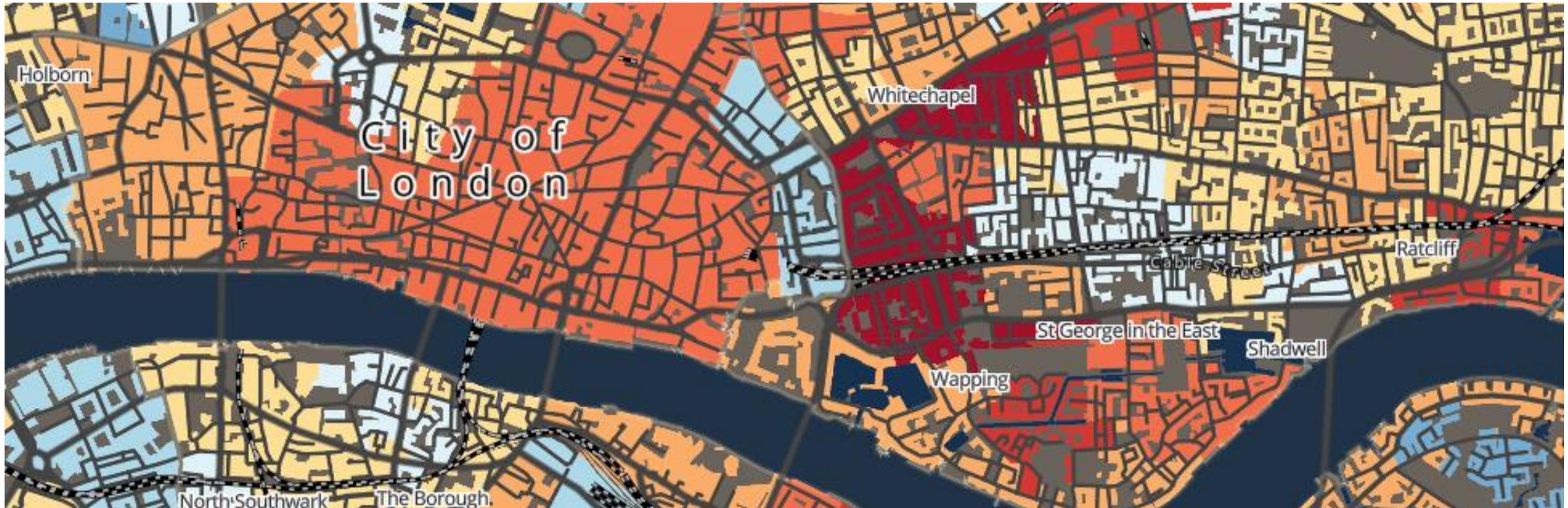


Methods in Human Geography

Quantitative Methods: Spatial Analysis II



Dr Justin van Dijk



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This week

Part I

- Mapping 101.

Part II

- More spatial analysis.
- Module summary.

Mapping 101

Mapping 101

- Use tables for precision.
- Use graphs to effectively summarise large volumes of information.
- Use maps to show spatially heterogeneous information.

Mapping 101

- Mapping is a process and a way of thinking which can conceal and reveal.
- Require simplification and choices, so a map is never an 'objective' representation.
- Most common: choropleth map showing aggregate data across spatial units.
- It is hard to make a good map, but relatively easy to make a bad one.

Mapping 101

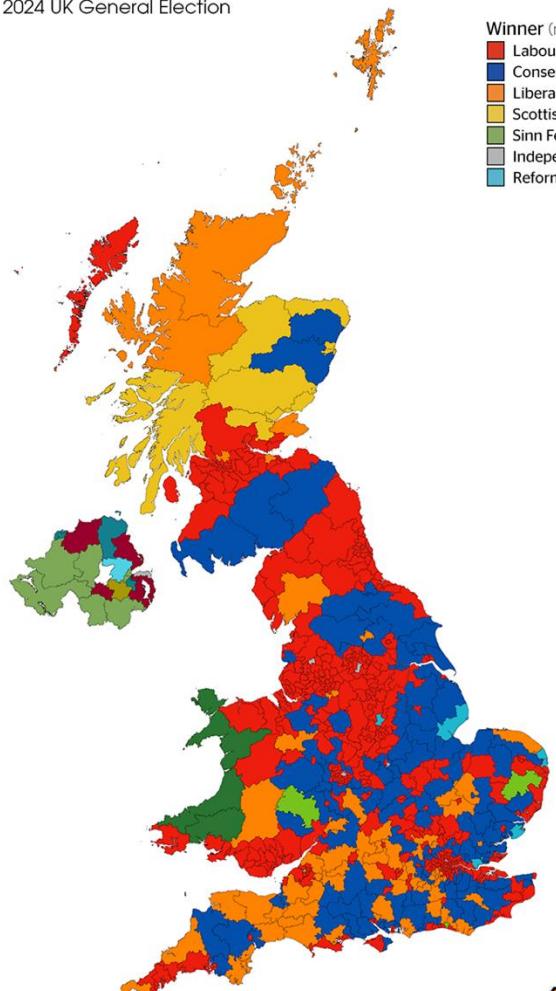
Winning party
2024 UK General Election

Winner (number of parliamentary seats)

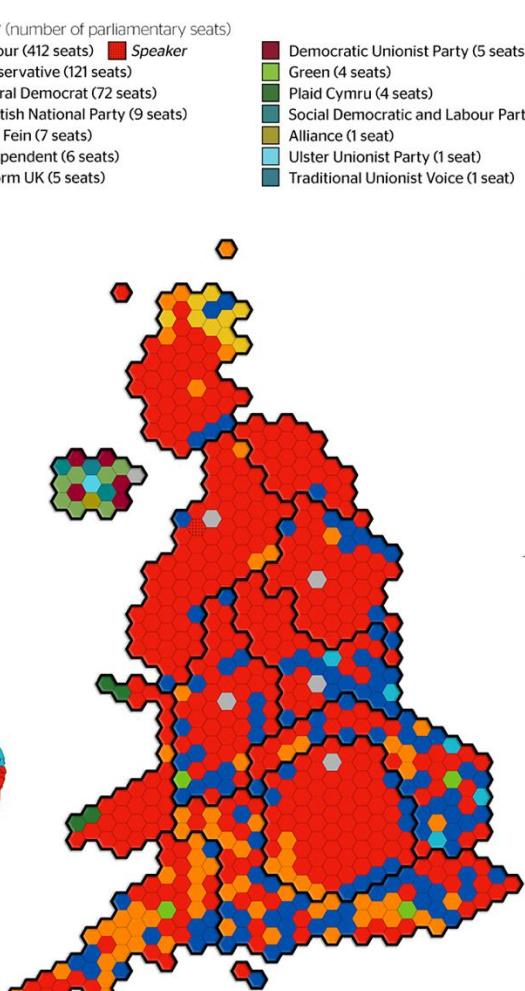
- Labour (412 seats)
- Conservative (121 seats)
- Liberal Democrat (72 seats)
- Scottish National Party (9 seats)
- Sinn Fein (7 seats)
- Independent (6 seats)
- Reform UK (5 seats)

- Speaker
- Democratic Unionist Party (5 seats)
- Green (4 seats)
- Plaid Cymru (4 seats)
- Social Democratic and Labour Party (2 seats)
- Alliance (1 seat)
- Ulster Unionist Party (1 seat)
- Traditional Unionist Voice (1 seat)

