

IBM Data Science Capstone Project

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**Battle of the Neighbourhood Project
(Restaurant Analysis of Hotels)**

Introduction

Background

Shanghai is a large international city, with millions of tourists visiting each year. It is one of the densest cities in the world, where over 20 million people live in the city, and another 300 million in the surrounding area.

It is advantageous to know where would be an underserved location in order to suggest where to open a restaurant.

Problem

For this case study we are investigating which hotels are closest to the best rated restaurant in Shanghai, and in theory, in the most popular area of the city.

From those results we will find which restaurants types are the most popular around the hotels, in order to try find an opportunity to find a location that is underserved.

Who would be interested in this project?

Restaurant investors looking for data on locations to open a new restaurant.

This project can also assist existing restaurants looking to change cuisine type.

Data Acquisition

The data requirements include

- **Most popular rated restaurant in the city**
- **List of Hotels and co-ordinates around the top rated restaurant**
- **List of Restaurants around the hotels using the Foursquare API**

The Foursquare API was used to retrieve restaurant data and Hotel Data for the city. No other data sources were used.

Note: The Foursquare data set is quite small, and lacks detailed data for Shanghai.

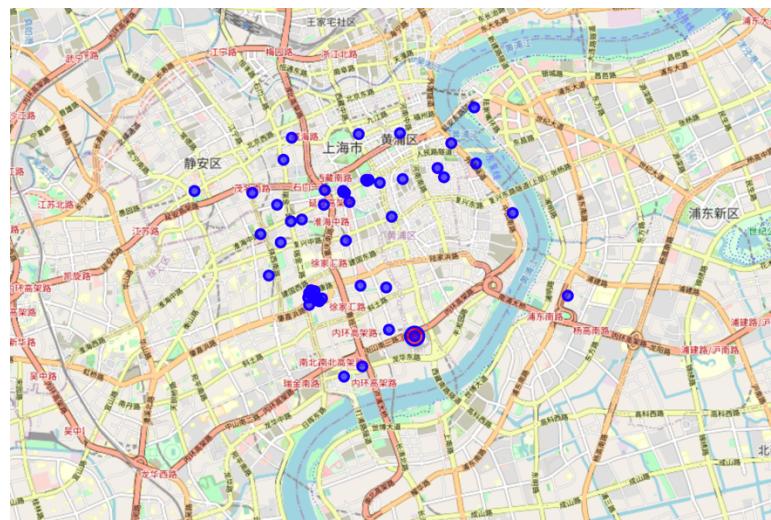
Data Science Methodology

The data was extracted, and cleaned, and features were selected.

Foursquares API was used to locate the nearest restaurants closest to the centre of the city (within a 5km radius)

	name	categories	lat	lng	labelLatLangs	distance	cc	city	state	country	formattedAddress	address	crossStreet	pos
0	葛记海鲜 Restaurant	Seafood	31.201691	121.482660	[{"label": "display", "lat": 31.201691, "lng": -121.482660}	1099	CN	上海市	上海市	中国	[上海, 上海市]	Nan	Nan	
1	Cuisine Restaurant	Chinese	31.209735	121.477438	[{"label": "display", "lat": 31.209735, "lng": -121.477438}	871	CN	上海市	上海市	中国	[徐园路50号, 上海市]	徐园路	50号	
2	Restaurant Bar	MZ Restaurant	31.203032	121.477878	[{"label": "display", "lat": 31.203032, "lng": -121.477878}	1198	CN	上海市	上海市	中国	[南门路650号102室, 上海市, 上海市]	南门路	650号	
3	Restaurant Tea Restaurant	Chinese	31.220597	121.478385	[{"label": "display", "lat": 31.220597, "lng": -121.478385}	1279	CN	Huangpu	上海市	中国	[西藏南路572号(近复兴东路)]	西藏南路	572号	
4	Restaurant Italian Restaurant	Italian	31.209987	121.472369	[{"label": "display", "lat": 31.209987, "lng": -121.472369}	1277	CN	上海市	上海市	中国	[梅园路(Xujiahui Road) 上海市, 上海市]	Mengui Road	Xujiahui Road	
5	Restaurant Asian Restaurant	Chinese	31.207974	121.465385	[{"label": "display", "lat": 31.207974, "lng": -121.465385}	1980	CN	上海市	上海市	中国	[卢湾区徐家汇路500弄1号(近淮海中路, 上海市, 上海市)]	打浦店		
6	Char's Restaurant (香港)	Hong Kong	31.220636	121.469609	[{"label": "display", "lat": 31.220636, "lng": -121.469609}	2522	CN	Huangpu	上海市	中国	[30 Sinan Rd, 1f 远南国际30-1号 (Huaihai Rd, Shanghai, China)]	30 Huaihai Rd	Sinan Rd	
7	Qian Restaurant (香港)	Guizhou	31.226825	121.472713	[{"label": "display", "lat": 31.226825, "lng": -121.472713}	2067	CN	Huangpu	上海市	中国	[93-111 Huaihai M Rd 11f Times Square (Times Square), Shanghai]	93-111 Huaihai M Rd	Times Square	
8	Chao Man Restaurant (重庆小面)	Hong Kong	31.226804	121.473690	[{"label": "display", "lat": 31.226804, "lng": -121.473690}	2066	CN	Huangpu	上海市	中国	[Huaihai, 上海市]	Nan	Nan	
9	Super Star Seafood Restaurant (海鲜)	Seafood	31.226507	121.469323	[{"label": "display", "lat": 31.226507, "lng": -121.469323}	2184	CN	Huangpu	上海市	中国	[300 Huaihai Rd, 4F-05 K11 Art Mall (上海K11购物艺术中心)]	300 Huaihai Rd	4F-05 K11 Art Mall	

