Analysis and Comparison of the Cities of Athens and Rome

Introduction – Description of the Business Problem

Athens and Rome are two of the most well-known cities in the world. Athens and Rome, both cities of the "South" (Europe), with a population of over 2 million people, similar climate conditions and mentality, seem to share a lot in common. Through their long presence in human history, they share a glorious past, and have faced several disasters. Athens and Rome. They both are the financial and political center of their respective countries. But how similar is living in Athens compared to Rome? Is there enough variety, or the recent financial crisis also affected the creativity of the market? Aim of this study will be to research, analyze and compare these two great cities, in order to answer the abovementioned questions. The conclusions of the analysis could be beneficiary to both existing and future businesses in the services industry (restaurants, cafes, bars etc) in both countries.

Data

Initially all the necessary data will be gathered in order to have a ground description of the two cities. The analysis and comparison of the two cities will be based on their administrative subdivision, aka their municipalities. Athens is divided into 41 municipalities and Rome into 15. The above-mentioned data will be scrapped from the internet (Citypopulation and Wikipedia respectively) and inserted into a panda data frame. (see figures).
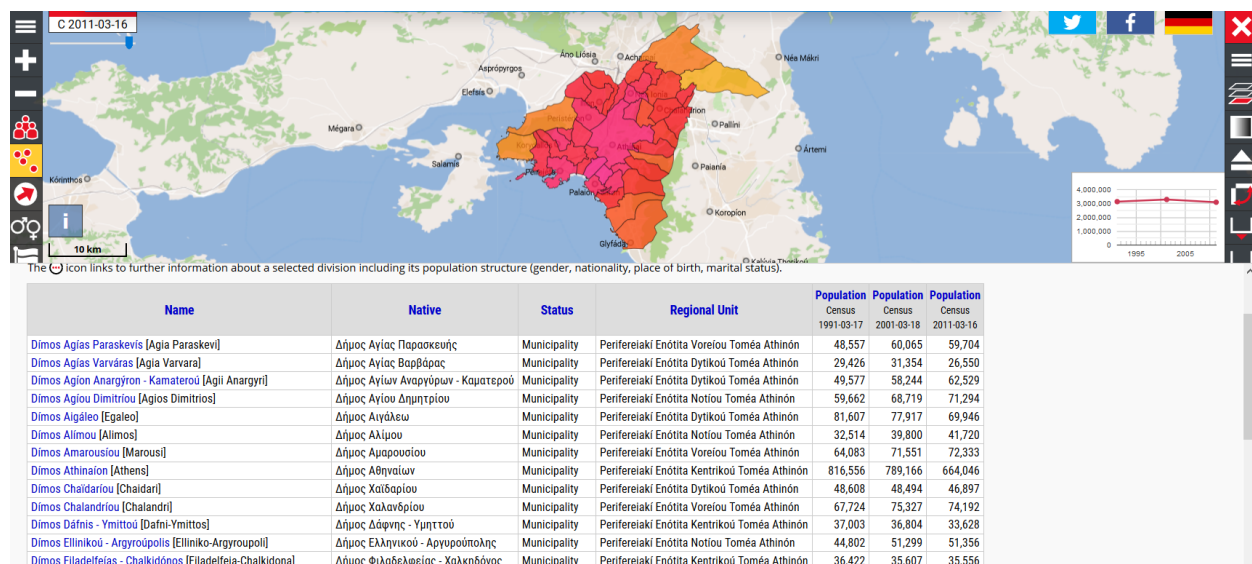

Figure 1. Administrative division of Athens (part of the data)

(Source: https://www.citypopulation.de/en/greece/athens/)

	Name	Native	Status	Regional unit	Population91	Population01	Population11	va
0	Dímos Agías Paraskevís [Agia Paraskevi]	Δήμος Αγίας Παρασκευής	Municipality	Perifereiakí Enótita Voreíou Toméa Athinón	48,557	60,065	59,704	
1	Dímos Agías Varváras [Agia Varvara]	Δήμος Αγίας Βαρβάρας	Municipality	Perifereiakí Enótita Dytikoú Toméa Athinón	29,426	31,354	26,550	
2	Dímos Agíon Anargýron - Kamateroú [Agii Anargyri]	Δήμος Αγίων Αναργύρων - Καματερού	Municipality	Perifereiakí Enótita Dytikoú Toméa Athinón	49,577	58,244	62,529	
3	Dímos Agíou Dimitríou [Agios Dimitrios]	Δήμος Αγίου Δημητρίου	Municipality	Perifereiakí Enótita Notíou Toméa Athinón	59,662	68,719	71,294	
4	Dímos Aigáleo [Egaleo]	Δήμος Αιγάλεω	Municipality	Perifereiakí Enótita Dytikoú Toméa Athinón	81,607	77,917	69,946	

