# Exploring the Services Available and the Quality of Playgrounds in Germany

IBM Applied Data Science Capstone Final Project

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# Introduction

**Description of the problem/background**

Before the series of coronavirus lockdowns that we've had in Germany, my spouse and I generally did our shopping and errands while our children were at school. We could then do family trips the nearby playgrounds in the afternoon. Playground trips would occur sometimes several times a week.

Now in coronavirus times, things are a bit different. For weeks at a time, our children are home ALL THE TIME in lockdown with us. So, to go do our shopping involves one of us staying with the children while the other is shopping. One option is of course to stay home with them, but they're also quite bored with being in lockdown and some outside time is great for them anyway. So, now that the lockdowns are less intense - playgrounds open but not always schools and day-cares - we like to combine shopping and playground trips. This generally involves one of us going into the store while the other takes the children to a playground.

To aid the combined shopping-playground process, this project will combine playground and commercial venue data. Using a crowd-sourced playground database and the Foursquare API, we can check which playgrounds are near what sorts of shops. Do we need to go to a variety of stores to meet our shopping requirements? There's a cluster of playgrounds for that. Do we need a set of playgrounds near supermarkets and such? Yep, we can find those. How about playgrounds with extensive equipment or playgrounds that are away from the shops so the children can really go crazy? Yes, we can identify those too. So, there's a couple different problems being discussed here. The primary one is combining shopping and playground trips into the village. The other is identifying playgrounds that fit specific playing needs. That is, playgrounds with a lot of equipment for an extended adventure versus more limited ones for shorter trips. I should be able to address both sorts of information requirements once I collect and prepare the data.

**Data plan**

The plan is to use html web scraping to retrieve a list of playgrounds and their characteristics from the crowd-source based website 'spielplatznet' (https://spielplatznet.de/spielplaetze). This site allows a user to search for a city in Germany which then returns a list of playgrounds in the vicinity. It is based on playground users inputting the data, so not all areas of the country are well-represented. However, the area where I will conduct the analysis - the village of Wedel in the state of Schleswig-Holstein (near Hamburg) has pretty good data. A plus is that I know many of the locations well and so can confirm when the data is complete or missing.

The second substantial data source is the Foursquare API. I will use it to retrieve information on venues near each playground. I can then classify the playgrounds based on what's nearby for the purpose of combining shopping/errands and playground trips to the village. I'll primarily use the Foursquare data in a k-means clustering process, but also to search through for particular types of venues. These will include particular stores, store types, or stores with keywords in their titles such as 'icecream' ('eis' in German).

I will also use geolocator to search for the village's geocoordinates. This is probably a little excessive as I could take an average/mean of the playground coordinates.

**Data examples**

| | playground | latitude | longitude | description | rating | water feature | sandpit | cable car | playhouse | tree house | slide | swing | climbing features | sledding hill | football field | seesa |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Spielplatz Waldspielplatz Moorwegsiedlung Wedel | 53.592631 | 9.731698 | Großer Spielplatz im Wald. Viel Wiese. | 5 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | |

| | Playground | Asian Restaurant | Auto Garage | Bakery | Beach | Beach Bar | Boat Rental | Boat or Ferry | Bookstore | Bus Stop | Café | Clothing Store | College Gym | Construction & Landscaping | Drugstore | Electroni Stc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Spielplatz Croningstraße Wedel | 0.0625 | 0.0625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

**Analysis plan**

The general plan follows:

- Retrieve a list of the playgrounds in the vicinity of a German city.

- Use that list to then look up each playground's detailed information.

- Use Foursquare's api to then find which venues are nearby and add to the dataset.

- Find the commercial characteristics of each playground's neighborhood.

- Cluster the playgrounds based on their commercial surroundings.

- Also cluster the playgrounds based on the equipment available.

- Finally, make a few lists of playgrounds with kid-friendly food and icecream nearby and certain playground features.

# Part I: Data preparation

## Part IA: Get a list of playgrounds in a city of interest

Save as a list of URLs linking to detailed playground information. Set up the search URL by specifying the city where we want to look for playgrounds. Import the city playground search data using a get request and make it more readable with Beautiful Soup. Given a search city, get a list of playground information urls.

Please enter a German city: Wedel

If the search does not return a list of playgrounds in the city, please enter the name of a larger city.

Here is the url where more information is available on the playgrounds available: https://spielplatznet.de/spielplaetze/Wedel

## Part IB: Get detailed playground information for each location

Transform the playground information into a dataframe. Note the source is an amateur, crowd-sourced site. So, getting the relevant information out of it is less straightforward than some of those used in the course. In this section I primarily rely on writing functions to do the work, then calling them at the end:

**A function that retrieves a playground's name and geocoordinates.** This function pulls the basic descriptive data for a playground. It takes a playground's url data as 'a_soup' and returns the playground's name, latitude, longitude, and a longer description that sometimes includes the street address. The longer description is crowd-sourced and so is a bit inconsistent. The output is a dictionary with entries {a_name: playground name, a_lat: latitude, a_long: longitude, a_name_address: long description}

**A function that retrieves a longer playground description and user rating.** The source website includes a space for users to write a longer description of the playground and various notes. For examples, they sometimes note the most appropriate age range for the equipment available. Some playgrounds also have a star rating (with 5-star being the best). However, not all are rated.

