Capstone Project - The Battle of Neighborhoods by Salil Ray

Introduction

Introduction where you discuss the business problem and who would be interested in this project.

"Would you recommend a location in Hong Kong to open a new cinema?"

My boss, the stakeholder wants to **open a new cinema as company's new business**.

He explains that watching movie is a part of whole afternoon or night activities. Cinema should has **many restaurants and shopping places nearby**. Transportation is also an important factor. Customer can walk to cinema within **5 minutes** from **public transport facilities** is perfect.

He wants me concentrated on selection of cinema location according to its nearby environment. Cinema facility and rental price is not my concern. He lists out his **top 10 favorite cinemas** in Hong Kong with rating.

I work with my teammates and select **5 possible locations** to build the cinema. Which location should be suggested to the stakeholder?

Data

Data where you describe the data that will be used to solve the problem and the source of the data.

According to the question, following data are required.

1. Geographic coordinate of Hong Kong cinemas

I need to **compare 5 possible locations with current cinemas** in Hong Kong. Therefore, I need to find a list of Hong Kong cinema and cinemas' geographic coordinates. Luckily, I can find the list and coordinates from the website [https://hkmovie6.com/cinema (https://hkmovie6.com/cinema)](https://hkmovie6.com/cinema) .

In [1]:
```
# Import necessary library
import json
import pandas as pd
```

In [2]:

```
# Download the cinema list
!wget -O hk_cinema_list.json https://hkmovie6.com/api/cinemas/lists
```

```
--2018-10-03 11:44:29--  https://hkmovie6.com/api/cinemas/lists
Resolving hkmovie6.com (hkmovie6.com)... 172.64.164.18, 172.64.165.18, 2606:4
700:30::ac40:a412, ...
Connecting to hkmovie6.com (hkmovie6.com)|172.64.164.18|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [application/json]
Saving to: ‘hk_cinema_list.json’

hk_cinema_list.json     [ <=>                 ]  51.76K   286KB/s    in 0.2s

2018-10-03 11:44:31 (286 KB/s) - ‘hk_cinema_list.json’ saved [53003]
```

In [3]:

```
# Convert the JSON data into DataFrmae
cinemas_json = None
with open('hk_cinema_list.json', 'r', encoding='utf-8') as f:
    cinemas_json = json.load(f)

cinemas = []
for data in cinemas_json['data']:
    cinemas.append({
        'Name': data['name'],
        'ChiName': data['chiName'],
        'Address': data['address'],
        'Latitude': data['lat'],
        'Longitude': data['lon']
    })
df_cinemas = pd.DataFrame(cinemas, columns=['Name','ChiName','Address','Latitu
de','Longitude'])
```

In [4]:

```
print('There are {} cinemas in Hong Kong'.format(len(df_cinemas)))
```

```
There are 68 cinemas in Hong Kong
```

First five records of Hong Kong cinemas

In [5]:
```
df_cinemas.head()
```

Out[5]:

	Name	ChiName	Address	Latitude	Longitude
0	Emperor Cinemas - Entertainment Building	英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
1	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
2	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
3	Broadway Circuit - CYBERPORT	百老匯戲院 - 數碼港	Shop L1 - 3, Level 1, The Arcade, 100 Cyberpor...	22.261067	114.129825
4	Broadway Circuit - PALACE IFC	百老匯戲院 - PALACE IFC	Podium L1, IFC Mall, 8 Finance Street, Central	22.285545	114.157979

2. Geographic coordinates of 5 possible cinema addresses

Geographic coordinates of 5 possible cinemas are required and I can use Google Map API to find this information

In [6]:
```
possible_locations = [
    { 'Location': 'L1', 'Address': 'Sau Mau Ping Shopping Centre, Sau Mau Ping'},
    { 'Location': 'L2', 'Address': 'Tuen Mun Ferry, Tuen Mun'},
    { 'Location': 'L3', 'Address': 'Un Chau Shopping Centre, Cheung Sha Wan'},
    { 'Location': 'L4', 'Address': 'Prosperity Millennia Plaza, North Point'},
    { 'Location': 'L5', 'Address': 'Tsuen Fung Centre Shopping Arcade, Tsuen Wan'},
]
```

In [7]:
```
# install the google map api client library
!pip install -U googlemaps
```

```
Collecting googlemaps
  Downloading https://files.pythonhosted.org/packages/5a/3d/13b4230f3c1b8a586
cdc8d8179f3c6af771c11247f8de9c166d1ab37f51d/googlemaps-3.0.2.tar.gz
Requirement not upgraded as not directly required: requests<3.0,>=2.11.1 in /
home/jupyterlab/conda/lib/python3.6/site-packages (from googlemaps) (2.18.4)
Requirement not upgraded as not directly required: chardet<3.1.0,>=3.0.2 in /
home/jupyterlab/conda/lib/python3.6/site-packages (from requests<3.0,>=2.11.1
->googlemaps) (3.0.4)
Requirement not upgraded as not directly required: idna<2.7,>=2.5 in /home/ju
pyterlab/conda/lib/python3.6/site-packages (from requests<3.0,>=2.11.1->googl
emaps) (2.6)
Requirement not upgraded as not directly required: urllib3<1.23,>=1.21.1 in /
home/jupyterlab/conda/lib/python3.6/site-packages (from requests<3.0,>=2.11.1
->googlemaps) (1.22)
Requirement not upgraded as not directly required: certifi>=2017.4.17 in /hom
e/jupyterlab/conda/lib/python3.6/site-packages (from requests<3.0,>=2.11.1->g
ooglemaps) (2018.8.24)
Building wheels for collected packages: googlemaps
  Running setup.py bdist_wheel for googlemaps ... done
  Stored in directory: /home/jupyterlab/.cache/pip/wheels/3c/3f/25/ce6d7722db
a07e5d4a12d27ab38f3d7add65ef43171b02c819
Successfully built googlemaps
distributed 1.21.8 requires msgpack, which is not installed.
Installing collected packages: googlemaps
Successfully installed googlemaps-3.0.2
```

In [8]:
```
google_act = None
with open('google_map_act.json', 'r') as f:
    google_act = json.load(f)

GOOGLE_MAP_API_KEY = google_act['api_key']

import googlemaps
gmaps = googlemaps.Client(key=GOOGLE_MAP_API_KEY)
```

In [9]:
```
# Retrieve geolocation and create the dataframe of pending cinema addresses
def getLatLng(address):
    latlnt = gmaps.geocode('{}, Hong Kong'.format(address))
    return (latlnt[0]['geometry']['location']['lat'], latlnt[0]['geometry']['l
ocation']['lng'])
```

Dataframe of 5 target locations with geographic coordinates information

In [10]:

```
for loc in possible_locations:
    (lat, lng) = getLatLng(loc['Address'])
    loc['Latitude'] = lat
    loc['Longitude'] = lng

df_possible_locations = pd.DataFrame(possible_locations, columns=['Location',
'Address', 'Latitude', 'Longitude'])
df_possible_locations
```

Out[10]:

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

3. Favorite cinema list of stakeholder

The favorite cinema list of stakeholder is an important information that I can **use it as profile to select the best location**.

