Defining the best place to install a liquor store

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1. Introduction

1.1 Background

Today, people who live in the city can find around the corner many places to buy different types of products. The growing commercialization of certain neighborhoods has generated high levels of competition among store owners, having to "fight" to seduce customers based on discounts and promotions. In the particular case of liquor stores and bars, the high demand from the Chilean population has generated an explosive increase in the number of franchises, liquor stores and bars. However, many times an incoming company is not able to withstand the price competition that exists between firms with greater capital backing and customer loyalty, so they have to quit the business.

1.2 Problem

The problem to be addressed is how to identify in which area it is convenient to install a liquor store, so as not to compete directly with other companies or supermarkets that offer the same type of products.

1.3 Interest

This will be a very useful tool for entrepreneurs who wish to start in the field of selling liquors or other types of products, mainly in the eastern sector of Santiago. With it, it will be possible to define in which neighborhood a stable clientele is most likely to exist.

2. Description of the data

For this task, the commune of Las Condes will be used as a base, located in the eastern zone of Santiago de Chile, a commune of middle-upper socioeconomic class and with high rates of consumption of alcoholic beverages. Numerous reports on land use and sectorization are presented on the website. Some of the links on which I relied to generate the candidate neighborhoods are:

- https://www.lascondes.cl/descargas/transparencia/plan_regulador/LAMINA_2_USO_DE_SUELO_PDF.pdf
- https://www.lascondes.cl/transparencia/plan_regulador.html
- http://www.lascondesonline.cl/Archivos%20Generales/asp/portalsit.asp
- The center of each zone will be determined based on the sectorization proposed by the Las Condes mayor's office and the coordinates were obtained through the page https://www.mapcoordinates.net/es

Being a territory of about 44 km^2, it will be divided into 26 neighborhoods representative of the different configurations in terms of infrastructure, commerce and land use. Once the above is ready, the Foursquare API will help us to obtain both the latitude and longitude of these points and, in turn, the points of sale of liquors and bars existing in the vicinity of each one.

In short, using the points that represent each district, Foursquare will give me its latitude and longitude. After that, it will help me find the number of bars and liquor stores within a radius of 800 meters from that point (which is considered a walkable distance for access). This process will be carried out for each of the 26 neighborhoods and based on this, the clustering will be carried out to

identify it as a "collapsed", "normal" or "free" neighborhood of liquor stores finding an adequate balance between audience attendance and competition for clients with other services.

To determine the best place, it will be evaluated how many stores of this type exist in the surroundings and with this, these neighborhoods will be clustered regarding their level of coverage of liquor stores**.**

3. Methodology

In this project we will endeavor to detect the areas of the Las Condes commune that have a low proportion of liquor stores compared to restaurants. Our analysis will focus on the entire communal area, corresponding to approximately 44 km^2 and for each neighborhood a radius of 800 meters will be used for the analysis, corresponding to a "walkable" distance. In the first step, we have collected and cleaned the required data: location and type (category) of each restaurant and bar within 0.8 km of the center of each neighborhood. In addition, we have identified the number of restaurants and alcohol outlets in that area. The second step in our analysis will be the calculation of the "ratio between the number of liquor stores and restaurants plus liquor stores" in the different areas of the commune.