**A function that builds a dictionary of German-English playground equipment names.** As the source website is in German, I find it useful to build a German-English dictionary of playground equipment. The German names of common playground equipment types is the key, and the English correspondence as a value. I am also using the dictionary in a later step to keep track of the equipment at a playground. So, the dictionary is of form {German name: [English name, 0]} and the zero is then replaced with a count later.

**A pair of functions that retrieve any playground equipment listed.** The source website sometimes makes note of the types of playground equipment available. The website is great for the intended use, but the html for this area is particularly difficult to retrieve and parse. So, I retrieve the start of the relevant section and the 1,000 chacters to follow. I then transform this information into a string, parse out just the section needed, clean it up a little, and then search through it for the dictionary keys from the prior function. When the relevant words are found, the playground equipment dictionary also acts as a counter and records their existence.

I then make a dataframe of playground information. The dataframe will contain the information for all listed playgrounds in the search city's area.

| | a_name | a_lat | a_long | a_name_address | a_description | a_rating | water feature | sandpit | cable car | playhouse | tree house | sl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Spielplatz Waldspielplatz Moorwegsiedlung Wedel | 53.5926308917772 | 9.73169803619385 | Großer Spielplatz im Wald. Viel Wiese. | Großer Spielplatz im Wald. Viel Wiese. | 5 | 0 | 0 | 1 | 0 | 0 | |
| 0 | Spielplatz Haselweg Wedel | 53.5912910844463 | 9.70646917819977 | Schöner Spielplatz mit angegliederter kleiner ... | Schöner Spielplatz mit angegliederter kleiner... | 5 | 0 | 0 | 0 | 1 | 0 | |
| 0 | Spielplatz Meisenweg Wedel | 53.5943062279335 | 9.71506834030151 | Großer Spielplatz mit viel Wiese. Die Spielger... | Großer Spielplatz mit viel Wiese. Die Spielge... | 5 | 0 | 0 | 0 | 1 | 0 | |
| 0 | Spielplatz Wasserspielplatz Haus am See Wedel | 53.5914407324793 | 9.70553040504456 | Spielplatz Wasserspielplatz Haus am See in Wed | Der Spielplatz macht einen herausragenden Eind | 5 | 1 | 0 | 0 | 0 | 0 | |

## Part IC: Visualizing the playground dataset

**Get some starting coordinates for mapping the playgrounds.** This can certainly be done by taking an average of the playground coordinates or something like that. Another way is to use geolocator searching for the coordinates based on a search for the city in Germany 'search_city'

