CAPSTONE : Where is the best neighborhood in Denpasar City, Bali to open New Fast Food Restaurant ?

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1. INTRODUCTION

In this Assignment, I will analyze a city in island of god, Bali Island neighborhood, which is Denpasar City neighborhood.in this assigment I will analyze where is the best neighborhood to open New Fast Food Restaurant in Denpasar City

2. PROBLEM

The aim of this Assigment is to try to help business owners to open new fast food restaurant in the neighborhood depending on the experiences that the neighborhood has.the requirements of the best Neighborhood to open new fast food is :

- there is no fast food restaurant in or near that neighborhood
- restaurant needs to be strategically located near public or crowded place in Denpasar area
- Confirm any assumption by means of modeling and testing the data

3. DATA REQUIREMENT

1. **The list of Denpasar city neighborhood (Kecamatan)**
   To get the neighborhood (Kecamatan) in Denpasar, we scrap the data from wikipedia link : https://id.wikipedia.org/wiki/Daftar_kecamatan_dan_kelurahan_di_Kota_Denpasar In this Wikipedia page, there is several information about neighborhood in Denpasar, but for this assignment we just need information about the name of all neighborhood in Denpasar
2. **Longitude and latitude information of each Neighborhood**
   The data scraping from the Wikipedia page does not give information about the coordinates for each neighborhood. So we can use Nominatim OpenStreetMap API in order to get latitude and longitude for each neighborhood. Using Nominatim OpenStreetMap API in python we can use geopy library and import geopy.geocoders.Nominatim package into a notebook. Using nominatim we can pass neighborhood keywords into nominatim objects and get the representing latitude and longitude so we can add this information into the neighborhood table for Denpasar
3. **Total Population in each Neighborhood**
   to know which neighborhood has a high or dense population, we need to download population data of Denpasar city in this link : https://denpasarkota.bps.go.id/indicator/12/49/1/proyeksi-penduduk-kota-denpasar.html this is the website of Denpasar City's central bureau of statistic that contain population data for each neighborhood in Denpasar city
4. **List of all venues and places from all neighborhood in Denpasar**
   to know all venues & places from all neighborhood in Denpasar city, we use Foursquare API .With Foursquare API we can make a call containing neighborhood information so we can gain information about the places or venues

Combine all data that we gather into dataset to demonstrate information :

- how populated each neighborhoods is

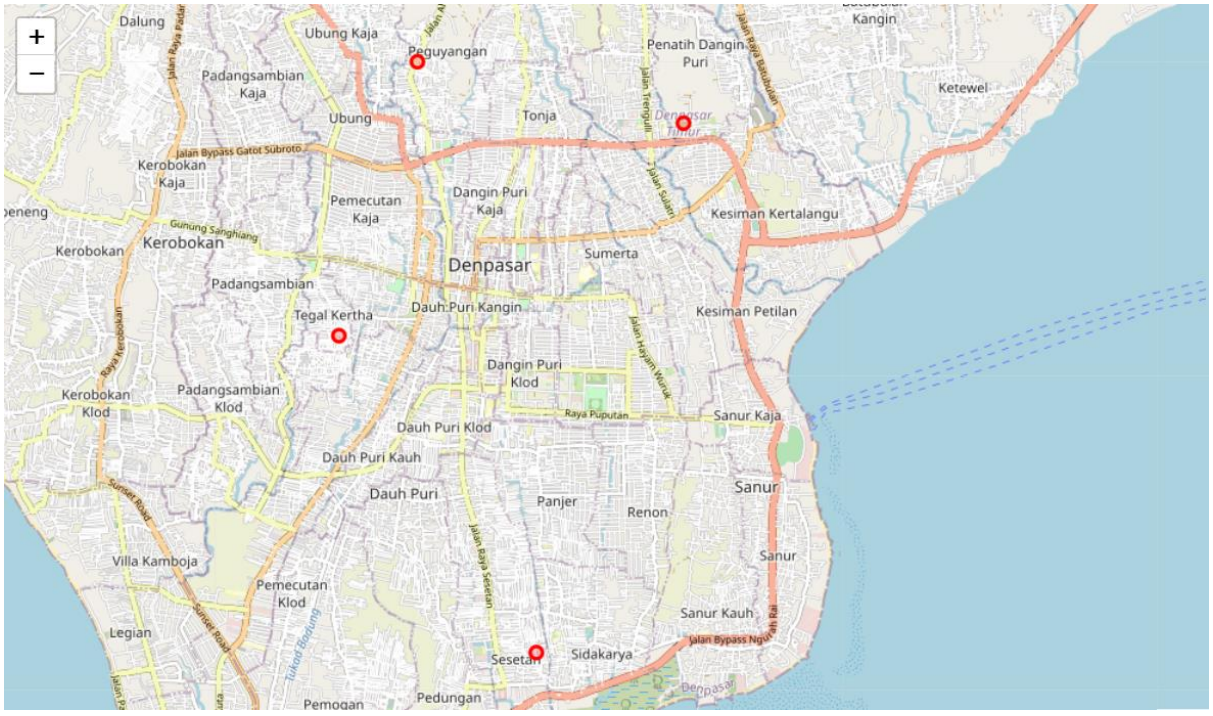
- which neighborhood still don't have fast food restaurant in its area
- which neighborhood have many public venues
- which neighborhood should targeted to open new fast food restaurant

