKOK	4.5	6-12 Sai Yeung Choi Street, Mongkok, Kowloon	22.317077	114.170662
Broadway Circuit - The ONE	4.5	6-11/F, The ONE, No. 100 Nathan Road, Tsim Sha...	22.300058	114.172667
Grand Ocean	4.3	Ocean Centre, 3 Canton Road, Kowloon	22.295165	114.169176
The Grand Cinema	3.4	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466
AMC Pacific Place	2.3	Level 1, Pacific Place, 88 Queensway Road, Hon...	22.277673	114.165566
UA IMAX @ Airport	1.5	6P059, Level 6, Terminal 2, 1 Sky Plaza Road, ...	22.316668	113.937787

4. Other hangout venues and Public transportation facilities in the locality

The recommended location for the restaurant should have other places of entertainment and hangout venues such as eateries, shopping malls, amusement parks etc. nearby and it should be well connected by public transport.

The following venue categories are used:

- Food, Shop & Service
- Bus Stop
- Metro Station
- Nightlife Spot, Arts & Entertainment

Our team assumed that such venues needs to be within 500 meter of the proposed restaurant which is about 5-minute walking distance.

For demo purpose we used FourSquare API to query some venues around the first cinema (Emperor Cinemas - Entertainment Building) in the cinema list above. The below is a list of results:

- **Metro Station**

Name	Latitude	Longitude
MTR Central Station (港鐵中環站)	22.281911	114.158406
MTR Hong Kong Station (港鐵香港站)	22.284926	114.158314

- **Bus Stop**

Name	Latitude	Longitude
Seymour Road / Robinson Road Bus Stop 西摩道／羅便臣道巴士站	22.280465	114.150347
Douglas Street Bus Stop 德忌利士街巴士站	22.283273	114.156910
Hang Seng Bank Headquarters / Connaught Road C...	22.284741	114.156404
HSBC Headquarters Bus Stop 匯豐總行巴士站	22.280577	114.159446
Dr. Sun Yat-Sen Museum Bus Stop 孫中山紀念館巴士站	22.279132	114.152743

- **Food**

Name	Latitude	Longitude
Mana! Fast Slow Food	22.282921	114.154651
Good Luck Thai Food (鴻運泰國美食)	22.281165	114.155296
Soul Food	22.281668	114.152495
Chiu Lung Fast Food (昭隆美食)	22.282659	114.156753

Name	Latitude	Longitude
Sun Hing Fast Food (新興美食)	22.282521	114.156717

- **Arts & Entertainment**

Name	Latitude	Longitude
Tai Kwun Centre for Heritage and Arts (大館古蹟及藝術館)	22.281668	114.154216
Wah Tung China Arts Limited (華通陶瓷藝術有限公司)	22.283046	114.152723
Ravenel Fine Arts Limited 睿芙奧	22.281819	114.156906
Ben Brown Fine Arts	22.281853	114.157285
KONG Arts Space	22.281751	114.153300

➤ Data Analysis Methodology

Our team decided to use content-based recommendation technique using the above data to find out the most favorable location for the new restaurant.

To do this we used FourSquare API which provided how many venues in different category are available near Hong Kong cinemas and a matrix captured characteristic of venues nearby cinemas. Stakeholder's favorite list was then combined with the matrix to make it a weighted matrix of favorite cinemas.

The weighted matrix then applied on five target locations with venues information to generate a ranking of each location. We then took into consideration the ranking of location as well as proximity of the location to favorite cinemas identified by stakeholders to propose a location.

To build such a weighted matrix we performed the below steps:

- **Data Cleansing and Preparation**

This is the pro-processing phase which took care of following activities:

- We prepared the data in such a way that duplicate entries were removed. For example, we found some duplicate cinemas which some are basically ‘Special House’ inside an existing cinema. Such records need to be corrected.

- Based on the requirement we identified the below 6 categories of venues one or more of which type should ideally be there nearby to the location of the restaurant. The venues are:
 - Food – other restaurants and coffee shops
 - Bus stop
 - Metro station
 - Shop & Services
 - Arts & Entertainment
 - Night life

We used Foursquare API to find the list of such venues around the cinemas in the mast list as well as surrounding the proposed locations.

We followed the below steps for data cleaning and preparation:

- Removed ChiName column as Chinese entries were not going to help the stakeholders. After removal of the column the cinema's list we earlier retrieved looks like below (only first few rows are shown).

