# Geographic Data Science

## Types of *W*

Dani Arribas-Bel

# *What is a neighbor?*

A neighbor is "somebody" who is:

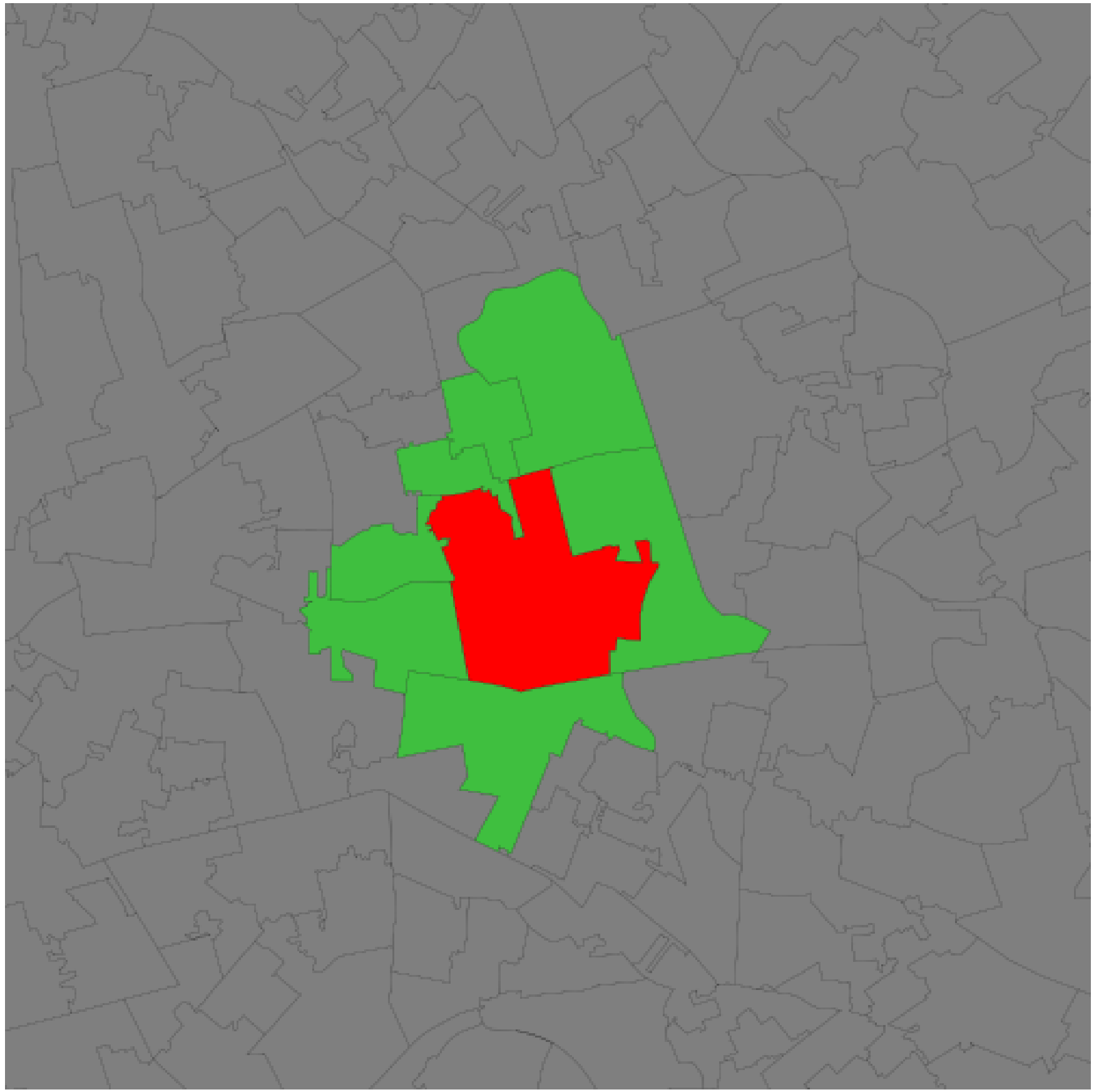
- Next door → **Contiguity**-based *W*s
- Close → **Distance**-based *W*s
- In the same "place" as us → **Block** weights
- …

See Anselin & Rey (2014) for an in-detail discussion and more types of *W*.