WORLD
MAPPER
www.worldmapper.org



Geographic view
Map showing land area

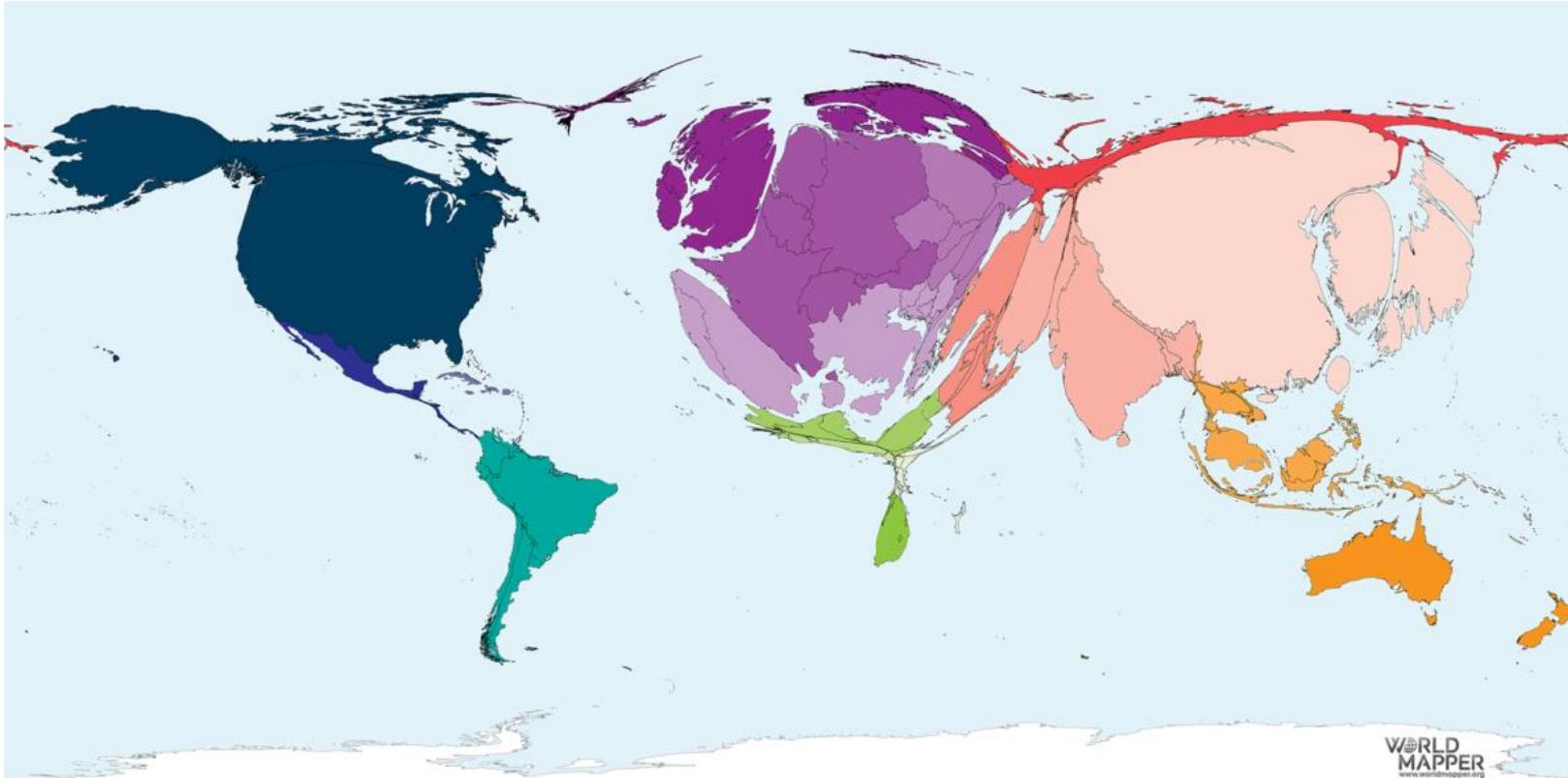


Constituency view
Map showing seats in parliament



Population view
Map showing population distribution

Mapping 101



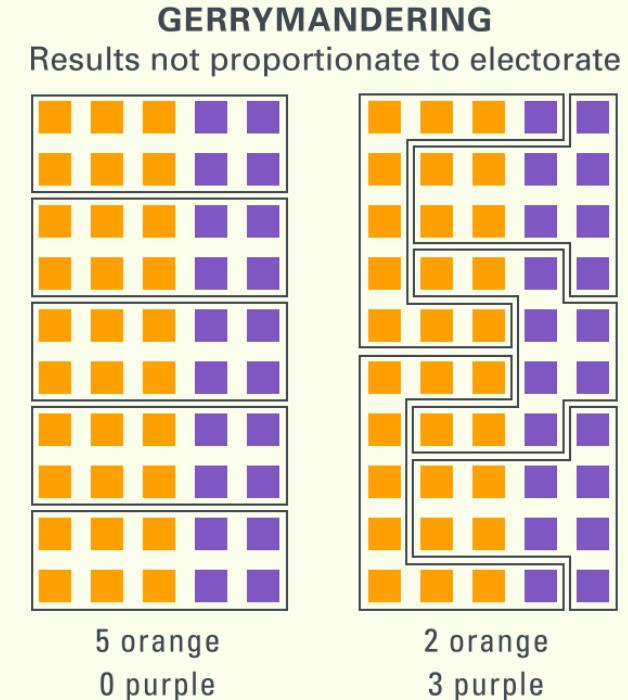
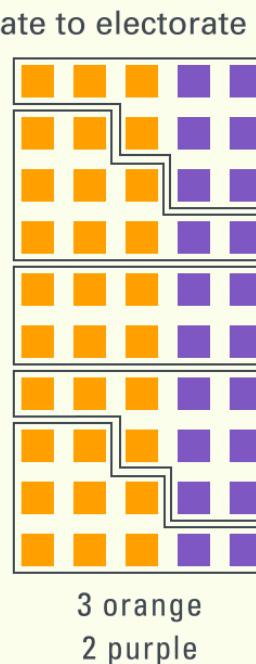
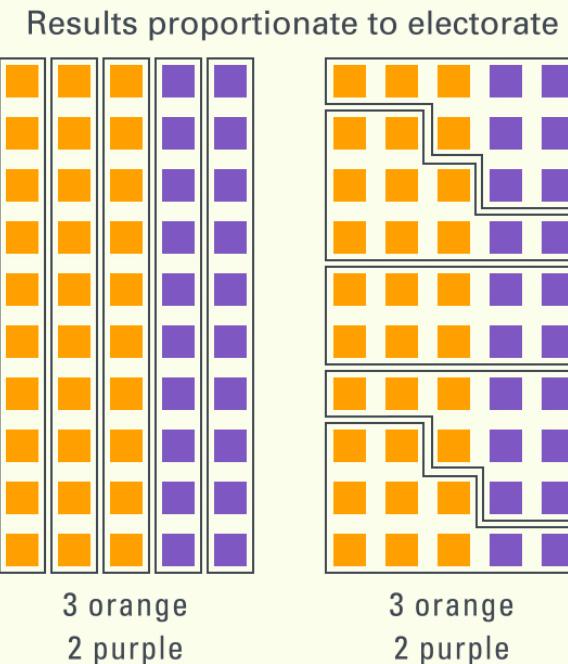
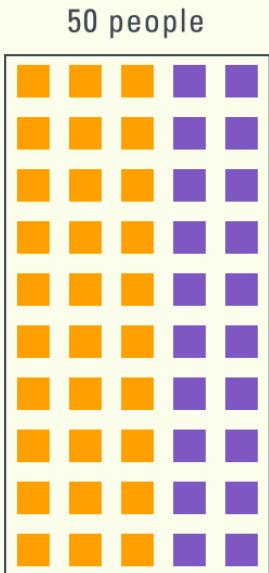
Scientific papers published in 2016.

Mapping 101

GERRYMANDERING

How differently drawn district maps produce different electoral results

FOUR WAYS TO DIVIDE 50 PEOPLE INTO 5 DISTRICTS:



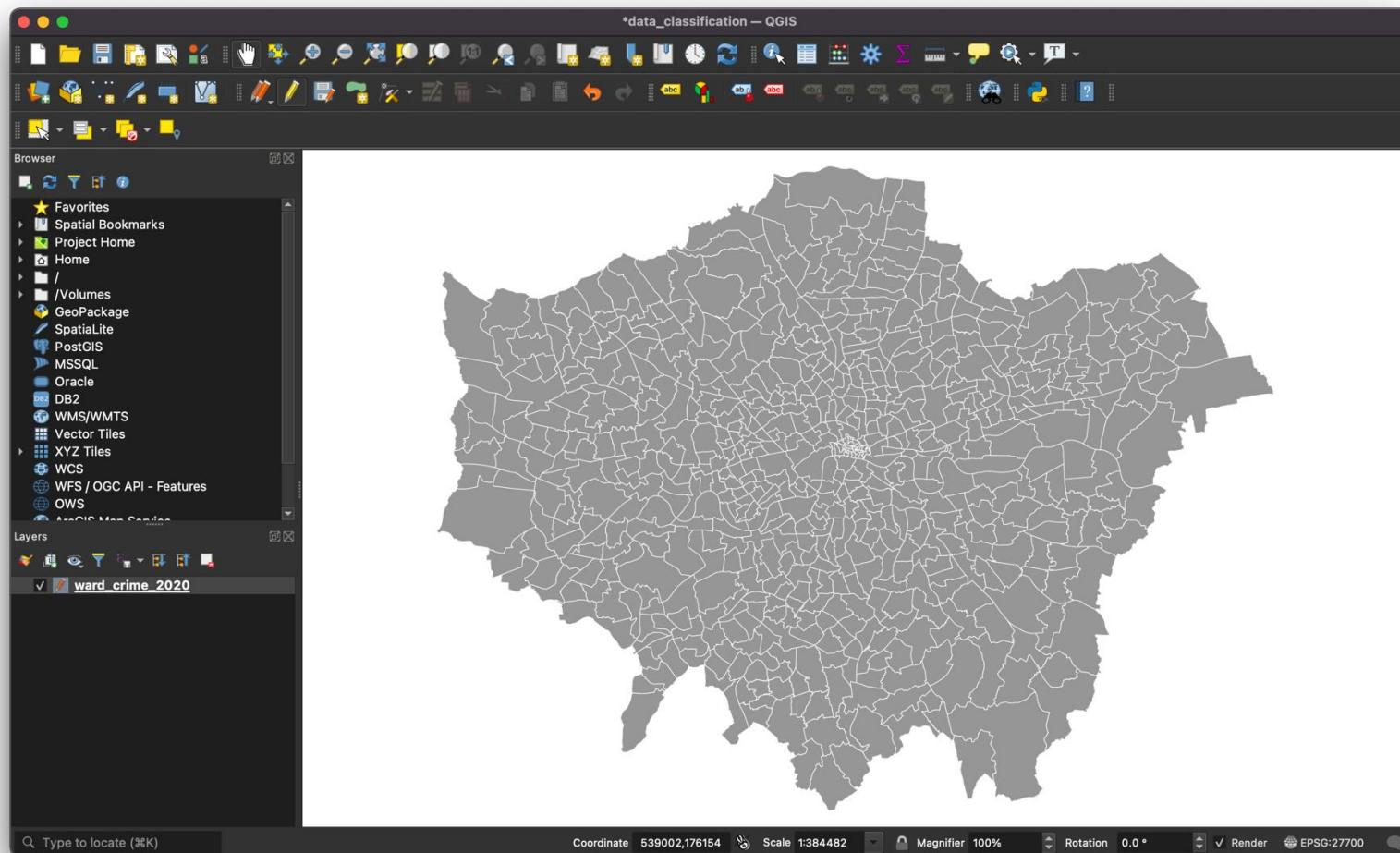
© Encyclopædia Britannica, Inc.

Mapping 101

Typical workflow:

- Importing spatial data into your GIS.
- Importing attribute data into your GIS – cleaning and wrangling might be required prior to importing (e.g. data preparation in R).
- Geoprocessing (e.g. point in polygon, but many more methods!).
- Creating and modifying maps and cartographic outputs.

