

Lody w Warszawie – where to open an ice cream shop in Warsaw

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29th June 2020

Introduction

As average temperatures rise on an yearly basis in Warsaw, selling ice cream is the type of business that can bring significant profits, especially in the heated summer months. Natural ice cream (or "lody naturalne", as locals call it) is becoming more and more popular and **entrepreneurs** with very well crafted recipes and marketing strategies are asking "where should I open my shop?", as the **location of the shop could exponentially impact the returns**.

Through this project, I intend to help such entrepreneurs make the right decision when it comes to choosing the location to open their shop using **geospatial data visualisation** such as **choropleth maps** and **KDE (Kernel Density Estimation) heatmaps**.

Data

Based on the definition of our problem, factors that will influence our decision are:

- population density in a given district of Warsaw;
- number of existing ice cream shops in the district;
- distance of the district the from city center.

The data used to solve this problem is:

- geospatial data for **each of the 18 districts in Warsaw** and **the most recent population statistics** been downloaded from GUS (Główny Urząd Statystyczny);
- geospatial data about **venues selling ice cream in Warsaw** collected from FourSquare.

Our dataset contains location data (*lat*, *lng*), where *lat* stands for *latitude* and *lng* for *longitude*, population, area and population per km² for each of the 18 districts of Warsaw. Furthermore, we will calculate the centroid of each district in order to compute the distance from the city center of each district.

Methodology

In this project we will direct our efforts on detecting the districts of Warsaw that can be suitable for opening a new ice cream shop, taking into consideration factors such as population density, number of existing ice cream shops in the district or distance from the city center.

As a first step in the analysis, we will create Folium maps to analyze our geospatial data. Specifically, we will create **choropleth maps** and **KDE (Kernel Density Estimation) heatmaps** to assess the demographical aspects of Warsaw's districts and determine the area of influence of the existing ice cream shops.

Analysis

Having created the geodataframe, we can now use the Folium library to create a map of Warsaw with the districts and their population statistics.