In [11]:

```
boss_favorite = [
    {'Name': 'Broadway Circuit - MONGKOK', 'Rating': 4.5},
    {'Name': 'Broadway Circuit - The ONE', 'Rating': 4.5},
    {'Name': 'Grand Ocean', 'Rating': 4.3},
    {'Name': 'The Grand Cinema', 'Rating': 3.4},
    {'Name': 'AMC Pacific Place', 'Rating': 2.3},
    {'Name': 'UA IMAX @ Airport', 'Rating': 1.5},
]

df_boss_favorite = pd.DataFrame(boss_favorite, columns=['Name','Rating'])
df_boss_favorite
```

Out[11]:

	Name	Rating
0	Broadway Circuit - MONGKOK	4.5
1	Broadway Circuit - The ONE	4.5
2	Grand Ocean	4.3
3	The Grand Cinema	3.4
4	AMC Pacific Place	2.3
5	UA IMAX @ Airport	1.5

4. Eating, Shopping and Public transportation facility around cinema

The recommended cinema location needs to have many eating and shopping venues nearby. Convenient public transport is also required.
These data can be found by using FourSquare API to find these venues around the location. The radius of exploration distance is set to 500 meters, which is about 5 minutes walking distance.

Following type of venue category will be used to search

```
In [12]: fs_categories = {
             'Food': '4d4b7105d754a06374d81259',
             'Shop & Service': '4d4b7105d754a06378d81259',
             'Bus Stop': '52f2ab2ebcbc57f1066b8b4f',
             'Metro Station': '4bf58dd8d48988d1fd931735',
             'Nightlife Spot': '4d4b7105d754a06376d81259',
             'Arts & Entertainment': '4d4b7104d754a06370d81259'
         }
```

```
In [13]: ', '.join([ cat for cat in fs_categories])
```

```
Out[13]: 'Food, Shop & Service, Bus Stop, Metro Station, Nightlife Spot, Arts & Entert
         ainment'
```

```
In [14]: cinema = df_cinemas.loc[0]
```

```
In [15]: print('Use the first cinema "{}" in the list as example to explore venues near
         yby'.format(cinema['Name']))
```

```
Use the first cinema "Emperor Cinemas - Entertainment Building" in the list a
s example to explore venues nearyby
```

In [16]:

```
# Install FourSquare client library
!pip install foursquare
```

```
Collecting foursquare
  Downloading https://files.pythonhosted.org/packages/7e/9f/21ef283c50eb576ea
ebb0525d8a988baffe4d59ac2bbb1f9d84434bdf616/foursquare-1%212016.9.12.tar.gz
Requirement already satisfied: requests>=2.1 in /home/jupyterlab/conda/lib/py
thon3.6/site-packages (from foursquare) (2.18.4)
Requirement already satisfied: six in /home/jupyterlab/conda/lib/python3.6/si
te-packages (from foursquare) (1.11.0)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /home/jupyterlab/cond
a/lib/python3.6/site-packages (from requests>=2.1->foursquare) (3.0.4)
Requirement already satisfied: idna<2.7,>=2.5 in /home/jupyterlab/conda/lib/p
ython3.6/site-packages (from requests>=2.1->foursquare) (2.6)
Requirement already satisfied: urllib3<1.23,>=1.21.1 in /home/jupyterlab/cond
a/lib/python3.6/site-packages (from requests>=2.1->foursquare) (1.22)
Requirement already satisfied: certifi>=2017.4.17 in /home/jupyterlab/conda/l
ib/python3.6/site-packages (from requests>=2.1->foursquare) (2018.8.24)
Building wheels for collected packages: foursquare
  Running setup.py bdist_wheel for foursquare ... done
  Stored in directory: /home/jupyterlab/.cache/pip/wheels/c1/a4/ff/e07a4f4f02
ef7189c5b1e0738a09131f6c5f2de811ce3a39a0
Successfully built foursquare
distributed 1.21.8 requires msgpack, which is not installed.
Installing collected packages: foursquare
Successfully installed foursquare-1!2016.9.12
```

In [17]:

```
fs_act = None
with open('fs_act.json') as json_data:
    fs_act = json.load(json_data)
```

In [18]:

```
import foursquare
from pandas.io.json import json_normalize # tranform JSON file into a pandas d
ataframe
fs = foursquare.Foursquare(client_id=fs_act['client_id'], client_secret=fs_act
['client_secret'])
```

In [19]:

```
RADIUS = 500 # 500m, around 5 minutes walking time
```

In [20]:
```
# Define a function to search nearby information and convert the result as dat
aframe
def venues_nearby(latitude, longitude, category, verbose=True):
    results = fs.venues.search(
        params = {
            'query': category,
            'll': '{},{}'.format(latitude, longitude),
            'radius': RADIUS,
            'categoryId': fs_categories[category]
        }
    )
    df = json_normalize(results['venues'])
    cols = ['Name','Latitude','Longitude','Tips','Users','Visits']
    if( len(df) == 0 ):
        df = pd.DataFrame(columns=cols)
    else:
        df = df[['name','location.lat','location.lng','stats.tipCount','stats.
usersCount','stats.visitsCount']]
        df.columns = cols
    if( verbose ):
        print('{} "{}" venues are found within {}m of location'.format(len(df
), category, RADIUS))
    return df
```

Find Metro Station around the cinema

In [21]:
```
venues_nearby(cinema['Latitude'], cinema['Longitude'], 'Metro Station').head()
```

```
2 "Metro Station" venues are found within 500m of location
```

Out[21]:

	Name	Latitude	Longitude	Tips	Users	Visits
0	MTR Central Station (港鐵中環站)	22.281911	114.158406	0	0	0
1	MTR Hong Kong Station (港鐵香港站)	22.284926	114.158314	0	0	0

Find Bus Stop around the cinema

In [22]:

```
venues_nearby(cinema['Latitude'], cinema['Longitude'], 'Bus Stop').head()
```

```
30 "Bus Stop" venues are found within 500m of location
```

Out[22]:

	Name	Latitude	Longitude	Tips	Users	Visits
0	Seymour Road / Robinson Road Bus Stop 西摩道 / 羅便臣道巴士站	22.280465	114.150347	0	0	0
1	Douglas Street Bus Stop 德忌利士街巴士站	22.283273	114.156910	0	0	0
2	Hang Seng Bank Headquarters / Connaught Road C...	22.284741	114.156404	0	0	0
3	HSBC Headquarters Bus Stop 匯豐總行巴士站	22.280577	114.159446	0	0	0
4	Dr. Sun Yat-Sen Museum Bus Stop 孫中山紀念館巴士站	22.279132	114.152743	0	0	0

Find eating places around the cinema

In [23]:

```
venues_nearby(cinema['Latitude'], cinema['Longitude'], 'Food').head()
```

```
25 "Food" venues are found within 500m of location
```

Out[23]:

	Name	Latitude	Longitude	Tips	Users	Visits
0	Mana! Fast Slow Food	22.282921	114.154651	0	0	0
1	Good Luck Thai Food (鴻運泰國美食)	22.281165	114.155296	0	0	0
2	Soul Food	22.281668	114.152495	0	0	0
3	Chiu Lung Fast Food (昭隆美食)	22.282659	114.156753	0	0	0
4	Sun Hing Fast Food (新興美食)	22.282521	114.156717	0	0	0

In [24]:

```
venues_nearby(cinema['Latitude'], cinema['Longitude'], 'Arts & Entertainment')
.head()
```

```
12 "Arts & Entertainment" venues are found within 500m of location
```

Out[24]:

	Name	Latitude	Longitude	Tips	Users	Visits
0	Tai Kwun Centre for Heritage and Arts (大館古蹟及藝術館)	22.281668	114.154216	0	0	0
1	Wah Tung China Arts Limited (華通陶瓷藝術有限公司)	22.283046	114.152723	0	0	0
2	Ravenel Fine Arts Limited 睿芙奧	22.281819	114.156906	0	0	0
3	Ben Brown Fine Arts	22.281853	114.157285	0	0	0
4	KONG Arts Space	22.281751	114.153300	0	0	0

Methodology

Methodology section which represents the main component of the report where you discuss and describe any exploratory data analysis that you did, any inferential statistical testing that you performed, and what machine learnings were used and why.

With above data, I can use content-based recommendation technique to resolve the problem.

Combine with FourSquare API which provides how many venues in different category of Hong Kong cinemas, a matrix which captured characteristic of venues nearby cinema are built. Stakeholder's favorite list is the profile to combine with the matrix to become a weighted matrix of favorite cinema.

The weighted matrix can be applied on 5 target locations with venues information to generate a ranking result. The the top one on the ranking list can be recommended to the stakeholder.

Before building the matrix, I have to prepare the required data and apply some data analysis.

Data Cleansing and Preparation

Check the cinemas dataset contains any duplicated address

In [25]:

```
duplicated = df_cinemas.duplicated('Address', keep=False)
df_cinemas[duplicated].sort_values('Address')
```

Out[25]:

	Name	ChiName	Address	Latitude	Longitude
5	Cinema City VICTORIA (Causeway Bay)	Cinema City VICTORIA (銅鑼灣)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
6	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
28	The Grand Cinema	The Grand Cinema	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466
29	The Grand SC Starsuite	The Grand SC Starsuite	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466
0	Emperor Cinemas - Entertainment Building	英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
1	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
43	BEA IMAX @ UA iSQUARE	BEA IMAX @ UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
46	Phoenix Club @ UA iSQUARE	鳳凰影院 @ UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
49	UA iSQUARE	UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
42	BEA IMAX @ UA Cine Moko	BEA IMAX @ UA Cine Moko	L4, MOKO, 193 Prince Edward Road West, Mongkok...	22.323800	114.172000
48	UA Cine Moko	UA Cine Moko	L4, MOKO, 193 Prince Edward Road West, Mongkok...	22.323800	114.172000
44	BEA IMAX @ UA MegaBox	BEA IMAX @ UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555
45	BEA Oscars Club @ UA MegaBox	BEA Oscars Club @ UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555
51	UA MegaBox	UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555

Some "special house" in cinema are separated as a new cinema in www.hkmovie6.com
These records are duplicated in my case and should be corrected.

In [26]:

```
# The Grand SC Starsuite -> The Grand Cinema
df_cinemas.loc[29, 'Name'] = 'The Grand Cinema'

# XXX @ UA MegaBox -> UA MegaBox
df_cinemas.loc[44, 'Name'] = 'UA MegaBox'
df_cinemas.loc[45, 'Name'] = 'UA MegaBox'

# BEA IMAX @ UA Cine Moko -> UA Cine Moko
df_cinemas.loc[42, 'Name'] = 'UA Cine Moko'

# XXX @ UA iSQUARE -> iSQUARE
df_cinemas.loc[43, 'Name'] = 'UA iSQUARE'
df_cinemas.loc[46, 'Name'] = 'UA iSQUARE'

# Emperor Cinemas - Entertainment Building
df_cinemas.loc[1, 'Name'] = 'Emperor Cinemas - Entertainment Building'

# Cinema City VICTORIA (Causeway Bay)
df_cinemas.loc[6, 'Name'] = 'Cinema City VICTORIA (Causeway Bay)'
```

In [27]:
```
df_cinemas[duplicated]
```

Out[27]:

	Name	ChiName	Address	Latitude	Longitude
0	Emperor Cinemas - Entertainment Building	英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
1	Emperor Cinemas - Entertainment Building	The Coronet @ 英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
5	Cinema City VICTORIA (Causeway Bay)	Cinema City VICTORIA (銅鑼灣)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
6	Cinema City VICTORIA (Causeway Bay)	Diamond Suite VIP House @ Cinema City VICTORIA...	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126
28	The Grand Cinema	The Grand Cinema	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466
29	The Grand Cinema	The Grand SC Starsuite	2/F, Elements, 1 Austin Road West, Kowloon	22.304118	114.161466
42	UA Cine Moko	BEA IMAX @ UA Cine Moko	L4, MOKO, 193 Prince Edward Road West, Mongkok...	22.323800	114.172000
43	UA iSQUARE	BEA IMAX @ UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
44	UA MegaBox	BEA IMAX @ UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555
45	UA MegaBox	BEA Oscars Club @ UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555
46	UA iSQUARE	鳳凰影院 @ UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
48	UA Cine Moko	UA Cine Moko	L4, MOKO, 193 Prince Edward Road West, Mongkok...	22.323800	114.172000
49	UA iSQUARE	UA iSQUARE	7/F, iSQUARE, 63 Nathan Road, Tsimshatsui	22.296648	114.171974
51	UA MegaBox	UA MegaBox	Level 11, MegaBox, Enterprise Square 5, 38 Wan...	22.319533	114.208555