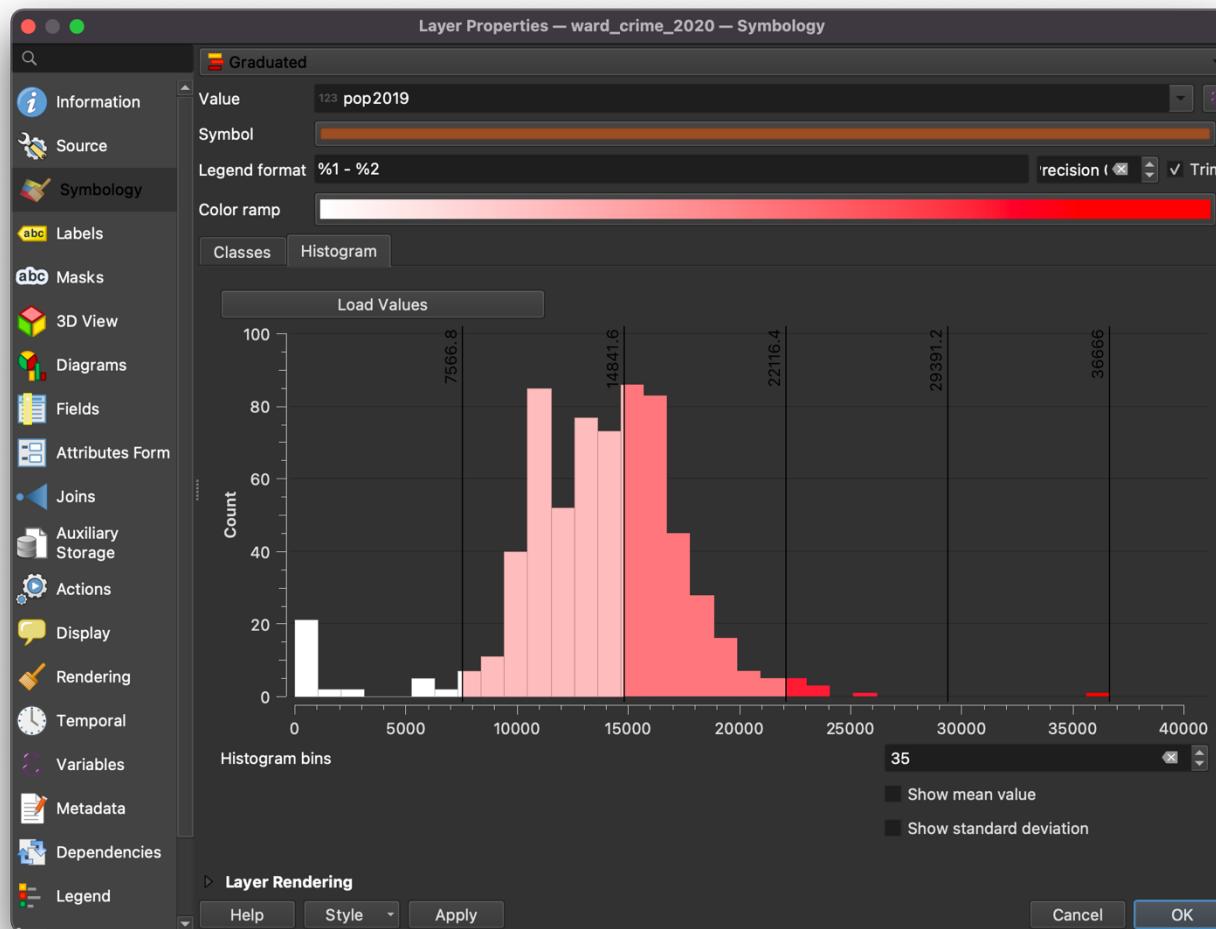
Mapping 101



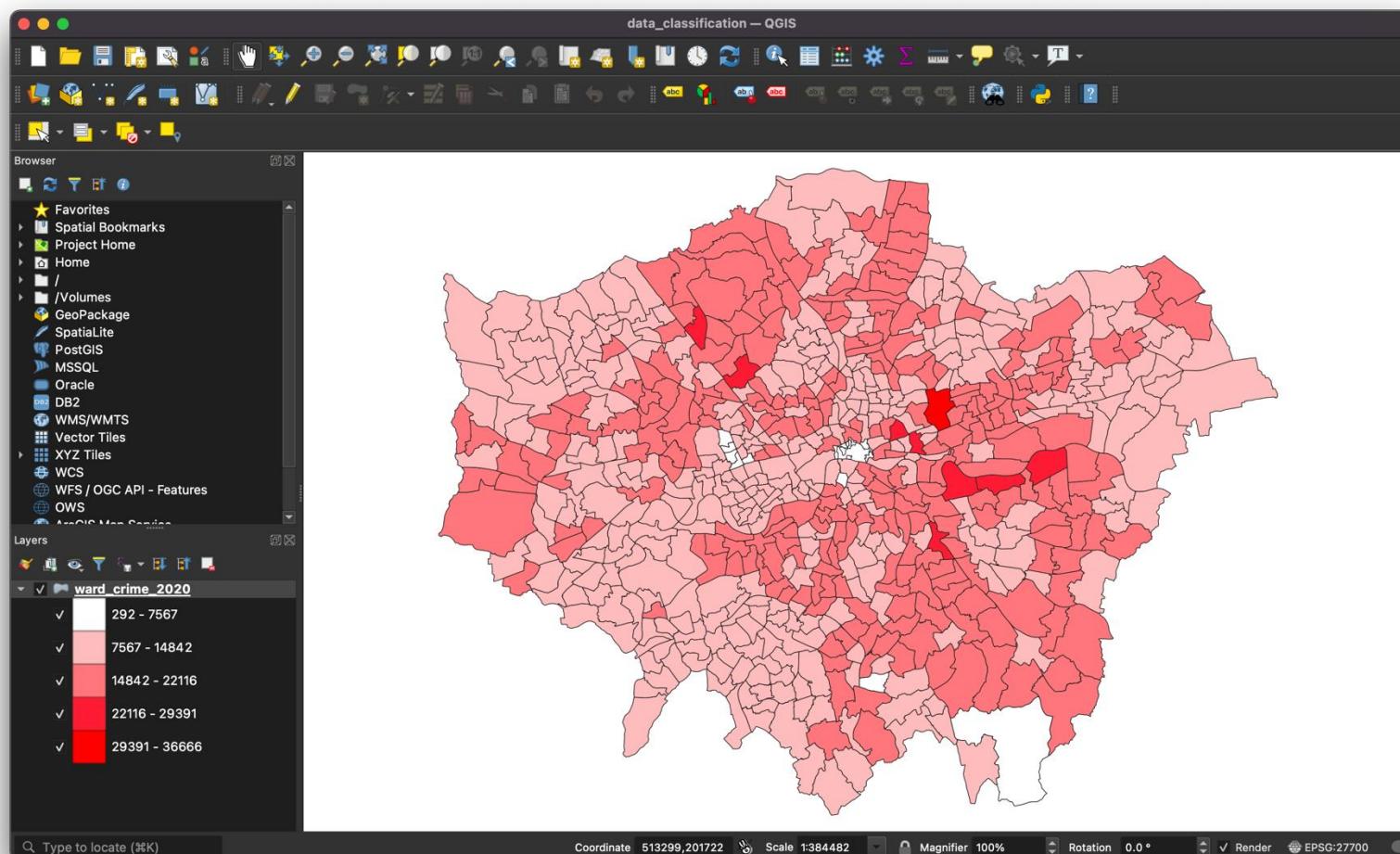
Mapping 101

Equal Interval: This method divides the range of data values into equal intervals based on numerical value. If the data distribution is skewed, this approach can give more weight to outliers, potentially leading to less balanced representation across the classes.

Mapping 101



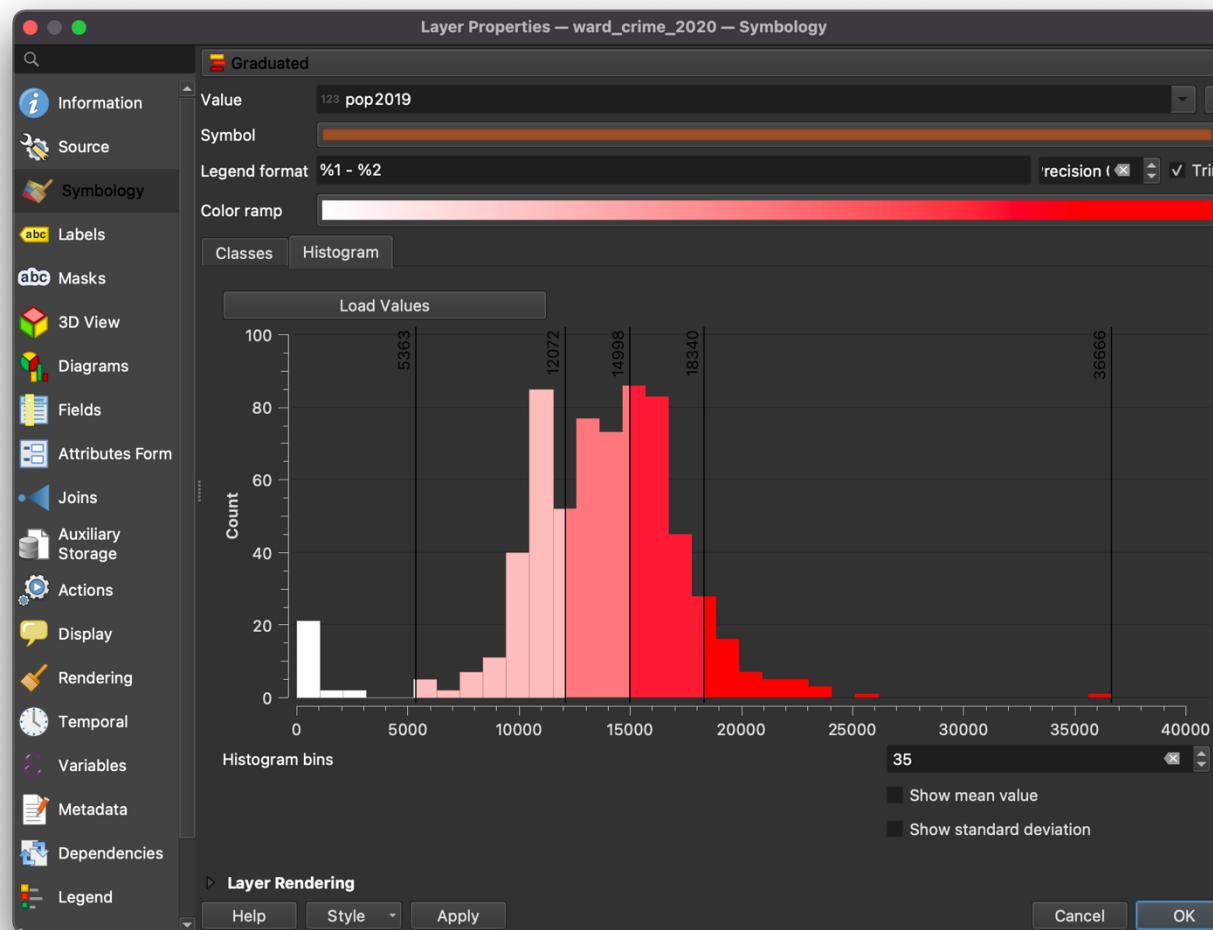
Mapping 101



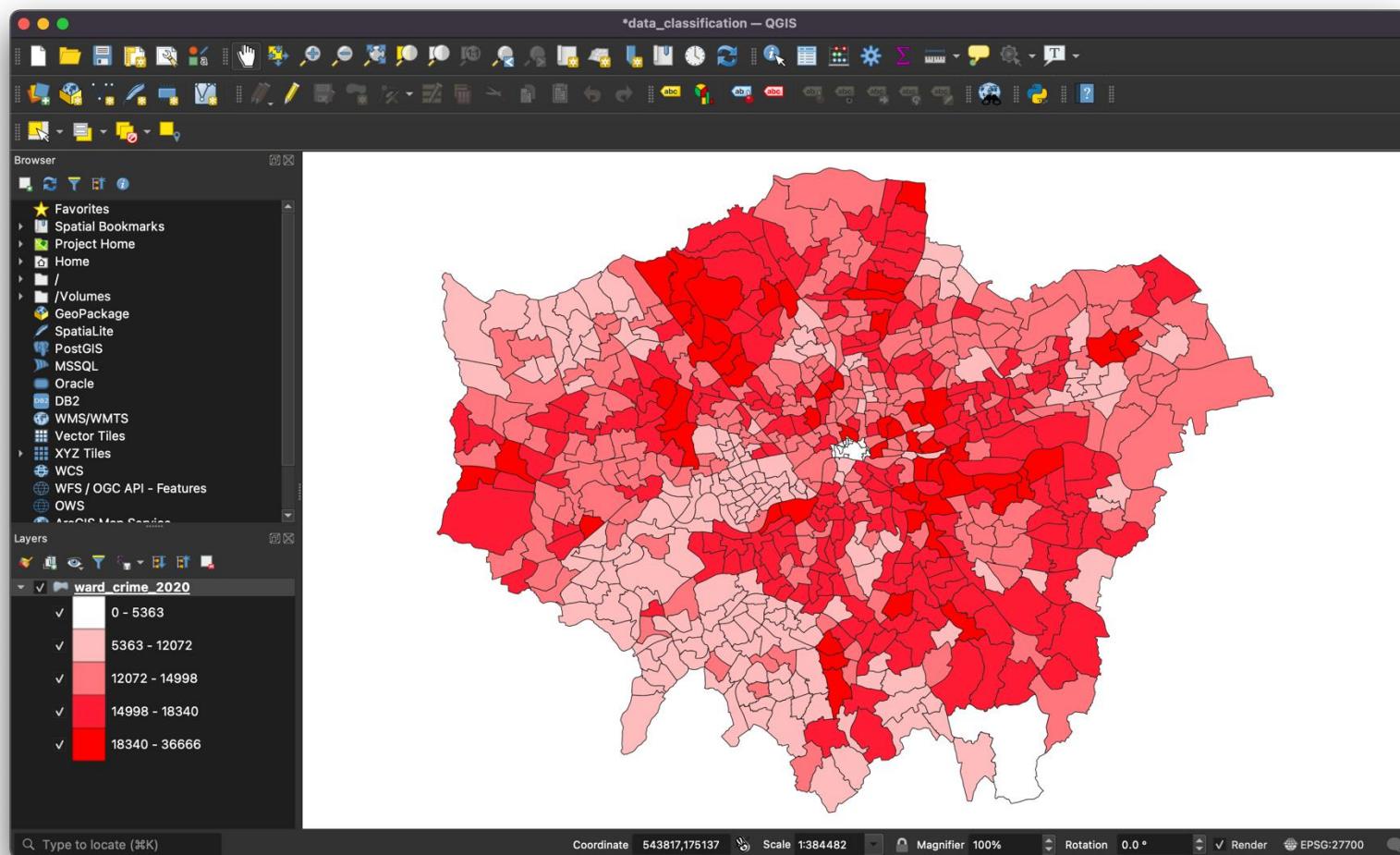
Mapping 101

Natural Breaks/Jenks: This method aims to minimise the average deviation within each class from the class mean while maximising the deviation between the means of different classes. In the case of a skewed distribution, outliers often end up in their own class, although this can vary depending on the number of classes chosen.

