



Understanding urban growth over time

Comparing Neighborhoods of The Hague

Do urban activities and their density depend on time and location?”

- HYPOTHESIS

Introduction

The Hague, in Netherlands is one of the oldest cities in Netherlands and the government of Netherlands and its parliaments works from this city.

Hague despite being an old city, is also very modern and multi-cultural with many international institutions and multi-national companies

We will investigate if urban spread or sprawl over time, affects the composition of activities and texture of the urban fabric

Hypothesis

To understand more clearly, we wish to investigate if urban venues and their type, and their density differs over space and time.

Our hypothesis is yes, urban density, development and land use depends on time, therefore the density of venues and type of venues we will be collecting from Foursquare should show this differences.

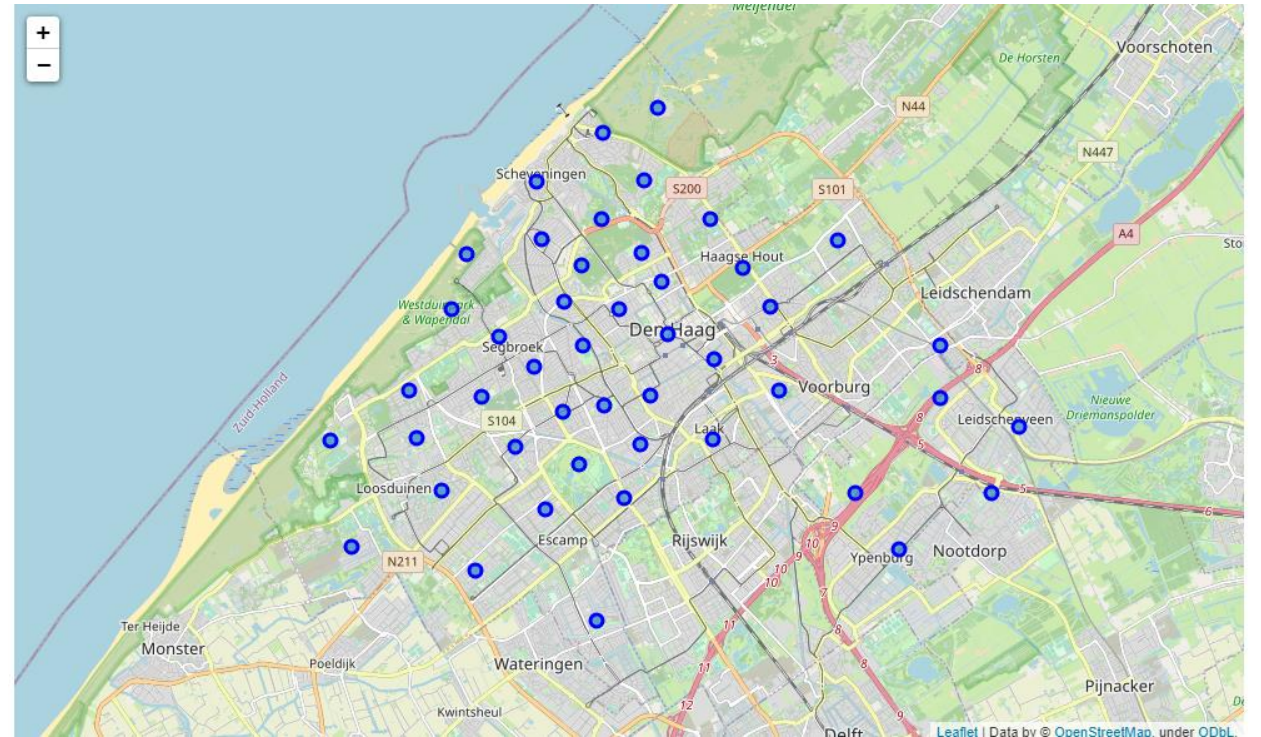
If our hypothesis is true, the clusters should show circular patterns

