

# **Finding Retail Store Optimal Locations in Tegucigalpa**

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## **1. Introduction**

### **1.1 Background**

Honduras is a small developing country located in Central America. Its capital, Tegucigalpa, is Honduras' largest and most populous city as well as the nation's political and administrative center [1].

Being the most populous city in Honduras, Tegucigalpa has a leading potential for anyone interested in opening a retail store in this country.

As you might already know, such a task is not easy. One of the main concerns and blockers that we can anticipate is the location of our store since it has a major impact on its success and growth. I have seen some retail stores shut down or relocate because they did not have enough traffic where they started. Therefore, identifying an optimal location for our store is of great importance.

### **1.2 Business problem**

This project tries to find an optimal location to open a new retail store in Tegucigalpa, based on the goods that they will be offering.

### **1.3 Interest**

Its target audience is for stakeholders interested in opening a retail store in Tegucigalpa.

## **2. Data**

When choosing a location to open a retail store, there are some aspects that we must consider. According to Shari Waters (2019), these aspects are:

- Similarity of neighbor stores – “Positioning a retail store next to a similar store will tend to draw the same demographic of customers, to more optimal results.”
- Visibility – “In many cases, the better visibility your retail store has, the less advertising is needed.”
- Transportation accessibility.
- Parking accessibility.

- Personal factors – “If you plan to work in your store, think about work-life balance issues such as the distance from the shop to home and other personal considerations.”

The goal is to locate the retail store where many shoppers meet the definition of the target market [2].

As such, to find optimal locations, I used Foursquare's location data as my source to obtain the venues of three of the aspects mentioned above (similarity of neighbor stores, transportation, and parking).

### 3. Methodology

As an example, for this analysis, I tried to find an optimal location for a **retail store that will sell and repair electronics-related products**. Take in mind the same analysis can be done for any goods the retail store offers.

#### 3.1 Exploratory analysis using Foursquare's location data

I used Foursquare's API to obtain data about transportation, parking, and similar electronics stores venues in Tegucigalpa.

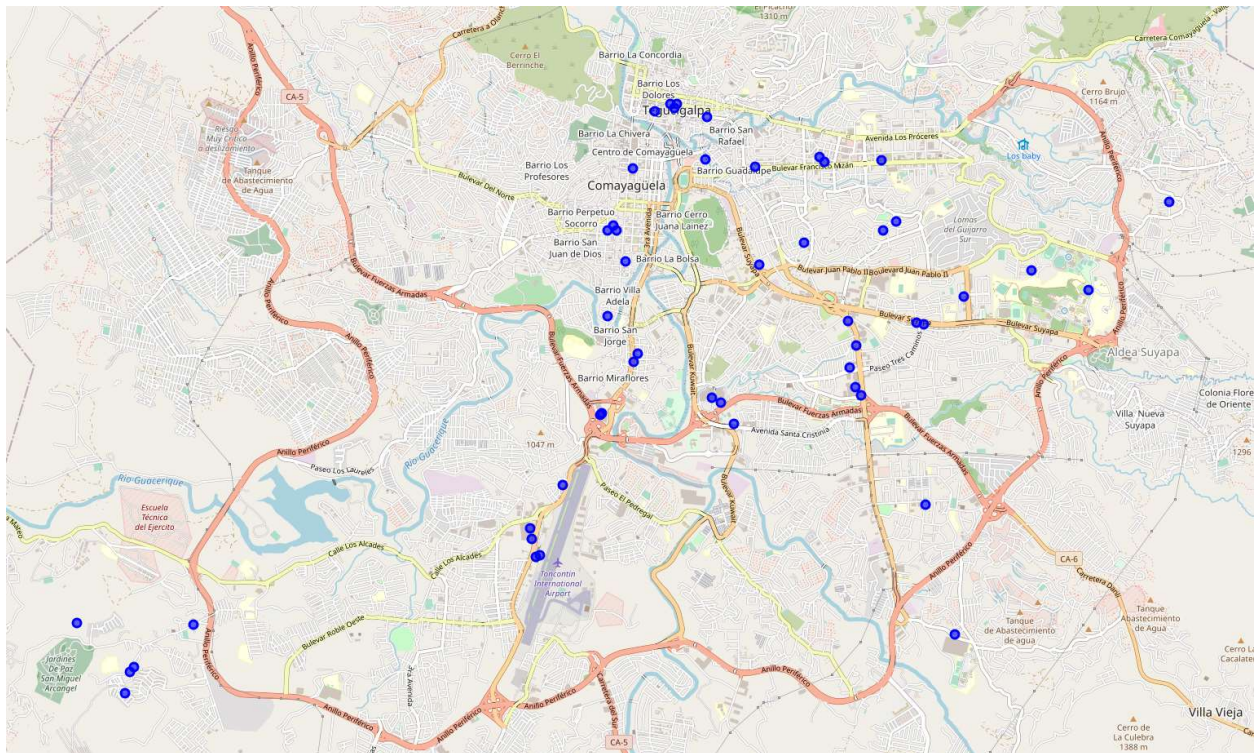
After retrieving the data, I found myself with three problems. First, the data was in the form of a json file, which makes it hard to visualize and analyze the data. To fix this problem, I used pandas' library and json\_normalize module to transform the data into a pandas DataFrame.