4. METHODOLOGY

In this part of the section, I will collecting data (data scrapping) from wikipedia page in order to get neighborhood information for Denpasar City,and then I will collect population data in each neighborhood & combine that data with neighborhood information data from wikipedia. After getting that informations, I will use name of the neighborhood as a keyword to providing information about neighborhood coordinates (latitude and longitude) using Nominatim with geopy.geocoders.Nominatim package. Using coordinates for each neighborhood i will use Foursquare API to get relevant venues and places near the given latitude and longitude. Using that information we create a pandas dataframe to analyze which neighborhood fit the requirements of the best Neighborhood to open new fast food.the resulted dataset is :

	Neighborhood	Population in 2020	Latitude	Longitude
0	Denpasar Selatan	311590	-8.706134	115.225676
1	Denpasar Timur	162220	-8.632914	115.246211
2	Denpasar Barat	278020	-8.662244	115.198067
3	Denpasar Utara	211070	-8.624513	115.209009

After that Visualizing map using Folium API with OpenStreetMap view with information of neighborhood from dataframes



And after that with Foursquare API,get all venues in each neighborhood,the result is :

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Category
0	Denpasar Selatan	-8.706134	115.225676	DEF Studio Music	Recording Studio
1	Denpasar Selatan	-8.706134	115.225676	Depot Laris Sate Plecing Singaraja	Indonesian Restaurant
2	Denpasar Selatan	-8.706134	115.225676	Texas Fried Chicken	American Restaurant
3	Denpasar Selatan	-8.706134	115.225676	Palapa Fitness Centre	Gym / Fitness Center
4	Denpasar Timur	-8.632914	115.246211	Roti Canai & Teh Tarik Bunana	Indian Restaurant
5	Denpasar Timur	-8.632914	115.246211	CV. Pelangi (rex's) pastry & bakery ingredients	Bakery
6	Denpasar Barat	-8.662244	115.198067	Conato Bakery	Bakery
7	Denpasar Barat	-8.662244	115.198067	SD Muhammadiyah 3 Denpasar	Arcade
8	Denpasar Barat	-8.662244	115.198067	Terang bulan dan martabak 'Sedap Mantap'	Food Truck
9	Denpasar Barat	-8.662244	115.198067	Warung Banyuwangi	Asian Restaurant
10	Denpasar Barat	-8.662244	115.198067	Alena Food Court	Fast Food Restaurant
11	Denpasar Barat	-8.662244	115.198067	Wedangan Sinten Ramen	Food Truck
12	Denpasar Barat	-8.662244	115.198067	Nice Ice	Ice Cream Shop
13	Denpasar Barat	-8.662244	115.198067	Indomaret	Convenience Store
14	Denpasar Barat	-8.662244	115.198067	EKA Print Rinjani	Print Shop
15	Denpasar Barat	-8.662244	115.198067	HR Foodcourt	Food Court
16	Denpasar Barat	-8.662244	115.198067	Tiara Monang Maning	Department Store
17	Denpasar Barat	-8.662244	115.198067	SD Muhammadiyah 3 Food Court	Food Truck
18	Denpasar Barat	-8.662244	115.198067	Kuta Gym	Gym / Fitness Center
19	Denpasar Barat	-8.662244	115.198067	Dapur Prima Monang Maning	Kitchen Supply Store
20	Denpasar Utara	-8.624513	115.209009	Warung Tahu Tek Khas Jakarta	American Restaurant
21	Denpasar Utara	-8.624513	115.209009	Bakso Supra Dynasti	Noodle House
22	Denpasar Utara	-8.624513	115.209009	Circle K	Convenience Store