**Visualize the playground dataset:** Create a folium map of the city's area using the latitude and longitude values. Add markers to the map for each playground in a loop over the dataframe.
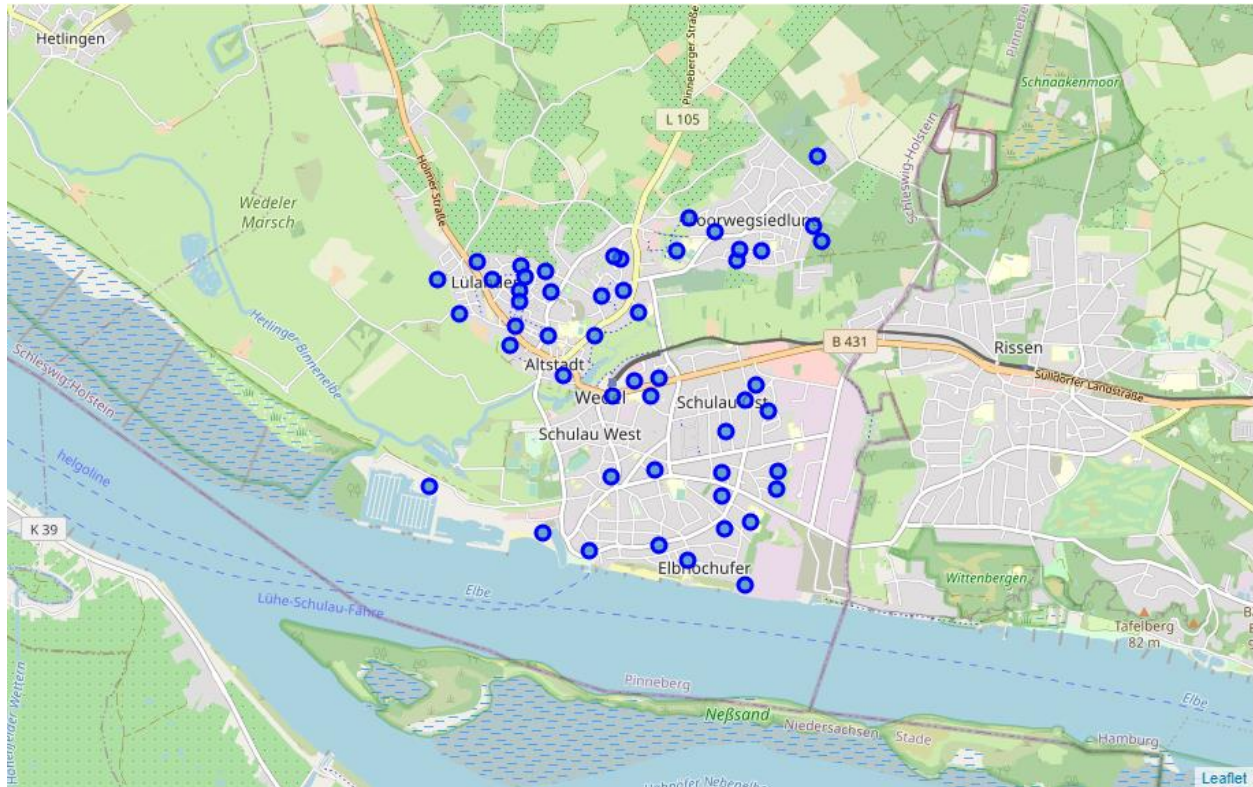
**Alternative, visualize as a heat map:** It might also be interesting to view the playgrounds in the form of a heat map.
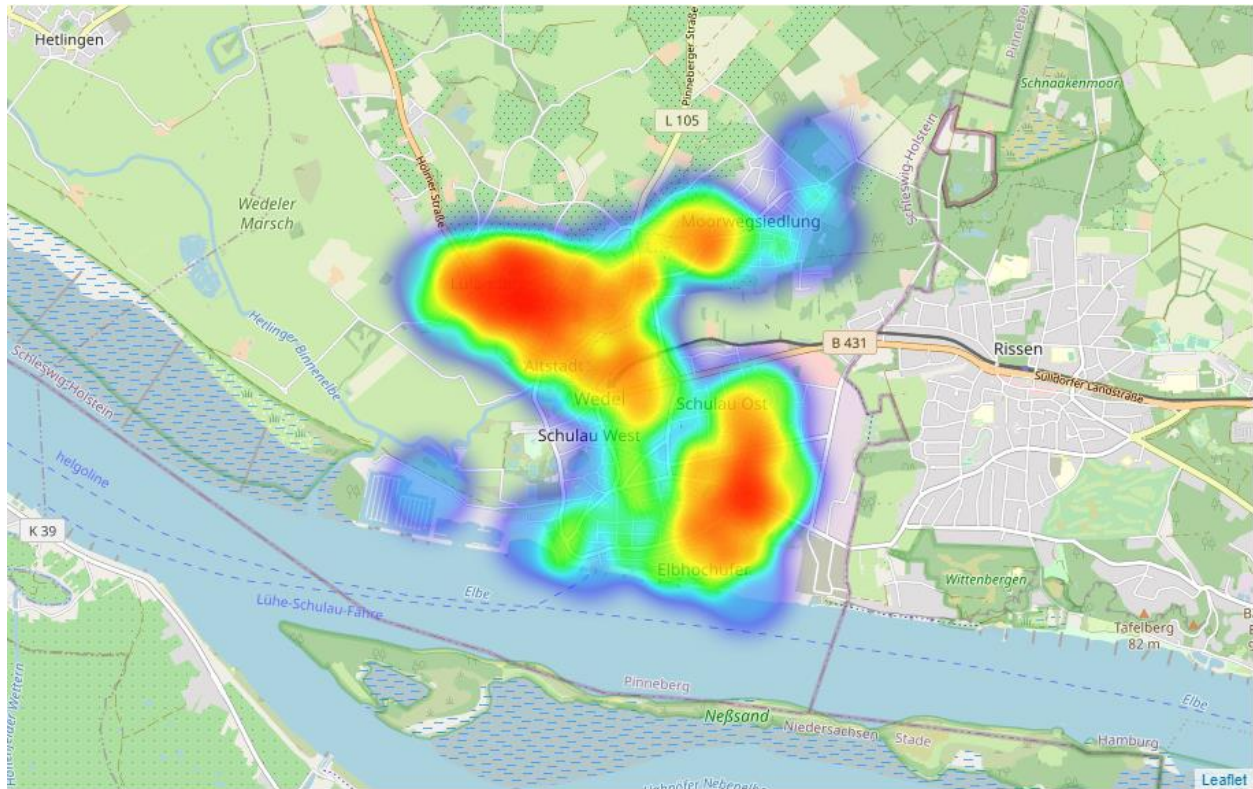


## Part ID: Adding Foursquare data

Set the Foursquare client information which are hidden when sharing (client ID and client secret). Establish the Foursquare search parameters (version, radius, and limit).

**A function that searches Foursquare for venues within a radius around a playground.** This function accesses the Foursquare API, passes the latitudes and longitudes of a set of playgrounds (as well as a radius and return limit), and receives back information on the commercial venues within the circle defined by the radius around each playground.