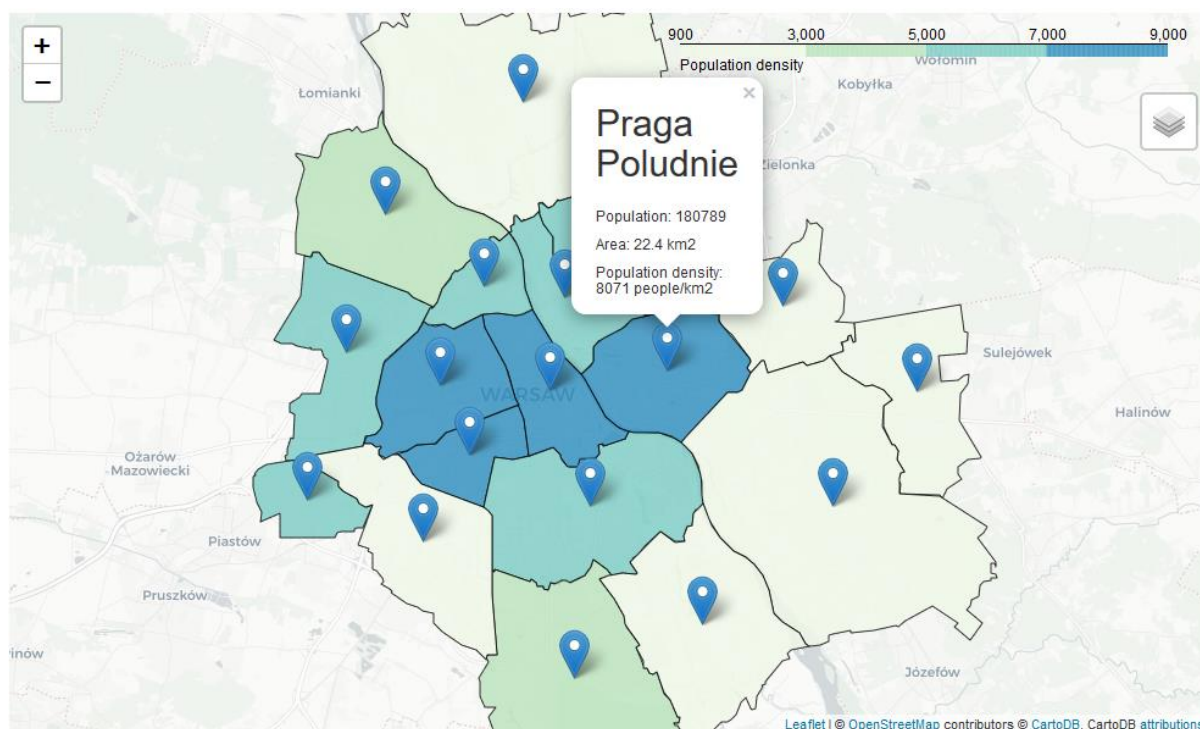


Figure 1. Choropleth map of Warsaw districts by population density

After analyzing the map above, we can observe that the most densely populated districts of Warsaw are: Srodmiescie, Wola, Ochota and Praga Poludnie, whereas the least densely populated districts are at the outskirts, such as Wilanow or Ursus.

Next, let's create a heatmap to have a better view of the spread of ice cream shops in Warsaw.

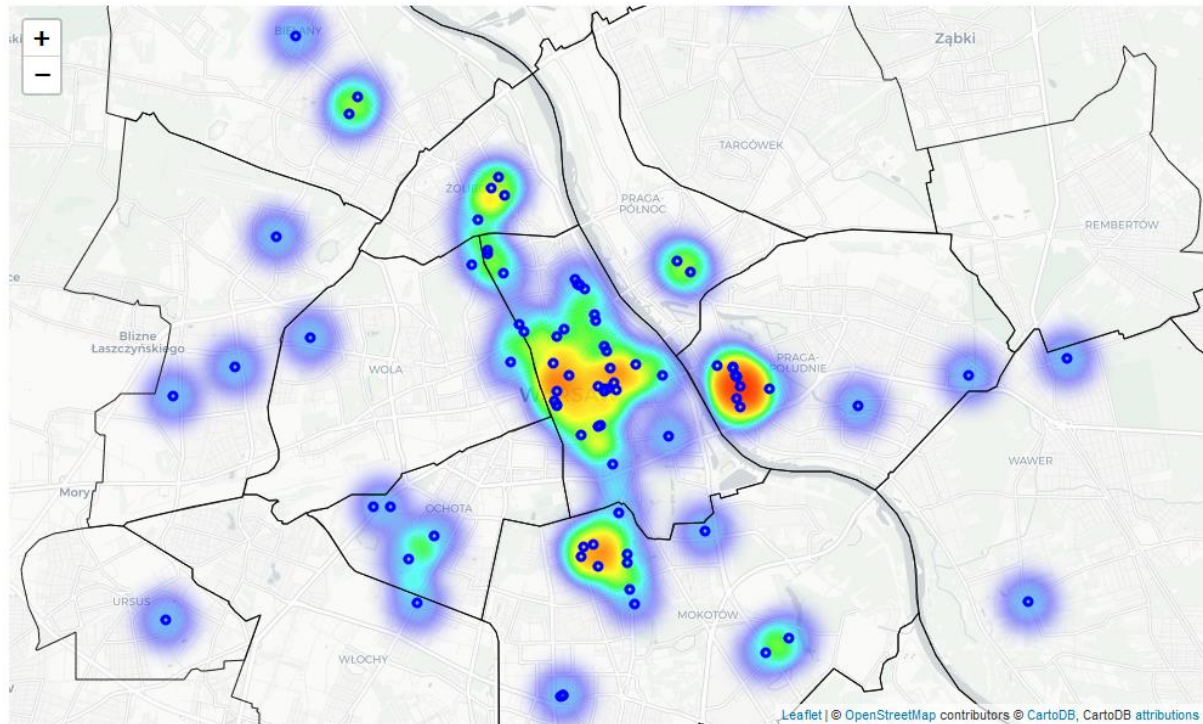


Figure 2. KDE heatmap of Warsaw by ice cream shop localization

The map above gives us a better overview of the number of shops in each district and we can clearly see how the majority of ice cream shops concentrate in the districts of Srodmiescie, Zoliborz, Mokotow, Ochota and Praga Poludnie.