Data

Neighborhood data

Buildings data

Four Square data



Neighborhoods

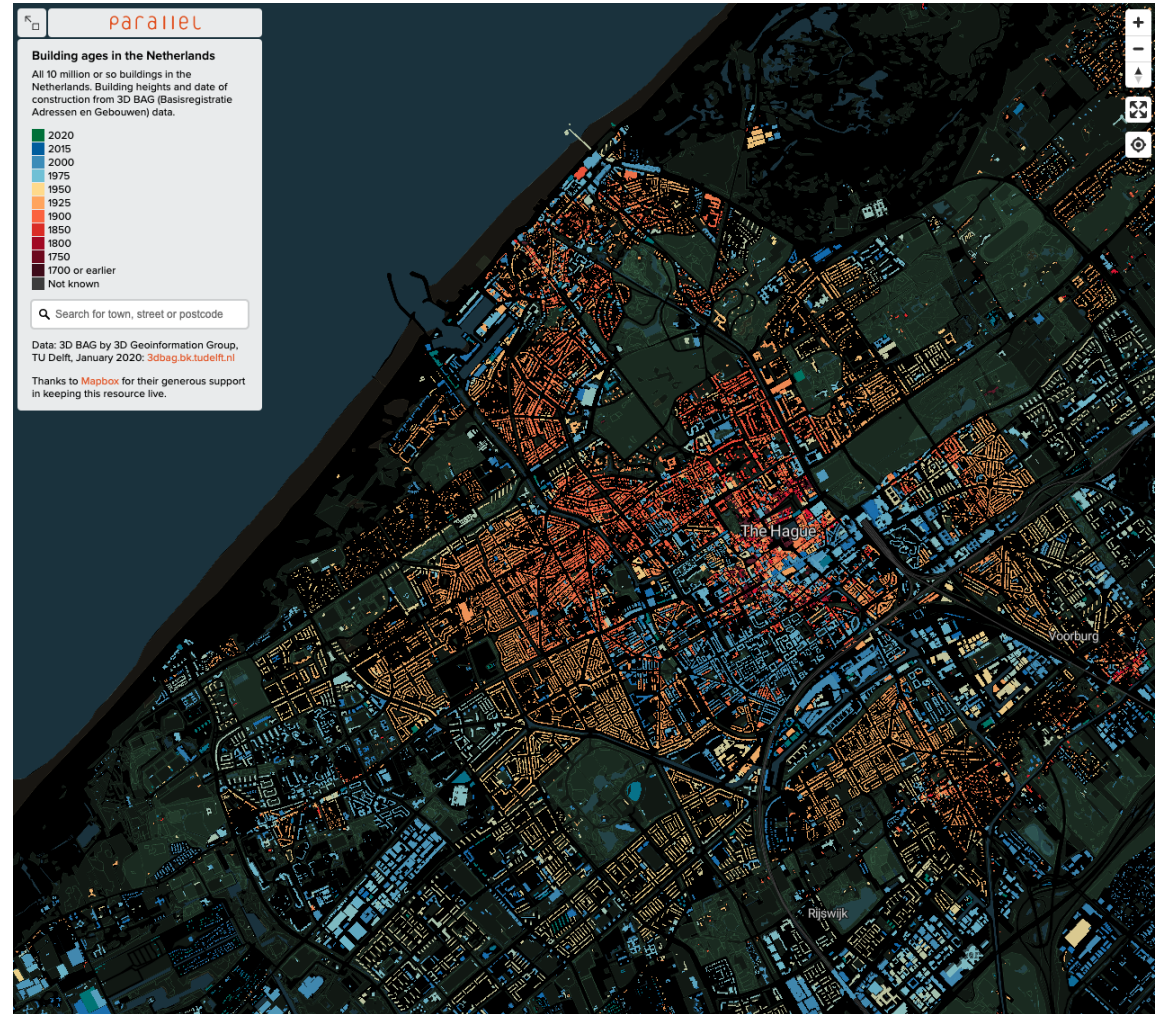
There are 46 neighborhoods in Hague

Data

Neighborhood data

Buildings data

Four Square data



Buildings Data

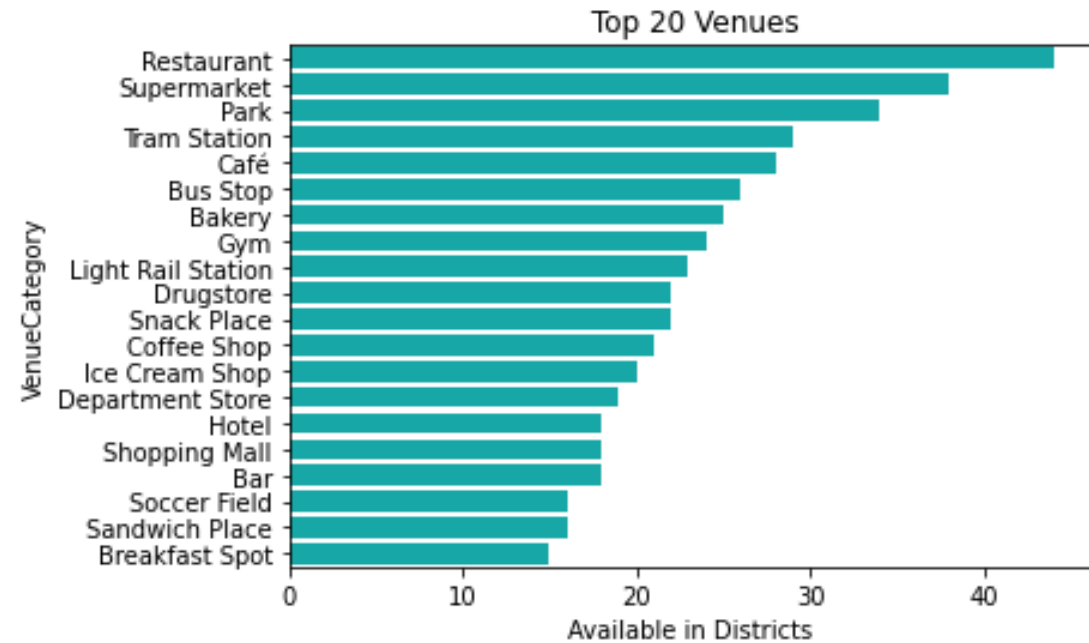
