

## Recommend Neighborhood to Open an Indian Restaurant near Dubai Mall, Dubai



Family enterprises running a restaurant business for years in India wish to open a restaurant in Dubai. They possess core Skills in the food industry as well as great supply chain. However to have appropriate footfalls in their restaurant they wish to choose location very wisely.

Dubai Mall is considered to be center of Dubai and considering the overall footfall there, they wish to open a restaurant near Dubai Mall. However the family is not entirely sure of the neighborhood they should opt for.

Thus they have assigned a project to me to analyze neighborhoods in the area surrounding Dubai Mall within radius of 10 Kms to zero down on best place to open a restaurant.

In this project we will try to find an optimal location for a restaurant. Specifically, this report will be targeted to stakeholders interested in opening an **Indian restaurant** in **Dubai**, UAE.

Since there are lots of restaurants in Berlin we will try to detect locations that are not already crowded with restaurants. We are also particularly interested in areas with no Italian restaurants in vicinity. We would also prefer locations as close to city center as possible, if first two conditions are met.

We will use our data science powers to generate a few most promising neighborhoods based on this criteria. Advantages of each area will then be clearly expressed so that best possible final location can be chosen by stakeholders.

## Data

Based on definition of our problem, factors that will influence our decision are:

- Number of existing restaurants in the neighborhood (any type of restaurant)
- Number of and distance to Indian restaurants in the neighborhood, if any
- Distance of neighborhood from city center

We decided to use regularly spaced grid of locations, centered around city center, to define our neighborhoods.

Following data sources will be needed to extract/generate the required information:

- Centers of candidate areas will be generated algorithmically and approximate addresses of centers of those areas will be obtained using Google Maps API reverse geocoding
- Number of restaurants and their type and location in every neighborhood will be obtained using Foursquare API

Coordinate of Dubai center will be obtained using Google Maps API geocoding of well-known Dubai location (Dubai Mall)

## Get the valuable data

Now let's create a grid of area candidates, equally spaced, centered around city center and within ~5km from Dubai Mall. Our neighborhoods will be defined as circular areas with a radius of 300 meters, so our neighborhood centers will be 600 meters apart.

To accurately calculate distances, we need to create our grid of locations in Cartesian 2D coordinate system which allows us to calculate distances in meters (not in latitude/longitude degrees). Then we'll project those coordinates back to latitude/longitude degrees to be shown on Folium map. So let's create functions to convert between WGS84 spherical coordinate system (latitude/longitude degrees) and UTM Cartesian coordinate system (X/Y coordinates in meters).

Lets use Foursquare APIs with respective developer accesses to understand, number of Indian restaurants in the neighborhood

```
In [32]: results = requests.get(url).json()
results

Out[32]: {'meta': {'code': 200, 'requestId': '5d11b463342adf0038b94c23'},
  'response': {'venues': [{'categories': [{'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/indian_',
  'suffix': '.png'}},
  'id': '4bf58dd8d48988d10f941735',
  'name': 'Indian Restaurant',
  'pluralName': 'Indian Restaurants',
  'primary': True,
  'shortName': 'Indian']],
  'hasPerk': False,
  'id': '5be56ba5646e38002c6fb889',
  'location': {'address': 'Dubai Design District D3',
  'cc': 'AE',
  'city': 'دبي',
  'country': 'الإمارات العربية المتحدة',
  'distance': 2159,
  'formattedAddress': ['Dubai Design District D3',
  'دبي',
  'الإمارات العربية المتحدة'],
  'labeledLatLngs': [{'label': 'display',
```

