“Analysis and location of Technical Service venues for computers and laptops in Lima, Peru".

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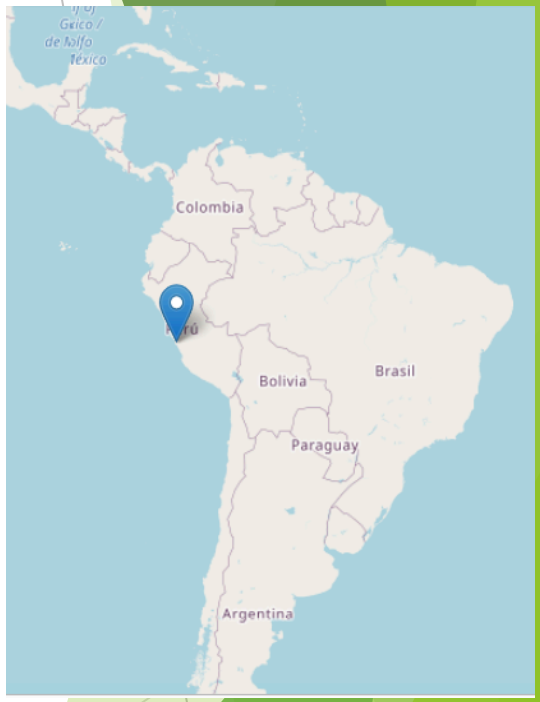
1. Introduccion

Lima city, where I live, is the capital and the most populous city in the Republic of Peru. It is located on the central coast of the country, on the shores of the Pacific Ocean, with approximately 11 million inhabitants representing 32% of the Peruvian population. Metropolitan Lima is divided into 50 districts (Boroughs) in total, where the province of Lima has 43 districts and the constitutional province of Callao with 7 districts. It is also organized in cones or axes of the city: North Lima, Downtown Lima, Modern Lima, East Lima, South Lima, Callao and health resort.

Currently in the world, the Covid-19 pandemic has brought damage in health, job dismissal and the economy of many countries, confining us into our houses in social isolation; in this way, families have changed: their consumption habits, remote work, online classes for children, deliverys services, use of streaming platforms (for example Netflix, Youtube, Spotify, etc.), learning platforms and others. All of this make us purchase, repair computers, laptops, tablets, printers and mobile phones this way.

This is the reason why we could take advantage of the location data of “Foursquare API” which would help families to solve this problem of having a technical service nearby and, at the same time, the opportunity to invest in a similar business where this service does not exist, especially in the districts with higher economic incomes.



2. Data Description

To consider the problema, I can list the data below:

- * INEI: National Institute of Statistics and Informatics, which is an autonomous constitutional body of Peru. It is also in charge of population, housing, business, agrarian, university, etc. censuses.

  (https://www.inei.gob.pe/)

- * CPI: Peruvian company dedicated to research, market research and public opinion.

  (http://cpi.pe/)

- * APEIM: Peruvian Association of Market Intelligence Companies. It is a non-profit association that groups market research and public opinion companies with the purpose of promoting, developing, protecting and defending market research activity in Peru.

  (http://apeim.com.pe/)

- * Forsquare API: To get the closest places to locate technical service for computers, laptops, printers and accessories.

  (https://foursquare.com/)

- * Geodata: It allows obtaining the latitude and longitude of a point in the world.

  (https://www.geodatos.net/)