A map showing all buildings in Hague, colored according to their year of constructions.
This is used for verification

Methodology

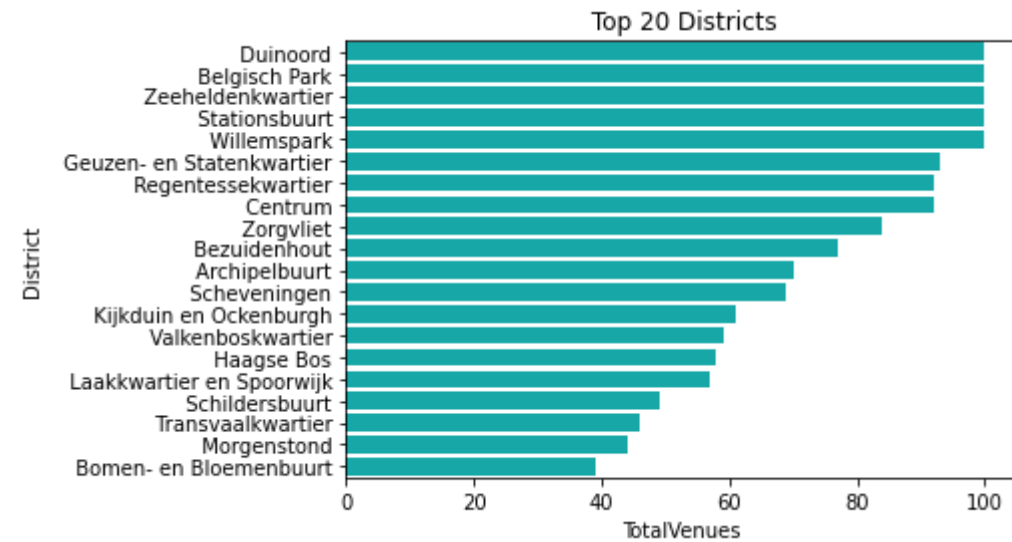
We will be following the methodology as listed in these steps