In [28]:
```
df_cinemas.drop_duplicates('Address', inplace=True, keep='first')
```

Drop the duplicated cinema records

In [29]:
```
df_cinemas[df_cinemas.duplicated('Name')]
```

Out[29]:

Name	ChiName	Address	Latitude	Longitude

In [30]:
```
df_cinemas.head()
```

Out[30]:

	Name	ChiName	Address	Latitude	Longitude
0	Emperor Cinemas - Entertainment Building	英皇戲院 - 娛樂行	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
2	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
3	Broadway Circuit - CYBERPORT	百老匯戲院 - 數碼港	Shop L1 - 3, Level 1, The Arcade, 100 Cyberpor...	22.261067	114.129825
4	Broadway Circuit - PALACE IFC	百老匯戲院 - PALACE IFC	Podium L1, IFC Mall, 8 Finance Street, Central	22.285545	114.157979
5	Cinema City VICTORIA (Causeway Bay)	Cinema City VICTORIA (銅鑼灣)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126

```
In [31]: df_cinemas['ChiName'].to_frame()
```

Out[31]:

	ChiName
0	英皇戲院 - 娛樂行
2	英皇戲院 - 屯門新都商場
3	百老匯戲院 - 數碼港
4	百老匯戲院 - PALACE IFC
5	Cinema City VICTORIA (銅鑼灣)
7	百老匯戲院 - 電影中心
8	百老匯戲院 - 荷里活
9	百老匯戲院 - 旺角
10	百老匯戲院 - MOViE MOViE Cityplaza
11	百老匯戲院 - PALACE apm
12	百老匯戲院 - The ONE
13	百老匯戲院 - 嘉湖銀座
14	百老匯戲院 - 葵芳
15	百老匯戲院 - MY CINEMA YOHO MALL
16	百老匯戲院 - 荃灣
17	AMC Pacific Place
18	康怡戲院
19	皇室戲院
20	MCL 粉嶺戲院
21	MCL 海怡戲院
22	MOVIE TOWN - 新城市廣場
23	MCL 德福
24	Festival Grand Cinema
25	CGV Cinemas D2 Place
26	MCL 新都城戲院
27	STAR Cinema
28	The Grand Cinema
30	嘉禾粉嶺
31	嘉禾黃埔
32	海運戲院
33	StagE
34	the sky (奧海城)
35	嘉禾荃新天地
36	星影匯
37	CANDY PARK BY CINEMA CITY (愉景新城)

	ChiName
38	Cinema City 柴灣
39	Cinema City JP
40	Cinema City 朗豪坊
41	UA Cine Times
42	BEA IMAX @ UA Cine Moko
43	BEA IMAX @ UA iSQUARE
44	BEA IMAX @ UA MegaBox
47	UA 淘大
50	UA 青衣城
52	機場UA IMAX 影院
53	總統
54	豪華
55	新寶
56	香港科學館演講廳
57	凱都
58	巴黎倫敦紐約米蘭戲院
59	元朗戲院
60	馬鞍山戲院
61	L Cinema Shau Kei Wan
62	饒館新一天院線
63	香港藝術中心古天樂電影院
64	寶石戲院
65	新光戲院大劇場
66	Super 3 影院
67	大館

Cinema '新光戲院大劇場' and '大館' should be considered as cinema in Hong Kong. These records must be rmeoved

```
In [32]: df_cinemas.drop(index=[65,67], inplace=True)
```

```
In [33]: df_cinemas.drop(axis=1, columns=['ChiName'], inplace=True)
```

In [34]:
```
df_cinemas.head()
```

Out[34]:

	Name	Address	Latitude	Longitude
0	Emperor Cinemas - Entertainment Building	3/F, Emperor Cinemas Entertainment Building, 3...	22.281453	114.154230
2	Emperor Cinemas - Tuen Mun	3/F, New Town Commercial Arcade, 2 Tuen Lee St...	22.390776	113.975983
3	Broadway Circuit - CYBERPORT	Shop L1 - 3, Level 1, The Arcade, 100 Cyberpor...	22.261067	114.129825
4	Broadway Circuit - PALACE IFC	Podium L1, IFC Mall, 8 Finance Street, Central	22.285545	114.157979
5	Cinema City VICTORIA (Causeway Bay)	2-8 Sugar Street, Causeway Bay, Hong Kong	22.279805	114.187126

Check the shape of cinemas dataset

In [35]:
```
df_cinemas.shape
```

Out[35]:
```
(58, 4)
```

Now I can use the FourSquare API to explore nearby venues of Hong Kong cinemas

In [36]:
```
from pathlib import Path

venues_csv = Path('./cinemas_venues.csv')
df_venues = None

# check the venues data is explored and downloaded
if( venues_csv.exists() ):
    df_venues = pd.read_csv('./cinemas_venues.csv')
else:
    # construct a dataframe to store data
    df_venues = pd.DataFrame(columns=['Cinema Name', 'Category', 'Name', 'Latitude', 'Longitude', 'Tips', 'Users', 'Visits'])
    for (name, address, latitude, longitude) in df_cinemas.itertuples(index=False):
        for cat, cat_id in fs_categories.items():
            df = venues_nearby(latitude, longitude, cat, verbose=False)
            df['Cinema Name'] = name
            df['Category'] = cat
            df_venues = df_venues.append(df, sort=True)
    df_venues.to_csv('cinemas_venues.csv', index=False)
```

In [37]:
```
print('Total {} of venues are found'.format(len(df_venues)))
```

```
Total 2223 of venues are found
```

In [38]:
```
# check the shape of data
df_venues.shape
```

Out[38]:
```
(2223, 8)
```

In [39]:
```
# check some data
df_venues.head()
```

Out[39]:

	Category	Cinema Name	Latitude	Longitude	Name	Tips	Users	Visits
0	Food	Emperor Cinemas - Entertainment Building	22.282921	114.154651	Mana! Fast Slow Food	0	0	0
1	Food	Emperor Cinemas - Entertainment Building	22.281165	114.155296	Good Luck Thai Food (鴻運泰國美食)	0	0	0
2	Food	Emperor Cinemas - Entertainment Building	22.281668	114.152495	Soul Food	0	0	0
3	Food	Emperor Cinemas - Entertainment Building	22.282659	114.156753	Chiu Lung Fast Food (昭隆美食)	0	0	0
4	Food	Emperor Cinemas - Entertainment Building	22.282521	114.156717	Sun Hing Fast Food (新興美食)	0	0	0