Lets convert it into a dataframe and have a look at the list

	name	categories	address	cc	city	country	crossStreet	distance	formattedAddress	labeledLatLngs	lat	lng	neighborhood	state	id
0	Mohalla Indian Street Food	Indian Restaurant	Dubai Design District D3	AE	دبي	الإمارات العربية المتحدة	NaN	2159	[Dubai Design District D3, دبي, الإمارات العرب...	[{"lng": 55.297947, "lat": 25.18795, "label": ...	25.187950	55.297947	Za'abee	دبي	5be56ba5646e38002c6fb889
1	India Palace Express	Indian Restaurant	The Dubai Mall	AE	دبي	الإمارات العربية المتحدة	NaN	245	[The Dubai Mall, دبي, الإمارات العربية المتحدة]	[{"lng": 55.276635557856295, "lat": 25.1967200...	25.196720	55.276636	NaN	دبي	4b99106f964a520fb5e35e3
2	Metro Grand Indian Restaurant	Asian Restaurant	NaN	AE	دبي	الإمارات العربية المتحدة	NaN	1660	[دبي, الإمارات العربية المتحدة]	[{"lng": 55.27153493265844, "lat": 25.21037743...	25.210377	55.271535	NaN	دبي	548130c6498e82fa71d319e4
3	Lazeez Indian Cuisine	Indian Restaurant	Wasi Square	AE	دبي	الإمارات العربية المتحدة	Safa Park Road	4022	[Wasi Square (Safa Park Road), دبي, الإمارات ا...	[{"lng": 55.241163, "lat": 25.185643, "label": ...	25.185643	55.241163	NaN	دبي	5a0f13df1755622302f4fe6d
4	Indian Handy Craft	Arts & Crafts Store	NaN	AE	NaN	الإمارات العربية المتحدة	NaN	3103	[الإمارات العربية المتحدة]	[{"lng": 55.257954, "lat": 25.176758, "label": ...	25.176758	55.257954	NaN	NaN	5016c225e4b0ad6ab3c135f0
5	Gazebo Indian cuisine DIFC	Indian Restaurant	NaN	AE	NaN	الإمارات العربية المتحدة	NaN	2290	[الإمارات العربية المتحدة]	[{"lng": 55.278635, "lat": 25.217665, "label": ...	25.217665	55.278635	NaN	NaN	56df0c60498e77585c2b553
6	The Indian Pavilion	Indian Restaurant	Safa Spinneys	AE	دبي	الإمارات العربية المتحدة	NaN	6045	[Safa Spinneys, دبي, الإمارات العربية المتحدة]	[{"lng": 55.22764292218067, "lat": 25.16905078...	25.169051	55.227643	NaN	دبي	4b5beabe964a520261d29e3
7	Indian Movie Night!	Other Nightlife	NaN	AE	دبي	الإمارات العربية المتحدة	NaN	5295	[دبي, الإمارات العربية المتحدة]	[{"lng": 55.23011502071296, "lat": 25.17967670...	25.179677	55.230115	NaN	دبي	4eeb67842c5beea6206a198e
8	Our Own Indian School	College Academic Building	NaN	AE	NaN	الإمارات العربية المتحدة	NaN	3313	[الإمارات العربية المتحدة]	[{"lng": 55.26103777113154, "lat": 25.17217907...	25.172179	55.261038	NaN	NaN	4f8a78d8e4b055d230f14c1d
9	Indian Barber Shop	Salon / Barbershop	Karama Bus Station 7333	AE	دبي	الإمارات العربية المتحدة	Al Karama Fish Market	5567	[Karama Bus Station 7333 (Al Karama Fish Marke...	[{"lng": 55.30212161437806, "lat": 25.24253264...	25.242533	55.302122	NaN	دبي	4f3755dae4b0a1f196cb3b16
10	Indian passport and visa services center	None	Near GPO	AE	الكرامة	الإمارات العربية المتحدة	Umm Hureir Road	6343	[Near GPO (Umm Hureir Road), الكرامة الإمارات]	[{"lng": 55.311326, "lat": 25.246021, "label": ...	25.246021	55.311326	NaN	دبي	4c455c622d3ec9b61e2830ae