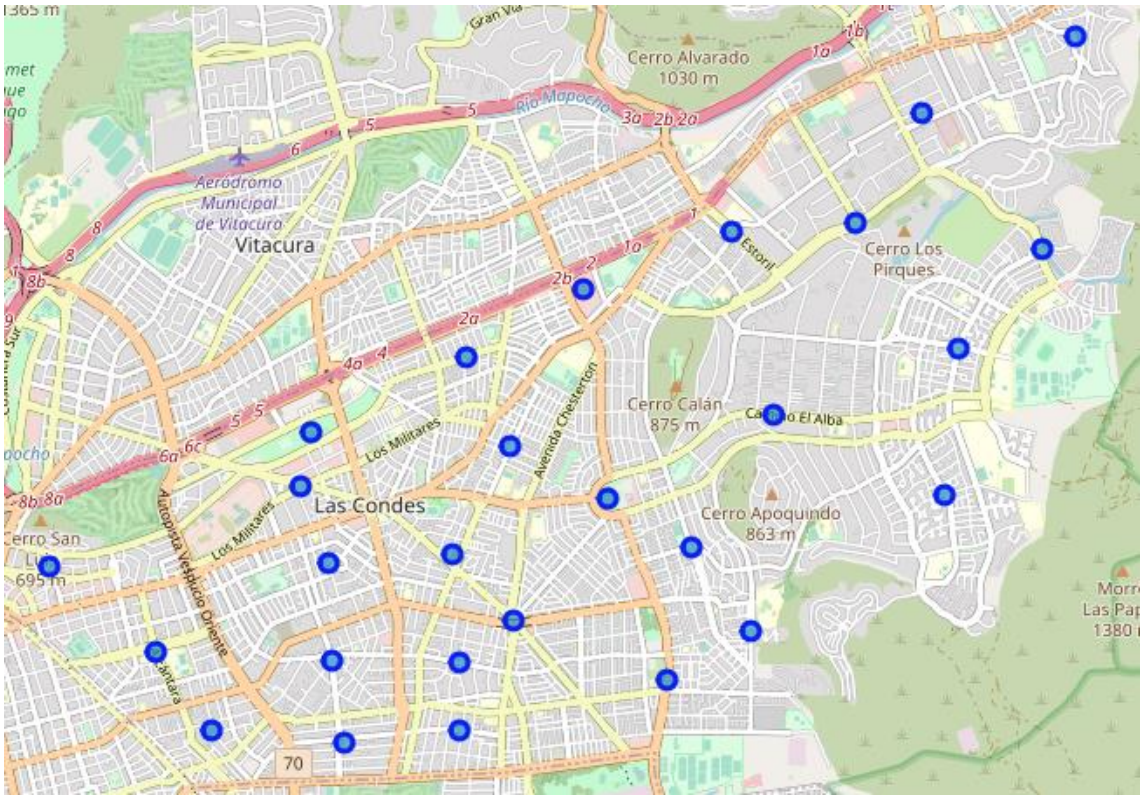


Figure 1: Location of the 26 preliminary study areas

Below are the results obtained based on the exploratory query from Foursquare. Figure 2 shows the total of venues by neighborhood and figure 3 the filtered result for alcohol outlets and restaurants. It can be noted that there is a great difference between the number of places found in the different neighborhoods, an attribute that has a direct implication on the behavior of citizens and their movements in search of shopping.