Number of venues in each category

In [40]:
```
df_venues['Category'].value_counts().to_frame(name='Count')
```

Out[40]:

	Count
Shop & Service	874
Bus Stop	704
Food	518
Arts & Entertainment	65
Metro Station	61
Nightlife Spot	1

In [41]:
```
df_venues[(df_venues.Tips > 0)|(df_venues.Users > 0)|(df_venues.Visits > 0)]
```

Out[41]:

Category	Cinema Name	Latitude	Longitude	Name	Tips	Users	Visits

In [42]:
```
df_venues.drop(columns=['Tips','Users','Visits'], inplace=True)
```

In [43]:
```
df_venues[df_venues.Category=='Nightlife Spot']
```

Out[43]:

	Category	Cinema Name	Latitude	Longitude	Name
87	Nightlife Spot	Emperor Cinemas - Entertainment Building	22.282246	114.152651	The Spot Bar

```
In [44]: df_venues.drop(index=87, inplace=True)
```

Comapred with other categories, only one 'Nightlife Spot' venue. This category is removed.

```
In [45]: df_venues.shape
```

```
Out[45]: (2222, 5)
```

Explore nearby venues of 5 possible/target locations

```
In [46]: df_target_venues = pd.DataFrame(columns=['Location', 'Category', 'Name', 'Lati
tude', 'Longitude', 'Tips', 'Users', 'Visits'])
for (location, address, latitude, longitude) in df_possible_locations.itertupl
es(index=False):
    for cat, cat_id in fs_categories.items():
        df = venues_nearby(latitude, longitude, cat, verbose=False)
        df['Location'] = location
        df['Category'] = cat
        df_target_venues = df_target_venues.append(df, sort=True)
```

```
In [47]: df_target_venues.head()
```

Out[47]:

	Category	Latitude	Location	Longitude	Name	Tips	Users	Visits
0	Shop & Service	22.319338	L1	114.231681	Sau Mau Ping Shopping Centre (秀茂坪商場)	0	0	0
1	Shop & Service	22.320360	L1	114.234489	On Tat Shopping Centre (安達商場)	0	0	0
2	Shop & Service	22.314968	L1	114.229987	Tsui Ping Shopping Circuit 翠屏商場	0	0	0
0	Bus Stop	22.316921	L1	114.235785	Sau Fai House Bus Stop 秀暉樓巴士站	0	0	0
0	Food	22.372900	L2	113.964900	Lee Kam Kee Vietnamese Food & Drinks (李錦基越南飲食)	0	0	0

```
In [48]: df_target_venues[(df_target_venues.Tips > 0)|(df_target_venues.Users > 0)|(df_
target_venues.Visits > 0)]
```

Out[48]:

Category	Latitude	Location	Longitude	Name	Tips	Users	Visits

```
In [49]: df_target_venues.drop(columns=['Tips','Users','Visits'], inplace=True)
```

In [50]:
```
df_target_venues['Category'].value_counts().to_frame(name='Count')
```

Out[50]:

	Count
Bus Stop	36
Shop & Service	30
Food	12
Metro Station	4
Arts & Entertainment	1

No venue is found for 'Nightlife Spot' category

In [51]:
```
df_target_venues.shape
```

Out[51]:
```
(83, 5)
```

I only interested in number of venues in each category of dataframe.

In [52]:
```
df_venues_count = df_venues.groupby(['Cinema Name','Category'], as_index=False
).count()
df_venues_count.drop(columns=['Latitude','Longitude'], inplace=True)
df_venues_count.rename(columns={'Name':'Count'}, inplace=True)
df_venues_count.head()
```

Out[52]:

	Cinema Name	Category	Count
0	AMC Pacific Place	Arts & Entertainment	8
1	AMC Pacific Place	Bus Stop	13
2	AMC Pacific Place	Food	8
3	AMC Pacific Place	Metro Station	1
4	AMC Pacific Place	Shop & Service	21

In [53]:
```
df_venues_count = df_venues_count.pivot(index='Cinema Name', columns='Category', values='Count').fillna(0)
df_venues_count.head()
```

Out[53]:

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 - CINEMATHEQUE	3.0	25.0	13.0	1.0	25.0
Broadway Circuit - CYBERPORT	0.0	2.0	1.0	0.0	3.0
Broadway Circuit - HOLLYWOOD	1.0	7.0	0.0	1.0	6.0
Broadway Circuit - KINGSWOOD GINZA	0.0	3.0	0.0	0.0	2.0

In [54]:
```
# Do the same process on target locations
df_target_venues_count = df_target_venues.groupby(['Location','Category']).size().reset_index(name='Count')
df_target_venues_count = df_target_venues_count.pivot(index='Location', columns='Category', values='Count').fillna(0)
```

In [55]:
```
df_target_venues_count
```

Out[55]:

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	4.0	1.0	9.0
L4	1.0	9.0	2.0	1.0	5.0
L5	0.0	13.0	4.0	2.0	12.0

Check boss's favorite cinema list

In [56]:
```
boss_favorite
```

Out[56]:
```
[{'Name': 'Broadway Circuit - MONGKOK', 'Rating': 4.5},
 {'Name': 'Broadway Circuit - The ONE', 'Rating': 4.5},
 {'Name': 'Grand Ocean', 'Rating': 4.3},
 {'Name': 'The Grand Cinema', 'Rating': 3.4},
 {'Name': 'AMC Pacific Place', 'Rating': 2.3},
 {'Name': 'UA IMAX @ Airport', 'Rating': 1.5}]
```

Check boss's favorite cinemas are inside the hong kong cinemas dataset

Check the Hong Kong cinema list contains all stakeholder's favorite cinemas

In [57]:
```
names = [ cinema['Name'] for cinema in boss_favorite ]
df_cinemas[df_cinemas.Name.isin(names)]
```

Out[57]:

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

Stakholder's favorite cinema list

In [58]:
```
df_boss_favorite = pd.DataFrame(boss_favorite, columns=['Name','Rating'])
df_boss_favorite
```

Out[58]:

	Name	Rating
0	Broadway Circuit - MONGKOK	4.5
1	Broadway Circuit - The ONE	4.5
2	Grand Ocean	4.3
3	The Grand Cinema	3.4
4	AMC Pacific Place	2.3
5	UA IMAX @ Airport	1.5