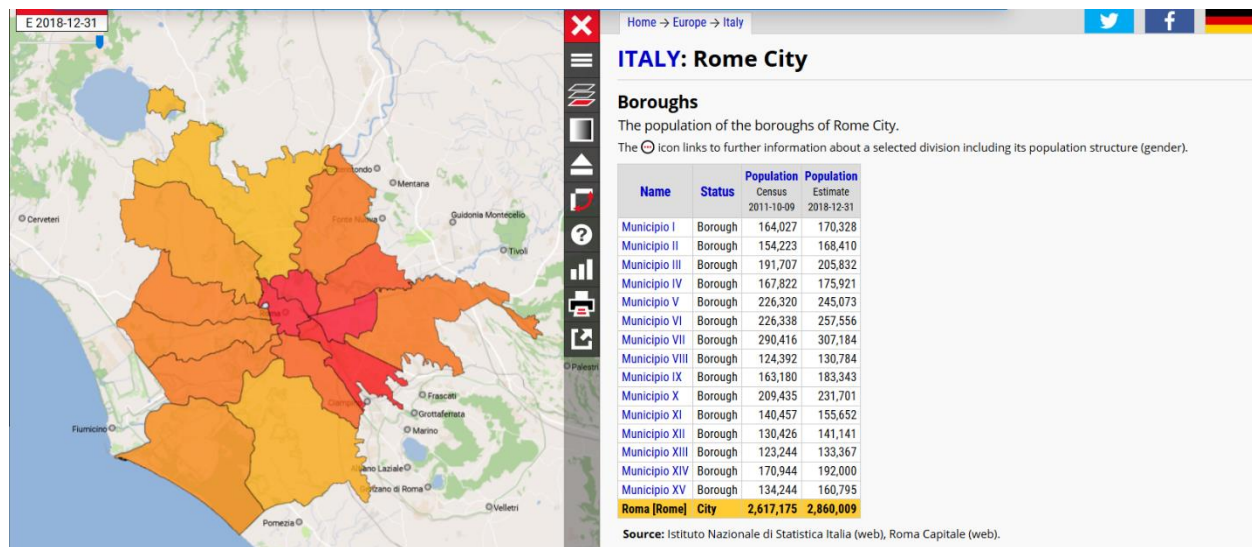**Figure 2**. Panda data frame for Athens (part of the data)

Figure 3. Administrative division of Rome

(Source: https://www.citypopulation.de/en/italy/romacity/)

	Name	Status	Population11	Population18	various
0	Municipio I	Borough	164,027	170,328	→
1	Municipio II	Borough	154,223	168,410	→
2	Municipio III	Borough	191,707	205,832	→
3	Municipio IV	Borough	167,822	175,921	→
4	Municipio V	Borough	226,320	245,073	→

Figure 4. Panda data frame for Rome (part of the data)

As shown in figures 1 and 3, the data used will be tables showing the subdivision of the cities in municipalities, their population and density. In figures 2 and 4 the created data frames for Athens and