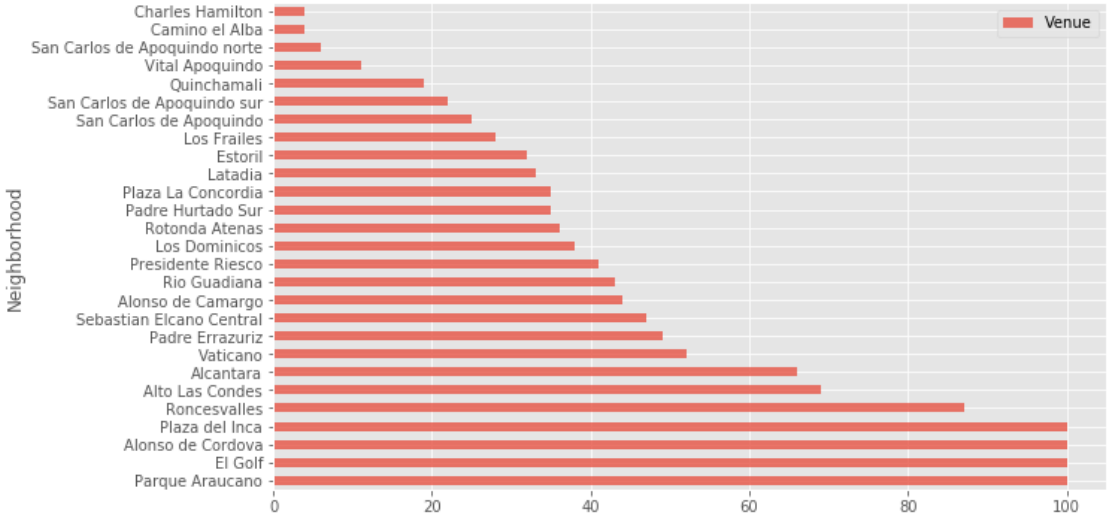


Figure 2: Number of venues found by Foursquare in each neighborhood

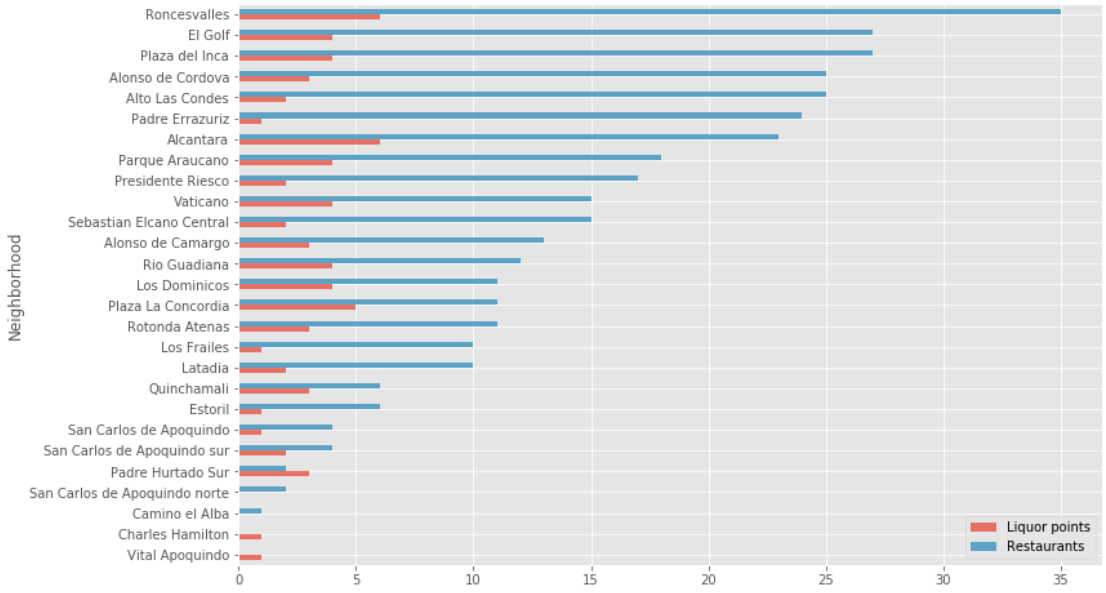


Figure 3: Number of liquor outlets and restaurants per neighborhood

We will use clustering to identify some promising areas near downtown with a low number of restaurants overall (and no liquor stores near restaurants and residential areas) and focus our attention on those areas. We will focus on understanding the characteristics of each cluster and its pros and cons regarding the installation of a liquor store. We present a map with the clusters where the geographic and data-based similarity can be evidenced, which will allow the stakeholder to be a starting point for the detailed exploration of the specific point where to install the liquor store.

For the clustering, the k-means algorithm was used based on the information on the number of restaurants and alcohol outlets near each neighborhood. Within the development of the project, it was iterated on different values of k, with k = 6 being the value that in our opinion generated the most accurate and representative results of the reality of the commune.