Second, the DataFrame generated was a mess. It had many columns that I did not need, and the category of each venue was not visible. I cleaned the data by only keeping the columns that I needed and extracting the category of each venue.

Third, Foursquare limits our search to 50 venues. This meant that I had to make sure I obtained a good mix of venues for a more accurate result. I had to repeat this process multiple times with a different combination of search parameters to obtain a good mix.

After I was happy with my DataFrame, I used the python folium library to generate a map centered in Tegucigalpa to visualize the geographic details of the venues.

id	name	categories	address	cc	city	country	crossStreet	distance	formattedAddress	labelLat,lng	lat	lng	postalCode	state	id
0	Tipo Aires La Castita	Mobile Phone Shop	Calle principal address la castita	HN	Tepejicapa	Honduras	N/A	0.0	[Calle principal address la castita, Tepejicapa,	[{"label": "display", "lat": 14.96559, "lng": 14.94845, "text": "Calle principal address la castita, Tepejicapa,"}	14.96559	-86.25764	N/A	Francisco Morazan	50b60e047b776a02378a67
1	Parque Residencial La Arroyita	Parking	Calle principal residencial arroyita	HN	Patate	Honduras	N/A	9121	[Calle principal residencial arroyita, Patate,	[{"label": "display", "lat": 14.04819, "lng": 14.04697, "text": "Calle principal residencial arroyita, Patate,"}	14.04819	-87.26764	N/A	Francisco Morazan	50c2301a10e4602d378a67
2	Jatibon	Electronics Store	City M&M	HN	Honduras	Honduras	N/A	5160	[City M&M, Tepejicapa, Francisco Morazan, H	[{"label": "display", "lat": 14.961939393939218, "lng": 14.96197, "text": "City M&M, Tepejicapa, Francisco Morazan, H	14.961939393939218	-87.19922	N/A	Francisco Morazan	50b60e047b776a02378a67
3	Papejela/Aires Castita	Bookstore	Aloja las castita	HN	Tepejicapa	Honduras	Fronte campo Tibol	8025	[Aloja las castita (Fronte campo Tibol), Teg	[{"label": "display", "lat": 14.951313, "lng": 14.95133, "text": "Aloja las castita (Fronte campo Tibol), Teg	14.951313	-87.25554	N/A	Francisco Morazan	50b60e047b776a02378a67
4	Verita Rosa Flores	Clothing Store	Aloja las castita frente campo Tibol,	HN	Tepejicapa	Honduras	N/A	8840	[Aloja las castita frente campo Tibol, Tegui,	[{"label": "display", "lat": 14.948323, "lng": 14.94833, "text": "Aloja las castita frente campo Tibol, Tegui,	14.948323	-87.28140	N/A	Francisco Morazan	50b60e047b776a02378a67
5	Avianca Toncontin	Airport Terminal	N/A	HN	Tepejicapa	Honduras	N/A	5295	[Tepejicapa, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.96020492470940, "lng": 14.96029, "text": "Tepejicapa, Francisco Morazan, Honduras"	14.96020492470940	-87.21979	N/A	Francisco Morazan	50b60e047b776a02378a67