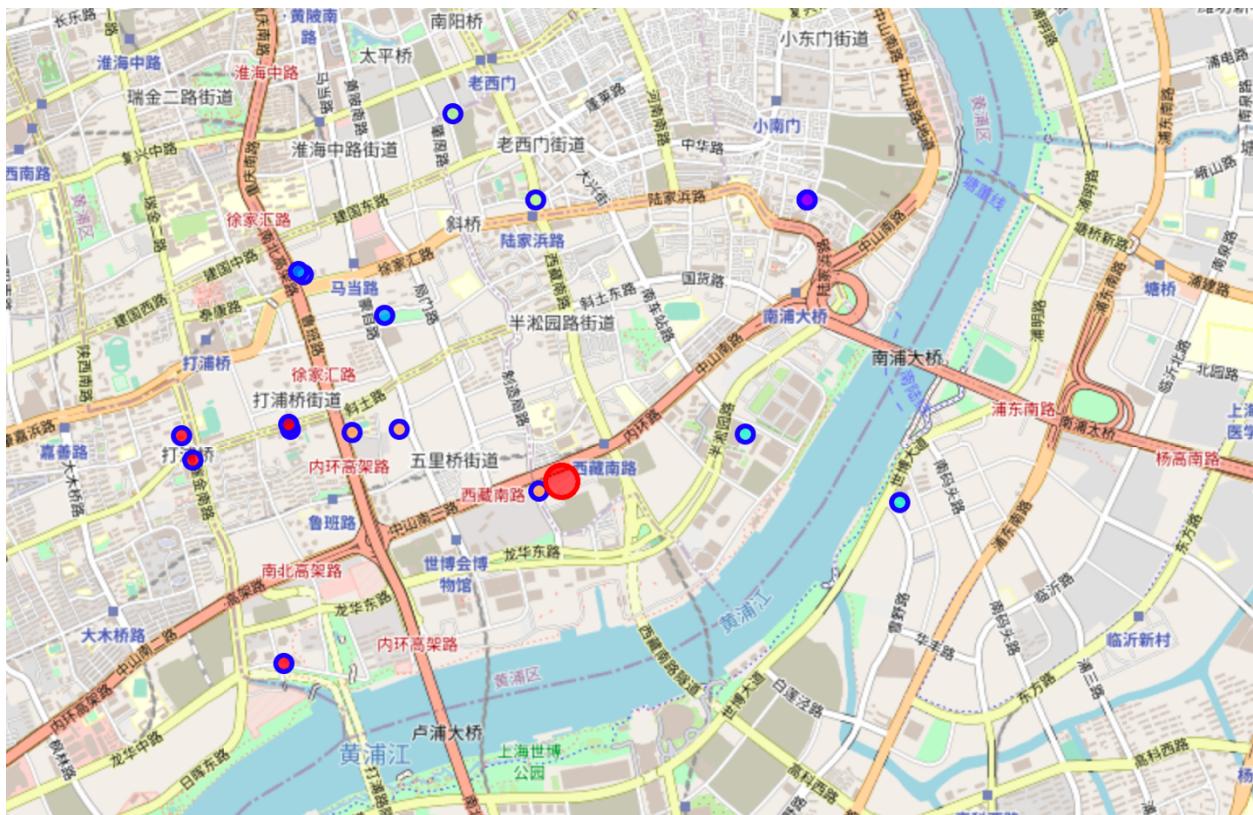
Restaurants were classified using ratings provided by Foursquare.
Best Rated Restaurant was chosen from that list.