**Call the getNearbyVenues(...) function for the playgrounds dataset.**

| | Playground | Playground Latitude | Playground Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 0 | Spielplatz Waldspielplatz Moorwegsiedlung Wedel | 53.592631 | 9.731698 | Waldspielplatz | 53.592623 | 9.731623 | Playground |
| 1 | Spielplatz Waldspielplatz Moorwegsiedlung Wedel | 53.592631 | 9.731698 | Hackradt Bäcker | 53.590744 | 9.725168 | Bakery |
| 2 | Spielplatz Haselweg Wedel | 53.591291 | 9.706469 | ALDI NORD | 53.592820 | 9.710503 | Supermarket |
| 3 | Spielplatz Meisenweg Wedel | 53.594306 | 9.715068 | ALDI NORD | 53.592820 | 9.710503 | Supermarket |
| 4 | Spielplatz Meisenweg Wedel | 53.594306 | 9.715068 | Spielplatz | 53.592523 | 9.710625 | Playground |
| 5 | Spielplatz Meisenweg Wedel | 53.594306 | 9.715068 | Schokoengel | 53.590827 | 9.715937 | Café |
| 6 | Spielplatz Meisenweg Wedel | 53.594306 | 9.715068 | elBistro Wedel | 53.590727 | 9.715602 | Mexican Restaurant |
| 7 | Spielplatz Meisenweg Wedel | 53.594306 | 9.715068 | Spielplatz | 53.592500 | 9.720890 | Playground |
| 8 | Spielplatz Wasserspielplatz Haus am See Wedel | 53.591441 | 9.705530 | ALDI NORD | 53.592820 | 9.710503 | Supermarket |
| 9 | Spielplatz Wasserspielplatz Haus am See Wedel | 53.591441 | 9.705530 | Steinberghalle Wedel | 53.589295 | 9.699597 | College Gym |

**Check which categories are returned and for which playgrounds**

There are 54 unique categories:

'Playground' 'Bakery' 'Supermarket' 'Café' 'Mexican Restaurant'
 'College Gym' 'Thai Restaurant' 'Italian Restaurant' 'Drugstore' 'Gym'
 'Doner Restaurant' 'Shopping Mall' 'Fast Food Restaurant' 'Garden Center'
 'Seafood Restaurant' 'Harbor / Marina' 'Boat or Ferry' 'Garden'
 'Photography Studio' 'Taverna' 'Bus Stop' 'Beach' 'Turkish Restaurant'
 'Clothing Store' 'Bank' 'Optical Shop' 'Pub' 'Pool' 'Steakhouse'
 'German Restaurant' 'Hotel' 'Trattoria/Osteria' 'Sculpture Garden'
 'Restaurant' 'Museum' 'Theater' 'Insurance Office' 'Tea Room'
 'Food & Drink Shop' 'Arts & Crafts Store' 'Sandwich Place' 'Nightclub'
 'French Restaurant' 'Gym / Fitness Center' 'Furniture / Home Store'
 'Electronics Store' 'Pet Store' 'Asian Restaurant' 'Plaza' 'Spa'
 'Beach Bar' 'Pier' 'Soccer Field' 'Sushi Restaurant'
Number of entries per playground range from one to 21 with about five on average.

**Prepare to analyze the data using dummy variable encoding.** Use one hot encoding on the venues data. For the purposes of clustering, normalize these by the mean.

| | Playground | Arts & Crafts Store | Asian Restaurant | Bakery | Bank | Beach | Beach Bar | Boat or Ferry | Bus Stop | Café | Clothing Store | College Gym | Doner Restaurant | Drugstore | Electron St |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Spielplatz Albert-Schweizer Schule Wedel | 0.20 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.200000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.00 | |
| 1 | Spielplatz Alter Zirkusplatz Wedel | 0.00 | 0.0 | 0.083333 | 0.083333 | 0.0 | 0.0 | 0.0 | 0.083333 | 0.083333 | 0.083333 | 0.000000 | 0.000000 | 0.00 | |
| 2 | Spielplatz Altstadtschule Wedel | 0.00 | 0.0 | 0.050000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.050000 | 0.000000 | 0.000000 | 0.050000 | 0.05 | |
| 3 | Spielplatz Anne-Frank-Weg Wedel | 0.00 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.000000 | 0.250000 | 0.000000 | 0.00 | |
| 4 | Spielplatz Ansgariusweg Wedel | 0.00 | 0.0 | 0.250000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.00 | |
| 5 | Spielplatz Appelboomtwiete Ecke Aastwiete Wedel | 0.00 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.000000 | 0.333333 | 0.000000 | 0.00 | |
| 6 | Spielplatz Appelboomtwiete Ecke Steinberg Wedel | 0.00 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.000000 | 0.333333 | 0.000000 | 0.00 | |
| 7 | Spielplatz Autal Wedel | 0.00 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.166667 | 0.000000 | 0.000000 | 0.000000 | 0.166667 | 0.00 | |
| 8 | Spielplatz Brombeerweg Wedel | 0.25 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.250000 | 0.250000 | 0.000000 | 0.000000 | 0.000000 | 0.00 | |
| 9 | Spielplatz Bürgerpark Wedel | 0.00 | 0.0 | 0.000000 | 0.000000 | 0.0 | 0.0 | 0.0 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.00 | |

# Part II: Methodology and results

## Part IIA: Exploring the top five venue types for each playground

As we want the top five for each, run as a loop of each playground. Example output:

```
---- Spielplatz Albert-Schweizer Schule Wedel----
                venue  freq
0   Arts & Crafts Store   0.2
1   Photography Studio    0.2
2            Bus Stop     0.2
3          Supermarket    0.2
4              Garden     0.2


---- Spielplatz Alter Zirkusplatz Wedel----
               venue  freq
0      Shopping Mall   0.17
1        Supermarket   0.17
2   Turkish Restaurant  0.08
3          Bus Stop    0.08
4            Taverna   0.08
```