Data Analysis

In [59]:

```
!conda install seaborn=0.9 --yes
```

```
Solving environment: done

## Package Plan ##

  environment location: /home/jupyterlab/conda

  added / updated specs: 
    - seaborn=0.9


The following packages will be downloaded:

    package                    |            build
    ---------------------------|-----------------
    seaborn-0.9.0              |           py36_0         379 KB
    conda-4.5.11               |           py36_0         1.0 MB
    ------------------------------------------------------------
                                           Total:         1.4 MB

The following packages will be UPDATED:

    certifi:         2018.8.24-py36_1     conda-forge --> 2018.8.24-py36_1 
    conda:           4.5.11-py36_0        conda-forge --> 4.5.11-py36_0    
    openssl:         1.0.2p-h470a237_0    conda-forge --> 1.0.2p-h14c3975_0
    seaborn:         0.8.1-py36hfad7ec4_0             --> 0.9.0-py36_0     

The following packages will be DOWNGRADED:

    ca-certificates: 2018.8.24-ha4d7672_0 conda-forge --> 2018.03.07-0     


Downloading and Extracting Packages
seaborn-0.9.0        | 379 KB    | ##################################### | 10
0% 
conda-4.5.11         | 1.0 MB    | ##################################### | 10
0% 
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
```

In [60]:

```
import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

Check the data type of variables

In [61]:
```
df_venues_count.dtypes.to_frame(name='Data Type')
```

Out[61]:

Category	Data Type
Arts & Entertainment	float64
Bus Stop	float64
Food	float64
Metro Station	float64
Shop & Service	float64

All datatype is numeric

Generates descriptive statistics that summarize the central tendency, dispersion and shape of a dataset's distribution

In [62]:
```
df_venues_count.describe()
```

Out[62]:

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
count	57.000000	57.000000	57.000000	57.000000	57.000000
mean	1.140351	12.350877	9.087719	1.070175	15.333333
std	2.430745	9.510316	8.018462	0.820706	10.736010
min	0.000000	1.000000	0.000000	0.000000	2.000000
25%	0.000000	5.000000	2.000000	1.000000	6.000000
50%	0.000000	9.000000	6.000000	1.000000	11.000000
75%	1.000000	21.000000	16.000000	1.000000	30.000000
max	12.000000	30.000000	27.000000	4.000000	30.000000

Cinema really has many 'Bus Stop', 'Food', 'Shop & Service' venues around. However it is unusual that a cinema has 4 metro stations nearby (within 500 meters).

In [63]:
```
df_venues_count['Metro Station'].value_counts().sort_index().to_frame('Cinema Count')
```

Out[63]:

	Cinema Count
0.0	13
1.0	30
2.0	12
3.0	1
4.0	1

One cinema contains 4 Metro Station around

In [64]:
```
df_venues_count[df_venues_count['Metro Station'] > 2]
```

Out[64]:

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Cinema Name					
Broadway Circuit - The ONE	3.0	21.0	27.0	3.0	30.0
LUX Theatre	0.0	12.0	12.0	4.0	11.0

In [65]:
```
metro_over_2 = df_venues_count[df_venues_count['Metro Station'] > 2].index.tolist()
df_venues[(df_venues['Cinema Name'].isin(metro_over_2)) & (df_venues.Category == 'Metro Station')]
```

Out[65]:

	Category	Cinema Name	Latitude	Longitude	Name
609	Metro Station	Broadway Circuit - The ONE	22.297150	114.172230	MTR Tsim Sha Tsui Station (港鐵尖沙咀站)
610	Metro Station	Broadway Circuit - The ONE	22.304787	114.171664	MTR Jordan Station (港鐵佐敦站)
611	Metro Station	Broadway Circuit - The ONE	22.295573	114.173652	MTR East Tsim Sha Tsui Station (港鐵尖東站)
2180	Metro Station	LUX Theatre	22.305477	114.188624	MTR Whampoa Station (港鐵黃埔站)
2181	Metro Station	LUX Theatre	22.309115	114.182668	MTR Ho Man Tin Station (港鐵何文田站)
2182	Metro Station	LUX Theatre	22.303110	114.181630	Mtr Hung Hom Station Platform 2
2183	Metro Station	LUX Theatre	22.303085	114.181160	Mtr Hung Hom Station Platform 4

Venue 'Mtr Hung Hom Station Platform 4' is duplicated and should be removed.

In [66]:
```
df_venues.loc[2182, 'Name'] = 'MTR Hung Hom Station'
```

In [67]:
```
df_venues.drop(index=2183, inplace=True)
```

Re-construct the dataframe again

In [68]:
```
df_venues_count = df_venues.groupby(['Cinema Name','Category'], as_index=False
).count()
df_venues_count.drop(columns=['Latitude','Longitude'], inplace=True)
df_venues_count.rename(columns={'Name':'Count'}, inplace=True)
df_venues_count = df_venues_count.pivot(index='Cinema Name', columns='Categor
y', values='Count').fillna(0)
df_venues_count.head()
```

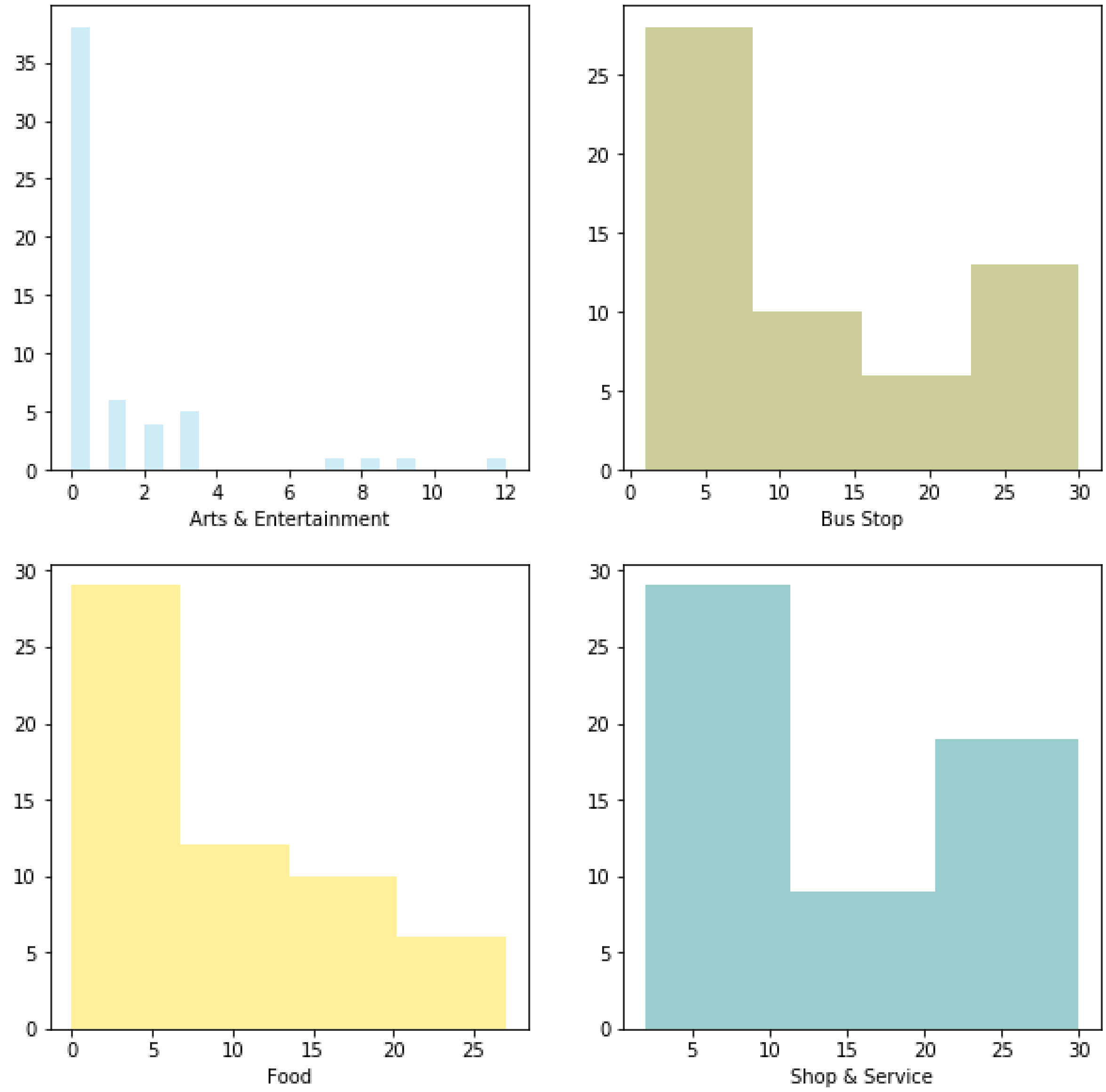
Out[68]:

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 - CINEMATHEQUE	3.0	25.0	13.0	1.0	25.0
Broadway Circuit - CYBERPORT	0.0	2.0	1.0	0.0	3.0
Broadway Circuit - HOLLYWOOD	1.0	7.0	0.0	1.0	6.0
Broadway Circuit - KINGSWOOD GINZA	0.0	3.0	0.0	0.0	2.0

Plot the distribution of other variables