6	Grupo ref Honduras	Electronics Store	Barrío guadalupe, av. San Martín de Porres, 1	HN	Tepejicapa	Honduras	N/A	5565	[Barrío guadalupe, av. San Martín de Porres, 1,	[{"label": "display", "lat": 14.10055625284454, "lng": 14.10058, "text": "Barrío guadalupe, av. San Martín de Porres, 1,"}	14.10055625284454	-86.20141	11101	Francisco Morazan	50d891441c105336a7c1a0
7	Jatibon	Electronics Store	Boulevard Morazan HN	HN	Tepejicapa	Honduras	N/A	2397	[Boulevard Morazan, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.1054510504260, "lng": 14.10058, "text": "Boulevard Morazan, Francisco Morazan, Honduras"	14.1054510504260	-87.183106	N/A	Francisco Morazan	40a017451014432c3a7c
8	Buena Aires La Castita	Bus Station	Fronte residencial santa cruz, Tepejicapa,	HN	Tepejicapa	Honduras	N/A	8968	[Fronte residencial santa cruz, Tepejicapa, F	[{"label": "display", "lat": 14.05337, "lng": 14.05370, "text": "Fronte residencial santa cruz, Tepejicapa, F	14.05337	-87.28745	N/A	Francisco Morazan	50a672c4e6b65565a3a6
9	Tecnoportal	Mobile Phone Shop	M&M El Dorado HN	HN	Tepejicapa	Honduras	N/A	2706	[M&M El Dorado, Honduras]	[{"label": "display", "lat": 14.06427, "lng": 14.06470, "text": "M&M El Dorado, Honduras"	14.06427	-87.15154	N/A	Francisco Morazan	50a750c4e404597c10a355
10	Estación de taxi la granja	Taxi	Com. Miraflores, Blvd. Comunidad Española Euro-	HN	Tepejicapa	Honduras	N/A	2080	[Com. Miraflores, Blvd. Comunidad Española Euro-	[{"label": "display", "lat": 14.0807336845006, "lng": 14.08073, "text": "Com. Miraflores, Blvd. Comunidad Española Euro-"}	14.0807336845006	-87.20875	11101	Francisco Morazan	50b60e047b776a02378a67
11	Punto de taxis Honduras - Kennedy - unah - centro	Taxi Stand	Ries, Honduras - Centro de Grupo BETA maquila, H	HN	Tepejicapa	Honduras	N/A	674	[Ries, Honduras - Centro de Grupo BETA maquila, H	[{"label": "display", "lat": 14.02124, "lng": 14.02125, "text": "Ries, Honduras - Centro de Grupo BETA maquila, H"	14.02124	-87.17460	N/A	Francisco Morazan	50b60e047b776a02378a67
12	Honduras computer trading	Electronics Store	Com Miraflores, Blvd. Santa Cruzita, Santa	HN	Tepejicapa	Honduras	N/A	3623	[Com Miraflores, Blvd. Santa Cruzita, Santa	[{"label": "display", "lat": 14.07360578795026, "lng": 14.07329, "text": "Com Miraflores, Blvd. Santa Cruzita, Santa"	14.07360578795026	-87.19669	11101	Francisco Morazan	50b60e047b776a02378a67
13	Empreses Tepejicapa El Ray	Bus Line	(Bus El Centro)	HN	Comayagua	Honduras	12 calle, 7 y 9 Avenida	4202	[Bus El Centro (12 calle, 7 y 9 Avenida)	[{"label": "display", "lat": 14.01910, "lng": 14.01910, "text": "Bus El Centro (12 calle, 7 y 9 Avenida)"}	14.01910	-86.91039	1201	Fos. Morazan	50b60e047b776a02378a67