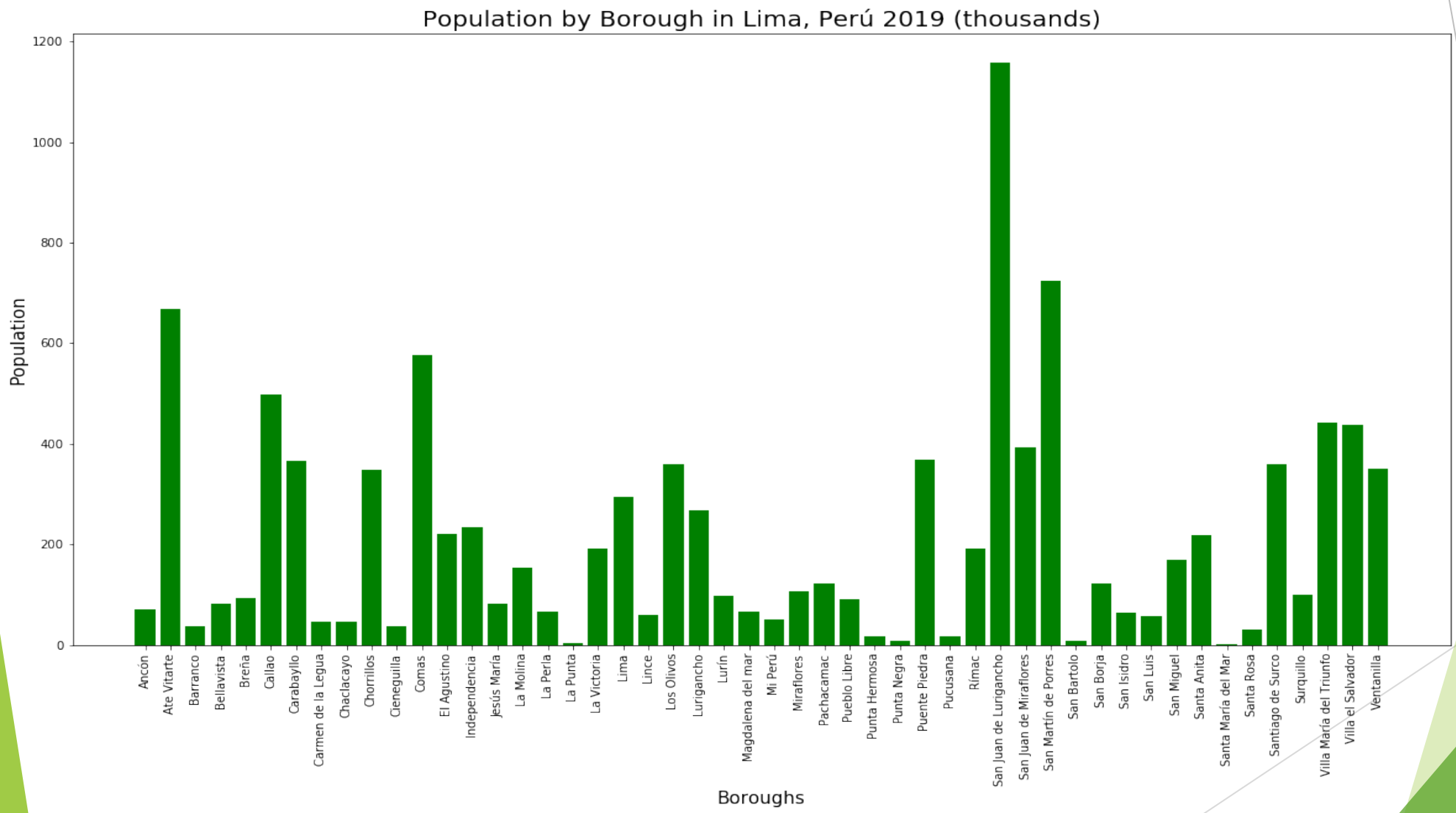
3. Methodology

The master data of Lima city is divided into 50 districts (Boroughs). It is also organized in cones or axes of the city: North Lima, Downtown Lima, Modern Lima, East Lima, South Lima, Callao and health resort. The master data has the folowing columns:

	Borough	Axes	Latitude	Longitude	Population
0	Ancón	Balnearios	-11.7736	-77.1761	70.1
1	Ate Vitarte	Lima Este	-12.0261	-76.9192	667.2
2	Barranco	Lima Moderna	-12.1492	-77.0217	37.5
3	Bellavista	Callao	-12.0601	-77.1116	81.7
4	Breña	Lima Centro	-12.0569	-77.0536	93.4

