

Capstone project: comparison of two cities, Torino and Lausanne

Introduction	1
Data collection	2
Methodology	2
General city analysis	3
Quarter analysis	3
Results	3
Lausanne	3
General city analysis	3
Quarter analysis	6
Torino	8
General city analysis	8
Quarter analysis	11
Discussion	13
Conclusions	14

Introduction

This project aims at studying and comparing the two cities of Torino, Italy, and Lausanne, Switzerland, from the viewpoint of a young adult who finished his/her studies and will be soon looking for a job. The person lived in both cities during the course of his student life and liked them both. Nevertheless he/she needs a better understanding of the opportunities offered by both cities in terms of:

- Work/career
- Cultural venues
- bars/restaurants
- Access to sport activities

The cities are rather different in size and possibilities they offer. Lausanne is a rather small city on the Lemman Lake shores, but it has a big urban area, especially if we include the peripheral villages. For sake of simplicity they are not included in this study. Torino is a larger city located in the Po Valley in northern Italy.

We'll be analyzing each city in its entirety and then divide them into their quarters to judge them according to the listed criteria. The collected data will allow for an informed choice about the best location overall and the best quarter to live in.

Data collection

For running the previously described analysis, we need to collect information about the geographical location of the two cities and their quarters and then we can look for venues around each neighbourhood.

The data source for finding the GPS coordinates of the cities is the geopy library. The source for finding a list of the quarters for each city is the wikipedia page dedicated to the subject:

- For Lausanne: https://fr.wikipedia.org/wiki/Liste_des_quartiers_de_Lausanne
- For Torino: https://it.wikipedia.org/wiki/Circoscrizioni_di_Torino

There's no available source for quarters coordinates in each city that is already in an organized form (csv file or similar), so I needed to copy and paste the coordinates for each quarter. For Lausanne from the Wikipedia page listed above we can find links to pages dedicated to each quarter separately. On these pages we find the GPS coordinates in DMS form. In order to convert them to DD format I used the website <https://www.latlong.net/degrees-minutes-seconds-to-decimal-degrees> for the conversion from DMS to DD coordinates. Lausanne has 18 quarters according to the Wikipedia page and I used exactly that administrative organisation to organize my data.

Torino is divided into 35 quarters. Since the number seemed to be too high to show data about each one of them, I decided to take into account a higher level administrative division, the "circoscrizione", a group of quarters. There are 8 "circoscrizioni" in Torino. I could not find an official geographical coordinate for each one of them, so I chose them visually on google maps using this map as reference: https://it.wikipedia.org/wiki/Circoscrizioni_di_Torino#/media/File:Circoscrizioni_torino_2016.png.

The source for collecting information about the different venues is FourSquare and its API, the one we used during the Capstone course.

Methodology

For each city I decided to first explore some overall characteristics in order to get a general overview and then proceed with a more thorough analysis of the neighbourhoods.

General city analysis

In the general overview I looked for the number of inhabitants, according to the data per quarter obtained from Wikipedia, and then I represented the city and its quarters on the map to get a glimpse at the geographical location and distribution. This first analysis allows to get an idea of the city size, how spread it is and how densely populated the neighbourhoods are.

The first part ends with an analysis of the number of venues found through FourSquare in a certain radius from the city center and their type. This gives an idea of the main activities available in the city and how easily accessible they are.

Quarter analysis

In the second part I concentrated on the quarters analysis. I collected the first 100 venues available per each quarter on FourSquare, I grouped them by type and I showed the most common first ten venues per quarter. This allows to get a better image of the different parts of the city and their general atmosphere and services. Finally I applied the k-means algorithm in order to group the quarters depending on their venues. The list of the first ten most frequent venues per quarter and the final representation of the clusters on the map give a full overview of each quarter and its localisation. I finally interpret the cluster distribution based on these two informations.