14	Estacionamiento sector 1	Parking	Bvd. Juan Pablo c/ Plaza Miraflores, Tegui	HN	Tepejicapa	Honduras	N/A	3290	[Bvd. Juan Pablo c/ Plaza Miraflores, Tegui,	[{"label": "display", "lat": 14.080111161111111, "lng": 14.08011, "text": "Bvd. Juan Pablo c/ Plaza Miraflores, Tegui,"}	14.080111161111111	-87.18735	N/A	Francisco Morazan	50b60e047b776a02378a67
15	Jatibon	Electronics Store	Plaza Miraflores	HN	Tepejicapa	Honduras	N/A	3290	[Plaza Miraflores, Tepejicapa, Francisco M&M,	[{"label": "display", "lat": 14.07360424145986, "lng": 14.07360, "text": "Plaza Miraflores, Tepejicapa, Francisco M&M,"}	14.07360424145986	-87.20087	N/A	Francisco Morazan Dept	4053951376336a0c1b0c
16	Transportes Lila	Bus Station	N/A	HN	Tepejicapa	Honduras	N/A	1554	(Honduras)	[{"label": "display", "lat": 14.093347737373737, "lng": 14.09334, "text": "(Honduras)"}	14.093347737373737	-87.21109	N/A	Francisco Morazan	5405951369a6139c20804
17	San Miguel Pub	Bar	Antigua Local de Saenz	HN	Tepejicapa	Honduras	N/A	4582	[Antigua Local de Saenz, Tepejicapa, Francisc	[{"label": "display", "lat": 14.0740563302552, "lng": 14.07407, "text": "Antigua Local de Saenz, Tepejicapa, Francisc"	14.0740563302552	-87.21654	N/A	Francisco Morazan	403c105607c27ee081949
18	Tecnoportal	Electronics Store	Bldv Suyas HN	HN	Tepejicapa	Honduras	N/A	3717	[Bldv Suyas, Tepejicapa, Francisco Morazan,	[{"label": "display", "lat": 14.08377, "lng": 14.08377, "text": "Bldv Suyas, Tepejicapa, Francisco Morazan,"}	14.08377	-87.17996	N/A	Francisco Morazan	50a3636130a46c22b26a3c
19	INPELSA	Electronics Store	N/A	HN	Tepejicapa	Honduras	N/A	2060	[Tepejicapa, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.09215871756591, "lng": 14.09218, "text": "Tepejicapa, Francisco Morazan, Honduras"	14.09215871756591	-87.19124	N/A	Francisco Morazan	52330a1c105336a7c1a0
20	Tecnoportal	Electronics Store	Taiji	HN	Tepejicapa	Honduras	N/A	62	[Barrío el cen, Cr. Cristobal Colon, calle P	[{"label": "display", "lat": 14.1024404477945, "lng": 14.10025, "text": "Barrío el cen, Cr. Cristobal Colon, calle P"	14.1024404477945	-87.20474	N/A	Francisco Morazan	50b60e047b776a02378a67
21	Master video	Video Game Store	Buvar Suyas D. M. D. C. Honduras	HN	Tepejicapa	M. D. C. Honduras	N/A	3645	[Buvar Suyas, Tepejicapa, M. D. C. Honduras]	[{"label": "display", "lat": 14.08393487365056, "lng": 14.08393, "text": "Buvar Suyas, Tepejicapa, M. D. C. Honduras"	14.08393487365056	-87.17949	N/A	Francisco Morazan	4ea6e406e04597c10a355