**A function that sorts and returns the most common venues, then display the playgrounds with their frequency of categories returned.** A top ten most common list is returned, but really the top five remain the useful metric for choosing shopping-playground trips. Example output:

| | Playground | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue |
|---|---|---|---|---|---|---|
| 0 | Spielplatz Albert-Schweizer Schule Wedel | Arts & Crafts Store | Garden | Supermarket | Photography Studio | Bus Stop |
| 1 | Spielplatz Alter Zirkusplatz Wedel | Supermarket | Shopping Mall | Turkish Restaurant | Café | Bakery |
| 2 | Spielplatz Altstadtschule Wedel | Italian Restaurant | Hotel | Sculpture Garden | Trattoria/Osteria | Museum |
| 3 | Spielplatz Anne-Frank-Weg Wedel | Garden Center | Supermarket | College Gym | Insurance Office | Turkish Restaurant |
| 4 | Spielplatz Ansgariusweg Wedel | Bakery | Tea Room | Supermarket | Garden Center | Turkish Restaurant |

## Part IIB: Clustering and mapping based on venues

Fit the k-means algorithm to the playground surrounding venues normalized data. Create a new dataframe that includes the cluster labels as well as the top 10 venues around each playground.

Example output (of 51 playground entries and 45 total columns of playground equipment, total, etc.):

| | Cluster Labels | Playground | a_lat | a_long | a_name_address | a_description | a_rating | water feature | sandpit | cable car | playhouse | tree house | slide | swing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | Spielplatz Waldspielplatz Moorwegsiedlung Wedel | 53.592631 | 9.731698 | Großer Spielplatz im Wald. Viel Wiese. | Großer Spielplatz im Wald. Viel Wiese. | 5 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | Spielplatz Haselweg Wedel | 53.591291 | 9.706469 | Schöner Spielplatz mit angegliederter kleiner ... | Schöner Spielplatz mit angegliederter kleiner... | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | Spielplatz Meisenweg Wedel | 53.594306 | 9.715068 | Großer Spielplatz mit viel Wiese. Die Spielger... | Großer Spielplatz mit viel Wiese. Die Spielge... | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | Spielplatz Wasserspielplatz Haus am See Wedel | 53.591441 | 9.705530 | Spielplatz Wasserspielplatz Haus am See in Wed... | Der Spielplatz macht einen herausragenden Eind... | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | Spielplatz Mühlenweg Wedel | 53.581066 | 9.710192 | Schön gestalteter Spielplatz am Mühlenweg. | Schön gestalteter Spielplatz am Mühlenweg. <br/> | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 4 | Spielplatz Rotdornstraße Wedel | 53.591067 | 9.688362 | Besonderheiten laut der Liste aus Wedel in Zah... | Besonderheiten laut der Liste aus Wedel in Za... | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | Spielplatz Hamburger Yachthafen Wedel | 53.574397 | 9.682394 | neuer, riesiger toller spielplatz, muss man hi... | neuer, riesiger toller spielplatz, muss man h... | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 3 | Spielplatz Ginsterweg Wedel | 53.573638 | 9.719113 | Der Spielplatz ist auf mehrere Ebenen in einem... | Der Spielplatz ist auf mehrere Ebenen in eine... | 4 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 3 | Spielplatz Hans-Böckler Platz Wedel | 53.568860 | 9.714913 | Der Spielplatz ist zur Straße hin mit einem Za... | Der Spielplatz ist zur Straße hin mit einem Z... | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 3 | Spielplatz Pulverstraße Wedel | 53.571205 | 9.719400 | Dieser mittelgroße Spielplatz befindet sich nö... | Dieser mittelgroße Spielplatz befindet sich n... | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 1 | Spielplatz Alter Zirkusplatz Wedel | 53.575596 | 9.710723 | Versteckter Spielplatz mit schattigen Ecken un... | Versteckter Spielplatz mit schattigen Ecken u... | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |

