

Tracking the most attractive spots for food truck fast food business in Skopje, North Macedonia

Gjorgji Dimeski

Business Problem Introduction

In developing countries, with still underdeveloped service industry there is a great potential in tapping into the underserved sectors and extract additional profits from being the first market entrants. Skopje, the capital city of North Macedonia is one such territory, where most of the fast food industry is based on traditional places such as restaurants, fast food chain joints and bakeries.

To stimulate the operationalization of different types of fast food ventures, this report aims to identify the potential of food truck type fast food ventures through tracking the spots where aforementioned trucks would serve their customers. To the author knowledge, they are currently no fast food trucks in Skopje, so this analysis is explorative in nature i.e. providing motivation and marketing sense to the potential of this particular industry.

The author believes that the advent of freely available geolocation data makes the market research easier and more effective; by leveraging existing venue mappings, food truck owners and no longer required to browse through detailed maps of every neighborhood or trial-and-error locations to test their attractiveness. Instead, a script could be written that, based on specified criteria, could access, analyze and visualize spots that would be attractive to the business at hand.

Methodology

The specific task at hand requires some industry-specific knowledge that would be utilized to compile a set of criteria used for the analysis of the specific spots. First off, the fast food trucks do not need specific business hours that could virtually be open 24/7 as long as they are close and easily accessible to potential customer base. To that end, as the hours of the day change, so do the venues in which people spend their time. For example, for the first shift parks and offices may be the most attractive, while for the later in the day (third shift) bars and clubs may be more suitable. For this purposes, this report will analyze and conclude on spots for all three shifts, divided in particular:

1. 09 AM – 16 PM (based around offices and parks)
2. 16 PM – 20 PM (residential areas and schools)
3. 20 PM – 02 AM (bars and dance clubs)

This task will require mapping all the spots, then segmenting them based on their venues tag and lastly, clustering the areas in which the spots are more prevalent.

As for the data, the authors will mainly use Foursquare API to extract the venues from specific neighborhoods in Skopje, with an additional dataset consisting of the neighborhood names and their coordinates. This dataset is created using a script that extracts the information from Wikipedia page on Skopje neighborhoods (link in Macedonian available [here](#)), and where needed, manually searching and inputting from other sources.

The data will then be used to firstly visualize the neighborhoods, select appropriate venues (depending on the criteria explained above) and conclude on the specific spots where a truck could be placed in a specific shift.

Data Sources and Preparation

To gather appropriate information for our analysis, we need to find the following data:

- List of neighborhoods in Skopje, as well as their latitude and longitude in order to visualize and map them.
- Venues in all neighborhood, particularly venues in the 750 meters radius of a previously defined point (latitude and longitude from above) .We will use this data to perform clustering on the neighbourhoods.

While several web scrapping techniques are used to extract neighborhood data from Wikipedia pages or other sources, in the case of Skopje, this proved especially challenging as most of the data was in Macedonian language or simply scattered through other web pages. For this reason, the author used Python web scrapping libraries (Requests and BeautifulSoup) for the majority of data points, but manually browsed and imputed some of the points which the techniques could not harvested.

After the data frame with all neighborhoods and their respective latitudes and longitudes was created, we could create an interactive neighborhood map that visualized the neighborhoods and their center points.

Using the Foursquare data, we created a data frame with venues and their categories for every single neighborhood. Our data frame consists of 187 unique venue categories, while the count per neighborhood can be seen in the table below:

Neighborhood	Count of categories	Neighborhood	Count of categories	Neighborhood	Count of categories
Debar Maalo	100	Crnice	41	Radishani	17
Prolet	100	Michurin	41	Skopje Sever	17
Kapishtec	100	Chair	38	Hrom	16
Karposh 1	100	Kisela Voda	32	Butel	12
Karposh 3	100	Vlae	29	Zelezara	7
Jane Sandanski	81	Avtokomanda	27	Zlokukjani	7
Karposh 2	81	Madzari	26	Pintija	7
Karposh 4	79	Topansko Pole	26	Shuto Orizari	6
Aerodrom	65	Kozle	24	Kisela Jabuka	6
Taftalidze	65	Keramidnica	21	Nerezi	5
Madzir Maalo	62	Gjorche Petrov	20	Lisiche	5
Vodno	56	Hipodrom	19		
Novo Lisiche	42	Drachevo	17		

