

# Capstone Project - The Battle of the Neighborhoods

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## Finding the most suitable places for opening a lunch restaurant in downtown of Yerevan



Applied Data Science Capstone by IBM/Coursera

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# Introduction: Business Problem

This project is aimed at finding an optimal location for a restaurant which will offer mainly business lunches for its customers. The area of interest is the downtown of Yerevan, capital of Armenia. Although Food and beverage service has been growing at a higher rate in Yerevan over the last years due to domestic demand as well as the growth of touristic inflows, there is still a gap between demand and supply in reasonable and high quality lunch restaurants. The majority of newly opened restaurants in Yerevan are either fast food restaurants or not affordable for ordinary citizens. Conducting a survey among the workers from different industries and locations it was evident that majority of them share the same concerns stating that the quality and the service of lunch restaurants are not satisfactory. Moreover, queues were mentioned as another serious problem which is due to the lack of lunch restaurants in vicinity of crowded areas. So, in this project we are going to find the most suitable locations for opening a lunch restaurant which can be beneficial for both the customers and the investors.

At first we are going to find all the restaurants operating in downtown of Yerevan, then detect those which offer lunch menus. The most suitable **locations could be those which are either less crowded with lunch restaurants or mostly have food chains with lower quality as well as those where the number of indirect competitors is comparably lower.** The proxy measure of demand factor should be considered as well by taking into consideration how crowded are that locations with offices and government and municipal buildings as the target customers of these restaurants are office workers.

## Data

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

- number of existing restaurants in the neighborhood,
- number of and the quality as well as the popularity and price segment of the restaurants offering lunch menus in the neighborhood,
- the number of indirect competitors,
- the locations with most crowded workplaces.

We decided to use regularly spaced grid of locations, centered around city center (Republic Square), 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, location, menu, rating in every neighborhood will be obtained using **Foursquare API**
- most popular Foursquare Food chains in Yerevan, Armenia will be obtained using <https://www.4sqstat.com>

## Methodology

In this project we will direct our efforts on detecting areas of Yerevan that have low restaurant density, particularly those with low number of lunch restaurants. We will limit our analysis to area ~1.5km around Republic Square of Yerevan.

In first step we have collected the required **data: location and type (category) of every restaurant within 1.5km from Yerevan center** (Republic Square). At first, we will obtain the ratings, prices and popularity rankings of all restaurants, then we will **identify lunch restaurants** (according to Foursquare categorization).

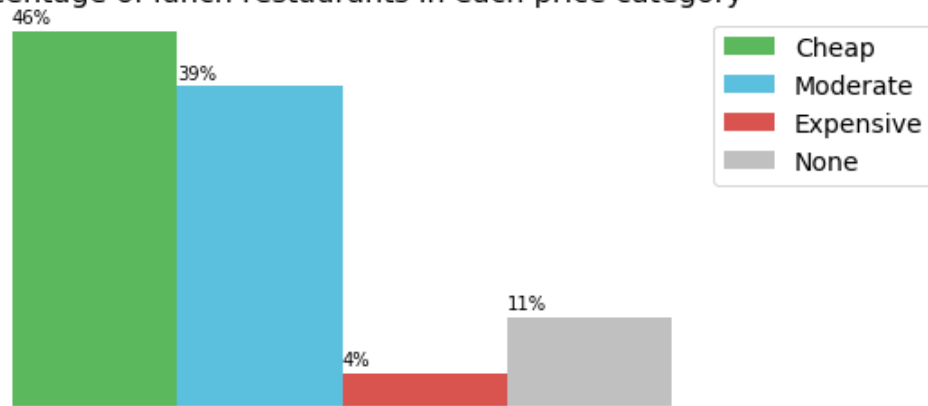
Second step in our analysis will be calculation and exploration of '**lunch restaurant density**' across different areas of Yerevan - we will identify a few promising areas close to the center with low number of lunch restaurants and focus our attention on those areas.