1. collect and prepare data from different sources
2. collect neighborhood data from the local government website
3. collect venue information from the **Foursquare API**
4. collect existing landuse data and construction history of the city from opensource data
5. all the data has a common field, neighborhood/district name, so we can combine them into a big data base for our analysis
6. we will explore this data with some descriptive statistics like frequency, tally counts along with maps
7. we will then prepare the data for cluster analysis using **one-hot encoding** method.
8. among different clustering algorithms, we will **use K-means** clustering algorithm
9. we will then calculate the appropriate number of clusters according to **the elbow plot**

What is
common
across
districts?

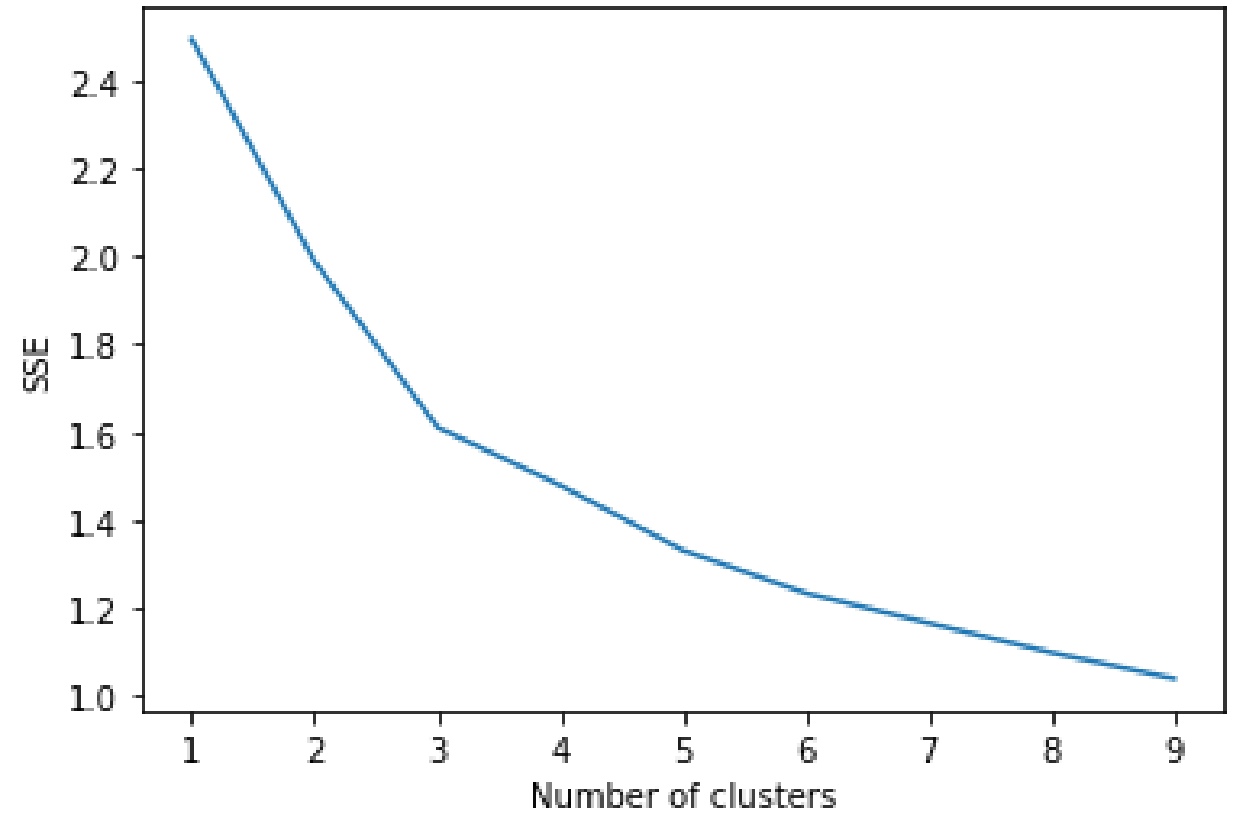


What are popular districts?