**Visualize the clustering result:**
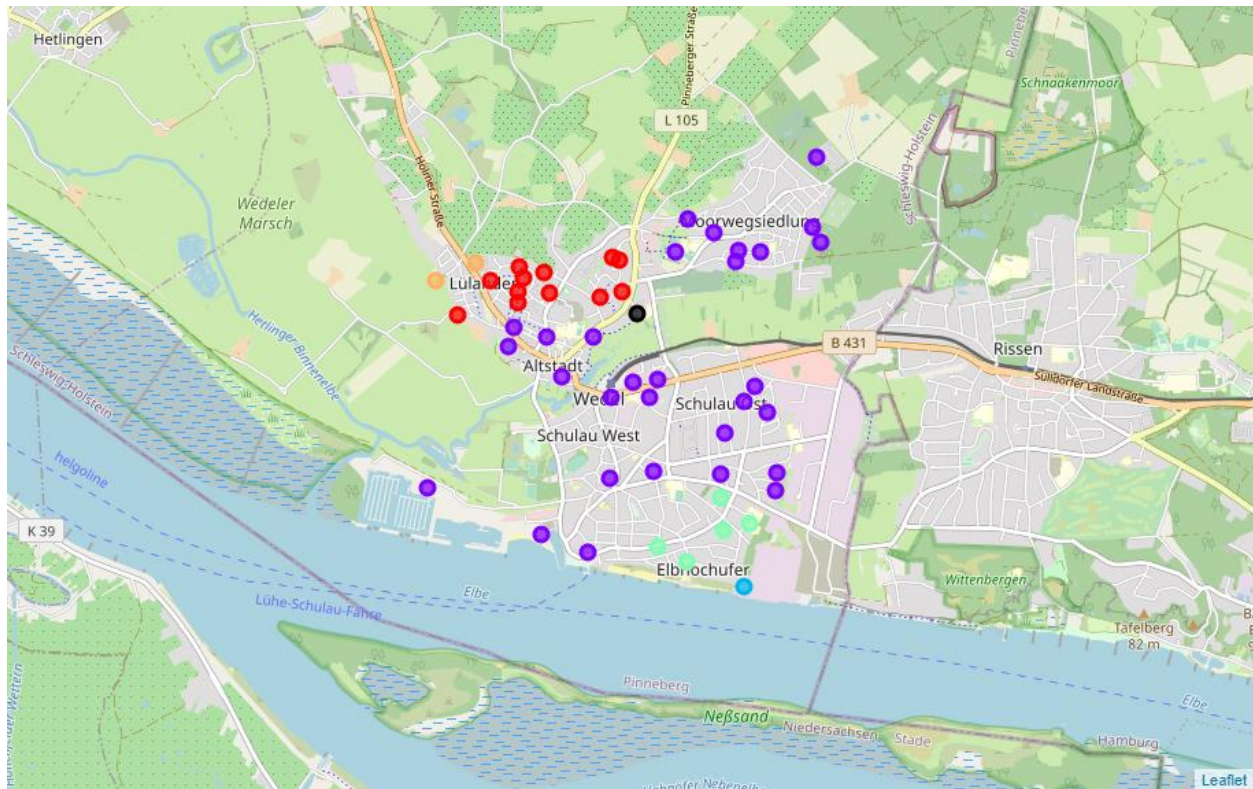


**Make detailed lists of each cluster for analysis:**

- Cluster 0 (red): A residential neighborhood of the village. There are less cafes here and a more residential/homeowner services

- Cluster 1 (purple): The bulk of observations. In the more urban area of the village with access to several small shops and services. A better choice for an extended outing that includes playgrounds and socializing

- Cluster 2 (blue): A beach playground isolated from most shops.

- Cluster 3 (light-green): 1960's-70's area of city with smaller home businesses and second-hand stores.

- Cluster 4 (orange): Playgrounds on the road into the village which share the same shops.

- Cluster 5 (black): This playground didn't return commercial venues nearby. Foursquare is not entirely consistent for this area as this playground isn't that isolated.

## Part IIC: Clustering and mapping based on playground equipment

This is an alternative way to map and explore that data. If the focus isn't on combining tasks, but rather choosing a playground based on the equipment available, clustering can help reduce the search cost involved.

Prepare a second dataframe to use in clustering on playground equipment. Normalize the data using StandardScaler. Run k-means clustering on the playground equipment data. Combine clustering result and datasets. Map the new clusters.
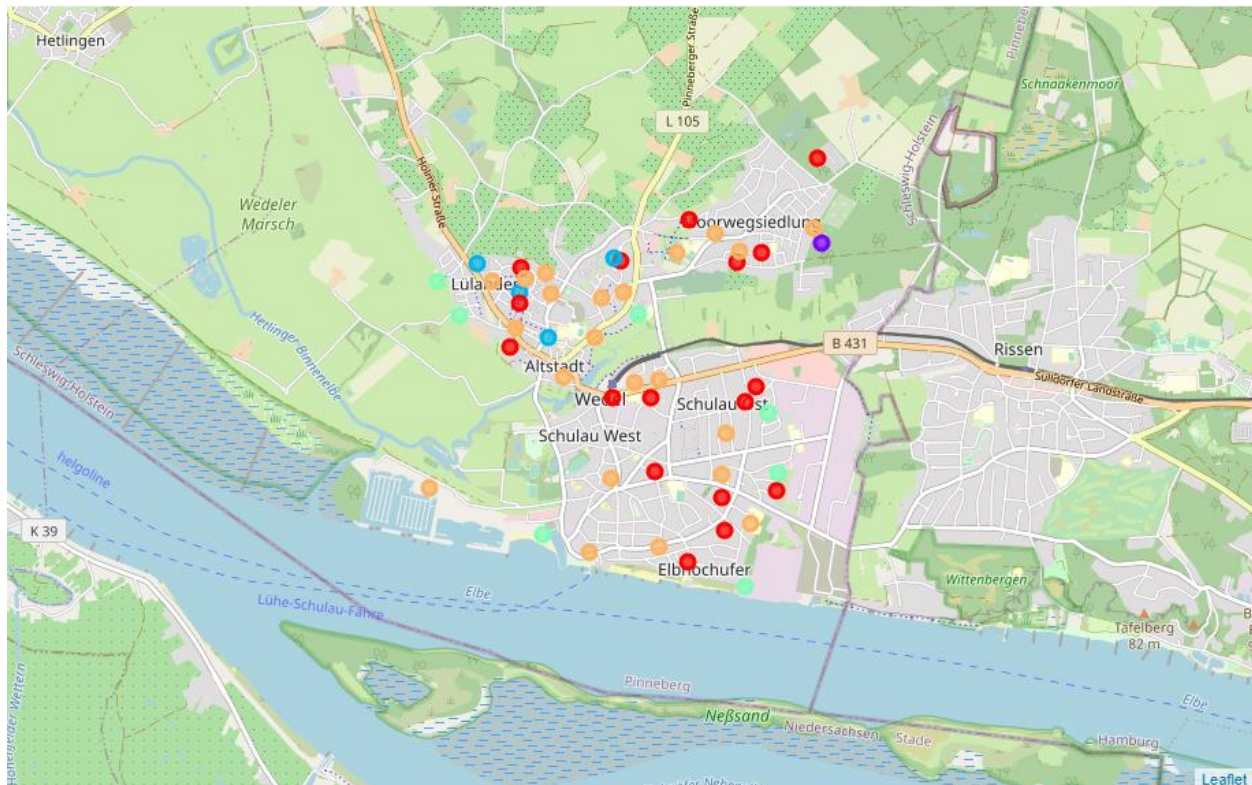