The closest hotels were then chosen around the best rated Restaurant.

'There are 19 Hotel results around 陈记海鲜酒家 Chen Ji Seafood Restaurant.'

KMeans Clusters of the Hotel locations were plotted on the map, and folium was used to visualize the geographic details for Central Shanghai, and the Hotels were plotted on top.



I then used the Foursquare API to retrieve a list of amenities surrounding the listed hotels, then filtered by Restaurants. 104 Restaurant results were returned, around the list of 19 hotels.

Filter result set to only contain restaurants near our hotels

```

1 df1 = venues_df.loc[venues_df['VenueCategory'].str.contains('Restaurant') == True]
2 display_html(df1.head())
3 print (df1.shape)
4
5
✓ 0.4s

```

Python

	Hotel	HotelLat	HotelLong	VenueName	VenueLatitude	VenueLongitude	VenueCategory
2	Pullman Shanghai Skyway Hotel	31.204089	121.471604	聰哥小館	31.204182	121.466744	Asian Restaurant
7	Pullman Shanghai Skyway Hotel	31.204089	121.471604	McDonald's (麦当劳)	31.201280	121.472769	Fast Food Restaurant
8	Pullman Shanghai Skyway Hotel	31.204089	121.471604	Remedy 365 (源氣 365)	31.207406	121.473457	Restaurant
9	Pullman Shanghai Skyway Hotel	31.204089	121.471604	Mr. Pancake	31.207638	121.473523	American Restaurant
11	Pullman Shanghai Skyway Hotel	31.204089	121.471604	Top Chef	31.207890	121.473130	Italian Restaurant

(104, 7)

Selection of the 19 hotels

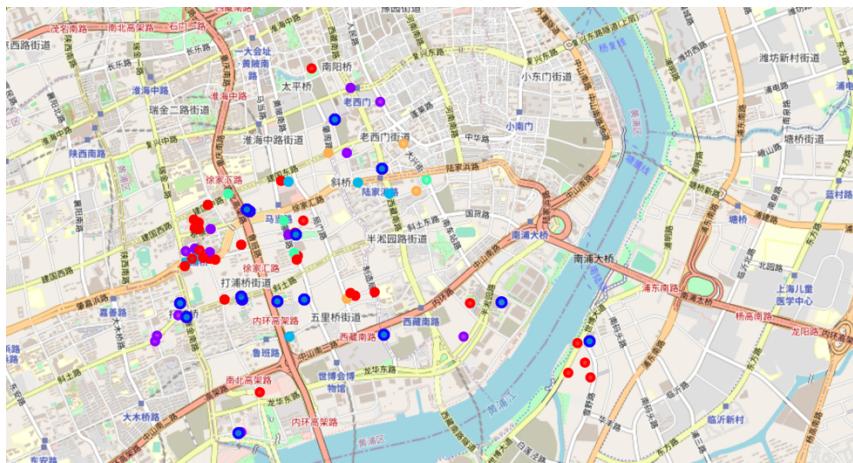
	Hotel	HotelLat	HotelLong	VenueName	VenueLatitude	VenueLongitude	VenueCategory
91	全季酒店 Ji Hotel	31.209369	121.473307	Mr. Pancake	31.207638	121.473523	American Restaurant
9	Pullman Shanghai Skyway Hotel	31.204089	121.471604	Mr. Pancake	31.207638	121.473523	American Restaurant
64	Magnotel	31.204249	121.474147	Mr. Pancake	31.207638	121.473523	American Restaurant
21	Intercontinental Shanghai Expo Hotel (上海世博洲际酒店)	31.200941	121.500556	多利夢瑪 Tony Roma's	31.198010	121.500630	American Restaurant
105	Atour S Hotel (Atour S Hotel 亞朵酒店)	31.204238	121.468373	聰哥小館	31.204182	121.466744	Asian Restaurant