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Category
Denpasar Barat	14	14	14	14
Denpasar Selatan	4	4	4	4
Denpasar Timur	2	2	2	2
Denpasar Utara	3	3	3	3

After that we need to find top 5 most common venues in each neighborhood. In order to find the top 5 most common venues, we need to transform each categorical data into a number with One Hot Encoding using pandas.get_dummies() function. After getting the one-hot encoded dataframe, then we can count the average for each venue in each neighborhood. Here are the result after applying the average most common venue in the neighborhood.

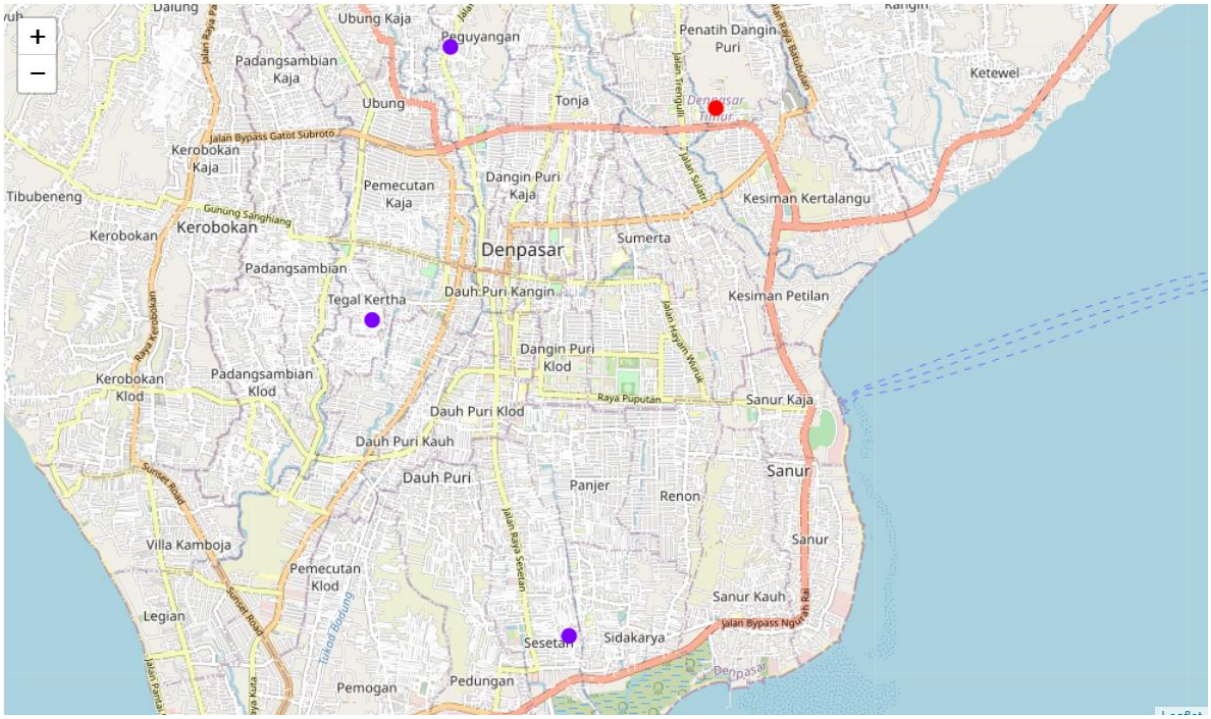
	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Denpasar Barat	Food Truck	Convenience Store	Arcade	Kitchen Supply Store	Asian Restaurant
1	Denpasar Selatan	Recording Studio	Indonesian Restaurant	Gym / Fitness Center	American Restaurant	Kitchen Supply Store
2	Denpasar Timur	Bakery	Indian Restaurant	Recording Studio	Food Court	Arcade
3	Denpasar Utara	American Restaurant	Noodle House	Convenience Store	Food Court	Arcade