Name	Address	Latitude	Longitude
Emperor Cinemas - Entertainment Building	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
The Coronet @ Emperor Cinemas - Entertainment ...	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
Emperor Cinemas - Tuen Mun	3/F, New Town Commercial Arcade, 2 Tuen Lee St...	22.390776	113.975983
Broadway Circuit - CYBERPORT	Shop L1 - 3, Level 1, The Arcade, 100 Cyberpor...	22.261067	114.129825
Cinema City VICTORIA (Causeway Bay)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126

- Certain cinemas have special houses in them which have the same address. We removed these duplicate address entries to further cleanup data. Some of the duplicate entries are shown below:

Name	Address	Latitude	Longitude
Cinema City VICTORIA (Causeway Bay)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
Diamond Suite VIP House @ Cinema City VICTORIA...	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
The Grand Cinema	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466

Name	Address	Latitude	Longitude
The Grand SC Starsuite	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466
Emperor Cinemas - Entertainment Building	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
The Coronet @ Emperor Cinemas - Entertainment ...	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
BEA IMAX @ UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
Phoenix Club @ UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
BEA IMAX @ UA Cine Moko	L4, MOKO, 193 Prince Edward Road West, Mongkok...	22.323800	114.172000
UA Cine Moko	L4, MOKO, 193 Prince Edward Road West, Mongkok...	22.323800	114.172000
BEA IMAX @ UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555
BEA Oscars Club @ UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555
UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555

• Data Analysis

Our target was to generate descriptive statistics that summarize the central tendency, dispersion and shape of a dataset's distribution. We performed regression analysis and used P-Value analysis to find out the best possible location for opening the restaurant. We then visualized the data in a map of Hong Kong where we showed the master set of cinemas (in blue), favorite cinemas provided by stakeholders (in red) and proposed location (in yellow) and tried to figure out which was the best location in terms of nearness to one or more of the favorite cinemas listed by the stakeholders as well as by the number and type of venues nearby.

For this we followed the below data visualization and analysis techniques:

- We used Foursquare API to find the venues near to each cinema. Below table lists the total count of each category of venues adjacent to cinemas.

Venue Category	Count
Shop & Service	933
Bus Stop	758

Venue Category	Count
Food	558
Arts & Entertainment	77
Metro Station	63
Nightlife Spot	2

Note: As we found only 2 nightlife spots in our dataset of venues nearby cinemas, we ignored this venues category.

- Similarly, we found the venues count for each category for the 5 proposed locations

Venue Category	Count
Bus Stop	36
Shop & Service	31
Food	13
Metro Station	4
Arts & Entertainment	1

- Also found the venues count for each category for the favorite cinemas suggested by stakeholders.

Venue Category	Count
Shop & Service	126
Bus Stop	90
Food	75
Arts & Entertainment	17
Metro Station	11

Observation: Using Foursquare API we analyzed the surrounding neighborhood of both the Possible venues (proposed by our team) and neighborhood of the favorite cinemas suggested by stakeholders. As per the above tables depicting categories count, we found that there are a greater number of facilities available, in almost each category, in locations surrounding the favorite cinemas.

Hence, now our team decided to take into consideration a locality nearer to a favorite cinema along with the nearby facilities available for each proposed location.

For an even better understanding of the data we created **Pivot tables** for all the cinemas, the proposed locations as well as for locations near to stakeholder's favorite cinemas. This gave us more structured representation of the distribution of venues surrounding each locality.

- **Pivot table for master list of cinemas (first few entries shown below)**

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Nightlife Spot	Shop & Service
Cinema Name						
AMC Pacific Place	8.0	13.0	8.0	1.0	0.0	21.0
BEA IMAX @ UA Cine Moko	0.0	23.0	14.0	1.0	0.0	30.0
BEA IMAX @ UA MegaBox	0.0	4.0	4.0	0.0	0.0	6.0
BEA IMAX @ UA iSQUARE	3.0	22.0	24.0	2.0	0.0	30.0
Broadway Cinematheque	3.0	25.0	14.0	1.0	0.0	26.0