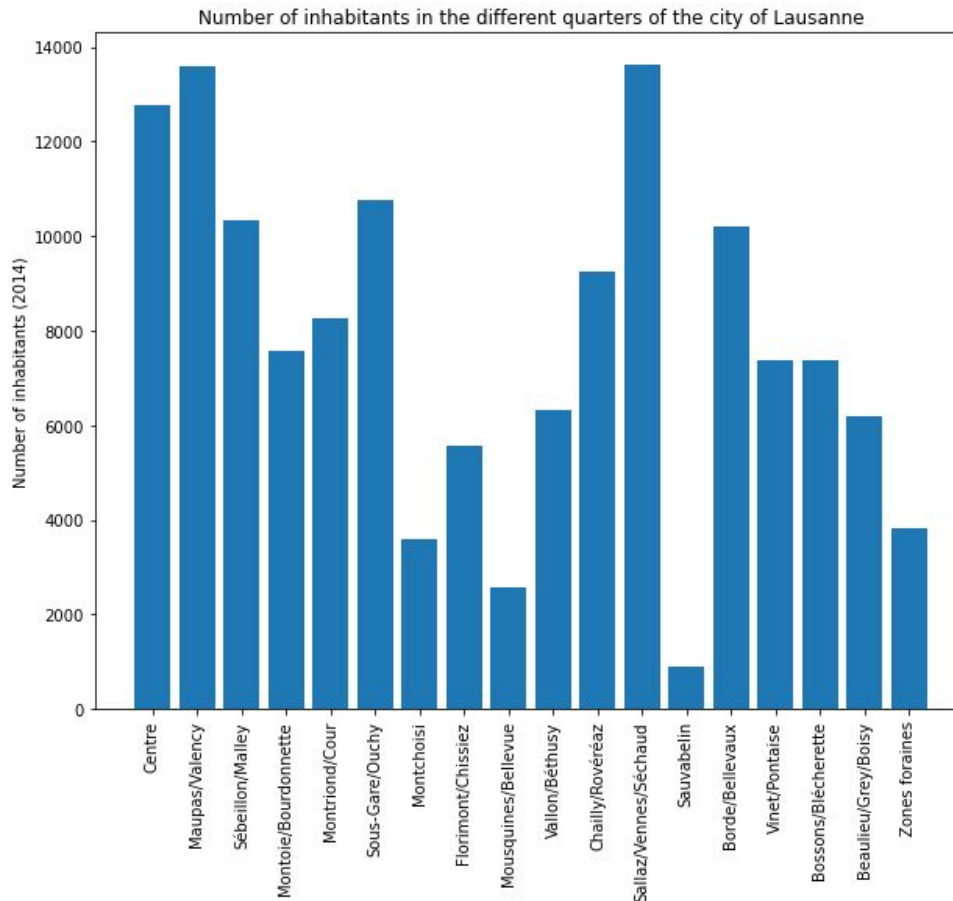
Results

Lausanne

General city analysis

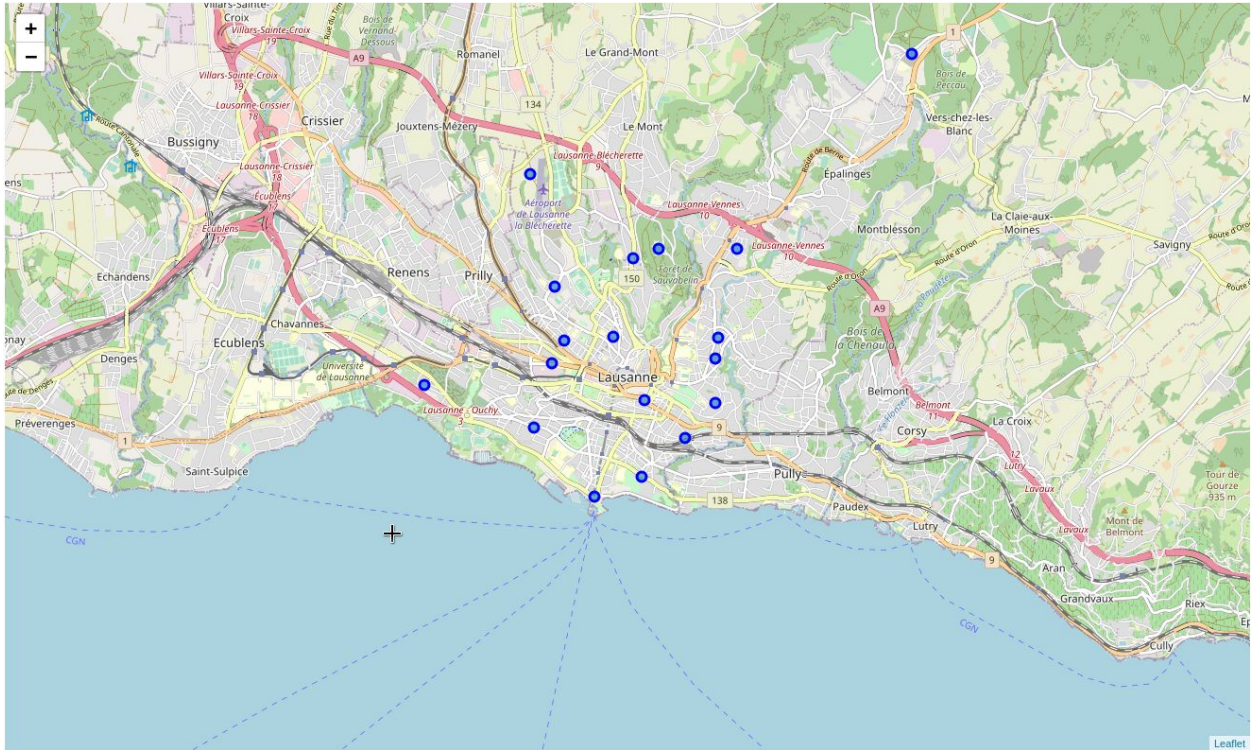
The first result is the total number of inhabitants per city and their distribution in quarters. Here we have the results for the city of Lausanne:

1. Total number of inhabitants: 140'023
2. Distribution of inhabitants per quarter

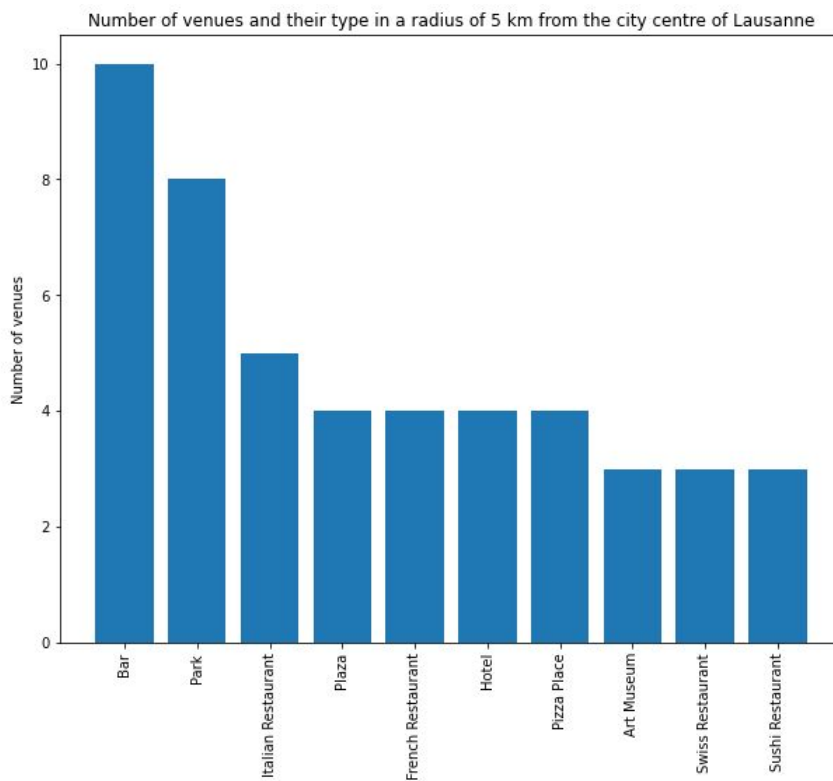


We can see that there's a big difference in the number of inhabitants per quarter, indicating that the density (and/or the area per quarter) is not uniform, for example the centre is, in general, more dense than the quarter of Sauvabelin or the Zones foraines. We should also consider the area occupied by each quarter to really have a complete view about the density. These are rough first observations.