Rome are shown. Using Folium Python Package, the data frames are visualized into maps (see figures 5 and 6 for Athens and Rome respectively).
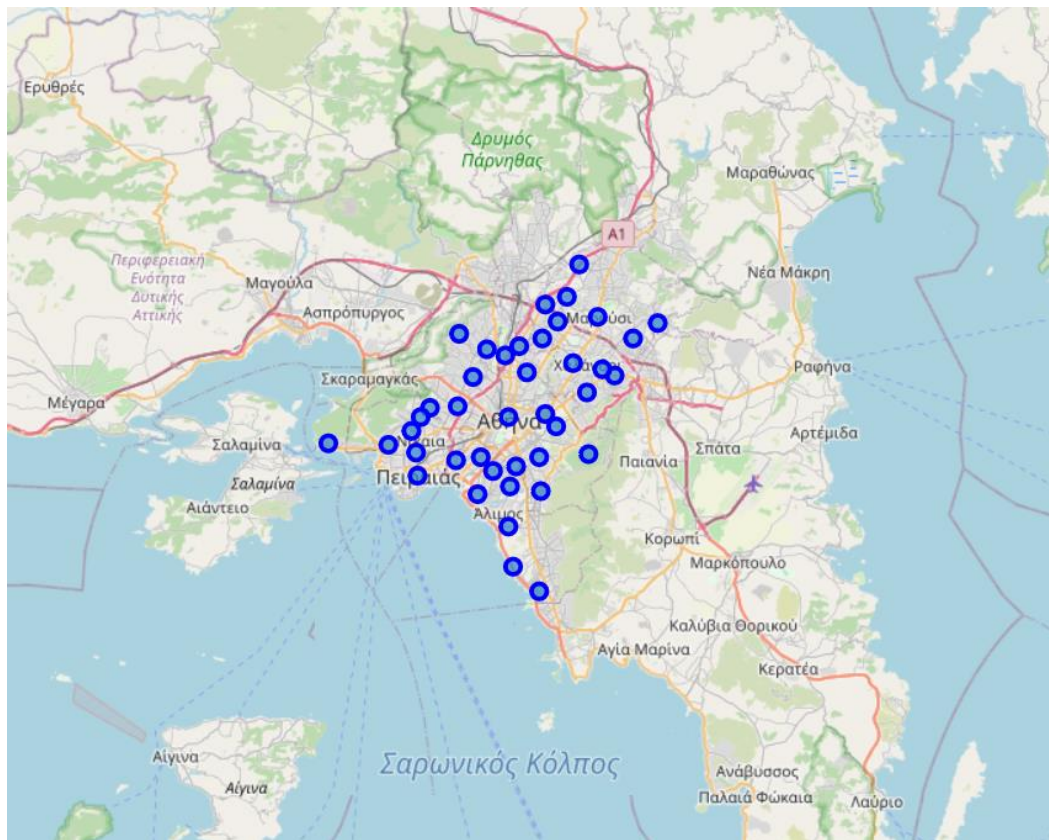

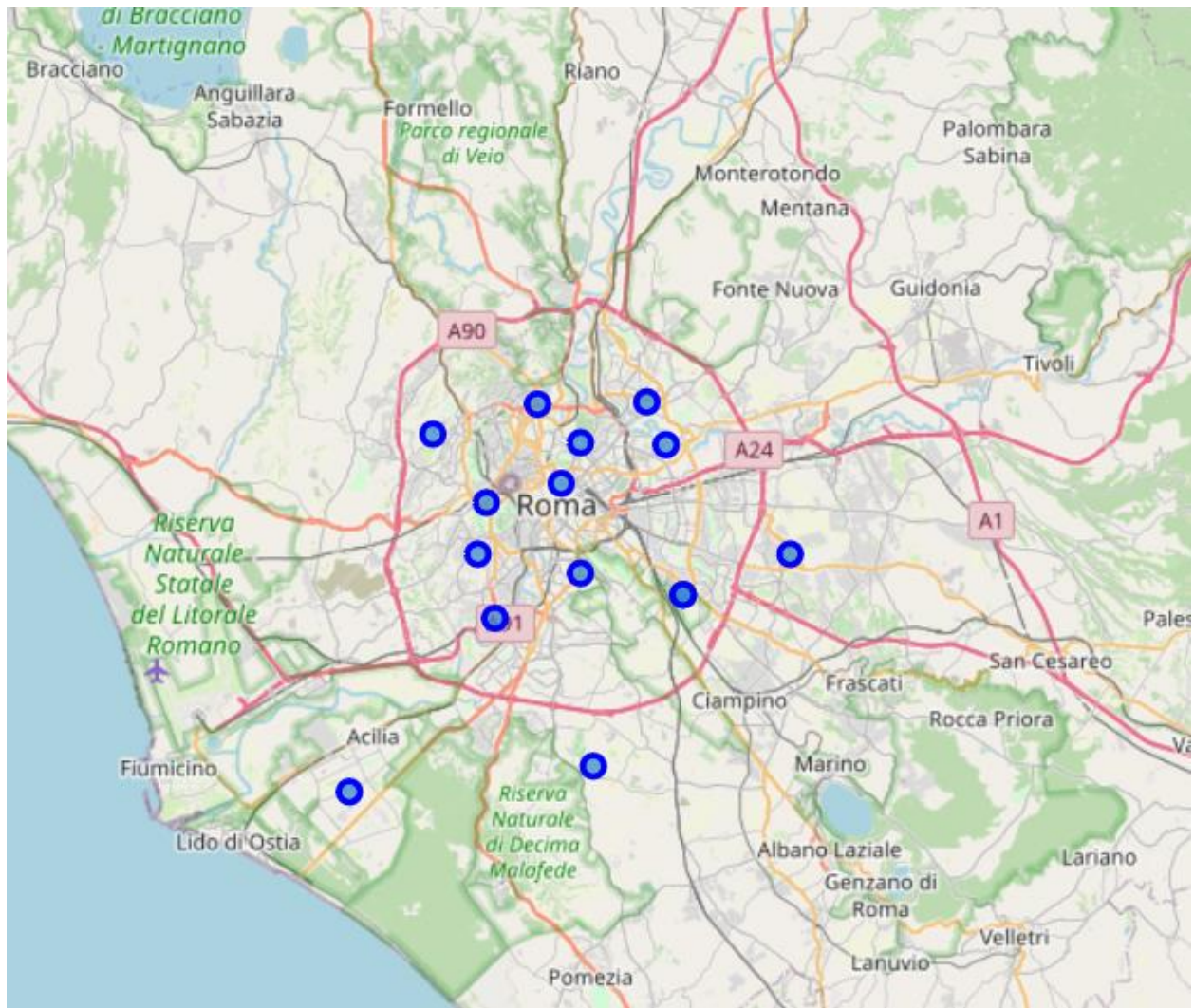**Figure 7**. Map of Athens municipalities using Folium Package