▪ Pivot table for the favorite cinemas

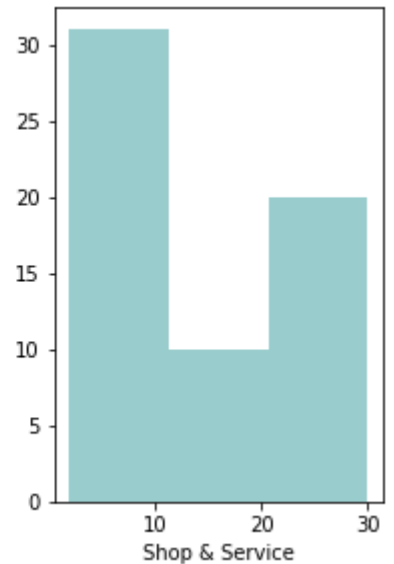
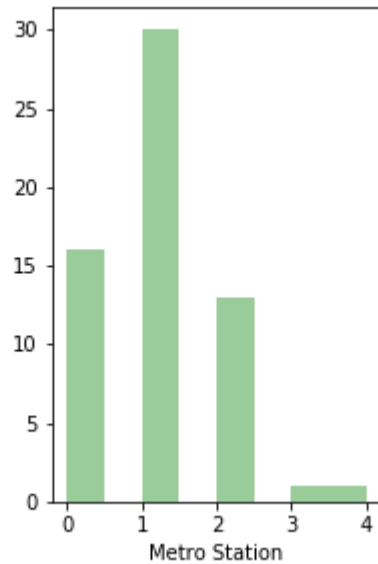
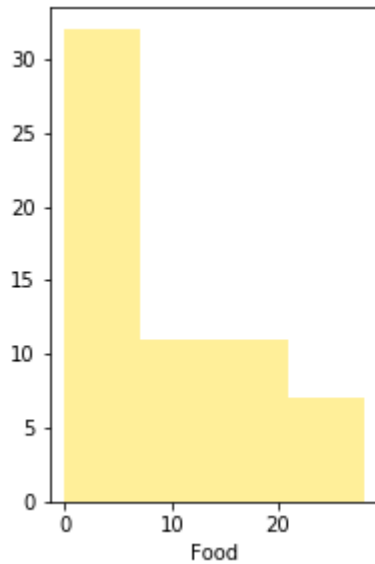
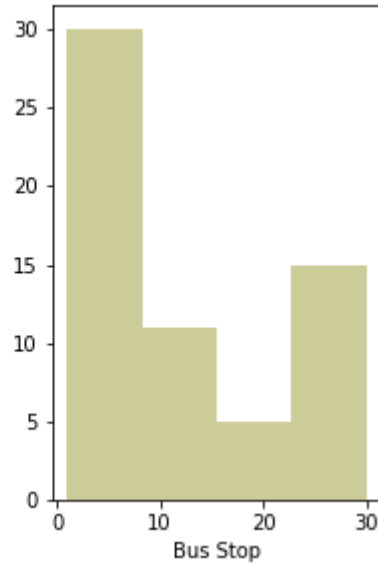
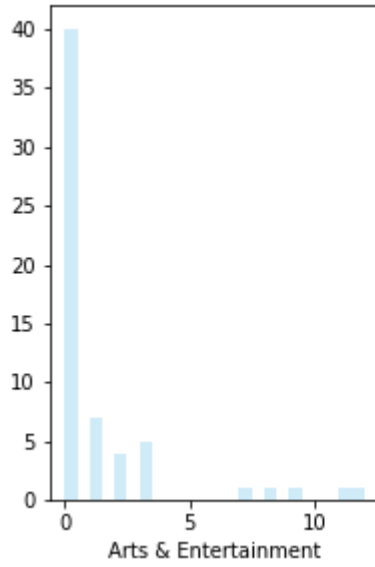
Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Cinema Name					
AMC Pacific Place	8.0	13.0	8.0	1.0	21.0
Broadway Circuit - MONGKOK	2.0	29.0	18.0	2.0	30.0
Broadway Circuit - The ONE	3.0	21.0	28.0	3.0	30.0
Grand Ocean	3.0	18.0	17.0	2.0	30.0
The Grand Cinema	1.0	4.0	2.0	2.0	3.0
UA IMAX @ Airport	0.0	5.0	2.0	1.0	12.0

▪ Pivot table for the proposed locations

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Location					
L1	0.0	1.0	0.0	0.0	3.0
L2	0.0	4.0	2.0	0.0	1.0
L3	0.0	9.0	5.0	1.0	9.0
L4	1.0	9.0	2.0	1.0	6.0
L5	0.0	13.0	4.0	2.0	12.0

Going through the above data, we needed to know the correlation between various venue categories. We approached this problem in below ways.

