Hogskolan Dalarna

Buffer Analysis of Proximity between Restaurants and Bus Stops Using the CeTLeR API

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Introduction

The significance of Points of Interest (POIs) in spatial analysis is profound, especially when evaluating urban infrastructure and service accessibility. The buffer analysis conducted as part of this GIS lab assignment aims to investigate the spatial relationships between restaurants and bus stops within selected areas in Sweden. By employing the CeTLeR API, this study provides insights into how proximity to public transport can influence the accessibility of eateries.

Objective

The primary objective of this lab assignment is to apply spatial buffering techniques to assess the proximity of restaurants to bus stops within specified areas in Sweden. The analysis will focus on visualizing the spatial distribution.

Materials and Methodology

To accomplish the task, the following tools and libraries were utilized:

- CeTLeR API for data retrieval
- R language for handling API data and performing spatial analysis
- Libraries including httr, jsonlite, sf, tmap, leaflet

Kiruna City

The first phase of the analysis focused on Kiruna. When generating the map for this city, it was observed that the proximity of restaurants to bus stops was less than ideal. The analysis revealed only a singular bus stop within the city, leading to many restaurants not being served by nearby public transport options. This resulted in a map dominated by red buffers, indicating a lack of bus stops within a 400-meter radius of the restaurants.

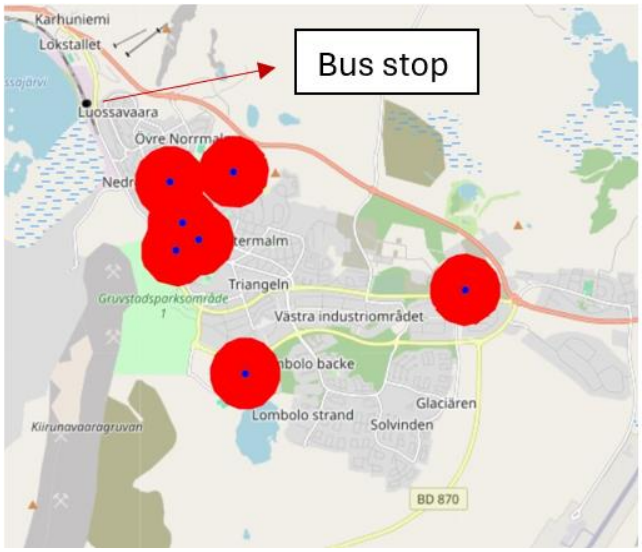

Figure 1 Restaurants and bus stops in Kiruna city.

Luleå City

The analysis proceeded with Luleå, where the situation differed significantly from Kiruna. The map generated for Luleå showed a better distribution of bus stops in proximity to restaurants. The application of the 400-meter buffers revealed a mix of green and red zones, indicating a more balanced presence of accessible restaurants near bus stops.

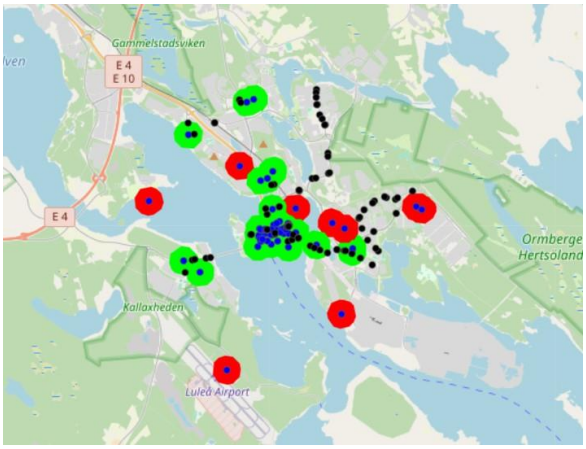

Figure 2 Restaurants and bus stops in Lulea city.