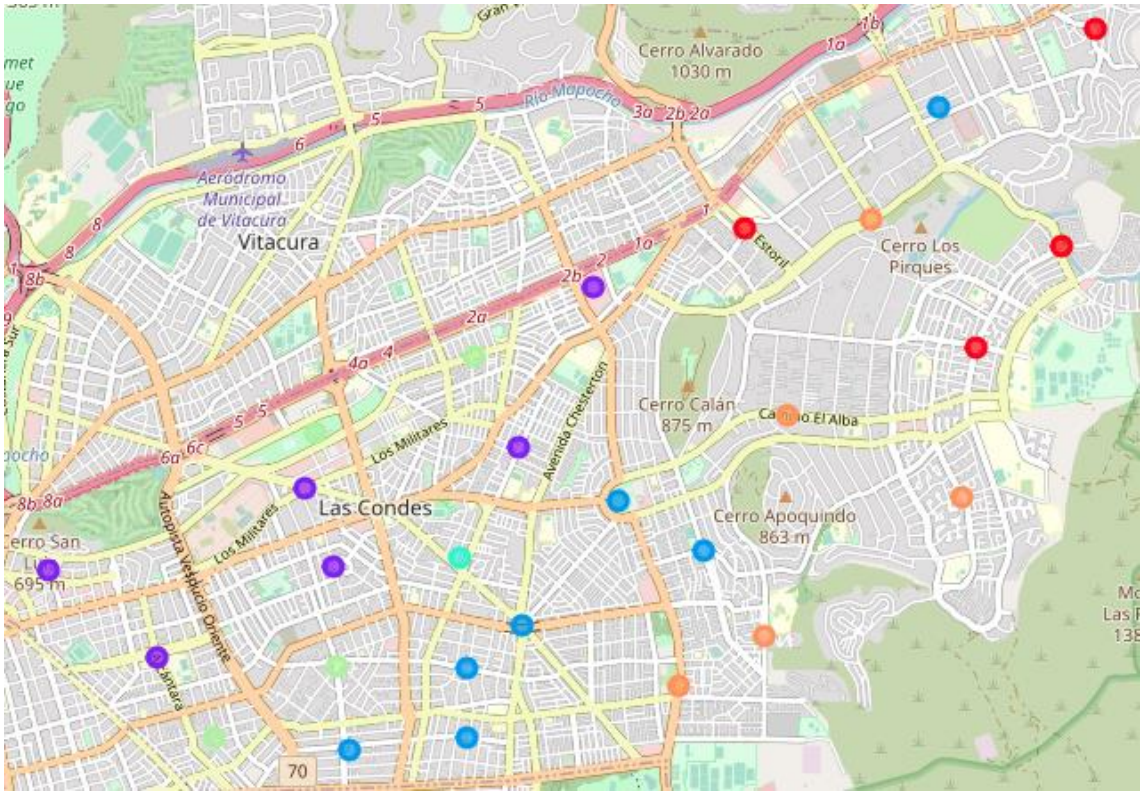
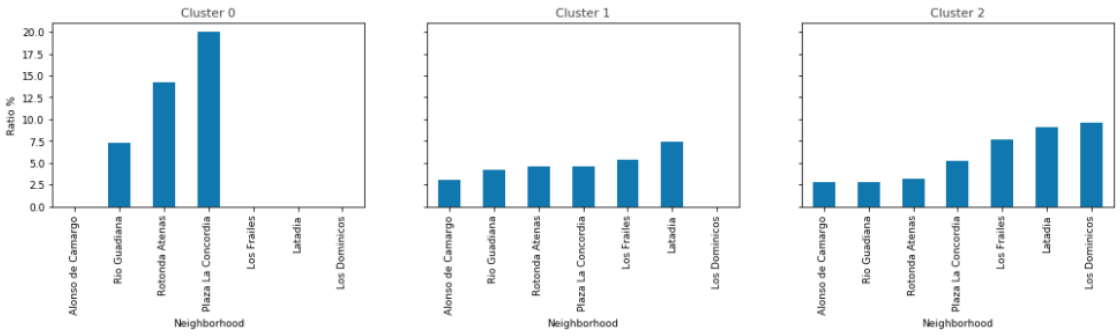


Figure 4: Clustering results with k = 6

From Figure 4 it can be seen that the distribution of neighborhoods in the clusters is quite proportional, with the exception of Roncesvalles, which remains the only neighborhood in a cluster. Similarly, the algorithm assignment gives us clusters where there is not only a similarity in terms of restaurants and bars but also a geographical similarity.