- First, we created distribution plot diagrams (using matplotlib and seaborn libraries) for each venue category from the master list of cinemas to better visualize frequency of distribution of each type of venue. This will help us to identify what to look for in an ideal location.



- We then figured out the **Pearson Correlation** between venue categories which is given below

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Arts & Entertainment	1.000000	0.547549	0.476023	0.234451	0.528145
Bus Stop	0.547549	1.000000	0.893810	0.477720	0.904756
Food	0.476023	0.893810	1.000000	0.486558	0.869059
Metro Station	0.234451	0.477720	0.486558	1.000000	0.436794
Nightlife Spot	0.710104	0.338211	0.357859	-0.007281	0.254070

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Shop & Service	0.528145	0.904756	0.869059	0.436794	1.000000

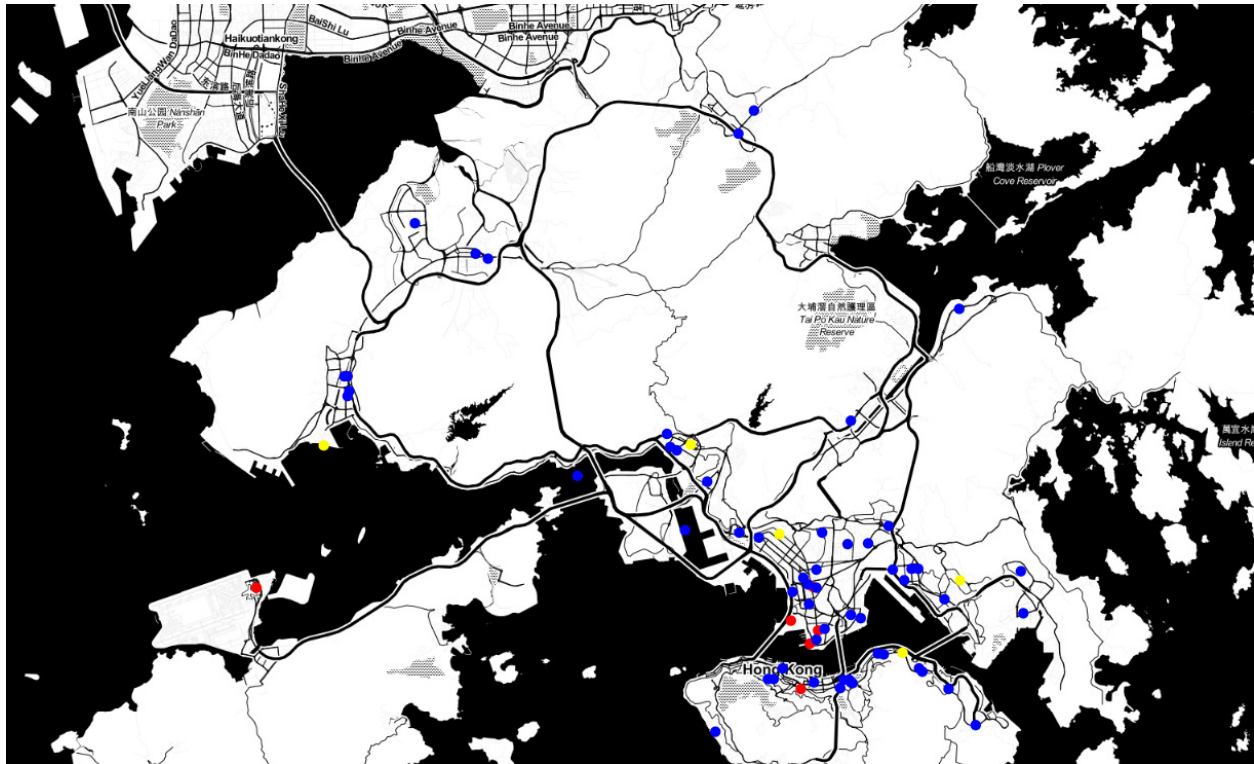
It seems 'Food' is strongly correlated to 'Bus stop' and 'Shop & Service' categories.

- We then did P-Value analysis to identify the correlation between the venue categories. By convention, when the p-value is:
 < 0.001 we say there is strong evidence that the correlation is significant,
 < 0.05 ; there is moderate evidence that the correlation is significant,
 < 0.1 ; there is weak evidence that the correlation is significant, and
 > 0.1 ; there is no evidence that the correlation is significant.