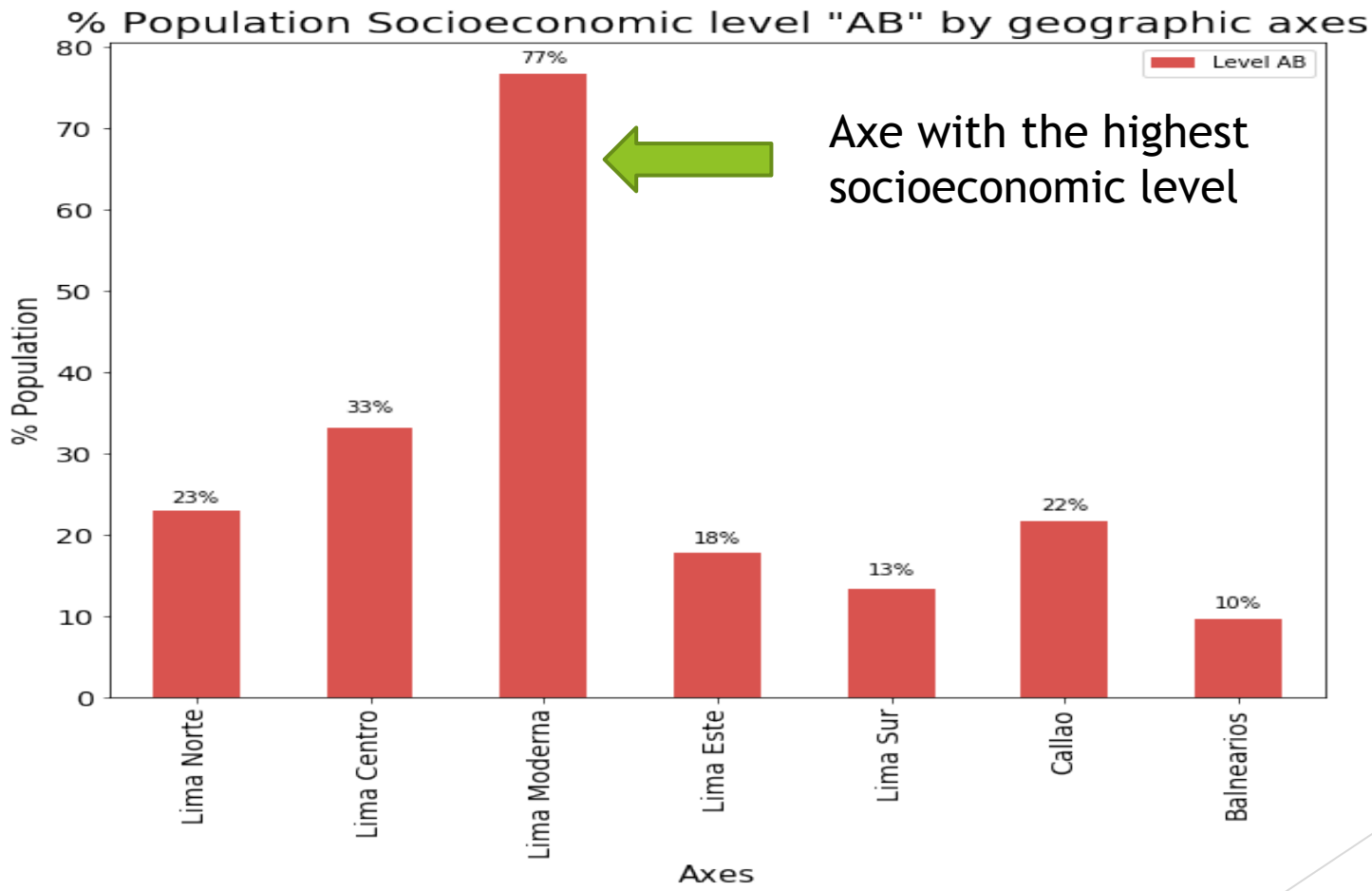
Data wrangling will include pre-processing, clean, transformation and data formatting.

