

# Geographic Data Science

Types of  $W$

Dani Arribas-Bel

# *What is a neighbor?*

A neighbor is “somebody” who is:

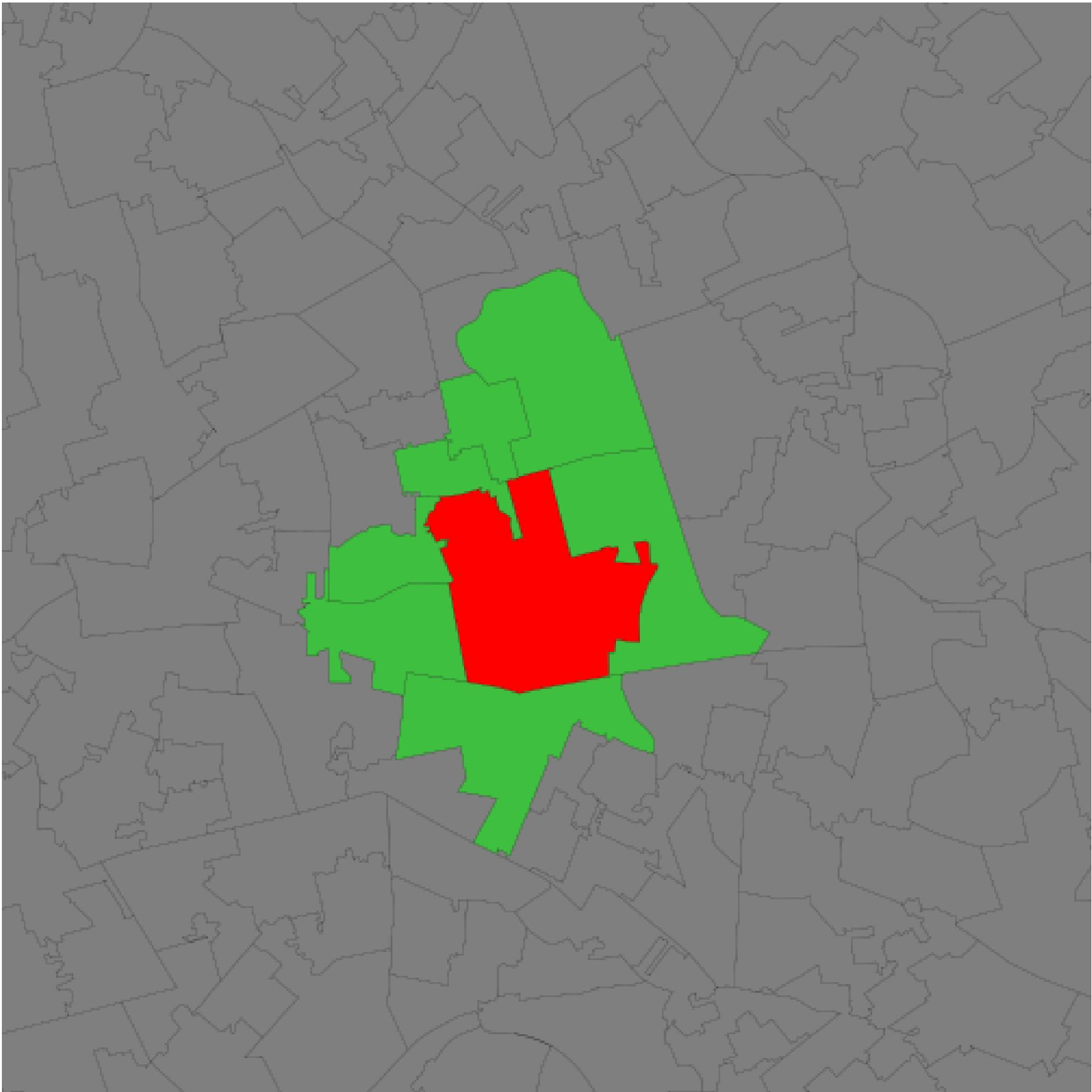
- Next door → **Contiguity**-based  $W$ s
- Close → **Distance**-based  $W$ s
- In the same “place” as us → **Block** weights
- ...