Figure 8. Map of Rome municipalities using Folium Package

Necessary information and prerequisite for the use of the Foursquare API, is the coordinates of the municipalities. This information can be provided either by the Geocoder Python package or by a custom-made csv file. In this case the use of the Geocoder Python Package was inefficient, so the use of the alternative solution has been followed. With the use of the Google search machine the coordinates of the municipalities for both cites have been acquired. A csv file has been created and inserted into the data frame. After the data wrangling and manipulation techniques the complete data frames for Athens and Rome are shown in the next figures.

	Name	Regional unit	Population11	latitude	longitude
0	Dímos Agías Paraskevís [Agia Paraskevi]	Perifereiakí Enótita Voreíou Toméa Athinón	59,704	38.013600	23.82180
1	Dímos Agías Varváras [Agia Varvara]	Perifereiakí Enótita Dytikoú Toméa Athinón	26,550	37.990400	23.65830
2	Dímos Agíon Anargýron - Kamateroú [Agii Anargyri]	Perifereiakí Enótita Dytikoú Toméa Athinón	62,529	38.027106	23.72545
3	Dímos Agíou Dimitríou [Agios Dimitrios]	Perifereiakí Enótita Notíou Toméa Athinón	71,294	37.935700	23.72950
4	Dímos Aigáleo [Egaleo]	Perifereiakí Enótita Dytikoú Toméa Athinón	69,946	37.991566	23.68188

Figure 7. Complete Panda data frame for Athens (part of the data)

	Municipio	latitude	longitude
0	Municipio I- Historical Center	41.9029	12.4855
1	Municipio II- Parioli/Nomentano	41.9224	12.4983
2	Municipio III- Monte Sacro	41.9425	12.5410
3	Municipio IV- Tiburtina	41.9216	12.5537
4	Municipio V- Prenestino/Centocelle	41.8696	12.6327

Figure 8. Complete Panda data frame for Rome (part of the data)

Methodology

Up to now all the necessary information is prepared and visualized. The next step is the exploration of each municipality οφ the two cities, through Foursquare API.

Using a repetitive formula, we search up to 100 venues within a 500m radius of the municipality center. The venues are grouped for each municipality and listed. In Athens there are 198 unique categories of venues, versus 64 in Rome. Municipalities of both cities will be analyzed through one hot encoding (setting "1" if a venue category is present in the are or "0" if not). On the basis of this method, the mean of frequency of occurrence of each category is calculated. Based on the frequency of occurrence the venues are sorted and the ten most frequent venues are selected.