# Contiguity-based weights

## Sharing boundaries to any extent

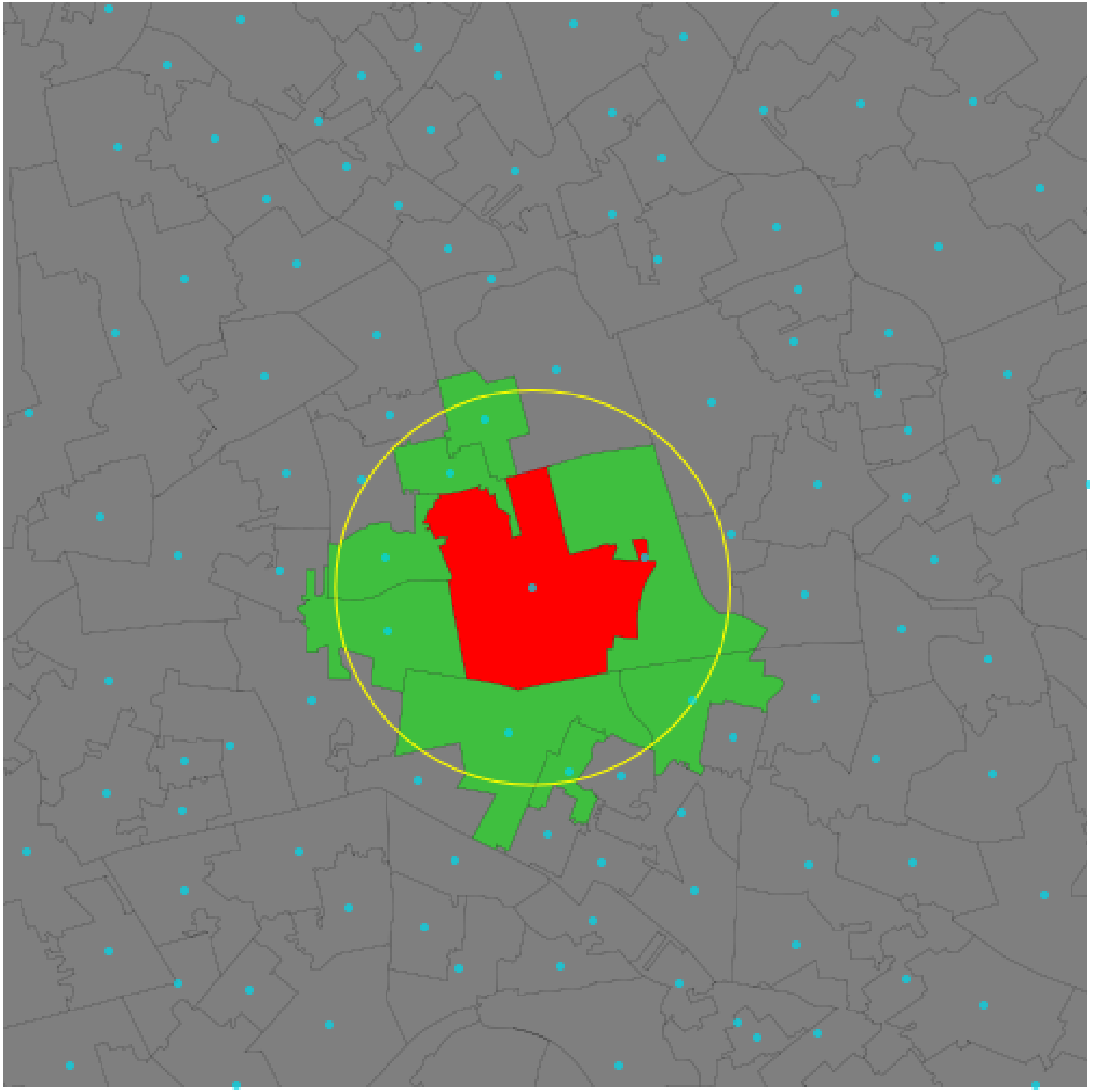
- Rook
- Queen
- …



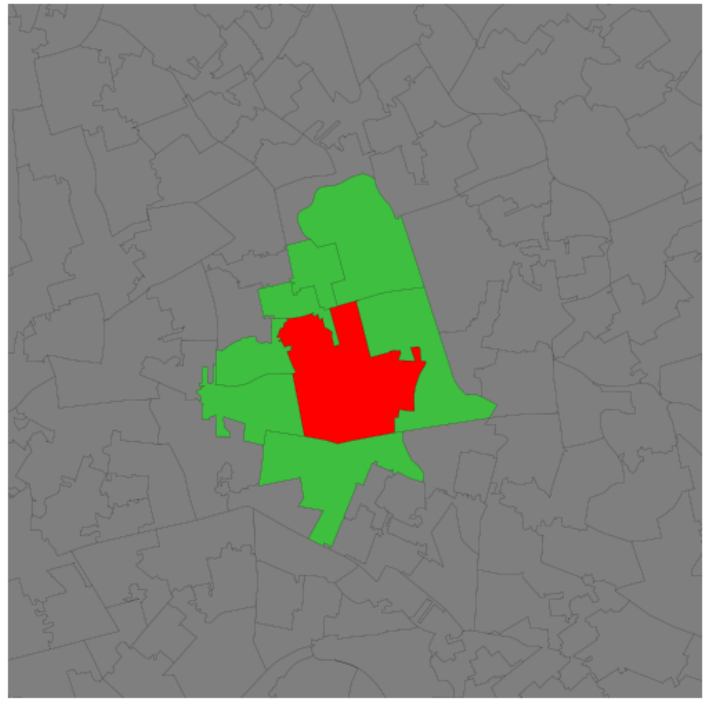