3. Number of quarters: 18
4. Representation of city quarters on the map. The representation allows us to understand the population distribution: the quarters of Sauvabelin and Zones foraines are mostly covered in green/cultivated areas, that's why the population is less dense.



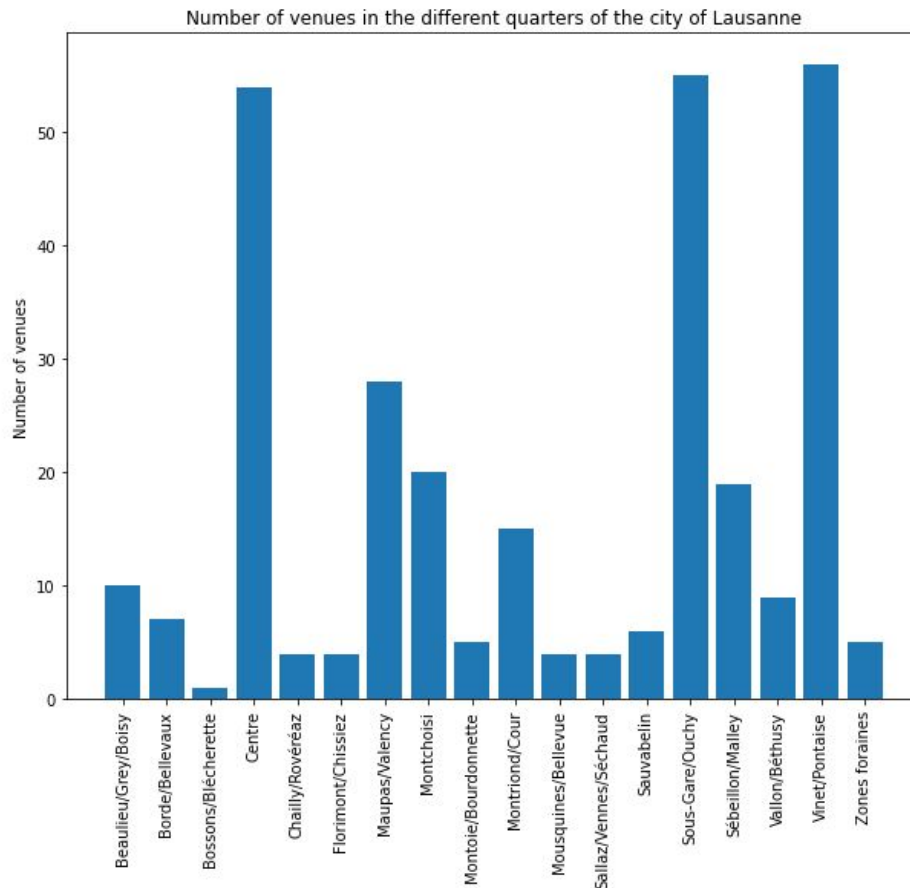
5. Total number of venues in a radius of 5 km from the city center (limited to 100 total venues) and their distribution per type



The main attractions in a 5 km radius from the city centre are bars and parks. The city map reinforce this finding showing big green areas amongst more urbanized areas (the parks). We see there's a good offer of activities for tourists (restaurants and hotels) and quite some interesting locations for a city tour (plazas and art museums).

Quarter analysis

In this part we concentrate on the analysis of the venues per quarter. The following figure summarizes the results.