Municipality	Municipality Latitude	Municipality Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Athínai [Athina]	100	100	100	100	100	100
Dímos Agías Paraskevís [Agia Paraskevi]	79	79	79	79	79	79
Dímos Agías Varváras [Agia Varvara]	22	22	22	22	22	22
Dímos Agíon Anargýron - Kamateroú [Agii Anargyri]	19	19	19	19	19	19
Dímos Agíou Dimitríou [Agios Dimitrios]	20	20	20	20	20	20
Dímos Aigáleo [Egaleo]	97	97	97	97	97	97
Dímos Alímou [Alimos]	13	13	13	13	13	13

Figure 9. Number of Venues in Athens municipalities

Municipality	Municipality Latitude	Municipality Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Municipio I- Historical Center	78	78	78	78	78	78
Municipio II- Parioli/Nomentano	29	29	29	29	29	29
Municipio III- Monte Sacro	7	7	7	7	7	7
Municipio IV- Tiburtina	2	2	2	2	2	2
Municipio V- Prenestino/Centocelle	5	5	5	5	5	5
Municipio VI- Roma Delle Torri	11	11	11	11	11	11
Municipio VII- Appio-Latino/Tuscolano/Cinecitta	11	11	11	11	11	11
Municipio VIII- Appia Antica	10	10	10	10	10	10
Municipio X- Ostia/Acilia	3	3	3	3	3	3

Figure 10. Number of Venues in Rome municipalities

The data are grouped, normalized and sorted, in order to create a new data frame, which shows the 10 most common venues for each municipality.

	Municipality	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	Athínai [Athina]	Café	Bar	Theater	Coffee Shop	Hotel	Falafel Restaurant	Greek Restaurant	Dessert Shop	Electronics Store	Comic Shop
1	Dímos Agías Paraskevís [Agia Paraskevi]	Coffee Shop	Electronics Store	Baby Store	Supermarket	Bakery	Pizza Place	Pharmacy	Café	Clothing Store	Furniture / Home Store
2	Dímos Agías Varváras [Agia Varvara]	Café	Grocery Store	Greek Restaurant	Kebab Restaurant	Theater	Optical Shop	Park	Fish Taverna	Fast Food Restaurant	Donut Shop
3	Dímos Agíon Anargýron - Kamateroú [Agii Anargyri]	Café	Snack Place	Coffee Shop	Bar	Supermarket	Breakfast Spot	Mobile Phone Shop	Greek Restaurant	Taverna	Souvlaki Shop
4	Dímos Agíou Dimitríou [Agios Dimitrios]	Ice Cream Shop	Plaza	Greek Restaurant	Sports Club	Health & Beauty Service	Souvlaki Shop	Sporting Goods Shop	Pharmacy	Coffee Shop	Supermarket

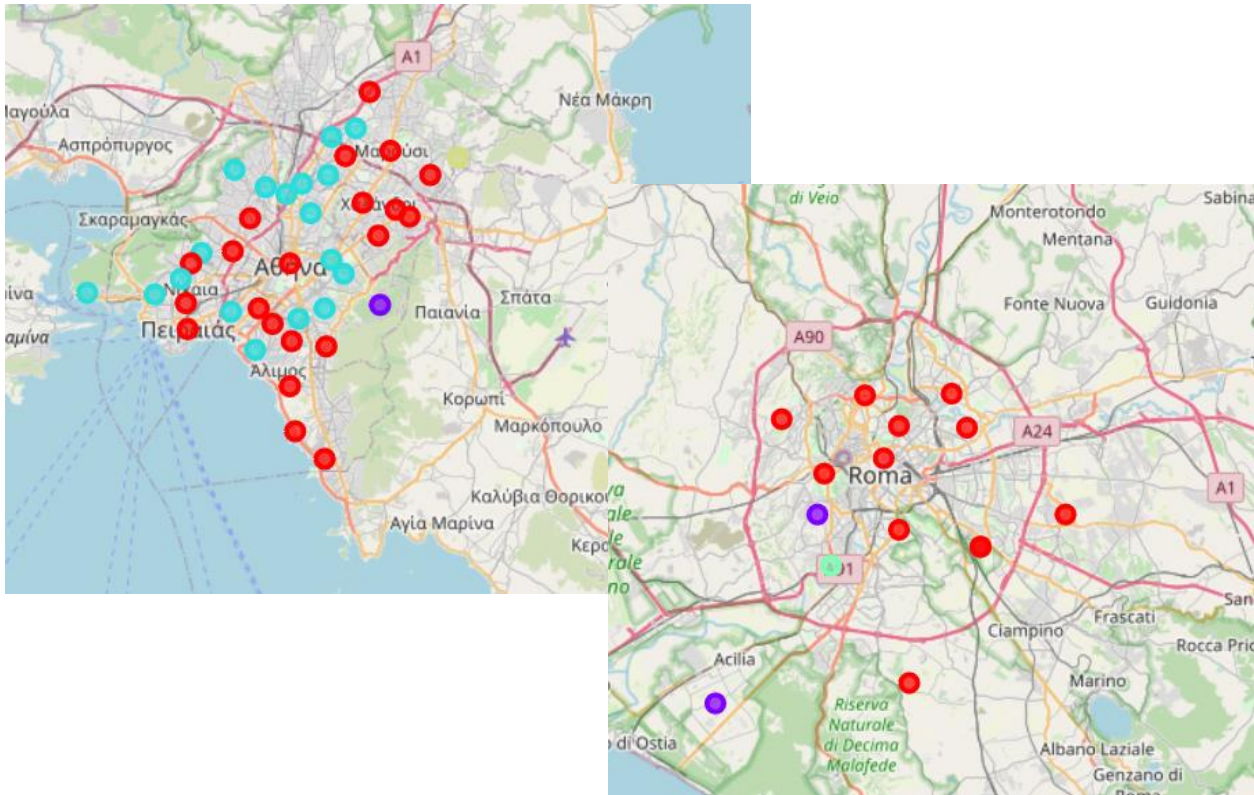**Figure 11.** Most occurring Venues in Athens municipalities