I then setup a onehot (binary table) for the restaurant types

	American Restaurant	Asian Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Fast Food Restaurant	French Restaurant	German Restaurant	Hainan Restaurant	Hotpot Restaurant	Indian Restaurant	Ita Restau
91	1	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	0	0	0	0	0	0	0	0	0	0	0
64	1	0	0	0	0	0	0	0	0	0	0	0	0
21	1	0	0	0	0	0	0	0	0	0	0	0	0
105	0	1	0	0	0	0	0	0	0	0	0	0	0
123	0	1	0	0	0	0	0	0	0	0	0	0	0
50	0	1	0	0	0	0	0	0	0	0	0	0	0
34	0	1	0	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0	0	0	0	0	0
276	0	1	0	0	0	0	0	0	0	0	0	0	0
56	0	0	1	0	0	0	0	0	0	0	0	0	0
115	0	0	1	0	0	0	0	0	0	0	0	0	0
284	0	0	1	0	0	0	0	0	0	0	0	0	0
43	0	0	1	0	0	0	0	0	0	0	0	0	0
135	0	0	1	0	0	0	0	0	0	0	0	0	0

This was merged with the Hotels List, and another KMeans Cluster Map was drawn for the hotels / restaurant types nearest the hotels.

This enabled us to drill down and find potential underserved locations close to Hotels in our chosen area's.



The datasets were merged and final figures could be collated

**(List of Restaurant counts per hotel
Hotels)**

Atour S Hotel (Atour S Hotel 亚朵酒店)	4
Hanting Seasons Hotel	16
Intercontinental Shanghai Expo Hotel (上海世博洲际酒店)	4
Ji Hotel (全季酒店)	4
Magnotel	7
Pullman Shanghai Skyway Hotel	5
Ramada Peace Hotel Shanghai	6
Shanghai Celadon Theme Hotel (上海青瓷主题酒店)	5
Shanghai Marriott Riverside Hotel (上海绿地万豪酒店)	2
URSIDE Hotel & Café	2
上海黄金岛大酒店	4
全季酒店 Ji Hotel	10
汉庭快捷酒店 HanTing Express	7
汉庭海友客栈(新天地店)	15
鼎园瑞峰公寓酒店	13

(List of Restaurants around

Hotels)

VenueCategory	Hotel count
American Restaurant	4
Asian Restaurant	6
Cantonese Restaurant	5
Chinese Restaurant	19
Dim Sum Restaurant	3
Dumpling Restaurant	6
Fast Food Restaurant	10
French Restaurant	3
German Restaurant	2
Hainan Restaurant	2
Hotpot Restaurant	6
Indian Restaurant	3
Italian Restaurant	9
Japanese Restaurant	3
Korean Restaurant	1
Moroccan Restaurant	2
Restaurant	6
Shanghai Restaurant	2
Sushi Restaurant	1
Szechuan Restaurant	5
Taiwanese Restaurant	2
Thai Restaurant	3
Yunnan Restaurant	1

Exploratory Data Analysis

**There are on average 7 restaurants within 500m of each hotel
(15 unique hotels and 104 restaurants - 104/15 = 7)**

The hotel with the highest number of restaurants is the Hanting Seasons Hotel, with 16 Restaurants within a 500m radius.

The hotel with the least amount of restaurants within a 500m radius was the URSIDE Hotel (2 results)

The most popular restaurants near hotels are Chinese Restaurants, with 19 Chinese restaurants in total near Hotels.

The most popular restaurants around the chosen hotels are:

- Chinese (19 results)
- Fast Food (10 results)
- Italian Restaurants (9 results)
- Dumpling Restaurants (6 results)

It might make sense to open up a Sushi, Korean, or Yunnan Restaurant near a hotel, as these are underserved.

The URSIDE Hotel could potentially be a good place to open a new restaurant, as it is underserved in comparison with other hotels. Suggestions include Fast Food, or Italian Restaurant.

Conclusion

This report concludes that the hotels and restaurants have been plotted on the map as per the hypothesis. Our exploratory data analysis above has led us to ascertain potential area's of investment that are suitable for opening a restaurant.

References

[1] Four Square API (<https://developer.foursquare.com/>)