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Arts & Entertainment	strong	strong	strong	weak	strong
Bus Stop	strong	strong	strong	strong	strong
Food	strong	strong	strong	strong	strong
Metro Station	weak	strong	strong	strong	strong
Nightlife Spot	strong	moderate	moderate	no	moderate
Shop & Service	strong	strong	strong	strong	strong

The correlation between 'Food', 'Bus Stop', 'Metro Station' and 'Shop & Service' categories are strong and significant.

- We then plotted a map of Hongkong in which all the cinema halls available are shown in **blue**, our proposed locations are shown in **yellow** and stakeholder's favorite cinema halls are shown in **red**.



It clearly indicates that the locations proposed by our team (in yellow) are nearer to the favorite cinemas identified by the stakeholders (in red) and also have many other cinema halls in vicinity which is a good for pulling movie goer crowd.

➤ Machine Learning

We used **Content-Based recommendation systems** as we have a list of cinemas which are preferred by the stakeholders. The objective was to figure out the new restaurant location by finding the cinema that should be in its locality and counting number of nearby venues and ratings given.

To obtain this we normalized the dataframe containing the master list of cinemas using MinMaxScalar method. We then merge it with the favorite list given by the stakeholders. We got the below table:

Arts & Entertainment	Bus Stop	Food	Metro Station	Nightlife Spot	Shop & Service
0.166667	0.965517	0.642857	0.50	0.0	1.000000
0.250000	0.689655	1.000000	0.75	0.0	1.000000
0.250000	0.586207	0.607143	0.50	0.0	1.000000
0.083333	0.103448	0.071429	0.50	0.0	0.035714
0.666667	0.413793	0.285714	0.25	0.0	0.678571
0.000000	0.137931	0.071429	0.25	0.0	0.357143

We then used Dot product to get the weight of rating on each category which is given below.

Arts & Entertainment	4.766667
Bus Stop	11.479310
Food	11.010714
Metro Station	10.425000
Nightlife Spot	0.000000
Shop & Service	15.517857

We then normalized the values of the possible venues which is given below.

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Location					
L1	0.0	0.000000	0.0	0.0	0.181818
L2	0.0	0.250000	0.4	0.0	0.000000
L3	0.0	0.666667	1.0	0.5	0.727273
L4	1.0	0.666667	0.4	0.5	0.454545
L5	0.0	1.000000	0.8	1.0	1.000000

➤ Result

We have complete list of cinemas, a list of favorite cinemas of the stake holders and a list of localities our team identified.

Taking weighted average of every location based on the profile we recommended the top location that is most suitable for the new Bollywood themed restaurant.

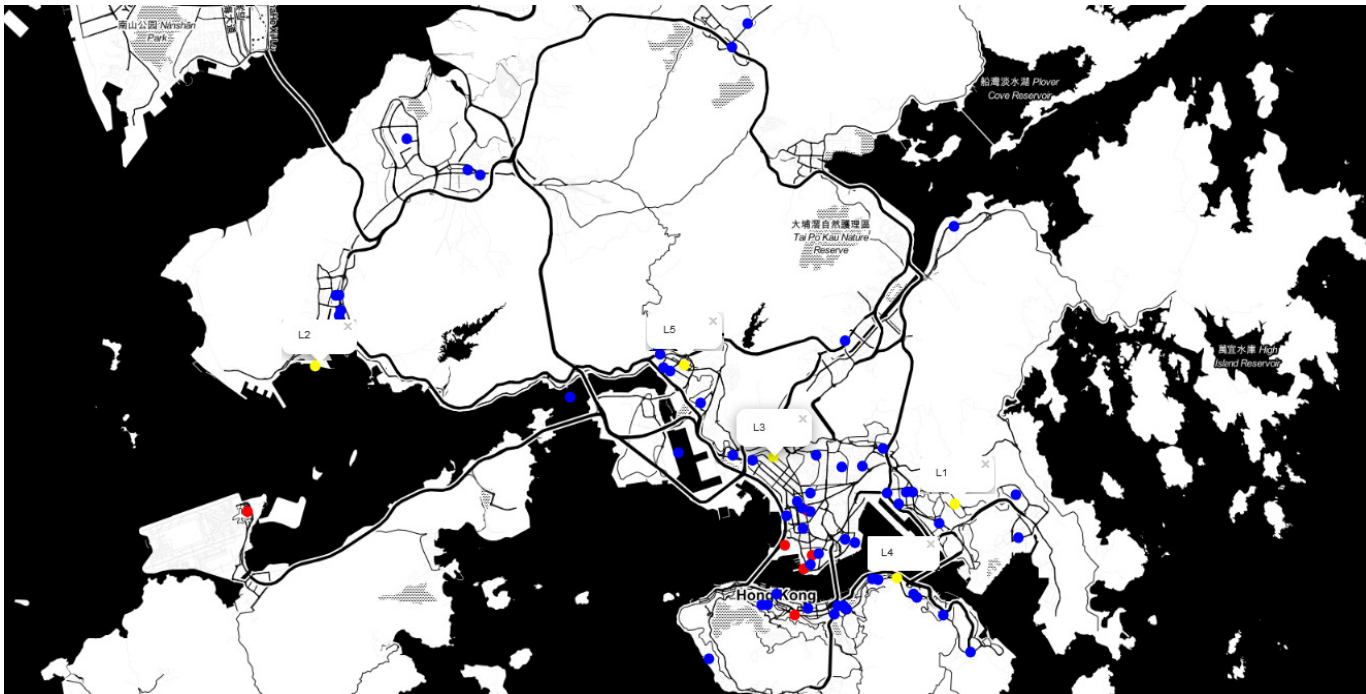
To draw our conclusion, we created the final sorted and weighted data which is given below.

