

Bussines optimization: where to start a korean restaurant in Spain

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1 Introduction

Korean cuisine has been rising in popularity for some years. Thanks to phenomena like k-pop or korean streamers and content creators their culture is closer than anytime. That makes people of all places of the world disposed to try things like kimchi or soju. In Spain this isn't happening as quick as in english countries but, as you can see on the next graph (*Fig. 1*), interest is also rising there too.

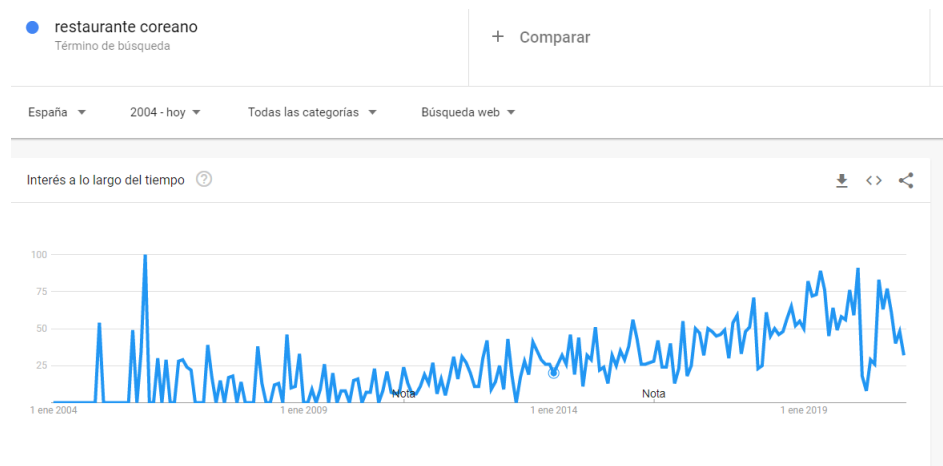


Figure 1: "Korean restaurant" frequency of search in Spain

The thing is that there isn't that much korean restaurants outside the biggest cities on Spain. The growing interest of the people and the low business competence are the reasons why I think this is a good opportunity. So, after deciding this is a good business opportunity we have to answer the first question: "Where are we going to place it?". That's why in this work I will analyze the biggest cities of Spain and which of them are the best for starting a

korean restaurant.

That being said this analysis can be easily extrapolated to any kind of restaurant with the correct data.

2 Data

For this problem I'm going to use:

- Number of asian restaurants and korean restaurants of each city, provided by the **Forsquare API**
- Coordinates of each city gotten from <https://www.geodatos.net/coordenadas/espana>
- Density of population of each city in 2019, collected from wikipedia.

3 Methodology

I started this problem creating a dataframe with one entry for each city that contains its coordinates and its density.

Out[3]:

	City	Latitude	Longitude	Density
0	Madrid	40.41650	-3.70256	5418.47
1	Barcelona	41.38879	2.15899	15992.20
2	Valencia	39.46975	-0.37739	5850.78
3	Zaragoza	41.65606	-0.87734	682.84
4	Malaga	36.72016	-4.42034	1428.76
5	Murcia	37.98704	-1.13004	513.98
6	Bilbao	43.26271	-2.92528	8295.91
7	Sevilla	37.38283	-5.97317	4896.55
8	Valladolid	41.65518	-4.72372	1514.40
9	Vigo	42.23282	-8.72264	2686.47
10	A Coruña	43.37135	-8.39600	6452.52
11	Granada	37.18817	-3.60667	2654.41
12	Oviedo	43.36029	-5.84476	1180.29
13	Cartagena	37.60512	-0.98623	383.77

Figure 2: Initial data

After that asked to the Forsquare API for the number of Korean restaurants (*Fig. 3*) and Asian restaurants (*Fig. 4*), which include Korean. This will give us information about how much the Korean cuisine it's being consumed at that moment compared to similar exotic cuisines

Out[8]:

Venue	
City	
Barcelona	27
Granada	1
Madrid	22
Malaga	3
Sevilla	3
Valencia	4

Figure 3: Number of Korean restaurants

Out[11]:

Venue	
City	
A Coruña	21
Barcelona	100
Bilbao	35
Cartagena	5
Granada	33
Madrid	100
Malaga	59
Murcia	30
Oviedo	12
Sevilla	42
Valencia	100
Valladolid	16
Vigo	12
Zaragoza	44

Figure 4: Number of Asian restaurants

Having all this data, and dropping the one that was not important for the classification like latitude and longitude I applied a K-nearest neighbor algorithm to cluster all these cities. I used $k=6$ as it was the one that gave me the most homogeneous clusters size-wise.