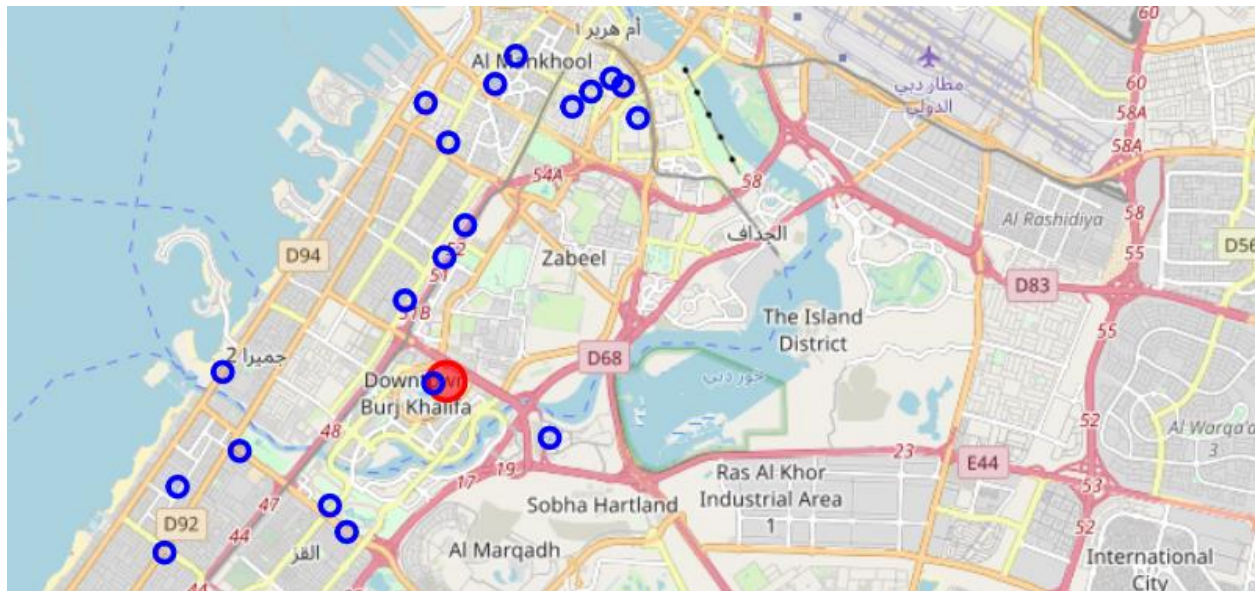
We see that there are roughly 9 restaurants in the neighborhood area around 5KMs and these are listed below

```

Out[35]: 0      Mohalla Indian Street Food
1      India Palace Express
2      Metro Grand Indian Restaurant
3      Lazeez Indian Cuisine
4      Indian Handy Craft
5      Gazebo Indian cuisine DIFC
6      The Indian Pavillion
7      Indian Movie Night!
8      Our Own Indian School
9      Indian Barber Shop
10     Indian passport and visa services center
11     Jashan Indian Restaurant
12     Indian Summer
13     Little Hut Indian Restaurant
14     Sapne Indian Cuisine
15     Pathans South Indian Restaurant, Satwa Round-a...
16     Temptation Indian Grills & Curries
17     Global indian international School
18     Claypot - Indian Cuisine
19     India Club
Name: name, dtype: object

```

Lets check on the map, density of the restaurants with respect to the Neighborhood



From above map we see that near Dubai Mall, there is maximum density of the Indian Restaurants in Zabeel and thus it is not advisable to start restaurant there .

Lets look at density of Indian Venues near Zabeel

```
25.23574595 55.29770931689

In [157]: search_query = 'Indian'
          radius1 = 1000
          print(search_query + ' .... OK!')

          Indian .... OK!

In [167]: LIMIT1 = 100 # limit of number of venues returned by Foursquare API
          radius1 = 2000 # define radius

          url = 'https://api.foursquare.com/v2/venues/search?client_id={}&client_secret={}&ll={},{}&v={}&query={}&radius={}&limit={}'.format(
          url
```

Now lets remove all Indian venues that are Indian Restaurants

```
filtered_columns1 = ['name', 'categories'] + [col for col in dataframe1.columns if col.startswith('location.')] + ['id']
dataframe_filtered1 = dataframe1.loc[:, filtered_columns1]

# function that extracts the category of the venue
def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']

# filter the category for each row
dataframe_filtered1['categories'] = dataframe_filtered1.apply(get_category_type, axis=1)

# clean column names by keeping only last term
dataframe_filtered1.columns = [column.split('.')[-1] for column in dataframe_filtered1.columns]

dataframe_filtered1
```

We get a list of Indian Venues which are not restaurants

```
dataframe_filtered2 = dataframe_filtered1[dataframe_filtered1.categories != 'Indian Restaurant']
dataframe_filtered2
```