We can see that some neighborhoods have more venue categories, meaning that they are the most served neighborhood in the city, in regards to venues opened at their territory. Some neighborhoods are vastly underserved (ex. Lisiche, Nerezi) meaning that here not many venue categories are present. In regards to our business analysis, this means that in some of these neighborhoods there is still an untapped potential in terms of venues.

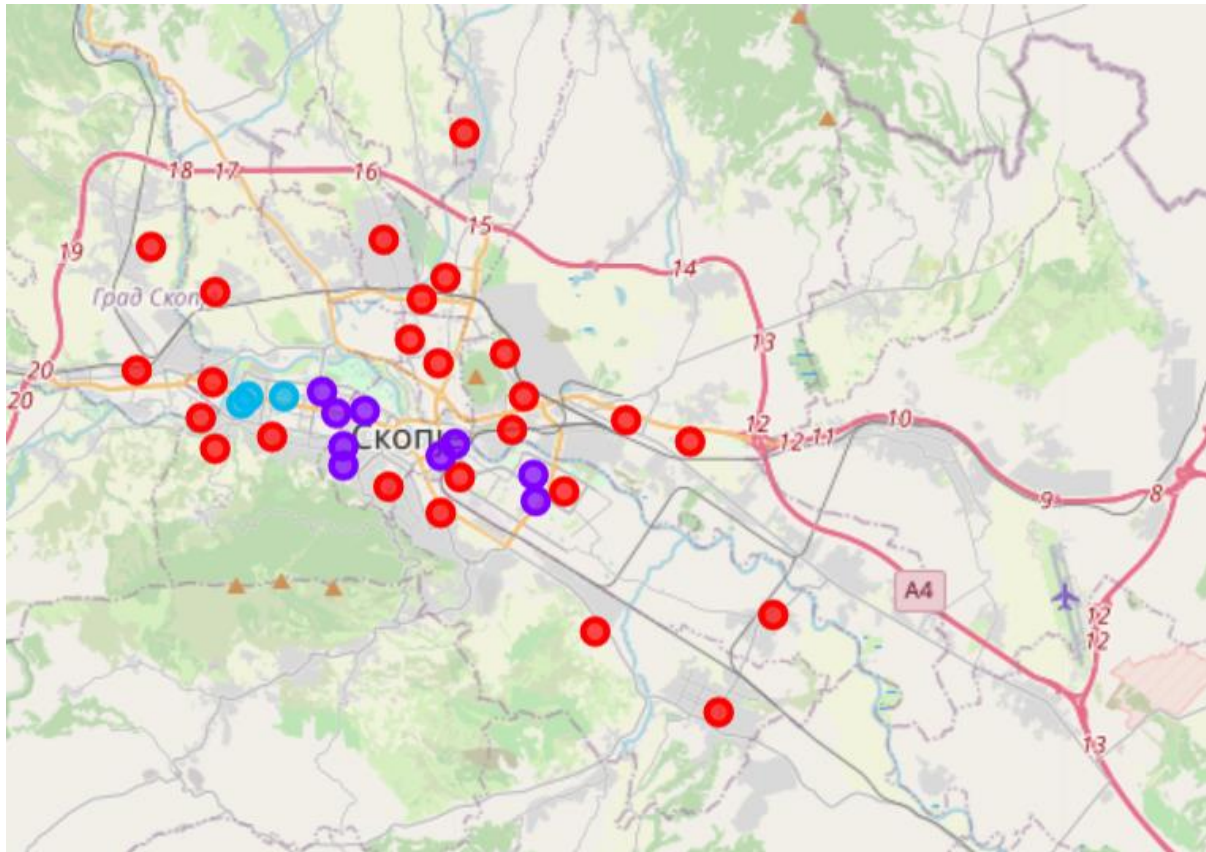
The next thing is to select the top 10 venue categories per neighborhood, via summing the number of venue categories. The resulting data frame will allow us to cluster the neighborhoods later, using the prevalence of venues in each neighborhood and finding similarities between them.

