

A guide to the neighborhoods of Düsseldorf, DE

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1 Introduction

1.1 Background

Düsseldorf is the 7th largest city of Germany and according to a study of the consulting company Mercer in 2019, one of the global top 10 cities it is worth living in.

Today, Düsseldorf is divided into 10 departments and 50 neighborhoods. Originally it was founded in the 12th/13th century next to the rivers Rhine and Düssel and has since grown into a city with a total population of ~620 thousands. In 2018 the population increased by ~14 thousands.

Due to its heritage and expansion over more than eight centuries, it is coined by a rather urbanized city center with a mix of historic and modernized buildings, accompanied by diverse neighborhoods surrounding the city centre.

1.2 Problem

Imagine you would like to move to Düsseldorf. One of the first questions is, to decide where you would like to live within the city. So the following two questions might be of relevance for you: Which neighborhoods would suit your preferences with regards to urban design? Which neighborhoods are more popular, i.e. in higher demand than others?

This project aims to provide a clustering of the different neighborhoods based on selected social and urban design specific indicators (e.g. % of urbanised and non-urbanised area, population per square kilometre), as well as the type of venues located in the neighborhoods. Next to the clustering of neighborhoods, an analysis of the change of population per neighborhood over the last five years aims to provide an additional perspective on the neighborhoods and their development.

1.3 Target Group

Anybody who is interested in the design and variety of the different neighborhoods of Düsseldorf is a potential interest in this report and might accompany any official city guide. Thereby it does not matter, if you would like to move to Düsseldorf or if you just would like to visit the city and plan your city tour.

2 Data Description

2.1 Data sources

The primary source of this project is a dedicated resource for datasets of Düsseldorf:

The city of Düsseldorf is publishing a large variety of datasets via the webpage <http://opendata.duesseldorf.de>. For this project I will focus on the datasets that provide the geometrical coordinates of the neighborhoods and social areas of Düsseldorf, as well as the data on population changes and composition of each social area.

The secondary source of this project is Foursquare and its API, which allows to perform requests on recommended venues in a specific radius around a specific geo location. Each venue is thereby categorized in a hierarchical category structure and thereby allows to cluster the different locations by their type.

In the iPythonNotebook of this project, for each data source the relevant link is provided.

2.2 Data Examples

Neighborhoods Geo Location Data

	Quelle	Stand	Stadtbezirk	Stadtteil	Name	geometry
0	Amt 12/2	31.12.2017	5	54	Wittlaer	POLYGON ((6.76623 51.31355, 6.76618 51.31359, ...
1	Amt 12/2	31.12.2017	5	55	Angermund	POLYGON ((6.80952 51.34292, 6.80948 51.34302, ...
2	Amt 12/2	31.12.2017	4	43	Lörrick	POLYGON ((6.74610 51.25203, 6.74602 51.25205, ...
3	Amt 12/2	31.12.2017	4	42	Heerdt	POLYGON ((6.73560 51.23767, 6.73522 51.23780, ...
4	Amt 12/2	31.12.2017	4	41	Oberkassel	POLYGON ((6.76868 51.23195, 6.76868 51.23196, ...

Description of columns:

Column	Translation	Description
Quelle	Source	Name of the city department that has created the data.
Stand	Status	Date of the data.
Stadtbezirk	Department	ID of the department.
Stadtteil	Neighborhood ID	ID of the neighborhood.
Name	Neighborhood	Name of the neighborhood.
geometry	geometry	Description of the borders of each neighborhood as polygon geo coordinates.

Content:

The data of the neighborhoods has been created by the department 'Amt 12/2' of the city of Duesseldorf with status of December 31st, 2017. The city area of Duesseldorf is divided into 10 departments and 50 neighborhoods. Each neighborhood is assigned to one department. Departments only have an ID and no name, whereas neighborhoods have an ID and a name. The neighborhood ID is a merged key based on the ID of the department and a digit for the neighborhood.

As the analysis will be based on the neighborhoods only the columns 'Neighborhood ID', 'Neighborhood' and 'geometry' will be used.

Population

	Stadtteilnummer	Stadtteilname	2012	2013	2014	2015	2016	2017	2018
0	11	Altstadt	2232	2253	2221	2264	2244	2358	2404
1	12	Carlstadt	2290	2323	2315	2491	2588	2279	2285
2	13	Stadtmitte	13900	13953	14388	14680	15008	14840	14954
3	14	Pempelfort	29931	30345	30814	31449	31897	32626	33064
4	15	Derendorf	19740	19927	20005	20232	20401	20651	20610

Description of columns:

Column	Translation	Description
Stadtteilnummer	Neighborhood ID	ID of the neighborhood.
Stadtteilname	Neighborhood	Name of the neighborhood.
2012-2018	2012-2018	Size of population per neighborhood at the end of the year.

Content:

The data includes the total population of each neighborhood by the end of the years 2012 to 2018. The population data is provided for all 50 neighborhoods.

For the analysis the data for the past five years (2013 to 2018) will be used.