# Distance-based weights

Weight is (inversely) proportional to distance between observations

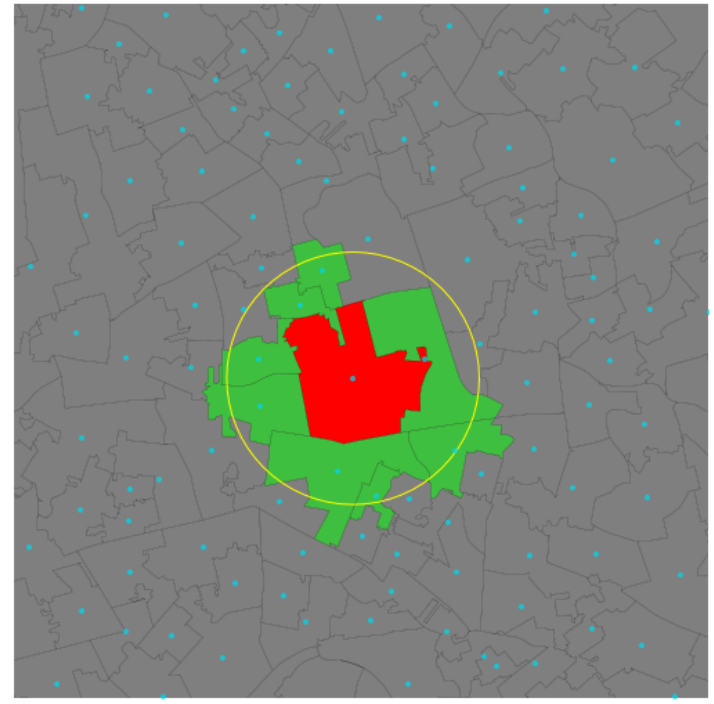
- Inverse distance (threshold)
- KNN (fixed number of neighbors)
- …