Mapping 101



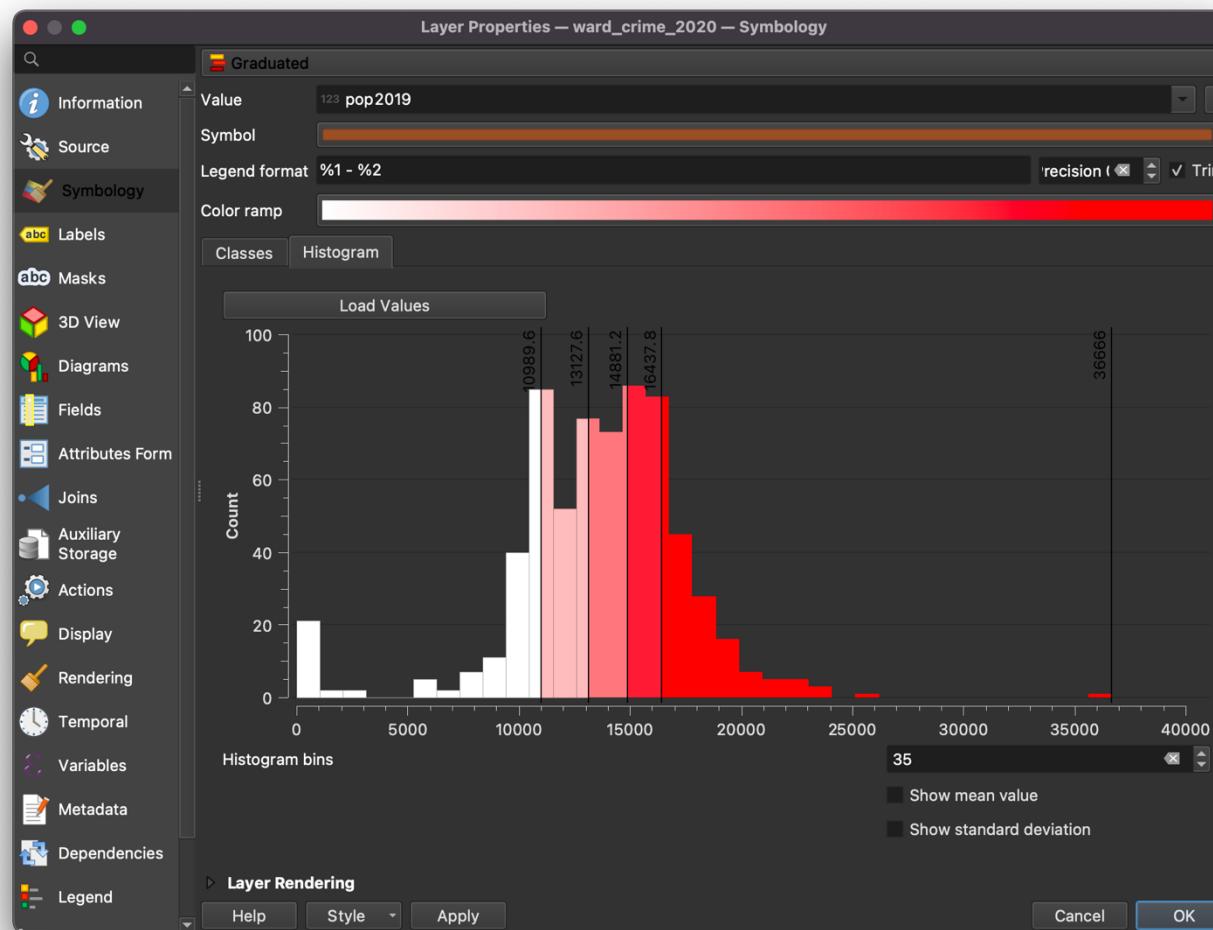
Mapping 101



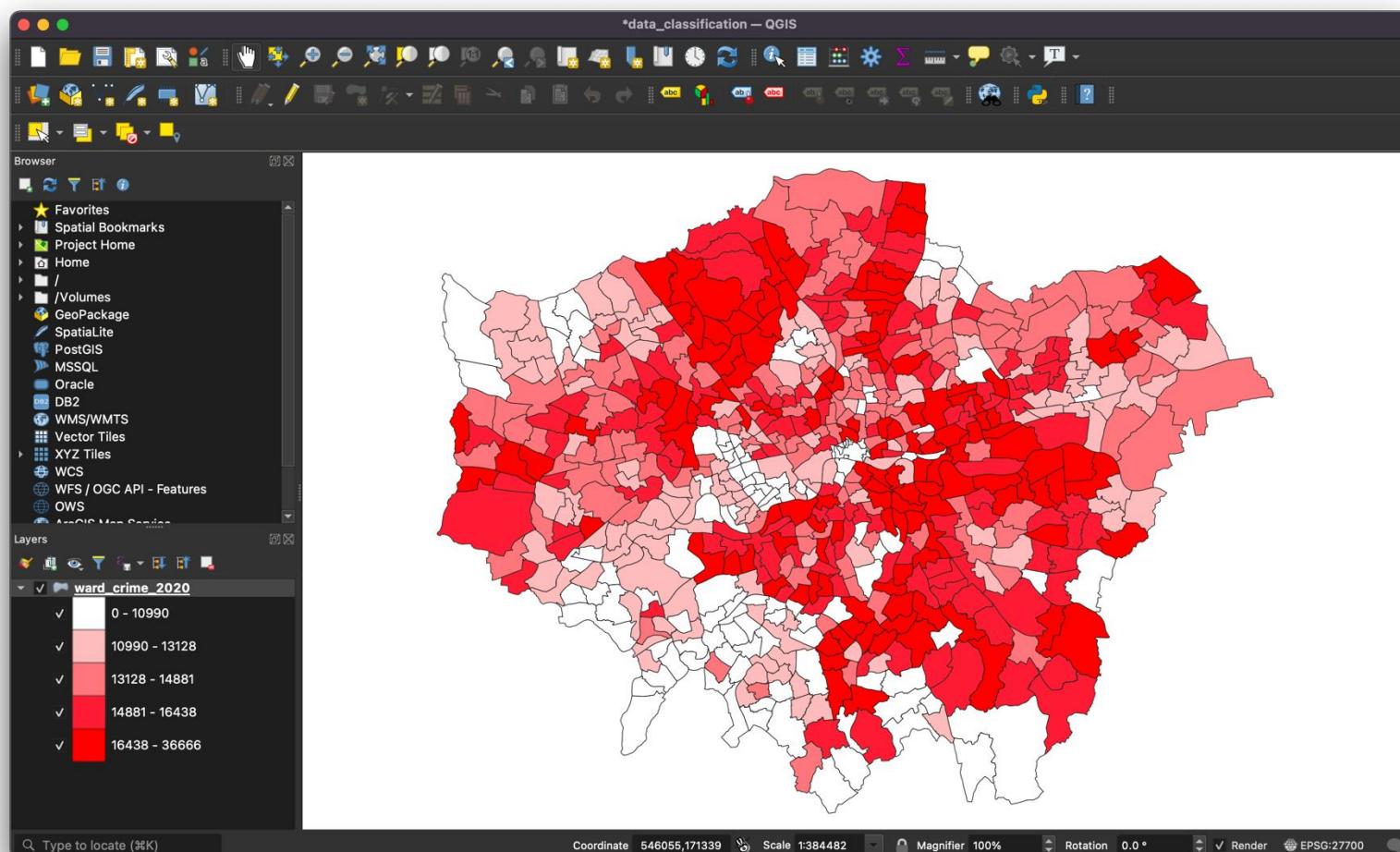
Mapping 101

Quantiles: This method divides the distribution into classes so that each bin contains the same number of values. The splits are based on the rank order of the data rather than the actual values. When the distribution is skewed, this approach can result in very different values being grouped together in the same bin.