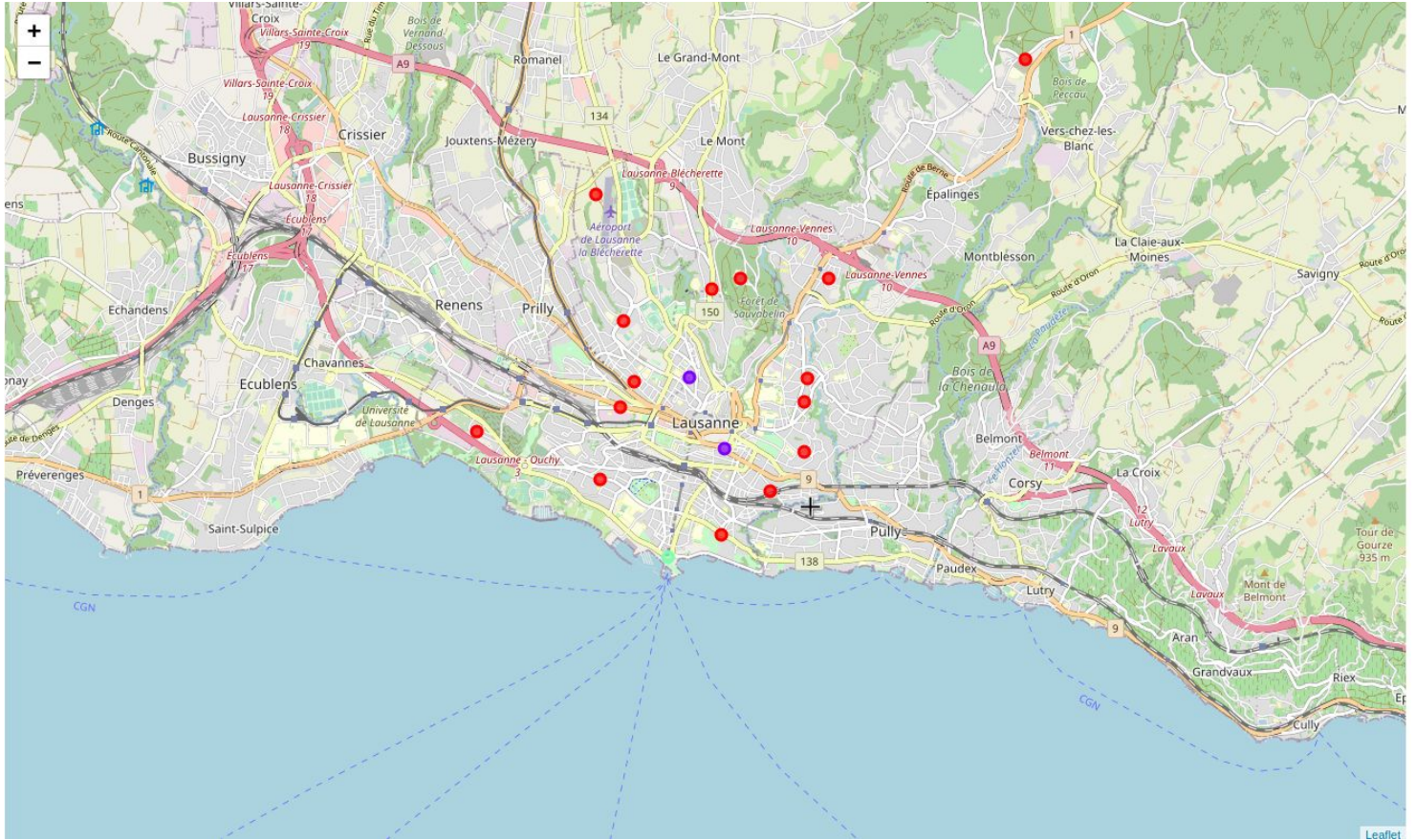
We see not surprisingly that most venues are concentrated in the centre and then in two other quarters: Sous-Gare/Ouchy, next to the lake, and Vinet/Pontaise, more in the northern part of the city. We can deduce that the other quarters are mostly residential.

In the following table we have a more detailed image of the type of venues per quarter and the results of the k-means clustering algorithm. Finally the clustering map gives a visual idea of the localisation of the clusters.

We see that the first findings are supported by the k-means analysis: the centre and Vinet/Pontaise are clustered together (group 1), the Sous-Gare/Ouchy forms a group on its own (group 2) and the rest of the quarters are another cluster (group 0). Group 1 has a lot of venues, mostly bars, group 2 has also a good number of venues, but mostly hotels and restaurants

(proximity to the lake). The group 0 is mostly residential quarters with other services than touristic ones.

	neighbourhoods	latitude	longitude	Cluster Labels	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
0	Centre	46.5189	6.6358	1	Bar	French Restaurant	Italian Restaurant	Plaza	Hotel	Café	Restaurant	Swiss Restaurant	Middle Eastern Restaurant	Pizza Place
1	Maupas/Valency	46.5264	6.6211	0	Italian Restaurant	Theater	Nightclub	Bus Stop	Sushi Restaurant	Restaurant	Steakhouse	Furniture / Home Store	Hotel	Food & Drink Shop
2	Sébellon/Malley	46.5236	6.6189	0	Grocery Store	Sushi Restaurant	Furniture / Home Store	Italian Restaurant	Japanese Restaurant	Jewish Restaurant	Nightclub	Paper / Office Supplies Store	Pizza Place	Bus Stop
3	Montoie/Bourdonnette	46.5208	6.5958	0	Hostel	History Museum	Beach	Bowling Alley	Yoga Studio	Fast Food Restaurant	Creperie	Cupcake Shop	Department Store	Dessert Shop
4	Montriond/Cour	46.5155	6.6156	0	Hotel	Bus Stop	Restaurant	Tennis Court	Park	Pizza Place	Pool	Bus Station	Supermarket	Gym
5	Sous-Gare/Ouchy	46.5069	6.6267	2	Hotel	Restaurant	Plaza	Café	Bar	Japanese Restaurant	Italian Restaurant	Hotel Bar	Grocery Store	Waterfront
6	Montchoisi	46.5094	6.6353	0	Café	Restaurant	Burger Joint	Gas Station	Hotel	Japanese Restaurant	Lake	Museum	Park	Plaza
7	Florimont/Chissiez	46.5142	6.6431	0	Bakery	Gas Station	Middle Eastern Restaurant	Bus Station	Yoga Studio	Fast Food Restaurant	Creperie	Cupcake Shop	Department Store	Dessert Shop
8	Mousquines/Bellevue	46.5186	6.6486	0	Bakery	Snack Place	Diner	Park	Yoga Studio	Fast Food Restaurant	Creperie	Cupcake Shop	Department Store	Dessert Shop
9	Vallon/Béthusy	46.5242	6.6486	0	Bakery	Bus Station	Sushi Restaurant	Department Store	Park	Fast Food Restaurant	Supermarket	Yoga Studio	Creperie	Cupcake Shop
10	Chailly/Rovéréaz	46.5267	6.6492	0	Department Store	Park	Supermarket	Sushi Restaurant	Yoga Studio	Falafel Restaurant	Cosmetics Shop	Creperie	Cupcake Shop	Dessert Shop
11	Sallaz/Vennes/Séchaud	46.5378	6.6525	0	Gas Station	Bus Station	Metro Station	Swiss Restaurant	Yoga Studio	Fast Food Restaurant	Creperie	Cupcake Shop	Department Store	Dessert Shop
12	Sauvabelin	46.5378	6.6383	0	Swiss Restaurant	Scenic Lookout	Grocery Store	Lake	Park	Supermarket	Falafel Restaurant	Cosmetics Shop	Creperie	Cupcake Shop
13	Borde/Bellevaux	46.5367	6.6336	0	Swiss Restaurant	Supermarket	Grocery Store	Bakery	Scenic Lookout	Lake	Park	Cosmetics Shop	Creperie	Cupcake Shop
14	Vinet/Pontaise	46.5269	6.6300	1	Bar	Pizza Place	Supermarket	Burger Joint	Italian Restaurant	Sandwich Place	Hotel	Cocktail Bar	Swiss Restaurant	Café
15	Bossons/Blécherette	46.5472	6.6150	0	Cosmetics Shop	Yoga Studio	Wine Bar	Creperie	Cupcake Shop	Department Store	Dessert Shop	Diner	Ethiopian Restaurant	Falafel Restaurant
16	Beaulieu/Grey/Boisy	46.5331	6.6194	0	Bus Stop	Supermarket	Chinese Restaurant	Bakery	Grocery Store	Pizza Place	Diner	Stadium	Convenience Store	Yoga Studio
17	Zones foraines	46.5622	6.6844	0	Track	Restaurant	French Restaurant	Food Court	Farmers Market	Convenience Store	Cosmetics Shop	Creperie	Cupcake Shop	Department Store