22	Bit abt	Electronics Store	4to piso Edificio Compañ. Boulevard Central-	HN	Tepejicapa	Honduras	N/A	3301	[4to piso Edificio Compañ. Boulevard Central-	[{"label": "display", "lat": 14.0816743027990, "lng": 14.08167, "text": "4to piso Edificio Compañ. Boulevard Central-"}	14.0816743027990	-87.18799	11101	Francisco Morazan	50d60e047b776a02378a67
23	Parque 5ta Avenida	Parking	5ta Avenida HN	HN	Tepejicapa	Honduras	N/A	832	[5ta Avenida, Tepejicapa, Francisco Morazan,	[{"label": "display", "lat": 14.09995455430446, "lng": 14.09996, "text": "5ta Avenida, Tepejicapa, Francisco Morazan,"}	14.09995455430446	-87.20290	N/A	Francisco Morazan	5167040a4054753bc70a0f
24	Transportes Urua	Bus Station	N/A	HN	Tepejicapa	Honduras	N/A	2477	[Tepejicapa, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.0949193227195, "lng": 14.09492, "text": "Tepejicapa, Francisco Morazan, Honduras"	14.0949193227195	-87.21189	N/A	Francisco Morazan	50b60e047b776a02378a67
25	Tecnia computer	Bus Line	Comayagua HN	HN	Tepejicapa	Honduras	N/A	1819	[Comayagua, Tepejicapa, Francisco Morazan,	[{"label": "display", "lat": 14.092135754974, "lng": 14.09217, "text": "Comayagua, Tepejicapa, Francisco Morazan,"}	14.092135754974	-87.21008	N/A	Francisco Morazan	492726a9e4065565a3a6
26	Cine internacional	N/A	N/A	HN	Tepejicapa	Honduras	N/A	5874	[Tepejicapa, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.092135754974, "lng": 14.09217, "text": "Tepejicapa, Francisco Morazan, Honduras"	14.092135754974	-87.21008	N/A	Francisco Morazan	49a07726a9e4065565a3a6
27	Sede Servicio Al Cliente Fan	IT Service	N/A	HN	Tepejicapa	Honduras	N/A	9335	[Tepejicapa, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.093096, "lng": 14.09306, "text": "Tepejicapa, Francisco Morazan, Honduras"	14.093096	-87.22016	N/A	Francisco Morazan	50a3636130a46c22b26a3c
28	La Casita Plaza Miraflores	Furniture Home Shop	Tercer nivel de mall Plaza Miraflores, Tegui,	HN	Tepejicapa	Honduras	N/A	3748	[Tercer nivel de mall Plaza Miraflores, Tegui,	[{"label": "display", "lat": 14.0774468471983, "lng": 14.07744, "text": "Tercer nivel de mall Plaza Miraflores, Tegui,"}	14.0774468471983	-87.20046	11101	Francisco Morazan	4a9f0b4a7759c40597c10a355
29	Chococot	Mobile Phone Shop	N/A	HN	Tepejicapa	Honduras	N/A	3580	[Tepejicapa, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.07856, "lng": 14.07856, "text": "Tepejicapa, Francisco Morazan, Honduras"	14.07856	-87.18250	N/A	Francisco Morazan	502a3636130a46c22b26a3c
30	Discovery	Bus Station	N/A	HN	Comayagua	Honduras	N/A	1503	[Comayagua, Francisco Morazan, Honduras]	[{"label": "display", "lat": 14.093381330835, "lng": 14.09338, "text": "Comayagua, Francisco Morazan, Honduras"	14.093381330835	-87.21022	N/A	Francisco Morazan	50a3636130a46c22b26a3c