Out[31]:

	Cluster Labels	City	Latitude	Longitude	Density	Asian Restaurants	Korean Restaurants
0	2	A Coruña	43.37135	-8.39600	6452.52	21	0.0
1	1	Barcelona	41.38879	2.15899	15992.20	100	27.0
2	4	Bilbao	43.26271	-2.92528	8295.91	35	0.0
3	5	Cartagena	37.60512	-0.98623	383.77	5	0.0
4	0	Granada	37.18817	-3.60667	2654.41	33	1.0
5	2	Madrid	40.41650	-3.70256	5418.47	100	22.0
6	3	Malaga	36.72016	-4.42034	1428.76	59	3.0
7	5	Murcia	37.98704	-1.13004	513.98	30	0.0
8	3	Oviedo	43.36029	-5.84476	1180.29	12	0.0
9	2	Sevilla	37.38283	-5.97317	4896.55	42	3.0
10	2	Valencia	39.46975	-0.37739	5850.78	100	4.0
11	3	Valladolid	41.65518	-4.72372	1514.40	16	0.0
12	0	Vigo	42.23282	-8.72264	2686.47	12	0.0
13	5	Zaragoza	41.65606	-0.87734	682.84	44	0.0

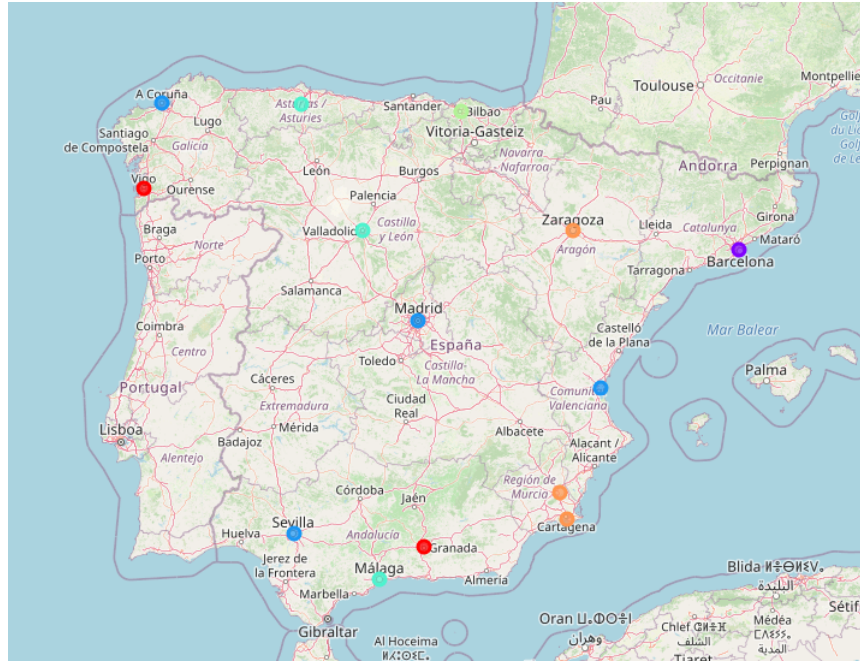


Figure 5: Cities clustered

4 Results

After doing the clustering we can group by cluster label and take the mean value for each cluster so we can analyze them So the clusters made are like this

```
In [32]: df.groupby('Cluster Labels').mean()
```

```
Out[32]:
```

	Latitude	Longitude	Density	Asian Restaurants	Korean Restaurants
Cluster Labels					
0	39.710495	-6.164655	2670.440000	22.500000	0.50
1	41.388790	2.158990	15992.200000	100.000000	27.00
2	40.160107	-4.612280	5654.580000	65.750000	7.25
3	40.578543	-4.996273	1374.483333	29.000000	1.00
4	43.262710	-2.925280	8295.910000	35.000000	0.00
5	39.082740	-0.997870	526.863333	26.333333	0.00

Figure 6: Clusters mean value

- Cluster 0: Medium density, low asian restaurants, Low - none korean restaurants
- Cluster 1: Maximum density, maximum asian restaurants, maximum korean restaurants
- Cluster 2: High density, High asian restaurants
- Cluster 3: Low density, low asian restaurants, low korean restaurants
- Cluster 4: Very High density, medium restaurants, none korean restaurants
- Cluster 5: Minimum density, low asian restaurants, none korean restaurants

5 Discussion

After doing the classification we just have to define which characteristics we want in the city of our choice. Those would be a high density of population so our business has more potential clients. We also want high number of asian restaurants so we know in that city similar food is popular. Obviously we want a low number of korean restaurants so there isn't that much competence.

With that in mind we have different options:

- The first option is to start the business in a city of the cluster 4 (only Bilbao is there). Because it has a really big density of population and zero restaurants of that kind that place would be ideal for a new korean restaurant

- Choose one of the cities of the cluster 2 (A Coruña, Madrid, Sevilla and Valencia). Those are cities with good density and not that much korean restaurants (In the case of A Coruña there isn't any yet), so they will probably won't have that much competence for the customers they offer. From those the only one I wouldn't recommend would be Madrid as it has more competence than the other 3 and being the capital of the country makes it more expensive to start a business there.
- Making a restaurant in Barcelona (Cluster 1). This is the option that has the most risk because there is a lot of other korean restaurants on that city, and being there is more expensive. But if the business plan also has a good and accurate marketing plan it can be done and it can earn more money than in the other places.

6 Conclusion

So finally we can agree that Spain has more than one good city for a korean restaurant. In this work we found some examples of them, and using more data ,like cost per rent by city or average earnings for a restaurant in each city, we could give a more accurate solution to this problem.