In third and final step we will focus on most promising areas and within those create **clusters of locations that meet some basic requirements**: we will take into consideration locations with **no more than 3 lunch restaurants in radius of 250 meters**, but other factors should be considered as well, such as **the ratings and popularity of the lunch restaurants, then the number of direct and indirect competitors and the concentration of offices or other public entities in the neighborhood**. We will present map of all such locations but also create clusters (using **DBSCAN clustering**) of those locations to identify general zones / neighborhoods / addresses which should be a starting point for final 'street level' exploration and search for optimal venue location by stakeholders.

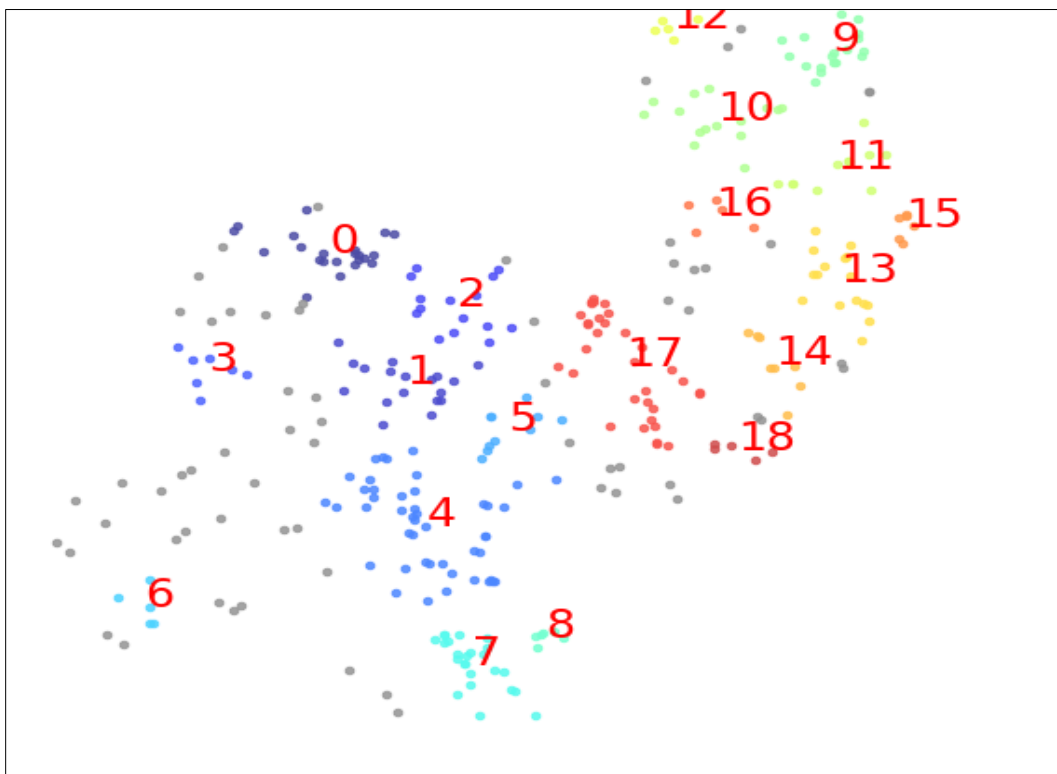
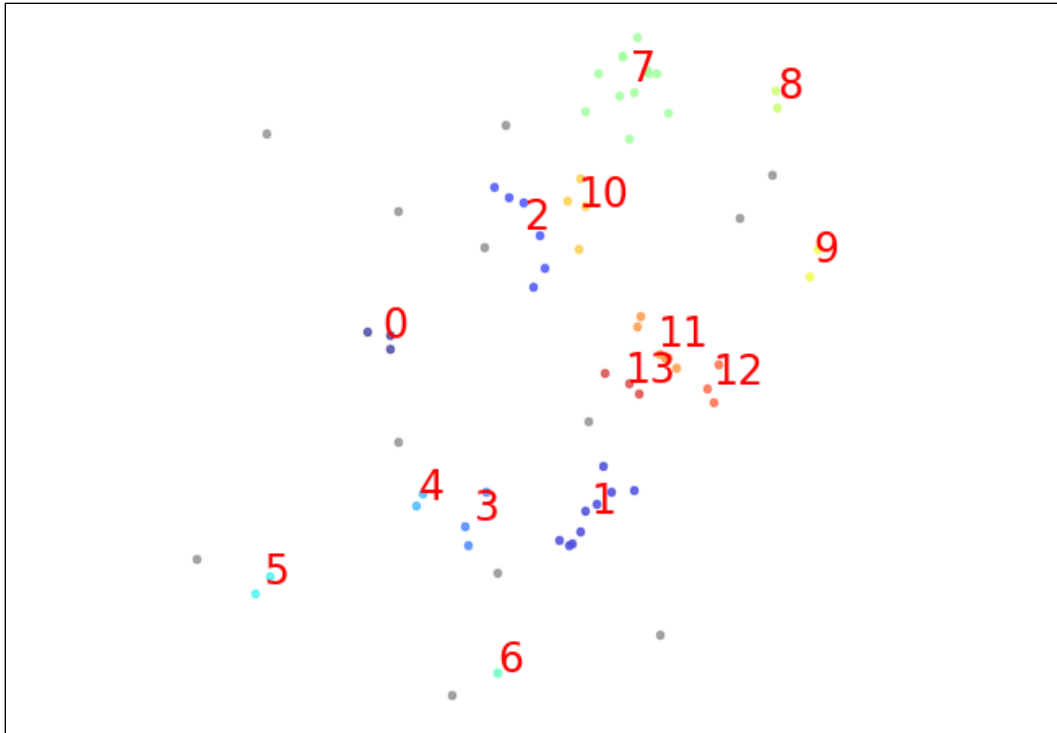
## Results and Discussion