Social Areas (Geo Location Data)

	OBJEKT	STADTBEZ	Sozialraum7	Sozialraum4	Quelle	geometry
0	Region	5	506053	506	Amt 12/2	POLYGON ((6.73981 51.30221, 6.73912 51.30235, ...
1	Region	4	409043	409	Amt 12/2	POLYGON ((6.72762 51.24037, 6.72785 51.24064, ...
2	Region	4	411043	411	Amt 12/2	POLYGON ((6.72426 51.24696, 6.72440 51.24771, ...
3	Region	6	604063	604	Amt 12/2	POLYGON ((6.82758 51.26707, 6.82614 51.26850, ...
4	Region	6	607064	607	Amt 12/2	POLYGON ((6.80817 51.25976, 6.80728 51.26016, ...

Description of columns:

Column	Translation	Description
OBJEKT	Object	Details not available.
STADTBEZ	Department	ID of the Department.
Sozialraum7	Social Area 7	Combined ID of Social Area ID and Neighborhood ID.
Sozialraum4	Social Area	ID of the Social Area.
Quelle	Source	Name of the city department that has created the data.
geometry	geometry	Description of the borders of each neighborhood as polygon geo coordinates.

Content:

The data includes the geo location data for the 179 social areas in Düsseldorf with status 2018. The social areas are mapped to the departments and with three exceptions, also to neighborhoods. The key in column "Sozialraum7" is a merged key, in which the last three digits represent the corresponding Neighborhood ID and all digits before that represent the Social Area ID ('Sozialraum4').

As transparent in the 'Description' of the DataFrame, the value '0' is appearing three times in the column 'Sozialraum7'. All other values are unique. The three '0' entries need to be further analyzed and decided on how to cope with those.

Social Areas (Geographical and Environmental Data)

Stadtbezirk	Sozialraum	Fläche in ha	Einwohner je km²	Wohnfläche Anteil in %	Grünfläche Anteil in %	Von Verkehrslärm betroffene Bevölkerung in %	
0	1	101	56,95	13440,85	29,82	0,31	47,95
1	1	102	43,62	5144,30	26,67	2,65	0,49
2	1	103	45,19	5727,21	22,84	9,37	8,94
3	1	104	116,03	2300,26	12,68	21,54	30,27
4	1	105	67,90	10501,97	18,79	3,07	32,86

Description of columns:

Column	Translation	Description
Stadtbezirk	Department	ID of the department.
Sozialraum	Social Area	ID of the social area.
Fläche in ha	Area in ha	Size of area in hectare.
Einwohner je km ²	Population per sqkm	Population per square kilometre.
Wohnfläche Anteil in %	Perc. of living space	Percentage of areas with living spaces.
Grünfläche Anteil in %	Perc. of green space	Percentage of areas with green spaces.
Von Verkehrslärm betroffene Bevölkerung in %	Perc. affected by traffic noise	Percentage of population affected by traffic noise.

Content:

The data includes the geographic and environmental data for the 179 social areas in Düsseldorf with status 2016. Besides the general information of the corresponding department, social area ID and total size in hectare, the data comprises of four different figures that can be summed up in three social characteristics:

- 1) Population density: Population per square kilometre.
- 2) Land use: Percentage of area used as living spaces or green spaces.
- 3) Noise pollution: Percentage of population affected by traffic noise.

This data will be aggregated on neighborhood level and combined with the information about recommended venues in the neighborhood (provided by foursquare) to cluster the neighborhoods.

Recommended Venues

	Neighborhood ID	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category ID
0	101	51.144373	6.898046	S Düsseldorf-Garath	51.143952	6.897350	4bf58dd8d48988d1fc931735
1	101	51.144373	6.898046	Netto Filiale	51.143584	6.896548	52f2ab2ebcbc57f1066b8b46
2	101	51.144373	6.898046	ALDI SÜD	51.143110	6.896143	52f2ab2ebcbc57f1066b8b46
3	101	51.144373	6.898046	Forst Garath	51.148080	6.902555	52e81612bcbc57f1066b7a23
4	102	51.133328	6.910560	EDEKA Rath	51.131841	6.907200	52f2ab2ebcbc57f1066b8b46

Description of columns:

Column	Translation	Description
Neighborhood ID	Neighborhood ID	ID of the neighborhood.
Neighborhood Latitude	Neighborhood Latitude	Latitude of the centre of the neighborhood.
Neighborhood Longitude	Neighborhood Longitude	Longitude of the centre of the neighborhood.
Venue	Venue	Name of a venue recommended by foursquare.
Venue Latitude	Venue Latitude	Latitude of the venue.
Venue Longitude	Venue Longitude	Longitude of the venue.
Venue Category ID	Venue Category ID	ID of the category that has been assigned to the venue.

Content:

The data consists of the Neighborhood ID and the geo coordinates of its centre as well as the venue name, its geo coordinates and the ID of the category it has been assigned to. This data will be aggregated on neighborhood and category level to get the count of the venues per category per neighborhood. This will provide a set of features that allows a clustering of similar neighborhoods based on the recommended venues.

As foursquare provides a hierarchical tree for the venue categories, it needs to be analysed, if all venues have been categorized on the same hierarchical level, before performing the aggregation. This should provide slightly less accurate but more consistent results, as e.g. a chinese restaurant could be categorized in one case as 'Asian' (level 2) and in another case as 'Chinese' (level 3). Both categorizations would be correct, but the clustering model would not recognize them as being the same. After the analysis on the categories provided, it will be decided on which level of the hierarchy all venues will be harmonized.