Out[176]:

	name	categories	address	cc	city	country	crossStreet	distance	formattedAddress	labeledLatLngs	lat	lng	postalCode	state
2	Indian Barber Shop	Salon / Barbershop	Karama Bus Station 7333	AE	دبي	الإمارات العربية المتحدة	Al Karama Fish Market	876	[Karama Bus Station 7333 (Al Karama Fish Marke...	[{"lng": 55.30212161437806, "lat": 25.24253264...	25.242533	55.302122	NaN	دبي
3	Indian Overseas Bank	Bank	Mohd. Sultan Belshalat Building	AE	دبي	الإمارات العربية المتحدة	Community 318, Street 6a	1236	[Mohd. Sultan Belshalat Building (Community 31...	[{"lng": 55.301937103271484, "lat": 25.2461738...	25.246174	55.301937	NaN	دبي
6	The Indian High School	High School	Oud Metha	AE	دبي	الإمارات العربية المتحدة	NaN	1879	[Oud Metha, دبي, الإمارات العربية المتحدة	[{"lng": 55.31556818954254, "lat": 25.24065952...	25.240660	55.315568	NaN	دبي
7	Indian passport and visa services center	None	Near GPO	AE	الكرامة	الإمارات العربية المتحدة	Umm Hureir Road	1785	[Near GPO (Umm Hureir Road), الإمارات, الإمارات...	[{"lng": 55.311326, "lat": 25.246021, "label": "...	25.246021	55.311326	NaN	دبي
8	Indian Visa Centre	None	Karama	AE	NaN	الإمارات العربية	NaN	1841	[Karama, الإمارات, الامم المتحدة	[{"lng": 55.309511, "lat": 25.248379, "label": "...	25.248379	55.309511	NaN	NaN

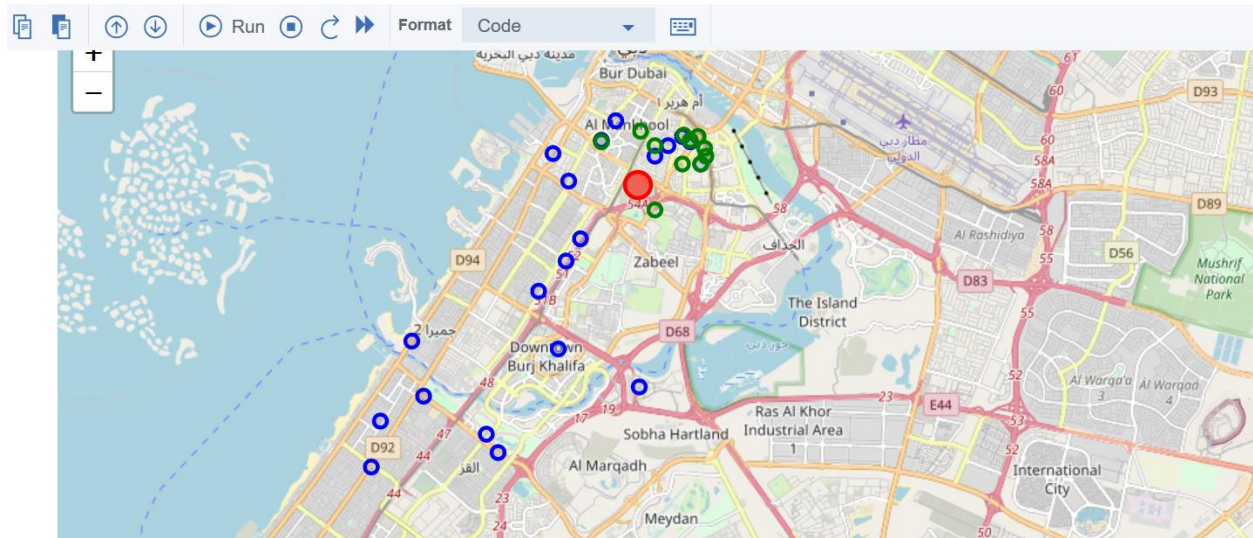
Here are names of these Indian Venues

```
In [177]: dataframe_filtered2.name
```

```
Out[177]: 2          Indian Barber Shop
          3          Indian Overseas Bank
          6          The Indian High School
          7  Indian passport and visa services center
          8          Indian Visa Centre
          10         Indian High School ground
          11         Indian Embassy
          12  Global indian international School
          17  Mohabbat Indian Night Club
          18         Mirchi Indian Restaurant
          22         India Club
          Name: name, dtype: object
```

Let us overlap Indian Venues on top of earlier map where Indian Restaurant Density





The map clearly shows that number of Indian venues near Zabeel is high however there are not enough restaurants there.

Thus we recommend to start restaurant in Zabeel neighborhood near Dubai Mall