The graphs of the percentage ratio of each cluster are presented below. This in order to understand how similar the neighborhoods belonging to the same cluster are according to said criteria.



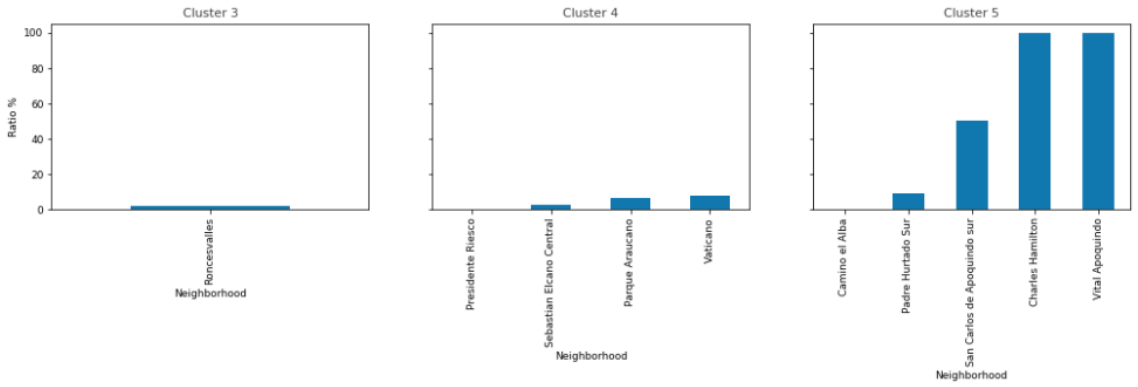


Figure 5: Percentage ratio of neighborhoods for each cluster

Cluster 0 contains neighborhoods with a low density of services. This can be seen by the low number of restaurants and liquor stores in general. Regarding the ratio, it is observed from 0% to 100% which shows that this is not the main attribute of the cluster, but rather the low amount of services for being a purely residential neighborhood with a high socioeconomic level. Cluster 1 corresponds to neighborhoods with a large number of restaurants compared to liquor stores. This translates into lower ratios of between 1.6 to 7.4%. Therefore, they are attractive neighborhoods for the installation of a liquor store, since many people pass through them daily and have movement both day and night Cluster 2 is characterized by a certain similarity with cluster 1, only with a smaller number of restaurants. Likewise, the ratios remain at low levels (between 2.8 and 16.7%), making them also attractive for the installation of a liquor store. Cluster 3 is not representative as it contains a single neighborhood. Cluster 4 is in our opinion one of the most appropriate for the installation of a liquor store in conjunction with cluster 1 because it contains a large proportion of restaurants and a high level of citizen movement. Finally, cluster 5 presents the greatest stability between liquor stores and restaurants, making them unattractive from the perspective of the percentage ratio.

In the third and final step, we will use a combination of the clusters and heat maps with the density of services in each zone to determine the appropriate balance that is convenient for the installation of a new liquor store. To do this, the data will be filtered appropriately to discard through the process those areas that are not suitable for one reason or another. This will be presented in the results chapter.

4. Results

Our analysis shows that, although there are a large number of services in the commune of Las Condes (more than 1200 on the surface of Las Condes, whose urban surface is approximately 44 km^2on the foothills of the Cordillera de Los Andes), there are areas with a low density of restaurants and services, mainly to the south and east in San Carlos de Apoquindo. The highest concentration of restaurants and liquor stores was detected in the western area of the commune, in the El Golf neighborhood, characterized by its large attendance, workplaces, financial and commercial services, in addition to being located on the axis of Metro line 1 from Santiago, the main transportation hub of the capital.