Our analysis shows that although there is a great number of restaurants as well as lunch restaurants in Yerevan downtown (~1500m from Republic Square), there are still some areas with low restaurant density compared to the offices operating nearby (within 250-300m). Highest concentration of restaurants was detected in Abovyan street, close to the Republic Square and in the neighborhood of Opera House, whereas in the South and South-West of the city the number of lunch restaurants and overall restaurants is comparably lower. So, we focused our attention to above mentioned areas as potential places for opening a lunch restaurant. However, in order to come up to a best solution we have taken into consideration several other important factors as well. One of the deciding factors is affordability as our target customers are office workers. However, analyzing the price categories of lunch restaurants it was evident that only 4% are considered as expensive, whereas 46% of the restaurants are cheap.

Percentage of lunch restaurants in each price category



To move forward and find candidate areas which will meet our requirements, we have used DBSCAN clustering algorithm to group lunch restaurants setting the distance between the two points 250m. Then, we have skipped those clusters which contain more than three restaurants close to each other. The offices operating in Yerevan center were clustered as well to match potential locations with areas with most crowded offices which helps to narrow the number of candidate locations based on demand factor.



After directing our attention to this more narrow area of interest we analyzed our clusters based on several factors. In order to consider the competition we have calculated the number of overall restaurants in each cluster. As a proxy of demand factor we have taken into consideration the

number of offices (College & University, States & Municipalities, Government Building, Medical Center, Office) in surrounding area as it shows how overcrowded the area is. The other important factors are the average rating and the average check-ins in each cluster which shows the overall customer satisfaction level and popularity of the restaurants operating within the same cluster.

Having chosen some candidate areas based the factors we have mentioned earlier, we analyzed the offices operating in downtown of Yerevan in order to filter candidate areas or to be sure that our selected areas can be profitable due to the concentration of office workers in that areas. Recommended places, however, should be considered only as a starting point for more detailed analysis which could eventually result in location which has not only lower nearby competition but also other factors taken into account and all other relevant conditions met.

## Conclusion

Purpose of this project was to identify areas in Yerevan center with low number of lunch restaurants or with most suitable conditions in order to aid stakeholders in narrowing down the search for optimal location for a new lunch restaurant. By getting restaurant density distribution from Foursquare data we have first filtered lunch restaurants, and then generated extensive collection of locations which satisfy some important requirements. Clustering of those locations was performed in order to create major zones of interest and addresses of those zone centers were created to be used as starting points for final exploration by stakeholders. Our preliminary recommended areas are as follows: 76, Aram street; 10, Vazgen Sargsyan street; 30, Abovyan street.

However, final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like more detailed analysis of competitors, real estate availability, social and economic dynamics of every neighborhood etc.