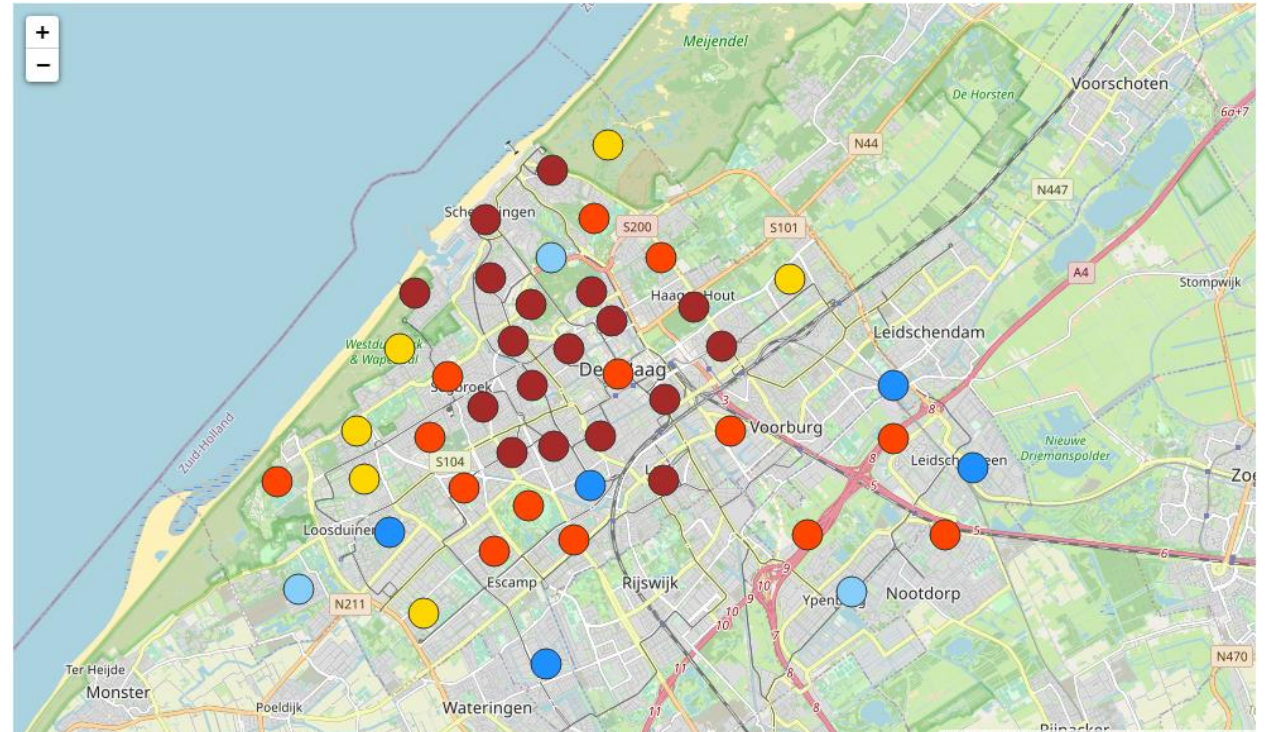
Appropriate
Number of
Clusters?

5



Clusters

This clusters and their circular patterns reflects the reality of development in Hauge as shown in slide 6



Color	Cluster	No. of districts	Position in city	time of development
brown	0	18	Inner core	Oldest (1800's)
red	4	14	first ring to inner core	second oldest (early 1900)
orange	3	6	second ring	1925-1950
dark blue	1	5	mixed/periphery	2000's
light blue	2	3	mixed/periphery	2000's

Venues Popular among clusters?