### 3.2 Finding retail store optimal locations

DBSCAN is an unsupervised machine learning algorithm that clusters our data based on density and excludes individual data points that are far away. It works based on two parameters: radius and minimum



points. R determines a specified radius that if it includes enough points within it, we call it a dense area. M determines the minimum number of data points we want in a neighborhood to define a cluster.

DBSCAN is ideal for our analysis because we want to locate our store near a high density of parking, similar store, and transportation venues to maximize shoppers' traffic in our store.

After clustering the venues, I obtained eleven optimal locations. I used folium once more to visualize the results.

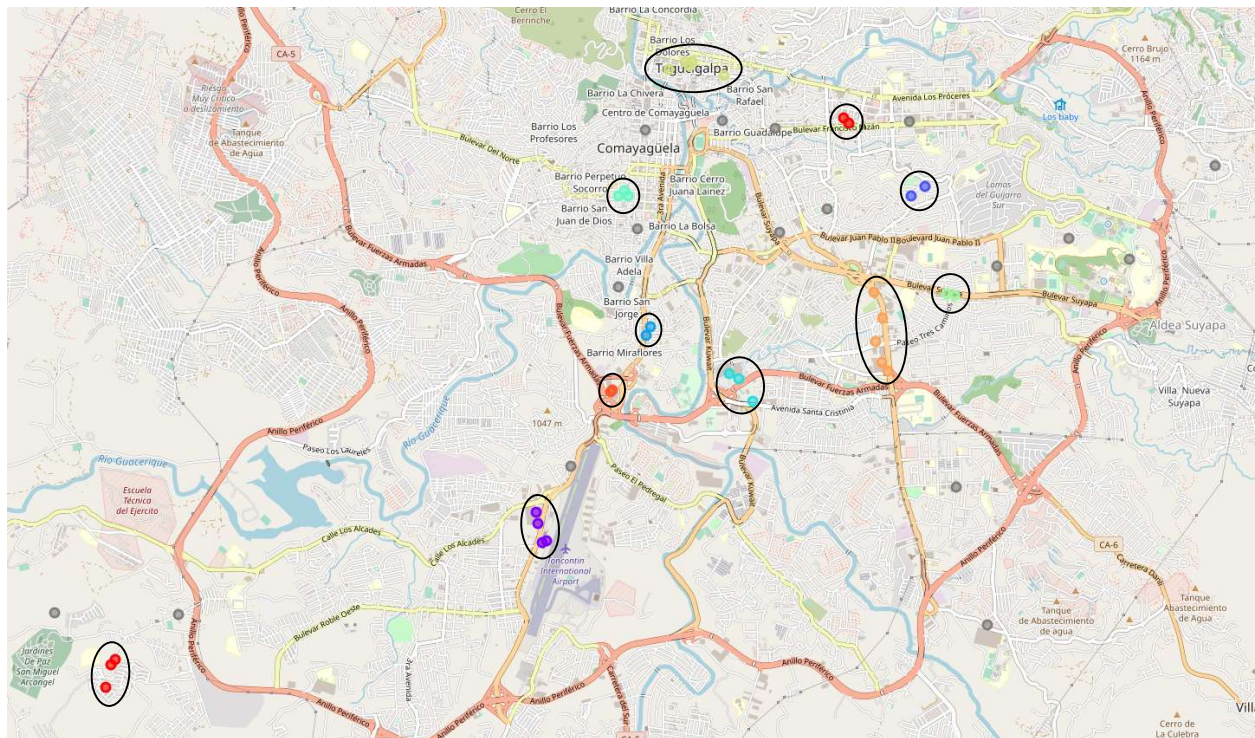


Figure 3.

## 4. Results and Discussion

Although Foursquare limits our search for up to 50 venues, I was able to obtain eleven optimal locations to open a new electronics retail store.

Highest concentrations were found near Tegucigalpa's airport, Toncontin (showed in purple), between El Hogar and San Ignacio neighborhoods (showed in orange), and in the historic downtown of Tegucigalpa (showed in lime). I also found different locations near the center and one location almost at the southwest border of the city.

Ideally, we would want to pick a location that is somewhere close to the center for higher visibility. It should always be considered our best option. However, one reason to choose one that is far away from the center is because of personal factors.

## 5. Conclusion

I successfully identified optimal locations in Tegucigalpa for a new electronics retail store to aid stakeholders to narrow down their search.

In the end, the final decision will be made by stakeholders based on personal factors. If stakeholders will be working in their retail store, they might think about work-life balance issues such as the distance from the shop to home.

## 6. References

- [1] Wikipedia, *Tegucigalpa*. Online at <https://en.wikipedia.org/wiki/Tegucigalpa>
- [2] Shari Waters, *Choosing a Retail Store Location*. Online at <https://www.thebalancesmb.com/choosing-a-retail-store-location-2890245#:~:text=When%20choosing%20a%20city%20or,commerce%20or%20the%20Census%20Bureau>