```
In [69]: f, axes = plt.subplots(2, 2, figsize=(10, 10))
         sns.distplot(df_venues_count['Arts & Entertainment'] , color="skyblue", ax=axe
         s[0, 0], kde=False)
         sns.distplot(df_venues_count['Bus Stop'] , color="olive", ax=axes[0, 1], kde=F
         alse)
         sns.distplot(df_venues_count['Food'] , color="gold", ax=axes[1, 0], kde=False)
         sns.distplot(df_venues_count['Shop & Service'] , color="teal", ax=axes[1, 1],
         kde=False)
```

```
Out[69]: <matplotlib.axes._subplots.AxesSubplot at 0x7fdcc5602a58>
```



The distribution of other variables are quite similar. Now check their **Pearson Correlation**

In [70]:

```
df_venues_count.corr()
```

Out[70]:

Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
Category					
Arts & Entertainment	1.000000	0.494525	0.414387	0.389271	0.506590
Bus Stop	0.494525	1.000000	0.893873	0.563799	0.896388
Food	0.414387	0.893873	1.000000	0.583749	0.872533
Metro Station	0.389271	0.563799	0.583749	1.000000	0.499546
Shop & Service	0.506590	0.896388	0.872533	0.499546	1.000000

It seems that 'Bus Stop', 'Shop & Service' and 'Food' category are highly correlated.
Find **P-Value** of the variables

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
- is > 0.1; there is no evidence that the correlation is significant.

In [71]:

```
from scipy import stats
```

In [72]:

```
p_value_data = []
for left in df_venues_count.columns:
    p_values = [left]
    for right in df_venues_count.columns:
        pearson_coef, p_value = stats.pearsonr(df_venues_count[left], df_venue
s_count[right])
        if(p_value < 0.001):
            p_values.append('strong')
        elif(p_value < 0.05):
            p_values.append('moderate')
        elif(p_value < 0.1):
            p_values.append('weak')
        else:
            p_values.append('no')
    p_value_data.append(p_values)
```

In [73]:

```
df_p_values = pd.DataFrame(p_value_data, columns=['Category'] + df_venues_coun
t.columns.tolist())
```

In [74]:
```
df_p_values
```

Out[74]:

	Category	Arts & Entertainment	Bus Stop	Food	Metro Station	Shop & Service
0	Arts & Entertainment	strong	strong	moderate	moderate	strong
1	Bus Stop	strong	strong	strong	strong	strong
2	Food	moderate	strong	strong	strong	strong
3	Metro Station	moderate	strong	strong	strong	strong
4	Shop & Service	strong	strong	strong	strong	strong

The correlation between 'Bus Stop', 'Food', 'Metro Station' and 'Shop & Service' are statistically significant, and the coefficient of > 0.5 shows that the relationship is positive

In [75]:
```
df_boss_favorite
```

Out[75]:

	Name	Rating
0	Broadway Circuit - MONGKOK	4.5
1	Broadway Circuit - The ONE	4.5
2	Grand Ocean	4.3
3	The Grand Cinema	3.4
4	AMC Pacific Place	2.3
5	UA IMAX @ Airport	1.5

```
In [ ]: !conda install -c conda-forge folium=0.5 --yes
        import folium

        print('Folium installed and imported!')
```

```
Solving environment: done

## Package Plan ##

  environment location: /home/jupyterlab/conda

  added / updated specs:
    - folium=0.5


The following packages will be downloaded:

    package                    |            build
    ---------------------------|-----------------
    folium-0.5.0               |             py_0          45 KB  conda-forge
    conda-4.5.11               |           py36_0         625 KB  conda-forge
    certifi-2018.8.24          |        py36_1001         139 KB  conda-forge
    vincent-0.4.4              |             py_1          28 KB  conda-forge
    branca-0.3.0               |             py_0          24 KB  conda-forge
    altair-2.2.2               |           py36_1         461 KB  conda-forge
    ------------------------------------------------------------
                                           Total:         1.3 MB