Mobility Gap: Exploring the differences between Sweden and Germany

In this comparative analysis, we explore the mobility differences between Hanau, the 81st largest city in Germany, and Örebro, the sixth largest city in Sweden. Despite their different rankings and similar demographic profiles, these cities demonstrate significant disparities in transportation solutions, particularly in terms of cost-effectiveness and efficiency.

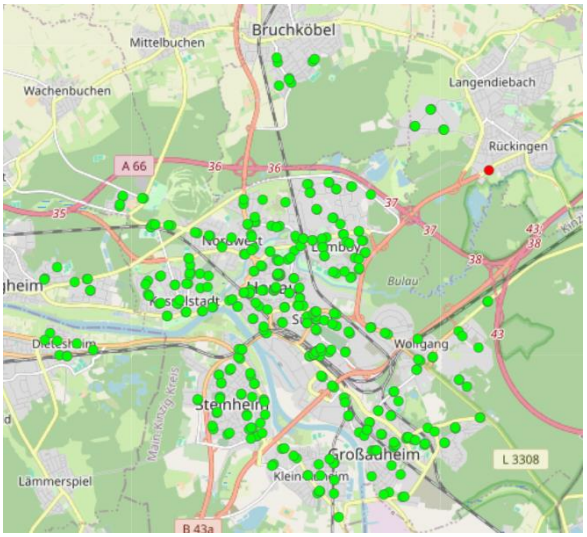

Figure 3 Bus stops in Hanau

In the figure above, you can see a map of Hanau and its bus stops. The green ones indicate stops that are within 500 meters of at least one other bus stop, while the red ones indicate stops that are not. The city appears to be well-served, with a relatively high density of bus stops given its size - a population of 100,000 in a country of 83 million.

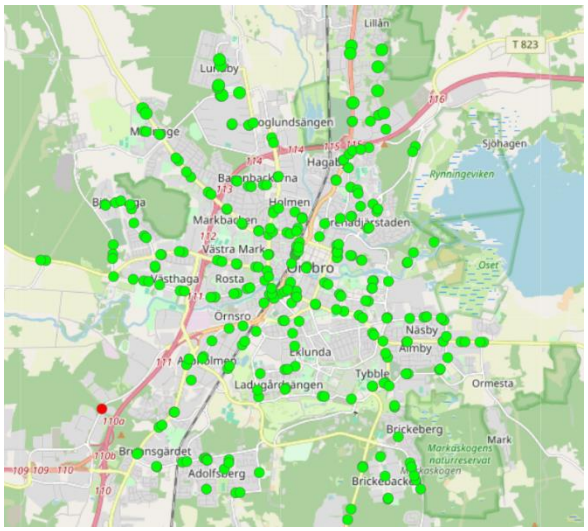

Figure 4 Bus stops in Orebro

Above is the same map, but this time for the Swedish city of Örebro, which is the 6th largest city in Sweden with over 100,000 inhabitants. Yet, it has a lower density of bus stops compared to Hanau.

Results

The analysis resulted in two maps for Kiruna and Luleå, showing buffer zones around restaurants and nearby bus stops. Compared to similar analyses in Germany, Hanau had a higher density of bus stops relative to its population size, highlighting potential differences in public transportation infrastructure and urban planning between the two countries.

Challenges Encountered

The primary challenge in this analysis was the unexpected distribution of bus stops, especially in Kiruna, which led to a predominance of red buffers. Another notable difficulty was managing the timing between API requests, as the fixed 1-second interval sometimes caused issues when executing both requests too quickly. Finding the right pace between requests to avoid overwhelming the system while ensuring timely data retrieval was crucial.

Conclusion

The buffer analysis for Kiruna and Luleå underscored the significance of visual tools in spatial analysis, alongside challenges in data representation. While the methodology was robust, effective communication relied heavily on visual representation. This highlights the importance of flexibility in data visualization. Additionally, despite potentially higher fares, Sweden's public transportation systems, as shown in the analysis, may not always surpass those of other countries, suggesting factors beyond pricing affect their effectiveness and accessibility.