Below is the heat map that contains all the alcohol and restaurant sales areas in the commune.

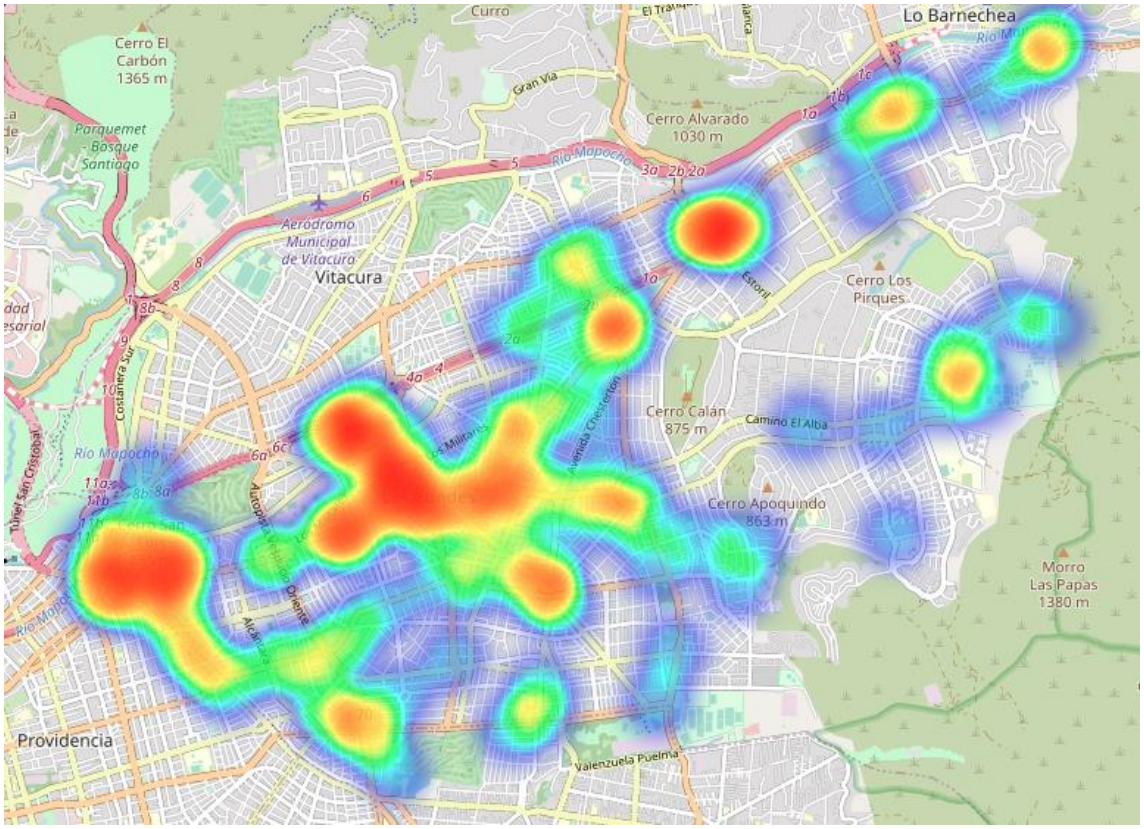


Figure 6: Density of services linked to the purchase of alcohol and restaurants in the Las Condes commune

It can be seen that there are at least three highly dense zones (with red and yellow hues). However, it is not a good strategy to consider the less dense areas (or directly without liquor stores), since there are probably good reasons for this. There are neighborhoods whose population behavior and road dynamics do not lend themselves to the emergence of a liquor store. That is why over time they have not prospered. Consequently, a balance must be sought between areas with diverse population densities.