Mapping 101



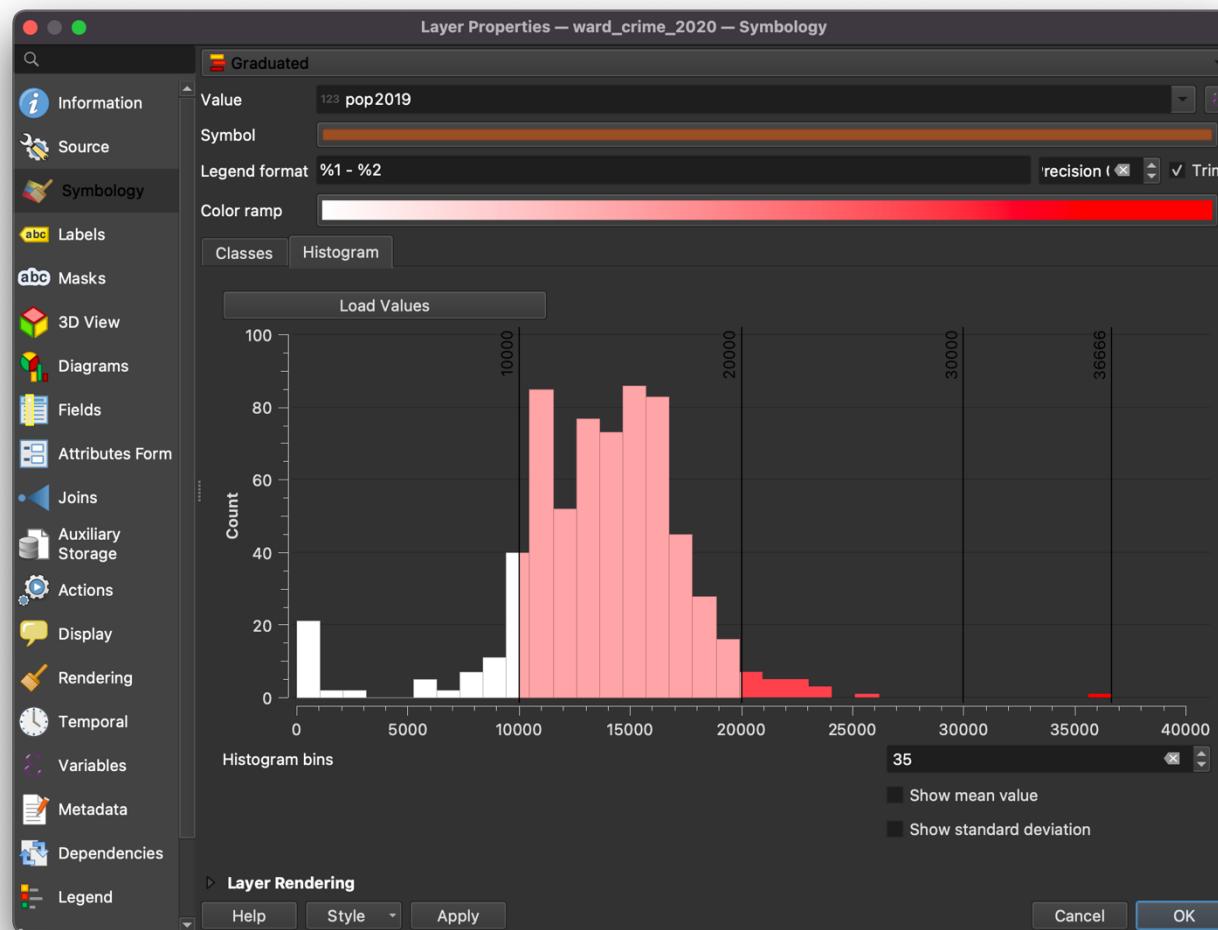
Mapping 101



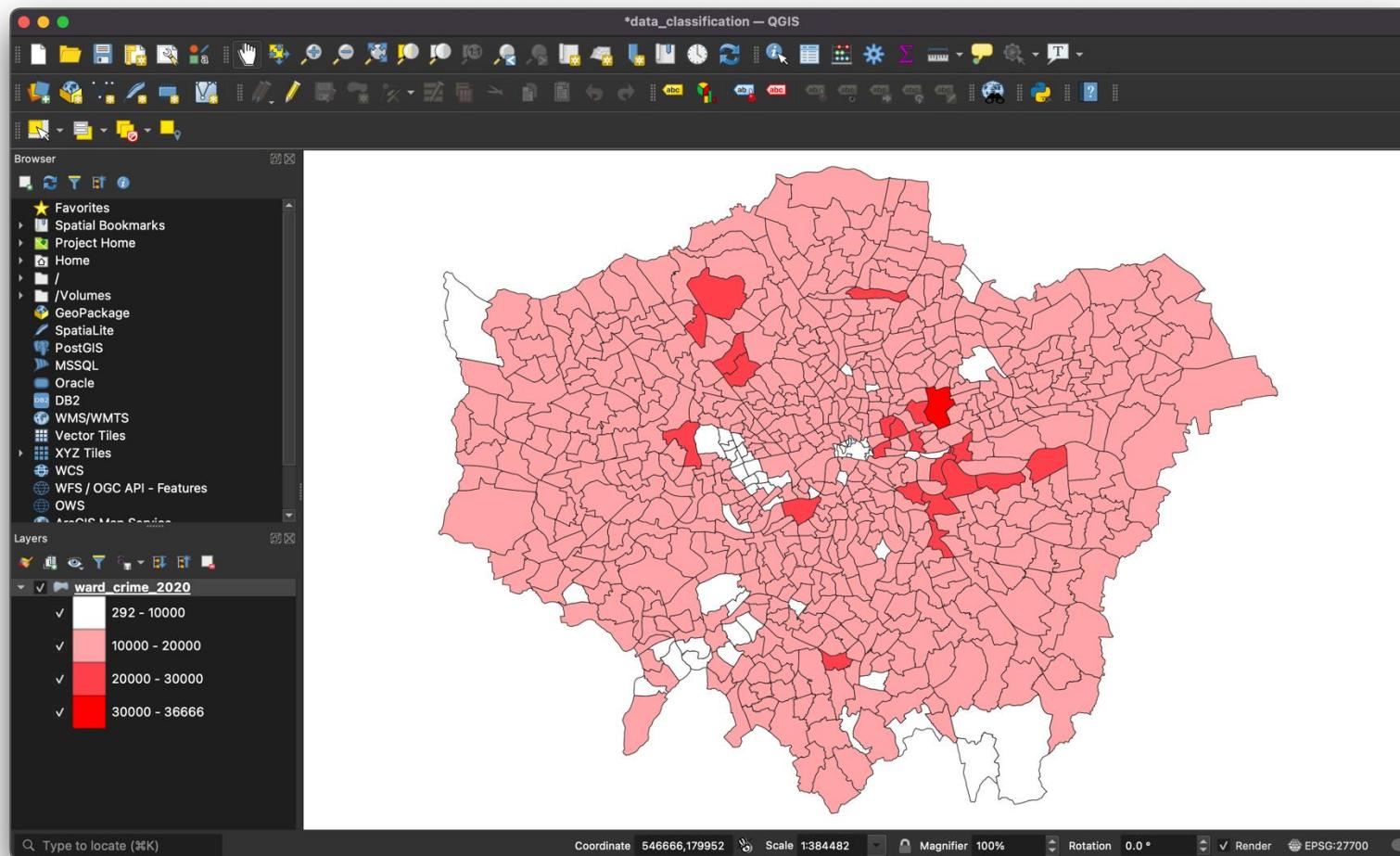
Mapping 101

Pretty: This method divides the distribution using a series of aesthetically pleasing, rounded values. The splits are not influenced by the data or its distribution. In cases of skewed distribution, this approach can lead to bins containing a low number of values, potentially overlooking important data patterns.