Queen neighbors of `E01006690`



Neighbors within 1km of `E01006690`

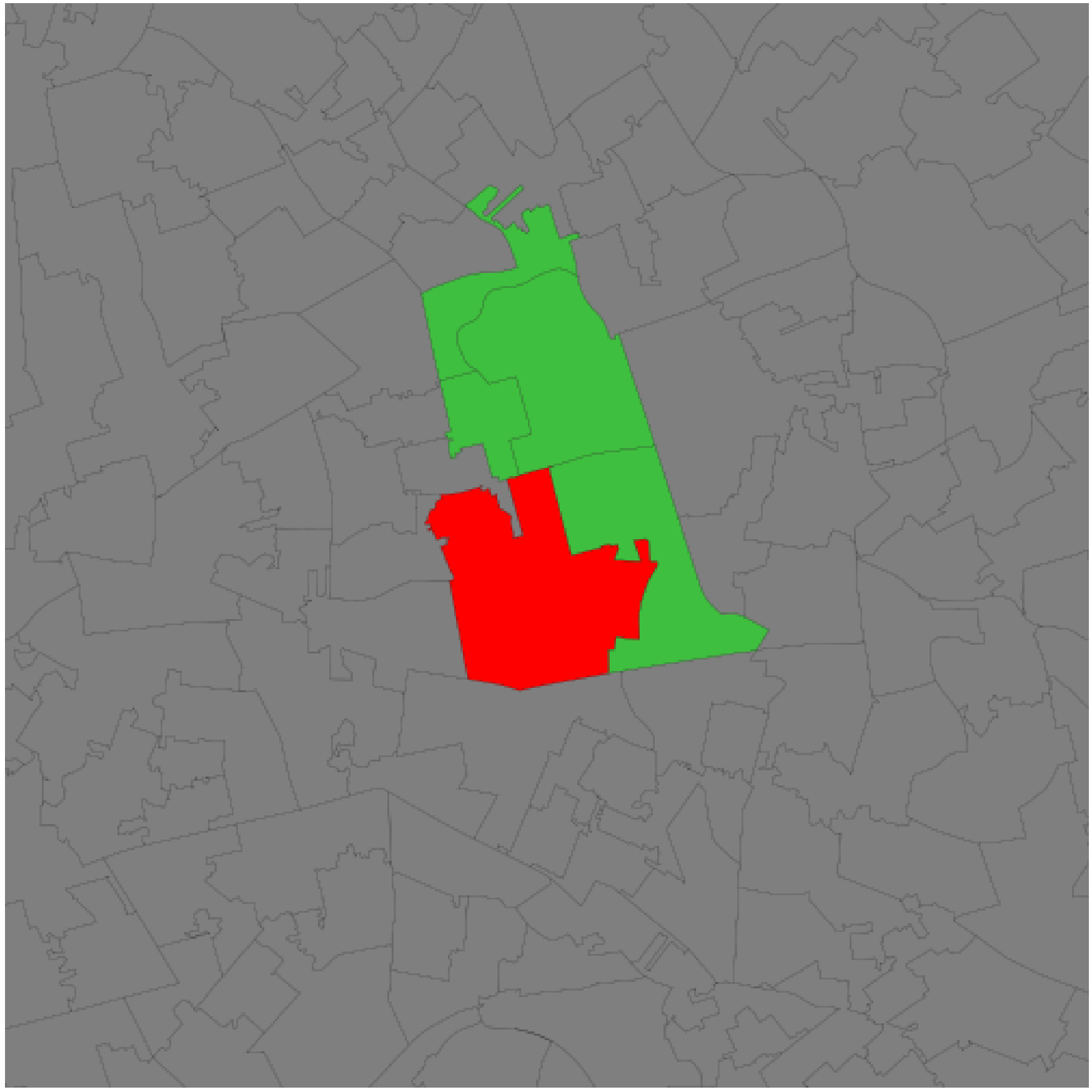


# Block weights

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 inmediate 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.