See [Anselin & Rey \(2014\)](#) for an in-detail discussion and more types of  $W$ .

# Contiguity-based weights

Sharing boundaries to any extent

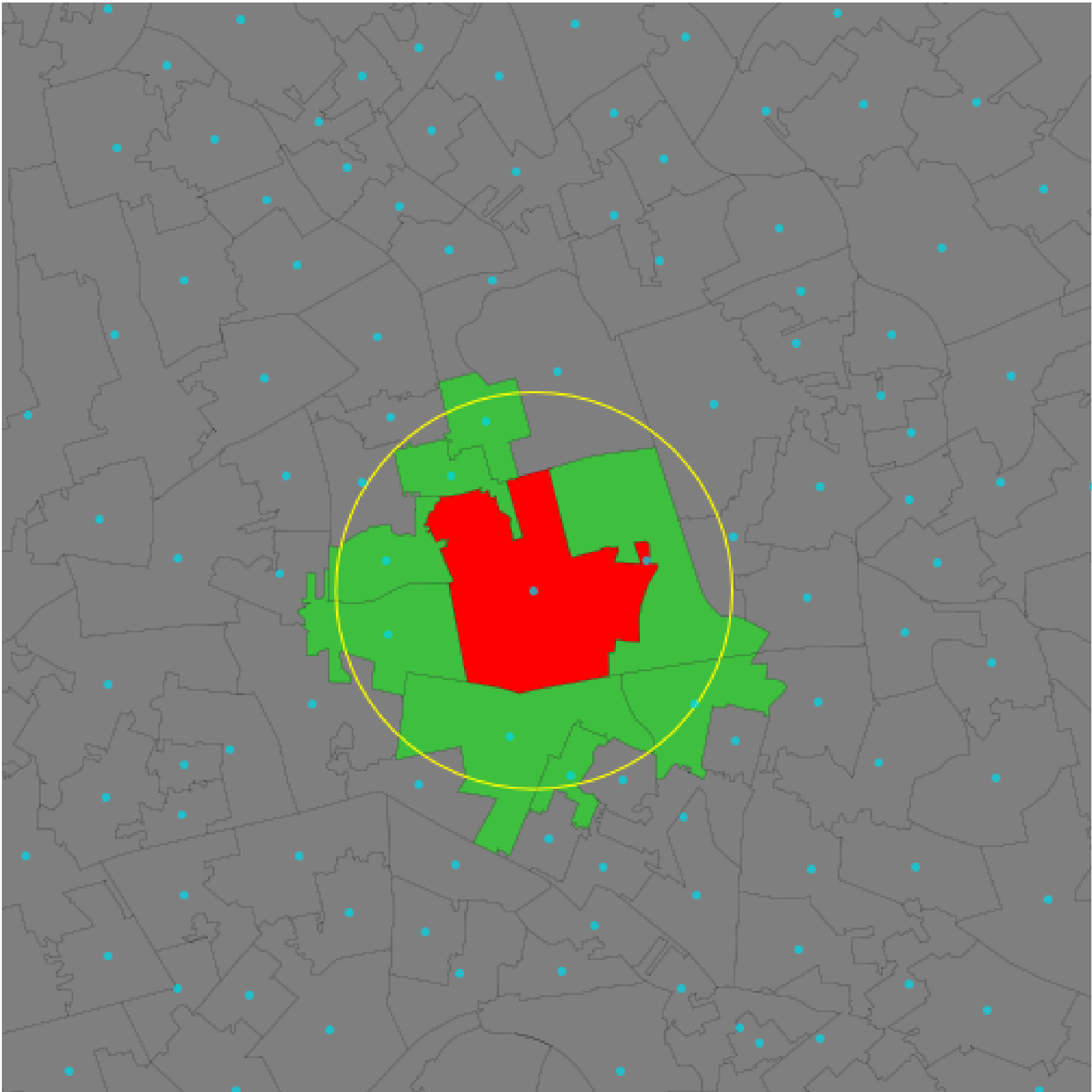
- Rook
- Queen
- ...