The following NEW packages will be INSTALLED:

    altair:          2.2.2-py36_1      conda-forge
    branca:          0.3.0-py_0        conda-forge
    folium:          0.5.0-py_0        conda-forge
    vincent:         0.4.4-py_1        conda-forge

The following packages will be UPDATED:

    ca-certificates: 2018.03.07-0                 --> 2018.8.24-ha4d7672_0 c
onda-forge
    certifi:         2018.8.24-py36_1             --> 2018.8.24-py36_1001  c
onda-forge
    conda:           4.5.11-py36_0                --> 4.5.11-py36_0        c
onda-forge
    openssl:         1.0.2p-h14c3975_0            --> 1.0.2p-h470a237_0    c
onda-forge


Downloading and Extracting Packages
folium-0.5.0         | 45 KB     | ##################################### | 10
0% 
conda-4.5.11         | 625 KB    | ##################################### | 10
0% 
certifi-2018.8.24    | 139 KB    | ##################################### | 10
0% 
vincent-0.4.4        | 28 KB     | ##################################### | 10
0% 
branca-0.3.0         | 24 KB     | ##################################### | 10
0% 
altair-2.2.2         | 461 KB    | ##################################### | 10
0% 
Preparing transaction: done
Verifying transaction: /
```

In [ ]:

```
hk_coords = getLatLng('Hong Kong')
```

Visualize the location of cinemas, target location and stakeholder's favorite cineams on the map

In [ ]:

```
hk_map = folium.Map(location=hk_coords, zoom_start=12, tiles='Stamen Toner')

cinemas_fg = folium.FeatureGroup()
targets_fg = folium.FeatureGroup()

for(location, address, latitude, longitude) in df_possible_locations.itertuples(index=False):
    targets_fg.add_child(
        folium.features.CircleMarker(
            location=(latitude, longitude),
            popup=location,
            radius=5,
            fill=True,
            color='yellow',
            fill_opacity=1.
        )
    )

boss_ratings = df_boss_favorite.set_index('Name')
name_list = boss_ratings.index.tolist()

for (name, address, latitude, longitude ) in df_cinemas.itertuples(index=False):

    color = 'blue'
    popup = name

    if( name in name_list ):
        color = 'red'
        popup = '{} - Rating: {}'.format(name, boss_ratings.loc[name,'Rating'])

    cinemas_fg.add_child(
        folium.features.CircleMarker(
            location=(latitude, longitude),
            popup=popup,
            radius=5,
            fill=True,
            color=color,
            fill_opacity=1.
        )
    )

hk_map.add_child(cinemas_fg)
hk_map.add_child(targets_fg)
```

Most of Hong Kong cinemas (blue circle) and stakeholder's favorite cinemas (red circle) location are built near main road, and centralized in urban area of Hong Kong. The target locations (yellow circle) of new cinema are not near to main road.

Machine Learning

Now, let's use **Content-Based** or **Item-Item recommendation systems**. In this case, I am going to try to figure out the boss's favorite new cinema location by counting number of nearby venues and ratings given.

Normalize the values of venues dataframe by using MinMaxScaler method

```
In [ ]: df_venues_count.head()
```

```
In [ ]: from sklearn.preprocessing import MinMaxScaler
        scaler = MinMaxScaler()
```

```
In [ ]: venues_normalized = scaler.fit_transform(df_venues_count)
```

```
In [ ]: df_venues_normalized = pd.DataFrame(
            venues_normalized,
            index=df_venues_count.index,
            columns=df_venues_count.columns
        )
```

```
In [ ]: df_venues_normalized.head()
```

Merge the data with boss's favorite list

```
In [ ]: boss_rating_table = pd.merge(
            df_boss_favorite,
            df_venues_normalized,
            how='inner',
            left_on='Name',
            right_index=True
        )
        boss_rating_table.drop(['Name','Rating'], axis=1, inplace=True)
        boss_rating_table
```

Dot product to get the weight of rating on each category according to boss's favorite

```
In [ ]: boss_profile = boss_rating_table.transpose().dot(df_boss_favorite['Rating'])
In [ ]: boss_profile
```

Normalize the values of target venues

```
In [ ]: df_targets_normalized = pd.DataFrame(
            scaler.transform(df_target_venues_count),
            index=df_target_venues_count.index,
            columns=df_target_venues_count.columns
        )
```

```
In [ ]: df_targets_normalized
```

Results

Results section where you discuss the results.

With the boss's profile and the complete list of cinemas and their venues count in hand, I am going to take the weighted average of every lcoation based on the profile and recommend the top location that most satisfy it.

```
In [ ]: df_recommend = (df_targets_normalized*boss_profile).sum(axis=1)/boss_profile.s
        um()
        df_recommend = df_recommend.reset_index(name='Rating')
```

```
In [ ]: df_possible_locations
```

```
In [ ]: df_final = pd.merge(
            df_possible_locations,
            df_recommend,
            left_on='Location',
            right_on='Location'
        )
        df_final.sort_values('Rating', ascending=False, inplace=True)
```

```
In [ ]: df_final
```

```
In [ ]: print('I should recommend the location "{}" of address "{}" to the stackholde
        r'.format(df_final.iat[0,0], df_final.iat[0,1]))
```

The result is reasonable. Location "L5" has the most number of venues in category "Bus Stop", "Food", "Metro Station" and "Shop & Service".

```
In [ ]: df_target_venues_count.head()
```

Moreover, these categories are most concerned by the stakeholder according to profile rating

```
In [ ]: boss_profile.sort_values(ascending=False)
```

Therefore, Location "L5" should be recommeded to the stakeholder

Discussion

Discussion section where you discuss any observations you noted and any recommendations you can make based on the results.

Number of venues of 5 target locations are actually below the average

```
In [ ]: df_venues_count.mean().to_frame(name='Average Count')
```

```
In [ ]: df_target_venues_count.mean().to_frame('Average Count')
```

I should contact local commercial property agents to find more suitable locations. Moreover, FourSquare is not popular in Hong Kong, the data maybe out-dated or unreliable, the report should gather more data from other location data source such as Google Place API.

Conclusion

Conclusion section where you conclude the report.

The stakeholder's problem is resolved. Stakeholder wants to find the best place to build a new cinema in Hong Kong, and the factors of "best location" is based on the number of venues in eating, shopping, transportation category around the location. Stakeholder also provide his favorite list of cinema to further explain what the "best location" is. Content-based filtering machine learning technique is the most suitable method to resolve the problem. It combines stakeholder's preference and cinema profile to make the recommendation result.

The 5 target locations of new cinema may not be a good choices. As the weighting matrix is developed, I can quickly pick other locations and make the recommendation again.