3.1 Show the population by Boroughs



3.2 Boroughs grouped by Socioeconomic level

- In this case, the next master data shows the Socioeconomic level of the population by geographic axes, the highest level is AB:



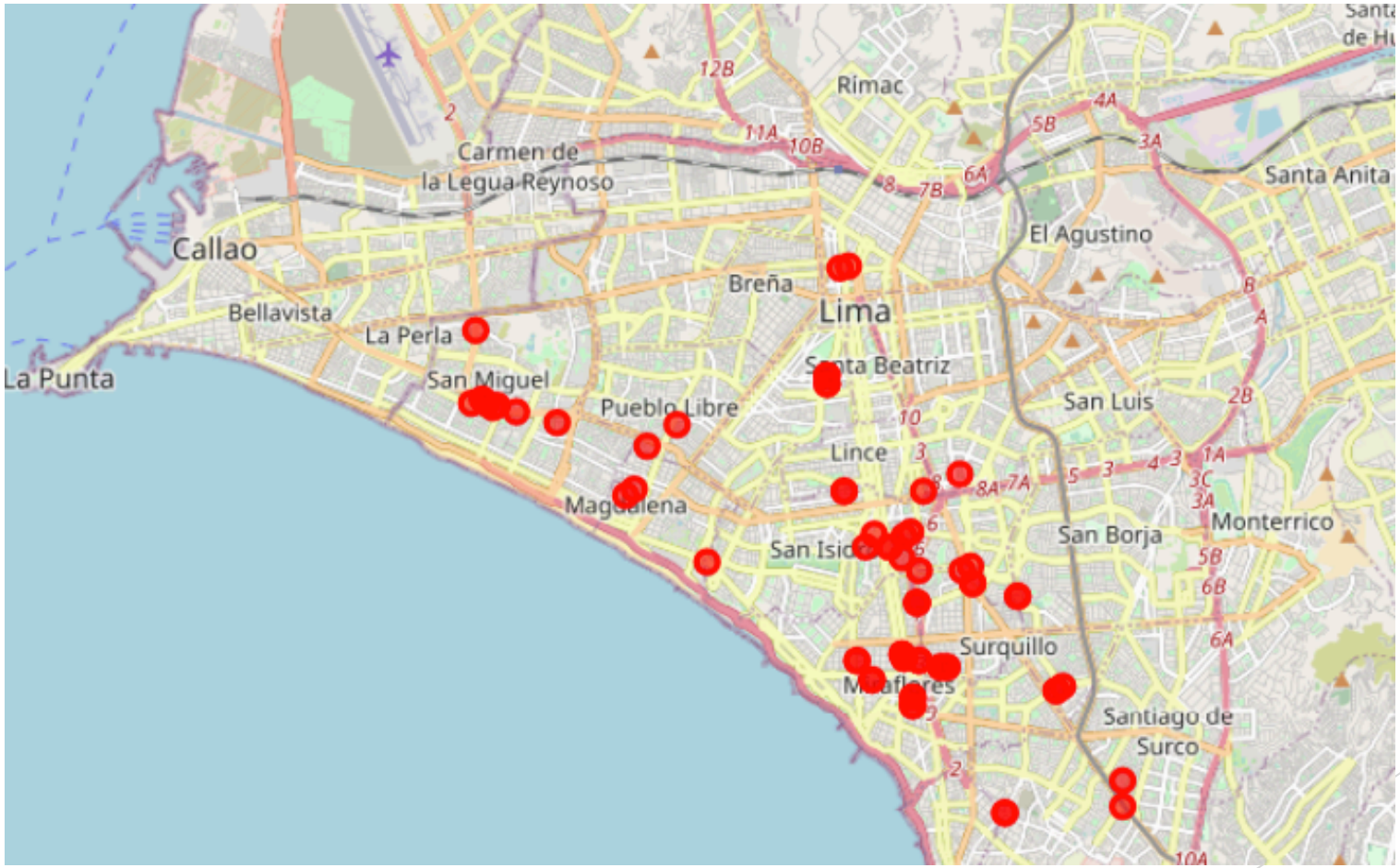
3.3 Borughs grouped by Socioeconomic level

The ”Lima Moderna” axe involved to next Boroughs:

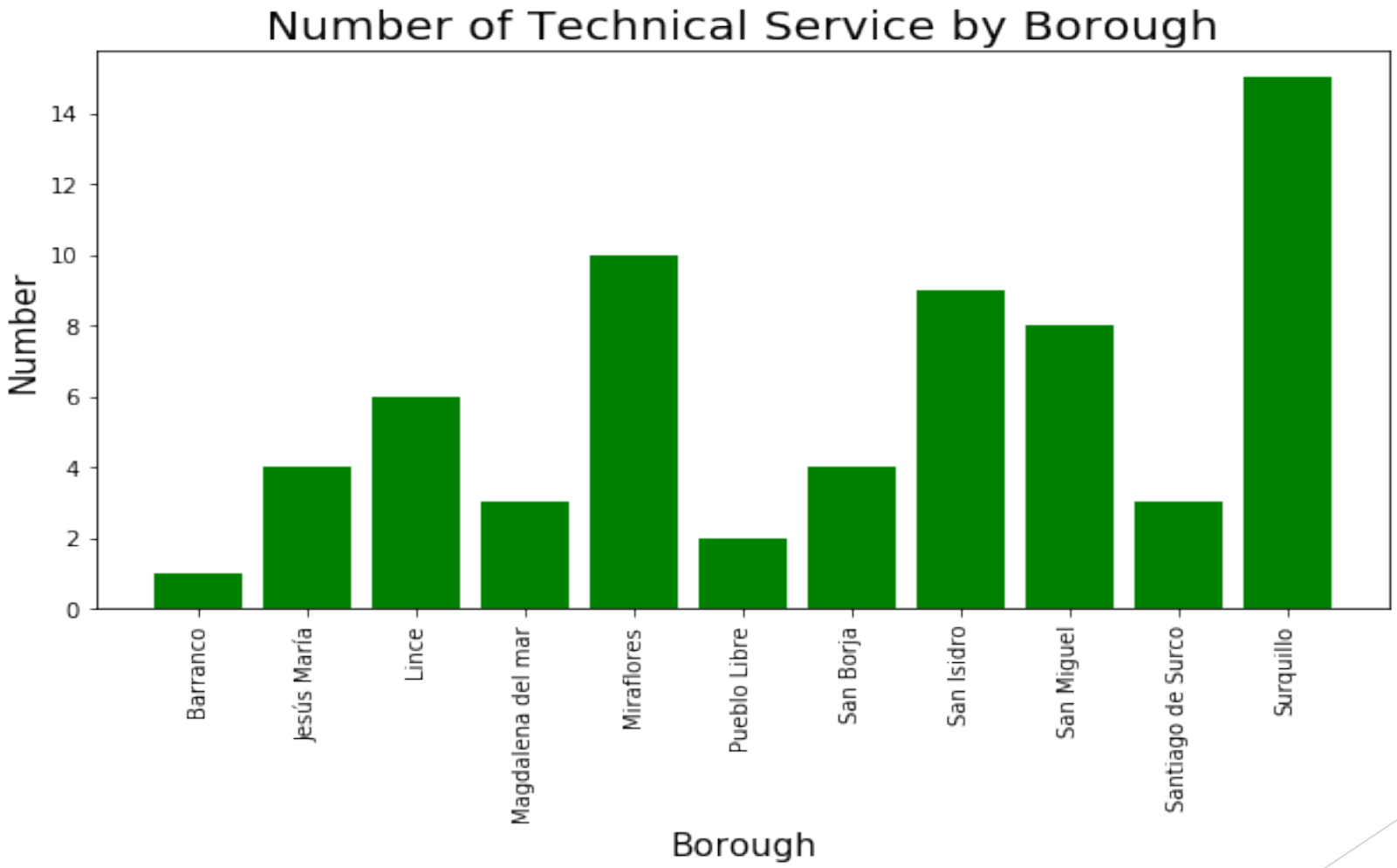
Borough	Axe	Latitude	Longitude
Barranco	Lima Moderna	-12.1492	-77.0217
Jesús María	Lima Moderna	-12.0700	-77.0453
La Molina	Lima Moderna	-12.0789	-76.9169
Lince	Lima Moderna	-12.0833	-77.0317
Magdalena del mar	Lima Moderna	-12.1002	-77.0647
Miraflores	Lima Moderna	-12.1207	-77.0299
Pueblo Libre	Lima Moderna	-12.0753	-77.0659
San Borja	Lima Moderna	-12.1072	-76.9992
San Isidro	Lima Moderna	-12.0991	-77.0375
San Miguel	Lima Moderna	-12.0763	-77.0909
Santiago de Surco	Lima Moderna	-12.1464	-77.0067
Surquillo	Lima Moderna	-12.1186	-77.0217