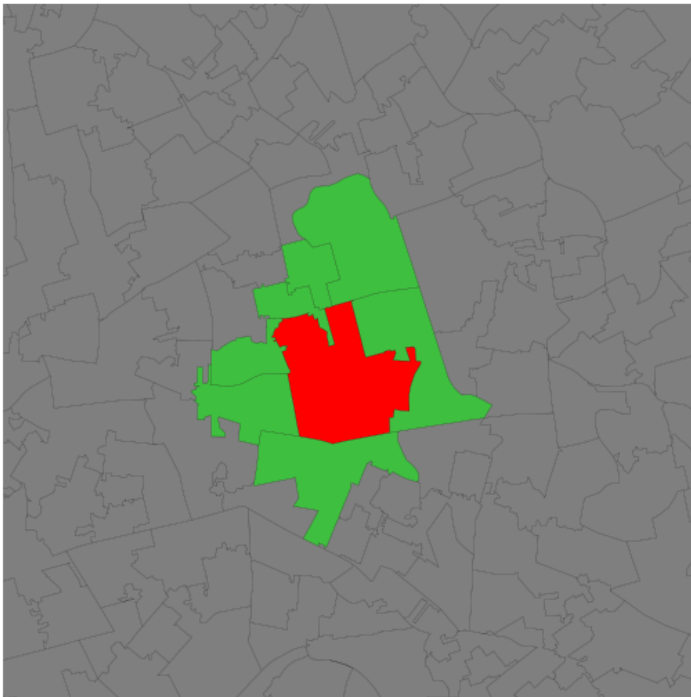
# Distance-based weights

Weight is (inversely) proportional to distance between observations

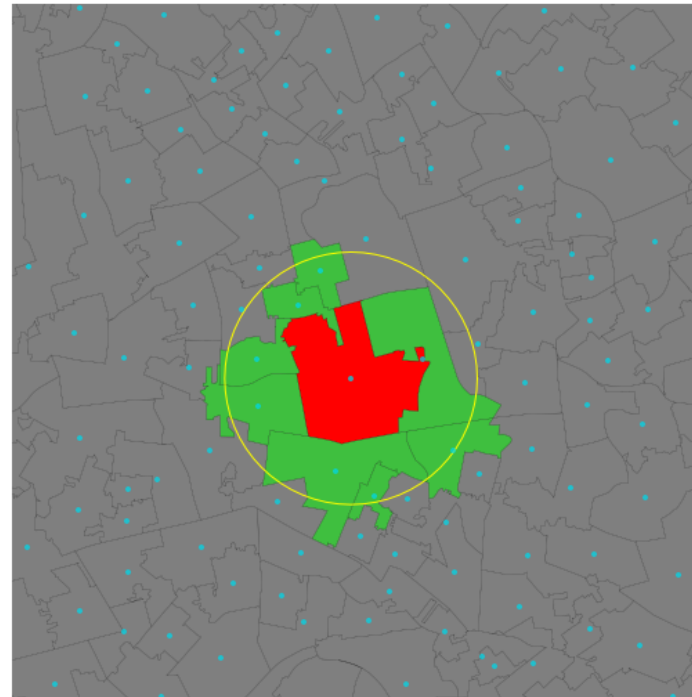
- Inverse distance (threshold)
- KNN (fixed number of neighbors)
- ...



Queen neighbors of 'E01006690'



Neighbors within 1km of 'E01006690'