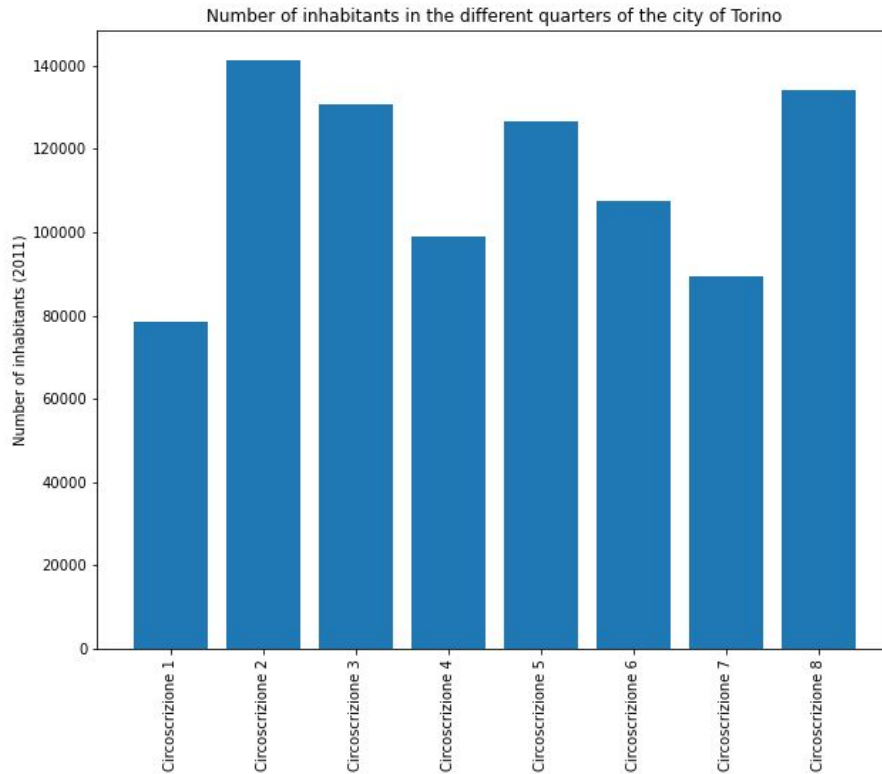


Torino

General city analysis

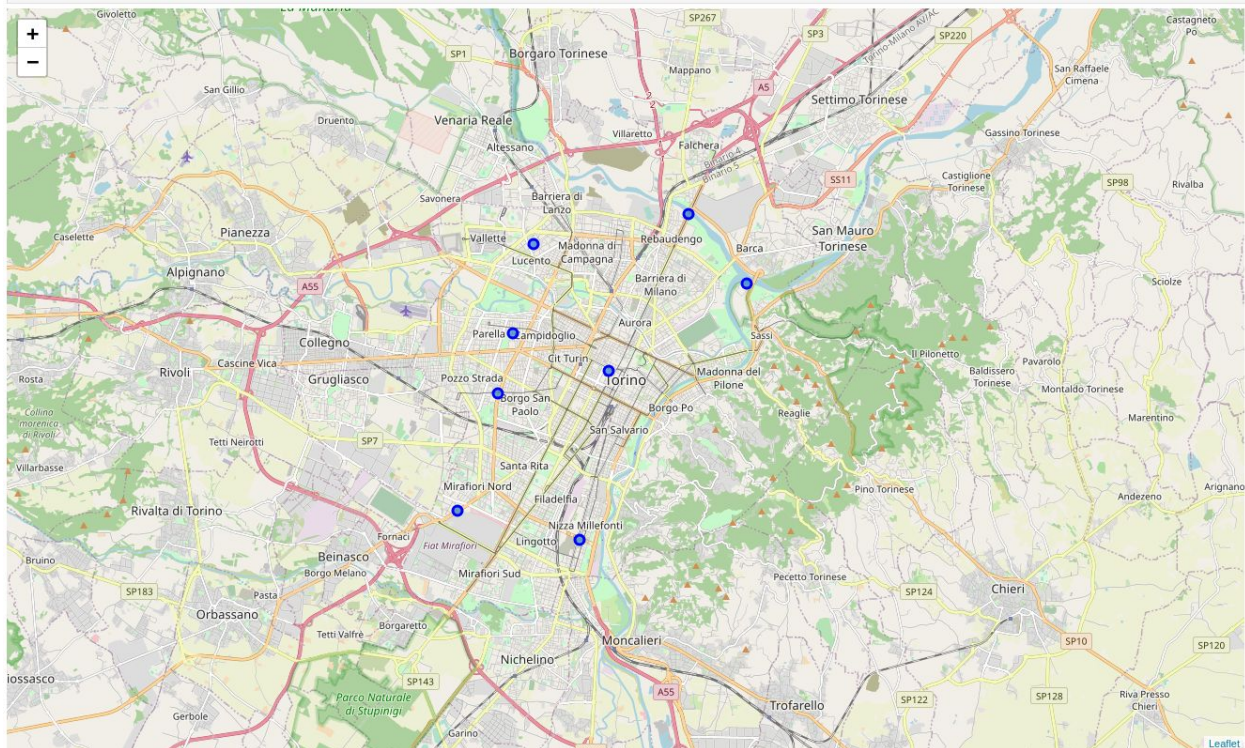
The first result is the total number of inhabitants and their distribution in quarters. Here we have the results for the city of Torino:

1. Total number of inhabitants: 906'874
2. Distribution of inhabitants per quarter



We notice that the number of inhabitants per quarter does not vary as much as in the Lausanne case. We can deduce that the distribution of people per quarter is more uniform. Again, we should certainly take into account the area of each quarter, here we are just stating general observations.

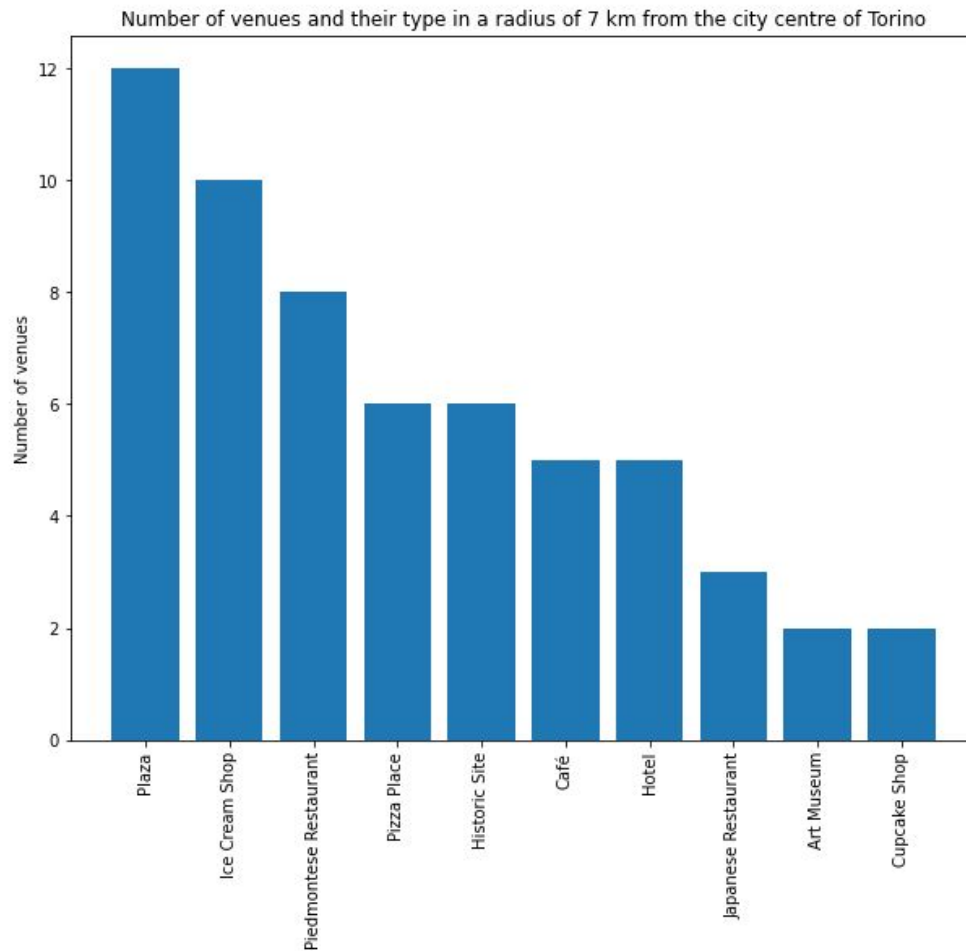
3. Number of quarters: 8 circoscrizioni and 35 quarters. As the total number of quarters seems to be too big to actually make a reasonable comparison with Lausanne, I decided to move one step up in terms of administrative division and I chose to work with the circoscrizione, that is a group of quarters.
4. Representation of city quarters on the map



We see that the city is located along a river, the Po river, and that the centres of the quarters are in densely urbanized areas, that explain partly the uniform population distribution. The main green areas are out of the center, along the river and to the east of the city.

5. Total number of venues in a radius of 7 km from the city center (limited to 100 total venues) and their distribution per type.