Clustering the neighborhoods

The clustering results will allow us to identify which neighborhoods have a higher concentration of specific venue and enable us to differentiate the distinctive characteristics of each cluster. Based on the occurrence of venue categories in different neighborhoods, the clustering will enable us answer the question of which neighborhoods are most suitable for the respective shift.

The number of clusters is set to 3, meaning that the neighborhoods will be differentiated into three distinct categories, suitable for each of the shifts defined above. After applying the K-Means clustering algorithm, all the neighborhoods get segregated and form different clusters.

The resulting cluster map, with each color denoting a specific cluster look like the following:



We can see that the clustering algorithm segmented the cluster in a way that shows clear geographical distinction. For example, the neighborhood located near the downtown is all segmented into the same cluster, while the outskirts are clustered into a different segment. By closely examining each of the clusters specifically, we can conclude on the types of venues prevalent in each cluster and give an answer to our question at hand: Which cluster is most suitable for each shift?

For example, close examination of cluster 1 (the red dots on the map) revealed that the neighborhoods in this cluster have more open-type categories such as park, forests, flea markets etc, while the cluster 3 (purple dots) are neighborhoods with more restaurants, bars, cafes and clubs. The shopping malls, stores and other types of trading posts are mostly located in cluster 2 (light blue dots).

An example cluster can be seen in the table below

Neighborhood	Cluster	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
Avtokomanda	I	Pizza Place	Athletics & Sports	Park	Market	Bakery	Forest	Nature Preserve	Department Store	Plaza	Cocktail Bar
Vlae	I	Grocery Store	Café	Auto Garage	Restaurant	Soccer Field	Optical Shop	Pizza Place	Department Store	Dessert Shop	Dive Spot
Zelezara	I	Forest	Market	Auto Garage	Bistro	Restaurant	Zoo	Restaurant	Farmers Market	Fair	Event Space
Kisela Voda	I	Café	Restaurant	Market	Park	Grocery Store	Supermarket	Fast Food	Bus Station	Bookstore	Laser Tag
Kozle	I	Park	Bakery	Gym / Fitness Center	Fast Food Restaurant	Café	BBQ Joint	Burger Joint	Electronics Store	Food & Drink Shop	Restaurant
Lisiche	I	Bus Station	Platform	Park	Diner	Fair	Event Space	Restaurant	Electronics Store	Restaurant	Donut Shop
Madzari	I	Casino	Restaurant	Basketball Court	Bakery	Palace	Soccer Stadium	Dessert Shop	Sporting Goods Shop	Martial Arts School	Fruit & Vegetable Store
Novo Lisiche	I	Park	Café	Grocery Store	Market	Cosmetics Shop	Pizza Place	Restaurant	Spa	Soccer Stadium	Soccer Field
Pintija	I	Park	Basketball Court	Pool	Moving Target	BBQ Joint	Bakery	Diner	Fair	Event Space	Restaurant
Radishani	I	Pizza Place	Park	Market	Bakery	Restaurant	Moving Target	Café	Bus Station	Cosmetics Shop	Performing Arts Venue
Hrom	I	Grocery Store	Restaurant	Comedy Club	Taxi Stand	Park	Department Store	Canal	Donut Shop	Market	Basketball Court
Nerezi	I	Restaurant	Furniture Store	Forest	Bakery	Zoo	Fair	Event Space	Restaurant	Electronics Store	Restaurant
Chair	I	Restaurant	Restaurant	Market	Furniture Store	Café	Park	Restaurant	Historic Site	Dessert Shop	Soccer Field
Shuto Orizari	I	Flea Market	Pizza Place	Costume Shop	Ice Cream Shop	Clothing Store	Market	Dive Spot	Fair	Event Space	English Restaurant
Aerodrom	2	Café	Park	Cosmetic	Supermarket	Grocery	Gym /	BBQ	Bakery	Bar	Restaurant