For this reason, we focus our attention on the areas with the lowest density of liquor stores by number of restaurants, corresponding to corresponding to the south-central area of the commune. Another districts were identified as potentially interesting are Estoril and Quinchamalí, in the eastern part of the commune and with a higher average socioeconomic level, but our attention was focused on the neighborhoods near Av. Apoquindo, since a large part of the micro and Metro passes through there, which facilitates the movement of potential customers, thus offering a combination of accessibility for tourists, proximity to public transport lines, medium-high socioeconomic level and high residential density.

Figure 7 shows the combination of the heat map with the centers of the neighborhoods whose percentage ratio between liquor stores and restaurants + liquor stores is less than 10%.

Figure 7: Heat map over neighborhoods with percentage ratio less than 10%

5. Discussion

The preliminary result shows 5 neighborhoods located in the south-central zone of the commune, which are located at a medium distance from the large avenues such as Apoquindo, Vespucio and Tomás Moro. After directing our attention to this narrower area of interest (covering approximately 5 km2 located mainly southeast of Av. Apoquindo), a heat map was first created showing the density of restaurants + liquor stores similar to the one presented above, only In this case, the information obtained through the Foursquare API corresponding only to the neighborhoods whose percentage ratio of liquor stores over total services was less than 10% was used. Then, on said map said neighborhoods were plotted, identifying the tonality of the heat map on which said point falls. Based on this, an optimality criterion was defined in terms of the location of a liquor store, corresponding to a trade-off between proximity to areas highly dense in services and areas with greater concurrence. Based on this criterion, it was defined that the best areas to locate a liquor store or a bar correspond to those that fall on green areas on the heat map, and those who match with these conditions are Alcántara, Vaticano, Plaza de Inca, Roncesvalles and Río Guadiana.

It should be noted that the purpose of this analysis is only to provide information on areas whose relationship between restaurants and liquor stores is suitable for the installation of a new liquor store; It is very possible that there is a very good reason for not installing liquor stores in any of the areas located further south of the commune, for which they have not been able to establish high-attendance areas. A priori it is presumed that the Santiago metro has an important influence on this, reasons why it would make them unsuitable for a new liquor store or bar despite the lack of competition in the area. Therefore, the recommended zones should be considered only as a starting point for a more detailed analysis at street level that could eventually result in a location that not only does not have close competition, but other factors are also taken into account such as existence of parks, proportion of buildings and houses, etc. and all other relevant conditions are met for an investor who wishes to succeed in the sale of alcohol.

6. Conclusion

The purpose of this project was to identify areas of the Las Condes commune with a low ratio of liquor stores over total services (defined as liquor stores + bars + supermarkets + restaurants) in order to help interested parties to define the search for a location optimal for a new liquor store or bar. When calculating the density distribution of restaurants, liquor stores and supermarkets from the Foursquare data, we first identified the neighborhoods that best represent the distribution of the commune (26 neighborhoods in total) and then a clustering was performed based on the number of alcohol outlets and restaurants, based on the premise that the Santiago`s population likes to go out to eat and then go to buy an alcoholic beverage to continue celebrating, so that both industries work together.

Then, a ratio was generated that identifies each cluster and based on this, areas of high concurrence and services were ruled out as a result of the high competition that exists there. With the above, those neighborhoods whose ratio is less than 10% were filtered and based on an analysis of a heat map of services, a criterion for defining the optimal sites was postulated where it is worth continuing to deepen the study. The chosen areas were Alcántara, Vaticano, Plaza de Inca, Roncesvalles and Río Guadiana.

Stakeholders will make the final decision on the optimal restaurant location based on the specific characteristics of the neighborhoods and locations in each recommended area, taking into account additional factors such as the attractiveness of each location (proximity to parks, number of buildings and houses, and main trade in the area), noise levels / proximity to main roads, rental prices and purchase of facilities, social and economic dynamics of each neighborhood, etc.