**Analyzing the playground equipment-based groupings:**

• Cluster 0 (red): These are mostly some pretty good playgrounds, good for hour-long trips

• Cluster 1 (purple): This is an exceptional forest playground, the kind that parents send pictures of to other people. There's probably even some equipment that's not listed here

• Cluster 2 (blue): All the playgrounds with water features (pumps, troughs, water wheels, etc.). These tend to have less standard playground equipment, and are more just focused on water play

• Cluster 3 (light-green): These playgrounds all include football/soccer fields and good equipment

• Cluster 4 (orange): Some have less going on –more neighborhood playgrounds than those worth driving to. Also, the playgrounds without ratings and poorly listed equipment. It may be that these do not have much data provided to the webpage.

## Part IID: Finding the playgrounds that are near fast food restaurants, icecream shops, etc.

Sometimes it's more important to find a playground with a particular venue nearby. Here's some of those sets.

**Find the playgrounds with 'fast food restaurants' nearby:** Listing the playgrounds but also the restaurant names. Kids gotta eat and sometimes playground adventures go longer than planned. If it seems like one of those days, maybe it's best to go to one of these playgrounds.

| | Playground | Playground Latitude | Playground Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 18 | Spielplatz Mühlenweg Wedel | 53.581066 | 9.710192 | Hähnchengrill Wedel | 53.579899 | 9.703757 | Fast Food Restaurant |
| 69 | Spielplatz Altstadtschule Wedel | 53.582625 | 9.699267 | Hähnchengrill Wedel | 53.579899 | 9.703757 | Fast Food Restaurant |
| 86 | Spielplatz Croningstraße Wedel | 53.581910 | 9.723378 | Burger King | 53.583856 | 9.726297 | Fast Food Restaurant |
| 92 | Spielplatz Croningstraße Wedel | 53.581910 | 9.723378 | McDonald's | 53.583530 | 9.723654 | Fast Food Restaurant |
| 123 | Spielplatz Heinrich-Schacht-Straße Wedel | 53.580021 | 9.724880 | Burger King | 53.583856 | 9.726297 | Fast Food Restaurant |
| 128 | Spielplatz Heinrich-Schacht-Straße Wedel | 53.580021 | 9.724880 | McDonald's | 53.583530 | 9.723654 | Fast Food Restaurant |
| 161 | Spielplatz Rosengarten Wedel | 53.581053 | 9.705455 | Hähnchengrill Wedel | 53.579899 | 9.703757 | Fast Food Restaurant |
| 199 | Spielplatz Kronskamp Wedel | 53.580795 | 9.722074 | Burger King | 53.583856 | 9.726297 | Fast Food Restaurant |
| 204 | Spielplatz Kronskamp Wedel | 53.580795 | 9.722074 | McDonald's | 53.583530 | 9.723654 | Fast Food Restaurant |
| 300 | Spielplatz Theaterstraße Wedel | 53.582217 | 9.708180 | Hähnchengrill Wedel | 53.579899 | 9.703757 | Fast Food Restaurant |

**Find the playgrounds near venues that service ice cream:** Search for 'Eis' in the business title since it doesn't have it's own venue category. Note 'Eis' is German for 'ice cream'. There is another restaurant in the village that has a walk-up ice cream window, but 'eis' isn't in the name. One option would be to vastly increase the number of Foursquare API calls and see if we can check menus for ice cream.