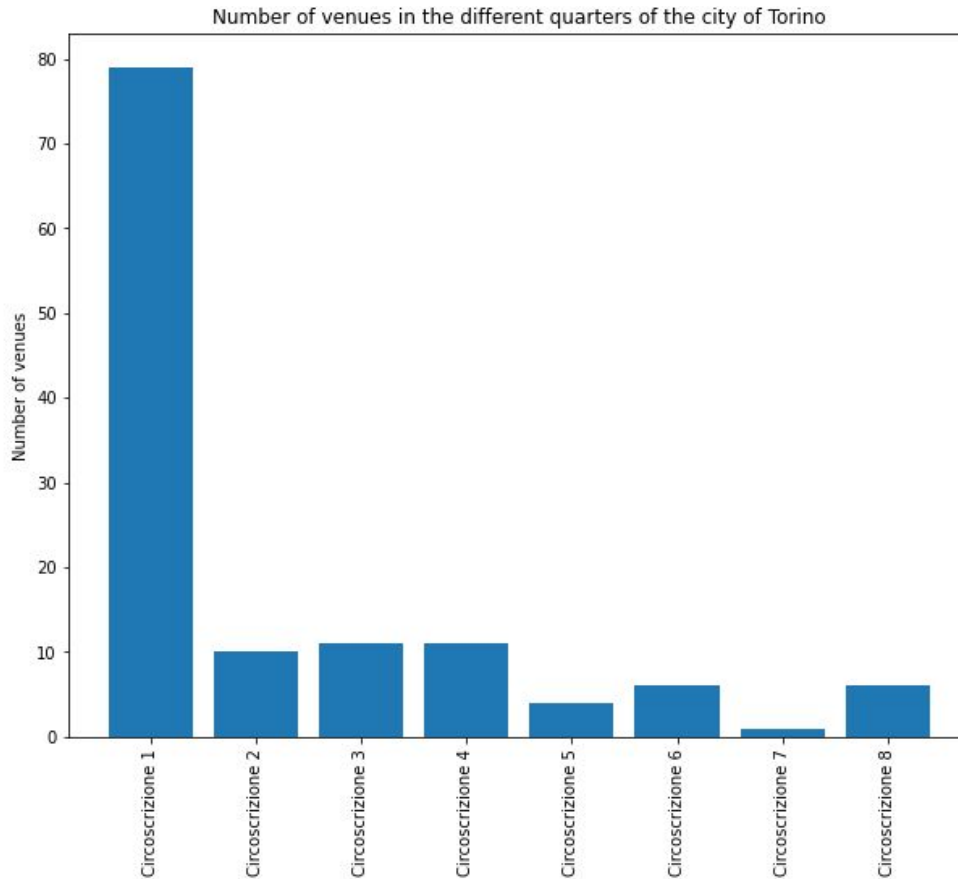
We observe that the main attractions are plazas, followed by ice-cream shops and local piedmontese restaurants. At the fourth place we have pizza places and historic sites. It seems that the city has more open air urban public spaces, but fewer parks than Lausanne. It also has a big offer in local food and historic sites, that makes it a good spot for tourism.



Quarter analysis

In this part we concentrate on the analysis of the venues per quarter. The following figure summarizes the results.

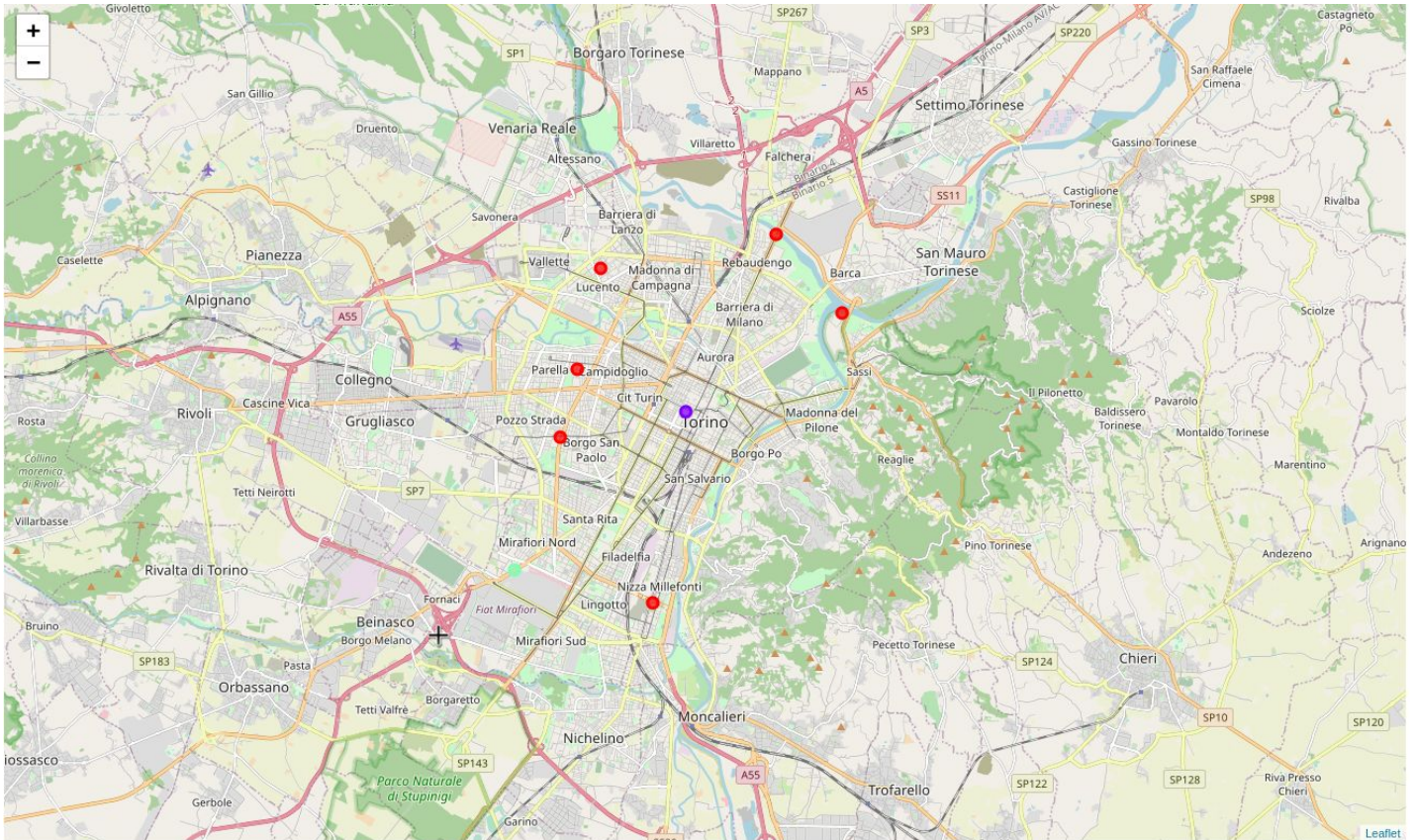
We see that the first circoscrizione has a remarkably bigger number of venues than all the other quarters. That is because this is the old city center and all the activities seem to concentrate over there. Despite the high presence of tourist related activities (bars and cafés, restaurants and hotels) also in the other quarters, nevertheless other services start to appear among the first positions too (see table).