	Municipality	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	Municipio I- Historical Center	Hotel	Italian Restaurant	Plaza	Ice Cream Shop	Boutique	Sandwich Place	Fountain	Women's Store	Café	Dessert Shop
1	Municipio II- Parioli/Nomentano	Italian Restaurant	Seafood Restaurant	Hotel	Restaurant	Pub	Plaza	Nightclub	Dessert Shop	Roman Restaurant	Electronics Store
2	Municipio III- Monte Sacro	Plaza	Café	Italian Restaurant	Trattoria/Osteria	Basketball Stadium	Gym / Fitness Center	Electronics Store	Flower Shop	Fountain	Gift Shop
3	Municipio IV- Tiburtina	Gym Pool	Pizza Place	Women's Store	Jazz Club	Ice Cream Shop	Hotel Pool	Hotel	Home Service	Historic Site	Gym / Fitness Center
4	Municipio V- Prenestino/Centocelle	Plaza	Pizza Place	Theater	Bus Station	Shopping Mall	Women's Store	Fountain	Electronics Store	Flower Shop	Gift Shop
5	Municipio VI- Roma Delle Torri	Pizza Place	Ice Cream Shop	Café	Miscellaneous Shop	Pub	Italian Restaurant	Cupcake Shop	Boarding House	Bookstore	Hotel Pool
6	Municipio VII- Appio-Latino/Tuscolano/Cinecitta	Pizza Place	Ice Cream Shop	Café	Miscellaneous Shop	Pub	Italian Restaurant	Cupcake Shop	Boarding House	Bookstore	Hotel Pool
7	Municipio VIII- Appia Antica	Café	Italian Restaurant	Pizza Place	Ice Cream Shop	Plaza	Supermarket	Vegetarian / Vegan Restaurant	Historic Site	Gym Pool	Gym / Fitness Center

Figure 12. Most occurring Venues in Rome municipalities

Next step is the analysis of the municipalities, by clustering using the k-mean method. The municipalities in Athens will be divided into 4 clusters and in Rome in 3.

Results

The results of the above analysis are shown in the following maps.

The municipalities in Athens are:

- Restaurants and coffee (centralized)

- Coffee and Fast food

- Close to nature

- Traditional cuisine

The municipalities in Rome are:

- Italian cuisine

- Services

- Touristic center

Discussion

The most common venues in both cities are from the food industry, either restaurants or cafes. In Rome they are focused on promoting Italian cuisine, whereas in Athens there is greater variety. Both municipalities can attract Tourists since they offer similar services. They differ of course on the historical places and venues that are present in each city.

In any case for more conclusive analysis more data should be considered.

Conclusion

Athens and Rome municipalities share among others, many similar venues. These venues are mostly restaurants, cafes and other venues of the food industry. Such a result is more than expected since both cities are among the top selected places to visit, thus they have to accommodate apart from its inhabitants a great number of tourists.