Location	Address	Latitude	Longitude	Rating
L5	Tsuen Fung Centre Shopping Arcade, Tsuen Wan	22.372112	114.119317	0.869006
L3	Un Chau Shopping Centre, Cheung Sha Wan	22.337280	114.156457	0.660942
L4	Prosperity Millennia Plaza, North Point	22.291698	114.208168	0.546807
L2	Tuen Mun Ferry, Tuen Mun	22.371780	113.966039	0.136733
L1	Sau Mau Ping Shopping Centre, Sau Mau Ping	22.319503	114.232187	0.053035

➤ Discussion

Before drawing conclusion let's check again the nearby venues count for each of above locations and check the locations on the map rendered.

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Location					
L1	0.0	1.0	0.0	0.0	3.0
L2	0.0	4.0	2.0	0.0	1.0
L3	0.0	9.0	5.0	1.0	9.0
L4	1.0	9.0	2.0	1.0	6.0
L5	0.0	13.0	4.0	2.0	12.0



So, going by the above output we can see that the location **L5** with address: **Tsuen Fung Centre Shopping Arcade, Tsuen Wan** has the greatest number of venues in the categories "Shop & Service", "Metro Station" and "Bus Stop" near to it. However, from the map, we can't find any of the stakeholder's favorite cinemas near to L5 locality. Also, there are only 3 other cinemas near to it.

On further analyzing the map we generated above, we can see that venue **L3** with address **Un Chau Shopping Centre, Cheung Sha Wan** is near to 3 of the favorite cinemas identified the stakeholders. As shown in the map, this location has many other cinemas surrounding it. It also has the second highest number of bus stops, metro stations and shops in the vicinity.

➤ Conclusion

The theme of the restaurant is Bollywood and movie goers are the primary consumer base. A venue which has many cinema halls, including some of the favorite cinemas of the stakeholders, is an ideal one as it will be easier to market and position the new concept of the Bollywood themed restaurant. The stakeholders can easily go ahead with the brand's existing movie centric promotional activities such as distributing movie ticket, food coupons of cinemas etc. The restaurant is known for inviting Bollywood stars frequently for special occasions. Bollywood movies and Bollywood stars have great fan base among Non-Resident Indians (NRI) so such a restaurant can easily attract NRI population as it has great nostalgic appeal. For past few decades Bollywood movies are doing good business in south-east Asian countries and hence have good appeal to the local movie goers as well. This restaurant can draw attention of such local public if it is well surrounded with movie theaters. We also need a locality with descent connectivity via public transport and many shops and other places of interest nearby so that the restaurant can grab attention of more people as going out for dinner is no more just about a meal but about a complete experience and there should be various type of venues nearby for family bonding activities.

Taking all these into consideration, our team has decided to propose the location L3 with address Un Chau Shopping Centre, Cheung Sha Wan to the stake holders.