In the following table we have a more detailed image of the type of venues per quarter and the results of the k-mean clustering algorithm. Finally the clustering map gives a visual idea of the localisation of the clusters.

	neighbourhoods	latitude	longitude	Cluster Labels	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
0	Circoscrizione 1	45.070203	7.676228	1	Italian Restaurant	Café	Piedmontese Restaurant	Pizza Place	Seafood Restaurant	Gift Shop	Bookstore	Bistro	Japanese Restaurant	Sushi Restaurant
1	Circoscrizione 2	45.033970	7.620971	2	Café	Gym / Fitness Center	Chinese Restaurant	Italian Restaurant	Plaza	Park	Garden	Cupcake Shop	Furniture / Home Store	Gastropub
2	Circoscrizione 3	45.064219	7.636010	0	Italian Restaurant	Pizza Place	Chinese Restaurant	Café	Piedmontese Restaurant	Park	Supermarket	Grocery Store	Hobby Shop	Gift Shop
3	Circoscrizione 4	45.079942	7.641316	0	Café	Italian Restaurant	Comic Shop	Pizza Place	Plaza	Sandwich Place	Park	Pet Store	Gastropub	Trattoria/Osteria
4	Circoscrizione 5	45.102908	7.649016	0	Coffee Shop	Sandwich Place	Furniture / Home Store	Café	Wine Shop	Gym / Fitness Center	Gym	Grocery Store	Gourmet Shop	Gift Shop
5	Circoscrizione 6	45.110617	7.705603	0	Hotel	Mattress Store	Café	Bus Stop	Breakfast Spot	Hotel Pool	Grocery Store	Gourmet Shop	Gift Shop	Cosmetics Shop
6	Circoscrizione 7	45.092651	7.726734	0	Trattoria/Osteria	Wine Shop	Cocktail Bar	Gym / Fitness Center	Gym	Grocery Store	Gourmet Shop	Gift Shop	German Restaurant	Gastropub
7	Circoscrizione 8	45.026379	7.665784	0	Skating Rink	Hobby Shop	Auditorium	Supermarket	Pizza Place	Gastropub	Cosmetics Shop	Cupcake Shop	Furniture / Home Store	Garden

Not surprisingly the clustering reflects the general findings: the circoscrizione 1 form a cluster on its own and a second separate cluster is formed by circoscrizione 2, probably because of its distance from the centre (green point south west of the city) that causes a difference in the activities types. The other quarters form a third cluster. They seem to be more uniform residential areas.



Discussion

The results allow us to compare the two cities and judge them according to the categories listed in the introduction. First of all we notice that Torino is a much bigger city with roughly six times the inhabitants of Lausanne. Torino seems to have a more uniform urban structure, with a more uniform population per quarter than Lausanne.

Both cities have a good offer of venues related to food and bars, Lausanne has more urban parks, while Torino offers more in terms of plazas and historic sites. The fact that FourSquare did not allow to get more than 100 venues per call limited the possible analysis, in particular the general city analysis, because we cannot compare the total number of venues found in a certain radius from the center. Also, we set the search radius for venues at 500 m from the point that identifies each quarter. A better analysis would take into account the actual borders of the quarter, since the quarter can have any arbitrary shape and it can be generally bigger than 500 m. I think this limit caused a relatively low number of venues found per quarter in Torino, since each one was on average bigger than 1000 m of diameter.

In terms of career/work, none of the venues available on FourSquare allowed us to judge the offer of the cities. It seems that none of the venues was related to this topic.

In terms of cultural venues (plazas, historic sites, art museums), Torino offers more venues than Lausanne. This seems legit since it's a much bigger city.

Concerning the bars/restaurants, both cities have a very good offer, with cuisines from different origins.

In regards to sport activities, Lausanne has many parks for outdoor activities and the lake. Few quarters also offer Yoga studios in the first 10 most frequent venues. Torino in general has less parks, but in the list per quarter we can find them among the 10 most frequent venues and there are also indoor gyms available.

In general the cities seem to offer diversified activities, Lausanne leaning towards more outdoors/sports and Torino more towards cultural activities. For food related activities the offer is very good in both locations.

Conclusions

We conducted an analysis of the city of Lausanne and Torino in order to compare them in terms of their venues and possible activities. This analysis should allow a young adult to choose between the two of them, considering work/career opportunities, bars/restaurants, cultural and sport activities. The size of the city is very different, Torino being much bigger than Lausanne. They have a very good and diversified offer in terms of bars and restaurants. Lausanne has more parks and outdoors activities, while Torino has a better cultural offer with historic sites, plazas and museums. In order to have a better overview of the cities, the analysis should be run collecting more than 100 venues per call, that is a limitation imposed by FourSquare. Also, the geographical limits of each quarter should be defined more precisely, rather than assuming a circular shape of a certain radius.