Inner Core

Cluster	VenueCategory	Total Venues
0	Restaurant	384
0	Coffee Shop	53
0	Caf��	51
0	Supermarket	44
0	Hotel	39

First Ring

Cluster	VenueCategory	Total Venues
4	Restaurant	80
4	Supermarket	20
4	Park	19
4	Gym	18
4	Bus Stop	16

Second Ring

Cluster	VenueCategory	Total Venues
3	Supermarket	14
3	Light Rail Station	11
3	Restaurant	11
3	Park	10
3	Tram Station	9

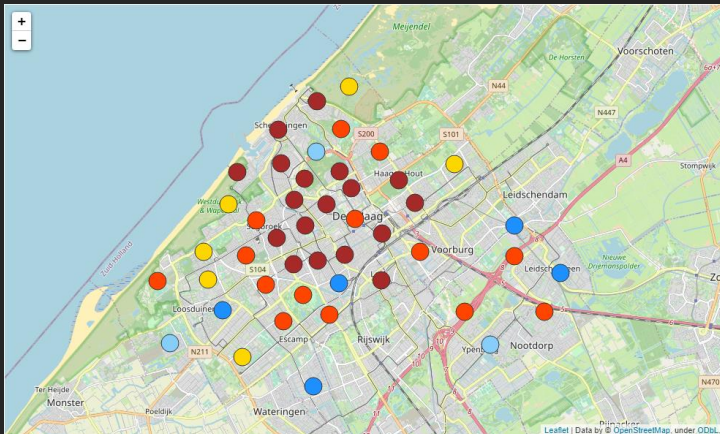
Modern Re-Development

Cluster	VenueCategory	Total Venues
1	Restaurant	24
1	Supermarket	10
1	Bus Stop	5
1	Ice Cream Shop	5
1	Shopping Mall	4

Outer Most

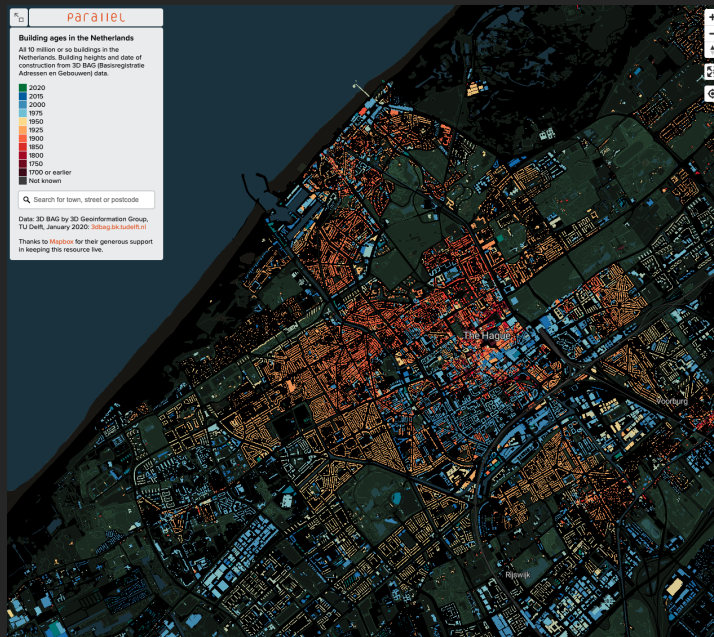
Cluster	VenueCategory	Total Venues
2	Park	11
2	Restaurant	5
2	Light Rail Station	4
2	Hotel	3
2	Tram Station	3

Discussion



- **Cluster 1** is modern development and we see presence of Shopping mall which are not in other clusters.
- **Cluster 2,3** are outer clusters and we can see the presence of Tram stations and Light rail stations. These transportation objects are among the most frequent venues in Foursquare API indicating that there are no other prominent venues. As these clusters are far from the city, they need such mass transportation modes to reach the city.
- Within the most dense clusters, **cluster 0** we see a huge number of restaurants, and this agrees to the reality, because most of Europe has this city center where all the squares have restaurants and shops around a church.

Conclusion



In this project, the neighborhoods of Hague were clustered into multiple groups based on the categories (types) of the venues in these neighborhoods:

- The results showed that the **clusters indeed reflect the existing reality** in terms of development and land use.
- The **results also show circular growth** away from the city core as hypothesized.

Future study:

If a deeper analysis—taking more aspects into account—is performed, it might result in discovering more intricate details that can help urban planners and designers understand the growth of the city.