| | Playground | Playground Latitude | Playground Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 39 | Spielplatz Alter Zirkusplatz Wedel | 53.575596 | 9.710723 | Eiscafé Venezia | 53.577454 | 9.70535 | Café |
| 154 | Spielplatz Rosengarten Wedel | 53.581053 | 9.705455 | Eiscafé Venezia | 53.577454 | 9.70535 | Café |
| 182 | Spielplatz Vogt-Körner Straße Wedel | 53.575123 | 9.705176 | Eiscafé Venezia | 53.577454 | 9.70535 | Café |

**Find the playgrounds that list water features:** These generally include various pumps, channels, waterwheels, etc. These are very popular and useful in the summer. Unfortunately, the playgrounds where water features were noted does not correspond to the playgrounds near the ice cream shop in the prior list (in the case of the village of Wedel).

| | Cluster Labels | Playground | a_lat | a_long | a_name_address | a_description | a_rating | water feature | sandpit | cable car | playhouse | tree house | slide | swing | clin fea |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2 | Spielplatz Wasserspielplatz Haus am See Wedel | 53.591441 | 9.705530 | Spielplatz Wasserspielplatz Haus am See in Wed... | Der Spielplatz macht einen herausragenden Eind... | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 0 | 2 | Spielplatz Rotdornstraße Wedel | 53.591067 | 9.688362 | Besonderheiten laut der Liste aus Wedel in Zah... | Besonderheiten laut der Liste aus Wedel in Za... | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |
| 0 | 2 | Spielplatz Anne-Frank-Weg Wedel | 53.588950 | 9.693766 | Spielplatz mit Matschanlage (also die Ersatzkl... | Spielplatz mit Matschanlage (also die Ersatzk... | 4 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | |
| 0 | 2 | Spielplatz Gärtnerstraße Wedel | 53.585607 | 9.697387 | Dieser Spielplatz wurde seit meinem letzten Be... | Dieser Spielplatz wurde seit meinem letzten B... | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | |

**Find the playgrounds with supermarkets nearby:** Gotta shop sometimes, might as well do a shopping-playground trip and save time. I'm partial to Netto, so searching based on that brand of supermarket.

| | Playground | Playground Latitude | Playground Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|---|---|---|---|---|---|---|
| 32 | Spielplatz Hans-Böckler Platz Wedel | 53.568860 | 9.714913 | Netto Marken-Discount | 53.569410 | 9.713800 | Supermarket |
| 36 | Spielplatz Pulverstraße Wedel | 53.571205 | 9.719400 | Netto Marken-Discount | 53.569410 | 9.713800 | Supermarket |
| 73 | Spielplatz Anne-Frank-Weg Wedel | 53.588950 | 9.693766 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |
| 76 | Spielplatz Ansgariusweg Wedel | 53.587196 | 9.686224 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |
| 105 | Spielplatz Gärtnerstraße Wedel | 53.585607 | 9.697387 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |
| 114 | Spielplatz Ernst-Thälmann-Weg Wedel | 53.588167 | 9.693680 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |
| 215 | Spielplatz Bürgerpark Wedel | 53.584817 | 9.692506 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |
| 228 | Spielplatz Elbstraße Wedel | 53.569940 | 9.711303 | Netto Marken-Discount | 53.569410 | 9.713800 | Supermarket |
| 249 | Spielplatz Reepschlägerstraße Wedel | 53.586330 | 9.693267 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |
| 258 | Spielplatz Schlehdornweg Wedel | 53.589801 | 9.690210 | Netto Marken-Discount | 53.585539 | 9.691813 | Supermarket |

# Discussion and concluding remarks

This section concludes the report with a discussion of the results and some concluding remarks.

The clustering methods used in this study appear to work well at dividing the playgrounds in the village of interest into groups. From experience with the village, clustering based on nearby venues captures differences in the village neighborhoods well. In particular, it is not ex ante apparent that the neighborhoods of clusters zero and one would fall into different clusters. Yet, the neighborhoods do have a different feel to them in real life. This exercise reveals that one of the sources of that difference is that different sorts of venues are concentrated in each. So too with clusters two and four which are in less-dense areas of the village (cluster three is also in an isolated corner on the Elbe beach).

When analyzing the data again based on clustering by playground characteristics, patterns again emerge. Many of the playgrounds in the village are good and fairly consistent and these have been grouped together. The really exceptional is placed in a cluster of its own. Then, playgrounds with football/soccer fields are also grouped well, as are those with water features. The playgrounds with less features and less information are sort of grouped together - those that we wouldn't want to show up to expecting the children to enjoy for an hour. These are the ones we'd want to have a backup plan for. Overall, I'd say the clustering exercise has worked well.

Finally, sometimes it's about have a lot of shops nearby or specific the equipment on the playground. But other times it's about having a specific business or business category nearby. Using the playgrounds and Foursquare data results in a few relevant lists. We now have lists of the playgrounds near fast food, ice cream, and one of the supermarkets readily available.

I think there is more that can be done with this sort of database. For instance, we could calculate the distance between each playground and the venues. This might be useful since walking with children can be difficult. I have also considered adding a visual analysis. For instance, I could use the coordinates to retrieve some satellite imagery, and then use some sort of computer vision approach to check how much shade is available. That could be an interesting and useful addition. Parking and other features would be interesting to retrieve too. Anyway, linking the Foursquare API to the data scraped from the community crowd-source spielplatznet website has led to some interesting and useful insights.