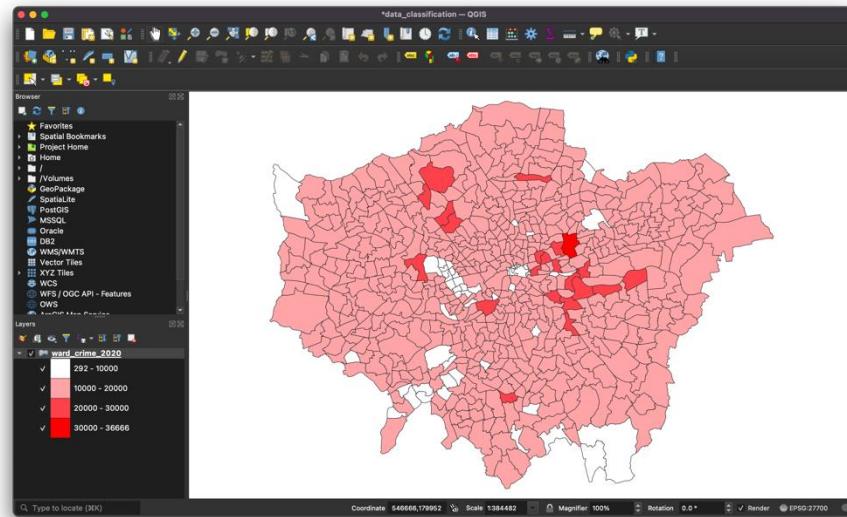
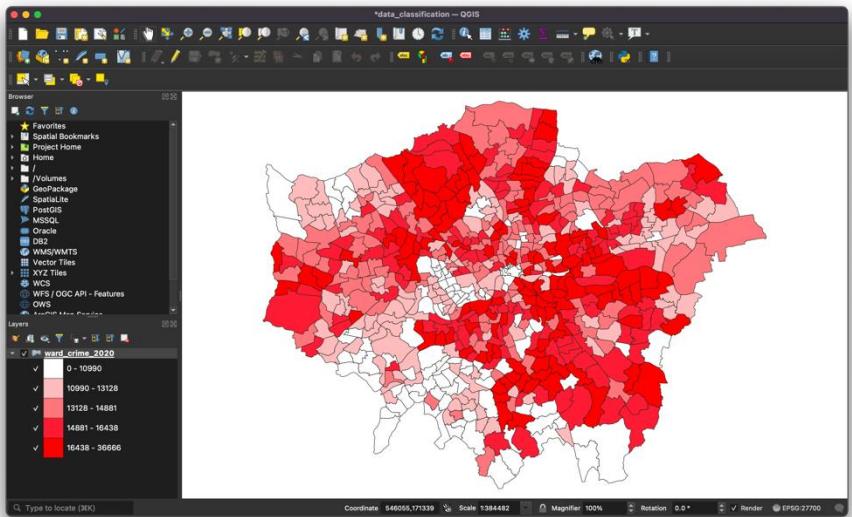
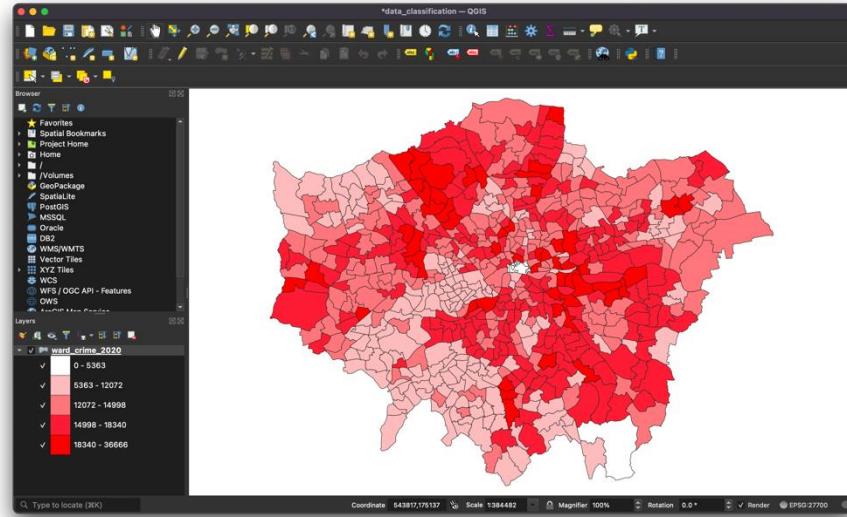
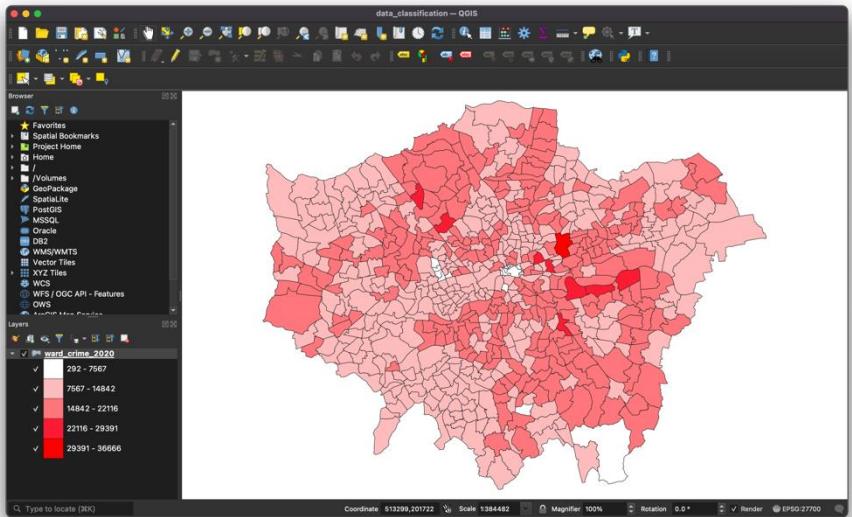
Mapping 101



Mapping 101



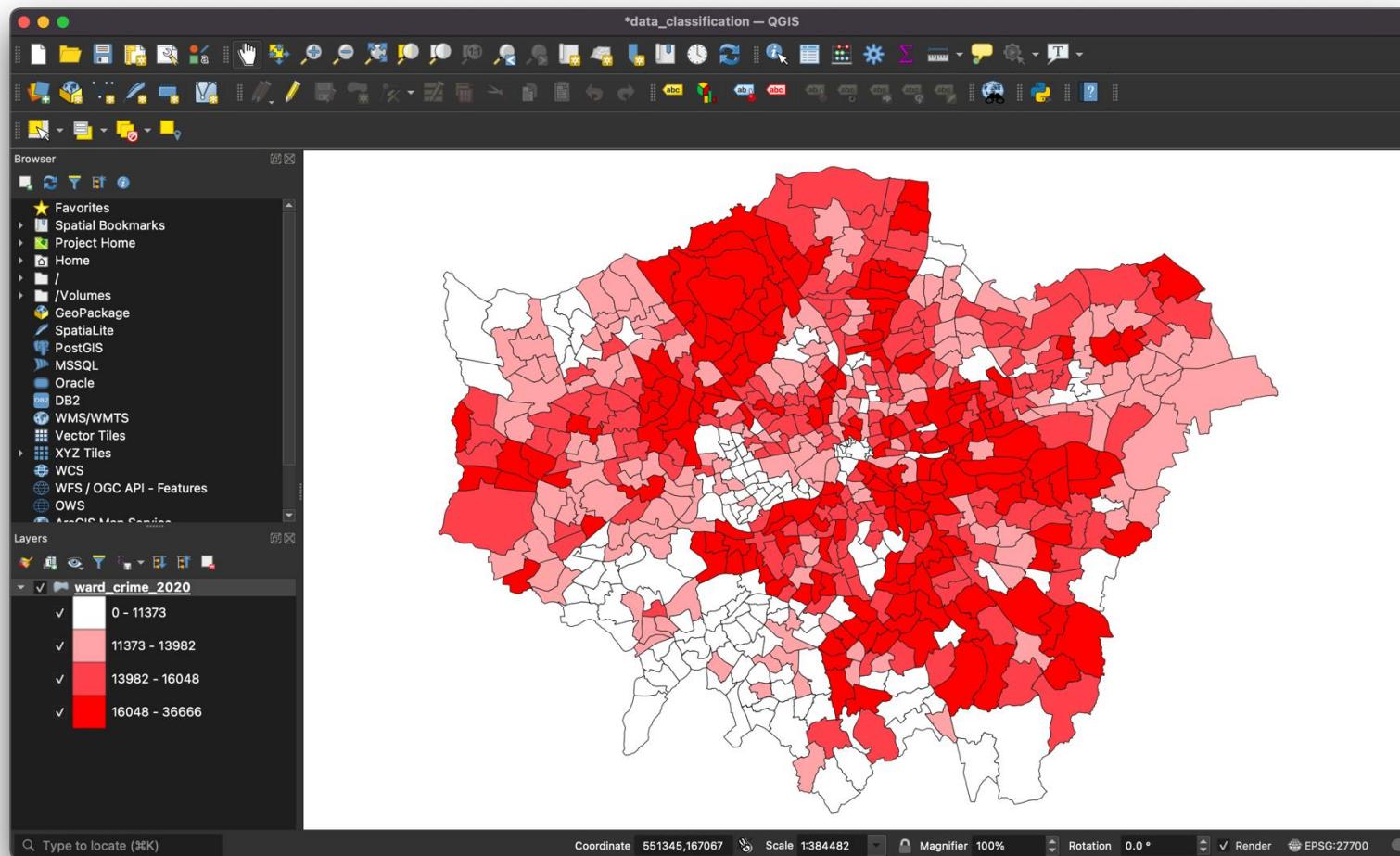
Different classifications, different maps