				s Shop	et	Store	Fitness Center	Joint			t
Vodno	2	Café	Gym / Fitness Center	BBQ Joint	Bar	Restaurant	Pizza Place	Coffee Shop	Lounge	Boutique	Hotel
Debar Maalo	2	Café	Bar	Restaurant	BBQ Joint	Burger Joint	Hotel	Eastern European Restaurant	Market	Pizza Place	Electronics Store
Jane Sandanski	2	Café	Restaurant	Park	BBQ Joint	Pizza Place	Bar	Gym / Fitness Center	Shopping Mall	Supermarket	Clothing Store
Karposh 1	2	Café	Bar	Restaurant	Hotel	Bakery	Lounge	Gym / Fitness Center	BBQ Joint	Supermarket	Cupcake Shop
Karposh 2	2	Restaurant	Café	Lounge	BBQ Joint	Diner	Italian Restaurant	Sporting Goods Shop	Playground	Gym / Fitness Center	Breakfast Spot
Madzir Maalo	2	Café	Restaurant	Hotel	Eastern European Restaurant	Gym / Fitness Center	Lounge	BBQ Joint	Dessert Shop	Hostel	Health Food Store
Prolet	2	Restaurant	Hotel	Café	BBQ Joint	Dessert Shop	Gym / Fitness Center	Hostel	Italian Restaurant	Shopping Mall	Eastern European Restaurant
Karposh 3	3	Clothing Store	Café	Restaurant	Pizza Place	Lounge	Fast Food Restaurant	Burger Joint	Cosmetics Shop	BBQ Joint	Park
Karposh 4	3	Clothing Store	Café	Park	Dessert Shop	BBQ Joint	Supermarket	Burger Joint	Pizza Place	Boutique	Shoe Store
Taftalidze	3	Clothing Store	Dessert Shop	Café	Boutique	Electronics Store	Burger Joint	Park	Lounge	Pizza Place	Fast Food Restaurant

Conclusion

The clustering results fit very nice into the task at hand, segmenting the neighborhoods in accordance to the types of venues prevalent in their territory. Our task required proposing neighborhoods which will be relevant for the first, second and third shift of the food truck operations, separating the shifts themselves by the venue categories. For example, the first shift should be around venues that have high traffic in the morning-to-noon hours such as parks, forests, soccer fields etc, while the second shifts should be around shopping malls and stores. As for the third (night) shifts, we find that the most relevant venues are bars, clubs and the like. The clustering algorithm used in our analysis, divided up the neighborhood in this fashion, providing us with a list of neighborhoods with high concentration of the respective types of venues.

From the segmentation, **we can conclude that the first shift of food truck operation can be set in cluster 1, the second shift can be place in cluster 3, while the third (night) shift can be placed in cluster 3, as all these clusters have venues relevant to the shift criteria outlined above in this report.**

The practical usage of this analysis lies specifically in the segmented list of neighborhoods, which can be used by potential business owners to capitalize on the high traffic and extract the most revenues from their food truck operations, Of course, there is more to the food truck business than just selecting high traffic venues , but this analysis could serve as a starting point to initially divide the operations in three shifts. Furthermore, we didn't limit ourselves to selecting one neighborhood but rather gave a list of neighborhoods, meaning that the truck can change locations each day, or the business owner can deploy several trucks to cover more areas at once.

However, they are certain limitations to this type of analysis. First off, we didn't consider other factors such as population density and income of residents that could influence the location decision. Moreover, we didn't account for potential competition from traditional places (such as bakeries, fast foods joints etc) or competition from other food trucks which may start to show up later. However, this is a preliminary analysis meant to explore the potentials and provide initial insights for the operationalization of these type of businesses. Further exploration of these matters is indeed relevant and encouraged by the author.