Results and Discussion

Taking into account all the information gathered so far, Wola seems the best district to open an ice cream shop at the moment as the population density is very high compared to other districts and the number of ice cream shops is significantly lower than in districts such as Mokotow or Srodmiescie.

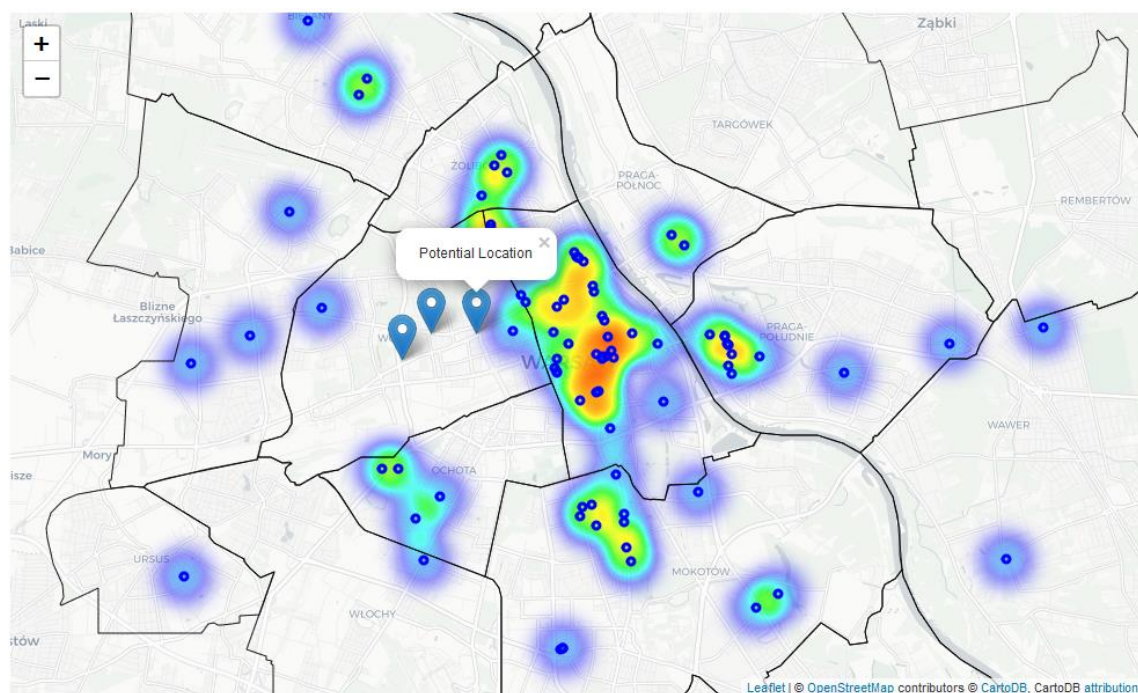


Figure 3. KDE heatmap of Warsaw by ice cream shop localization with potential location

On the map above, we have marked possible locations in the district of Wola that we consider great locations for opening an ice cream shop. All 3 are at the are at street intersections and are either closer to the city center or in a residential area, with no other ice cream shops nearby. For further analysis, we suggest to take into account other variables while creating the choropleth, such as average income level in the district.

Conclusion

The purpose of this project was to identify possible locations to open a new ice cream shop in the city of Warsaw. By gathering enough geospatial data from Foursquare and GUS, we have managed to create choropleth and KDE (Kernel Density Estimation) heatmaps that have facilitated our analysis. Lastly, we have made specific recommendations by marking possible locations in the district of Wola.

The final decision regarding the optimal ice cream shop location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.