After we get data about top 5 most common venue for each neighborhood in Denpasar we can begin create a clustering model using K-Means Clustering library from Scikit-Learn We will run the K-Means

Clustering to cluster and segment the neighborhood into 2 different clusters based on type of venues and places.the result is :

	Neighborhood	Population In 2020	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Denpasar Selatan	311590	-8.706134	115.225676	0	Recording Studio	Indonesian Restaurant	Gym / Fitness Center	American Restaurant	Kitchen Supply Store
1	Denpasar Timur	162220	-8.632914	115.246211	1	Bakery	Indian Restaurant	Recording Studio	Food Court	Arcade
2	Denpasar Barat	278020	-8.662244	115.198067	0	Food Truck	Convenience Store	Arcade	Kitchen Supply Store	Asian Restaurant
3	Denpasar Utara	211070	-8.624513	115.209009	0	American Restaurant	Noodle House	Convenience Store	Food Court	Arcade

And the visualization of each cluster is :



First Cluster Dataset :

	Neighborhood	Population In 2020	Latitude	Longitude	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Denpasar Selatan	311590	-8.706134	115.225676	Recording Studio	Indonesian Restaurant	Gym / Fitness Center	American Restaurant	Kitchen Supply Store
1	Denpasar Barat	278020	-8.662244	115.198067	Food Truck	Convenience Store	Arcade	Kitchen Supply Store	Asian Restaurant
2	Denpasar Utara	211070	-8.624513	115.209009	American Restaurant	Noodle House	Convenience Store	Food Court	Arcade

Second Cluster Dataset :

	Neighborhood	Population In 2020	Latitude	Longitude	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Denpasar Timur	162220	-8.632914	115.246211	Bakery	Indian Restaurant	Recording Studio	Food Court	Arcade

5. RESULT

as we can see the result of K-Mean clustering, first cluster have more dense venues such as recording studio,convenience store, etc and have most populated neighborhood (Denpasar Selatan).The optimum location for new restaurant is :

The best Location to open Fast Food Restaurant is near 500 m at lat : <b> -8.66429705 long 115.21091728122343 or imam bonjol street Denpasar Barat

6. DISCUSSION

From the resulting cluster in Denpasar we can see that The optimun places to open fast food restaurant is in first cluster, and more detailed in Denpasar Barat Neighborhood based on venue density, and according to population data Denpasar Barat is one of the most populated neighborhood in Denpasar, although in Denpasar Barat there is one fast food restaurant.

7. CONCLUSION

As we built our list of neighborhoods with venues exclusively we discovered most neighborhoods were similar and the greatest concentration of venues was in Denpasar Barat. This might seem obvious but it would also appear that these are some of the most affluent neighborhoods in Denpasar so there appears to be correlation. I feel confident with this analysis as it is backed up with demonstrated data analysis. While nothing can ever be 100% certain it will helped any business owner to open new Fast Food Restaurant in Denpasar.