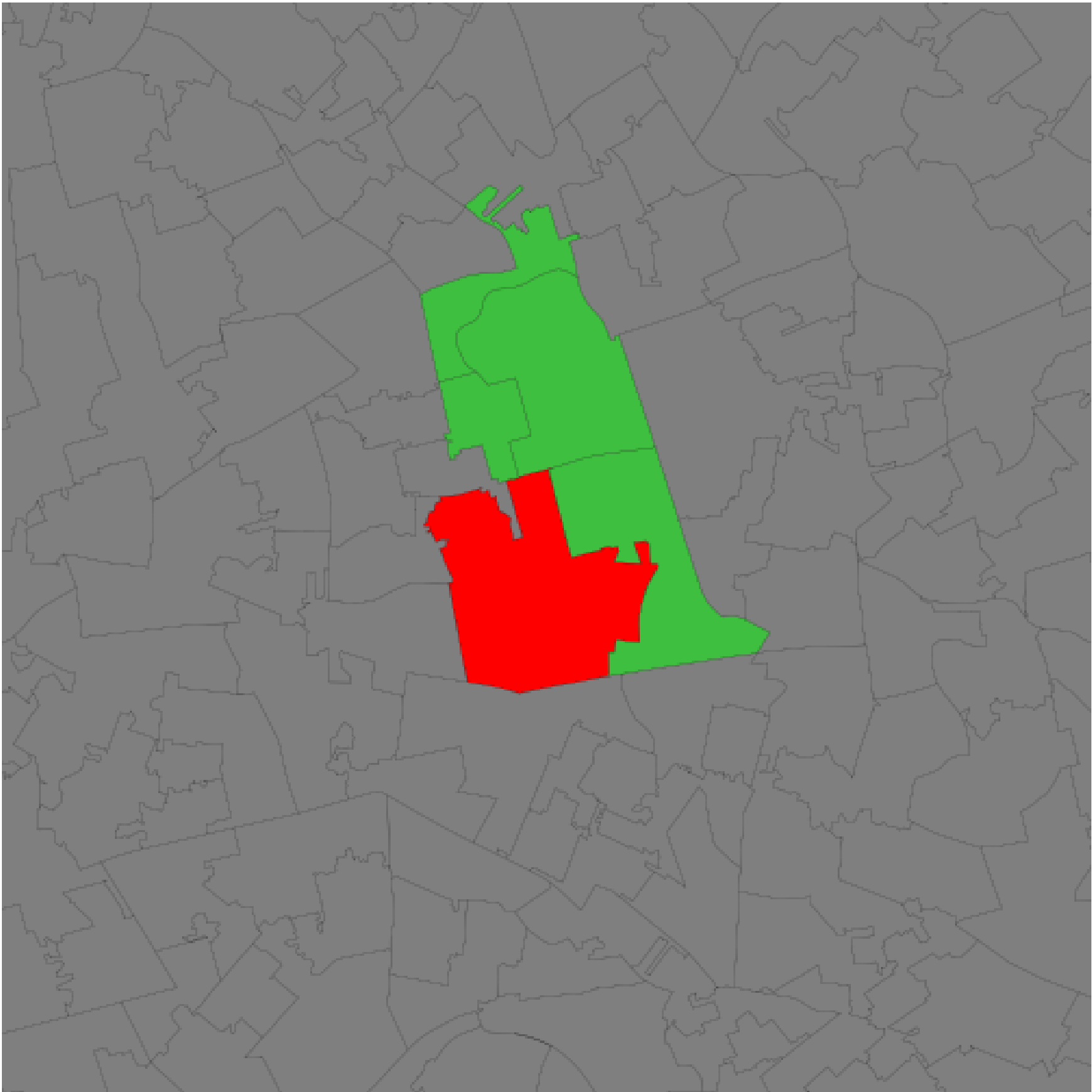
# Block weights

Weights are assigned based on discretionary rules loosely related to geography

For example:

- LSOAs into MSOAs
- Post-codes within city boundaries
- Counties within states
- ...





# *How much of a neighbor?*

No neighbors receive zero weight:  $w_{ij} = 0$

Neighbors, it depends,  $w_{ij}$  can be:

# Choice of $W$

Should be based on and reflect the underlying channels of interaction for the question at hand.

Examples:

- Processes propagated by immediate contact (e.g. disease contagion) → Contiguity weights
- Accessibility → Distance weights
- Effects of county differences in laws → Block weights

# Standardization

In some applications (e.g. spatial autocorrelation) it is common to *standardize*  $W$

The most widely used standardization is **row-based**: divide every element by the sum of the row:

where  $w_i$  is the sum of a row.



A course on Geographic Data Science by Dani Arribas-Bel is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.