4. Methodology

I utilized the "Foursquare API" to explore the boroughs and "Technical Services" (reparation and sale computers, laptops and accessories) venues. I aplied, as limit, 100 venues and the radius 1500 meter for each borough from their given latitude and longitude informations, indicated in the last table. I show the graph for Technical Services by Borough:



4.1 Check how many venues (Technical Service) were returned for each Borough

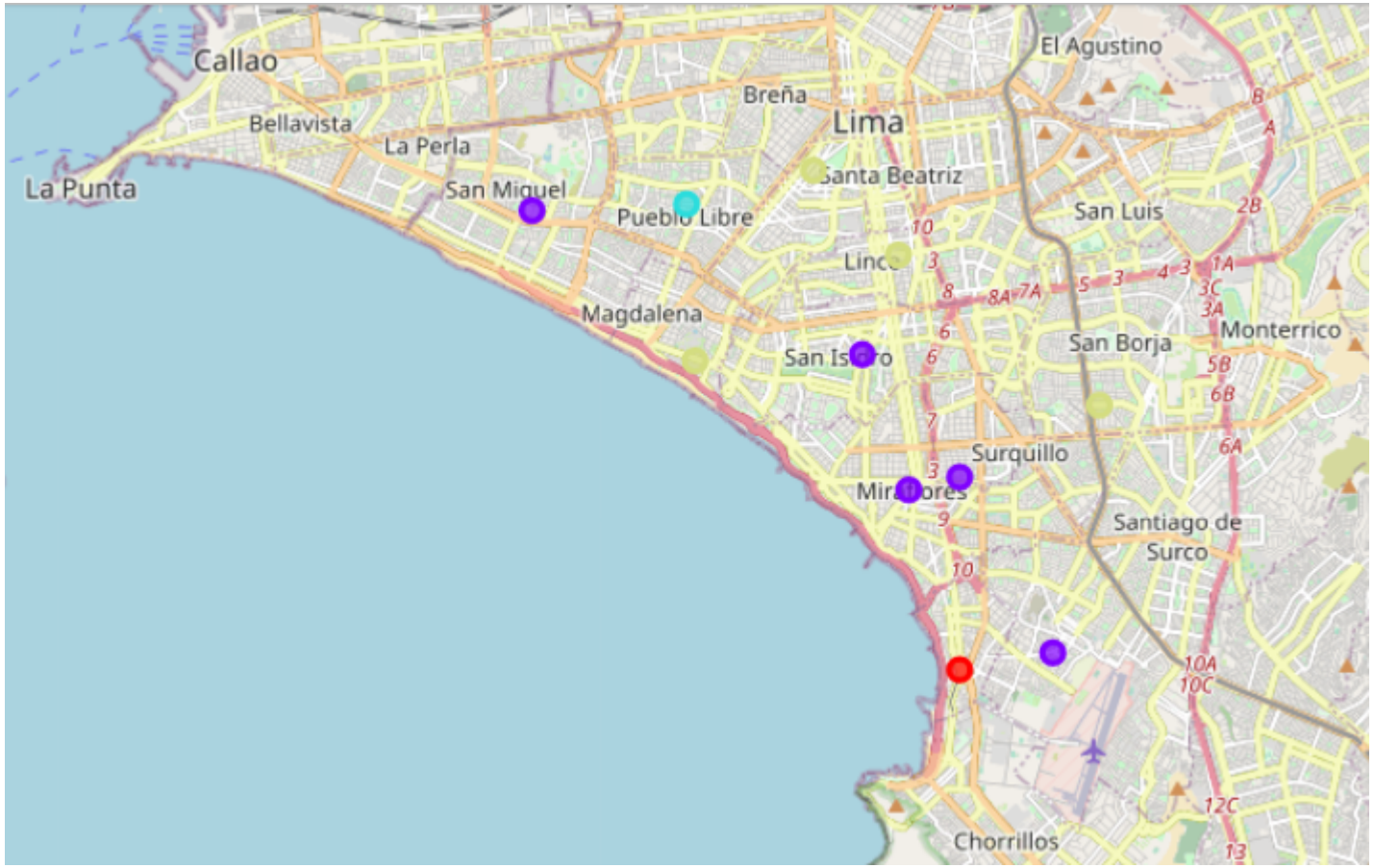


4.2 Display the top 10 venues for each Borough

Borough	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
Barranco	Automotive Shop	Shop & Service	Professional & Other Places	Auditorium	Auto Garage	Building	Business Service	Camera Store	College Lab	Convenience Store
Jesús María	Electronics Store	Coworking Space	Factory	Department Store	Auditorium	Auto Garage	Automotive Shop	Building	Business Service	Camera Store
Lince	Electronics Store	Office	Factory	Department Store	Auditorium	Auto Garage	Automotive Shop	Building	Business Service	Camera Store
Magdalena del mar	Electronics Store	Professional & Other Places	Auditorium	Auto Garage	Automotive Shop	Building	Business Service	Camera Store	College Lab	Convenience Store
Miraflores	Electronics Store	IT Services	Auditorium	Auto Garage	Business Service	Department Store	Shop & Service	Other Repair Shop	Medical Lab	Home Service

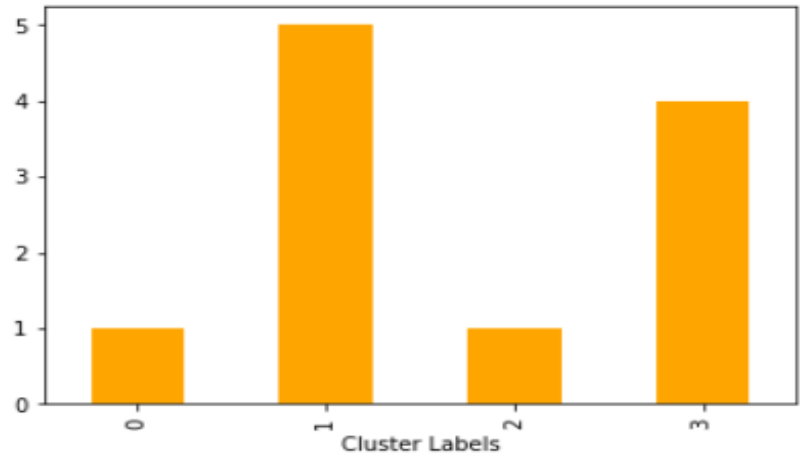
4.3 Cluster Boroughs

I used “Kmeans” algorithm to cluster the Boroughs with k=4, because the venues are the most important in the "Lima Moderna" axe:



5. Discussion

I can estimate the number of 1st Most Common Venue in each cluster. Thus, I created a bar chart which may help us to find proper labels for each cluster:



When we examine the above graph, we can label each cluster as follows:

Cluster 0 : Different services (repair of computer, laptops and accesories)
Cluster 1 : Electronics Store (sale and repair of computer, laptops and accesories)
Cluster 2 : Other repair services
Cluster 3 : Other services

The 4 identified clusters help us see the types of business of technical service, sale and repair of computers currently offered in these districts of "Modern Lima" with high economic income per family.

6. Conclusion

- The city of Lima, Peru, is divided into 50 districts (Boroughs), and organized into 7 axes or zones, and 5 socioeconomic segments (A, B, C, D, E). In the present study, I focused only on segment AB, which is the one with the highest economic income and belongs to the axe of "Modern Lima" with 13 districts.

- The objective of this study is to inform citizens that, due to the Pandemic and the fact that they are confined to their homes, the option of locating the closest place to their homes to find technical repair service and sale of computers, laptops and accessories, is necessary for working, studying and entertaining at home.

- At the same time, it helps to identify potential investors of the places where you can invest in a business of these types, since the number of devices in families is increasing over and over again, therefore it is a great opportunity.