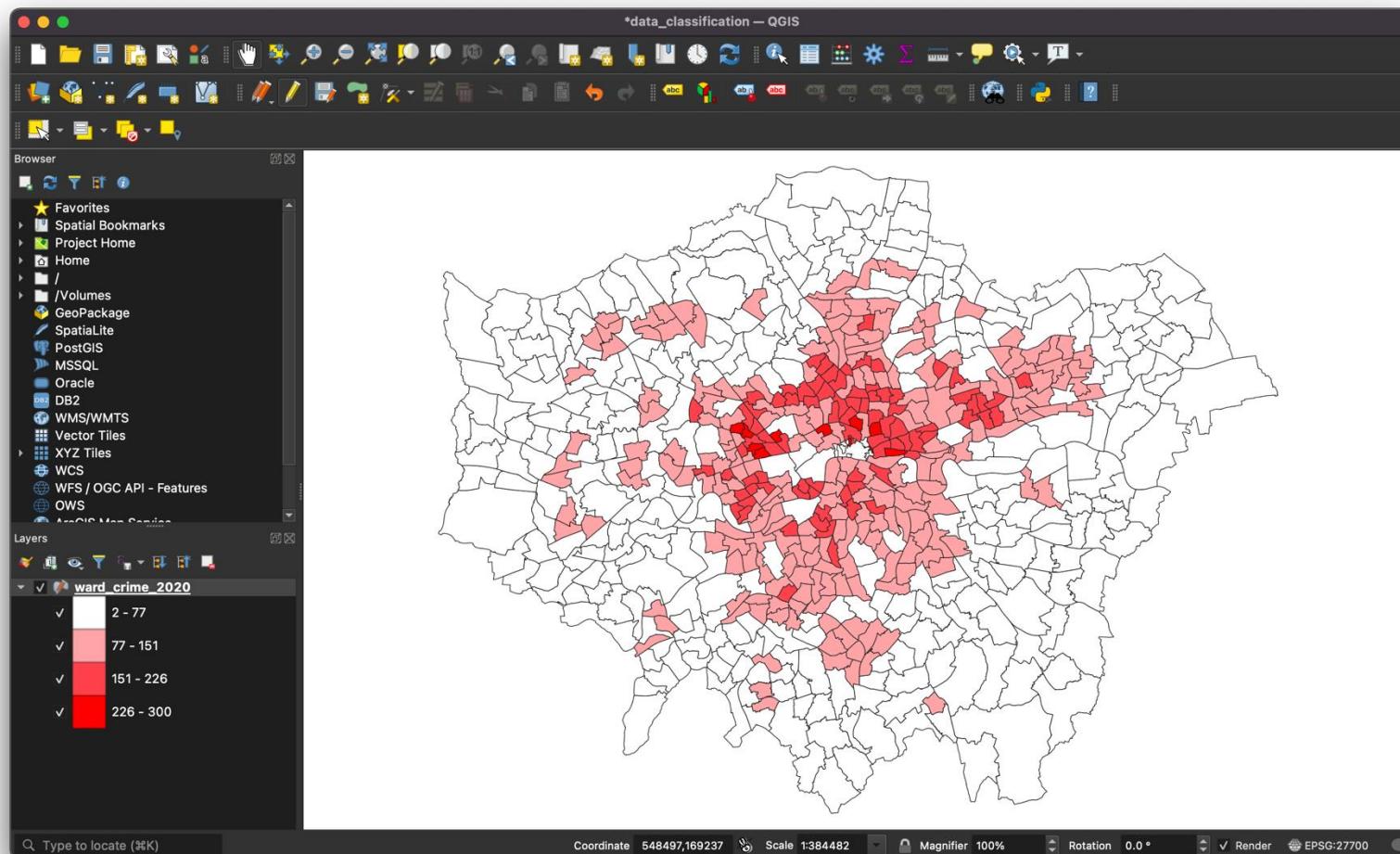
Mapping 101

Standardisation: Plotting raw numbers on choropleth maps should generally be avoided, as it can be misleading. Standardisation is achieved by dividing the variable of interest (numerator) by a standardising variable (denominator), such as total population, area, or another relevant metric. This approach allows for more accurate and meaningful comparisons across different regions or units.

Mapping 101



Mapping 101



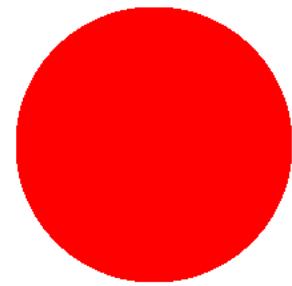
Mapping 101

Publishable maps should include the following essential elements:

- Title
- Legend
- Scale bar / scale text
- North arrow
- And: attribution and data sources

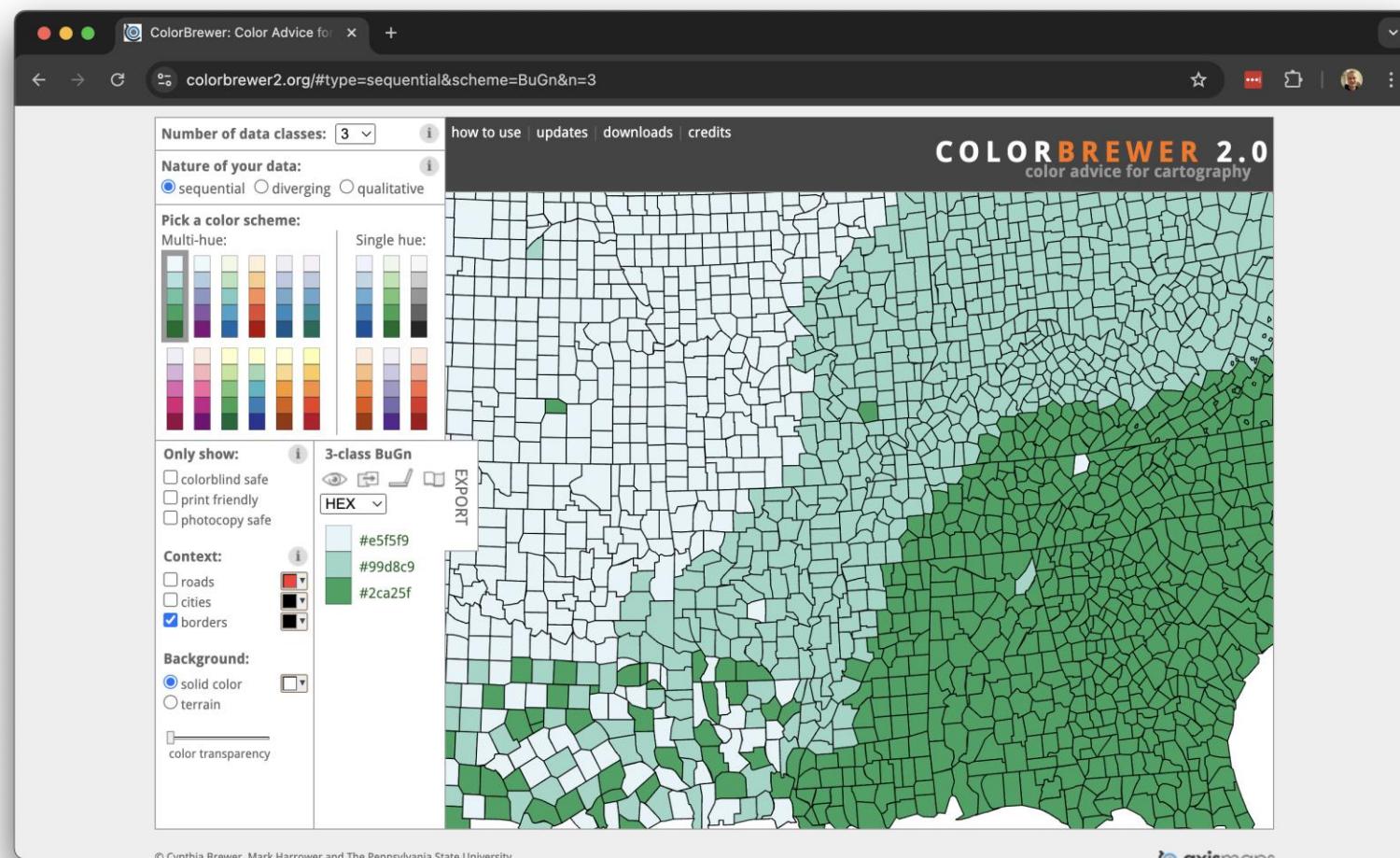
Optional:

- Text and labels can be important for providing context, but may sometimes be distracting, depending on the map's purpose.



LIVE

Mapping 101

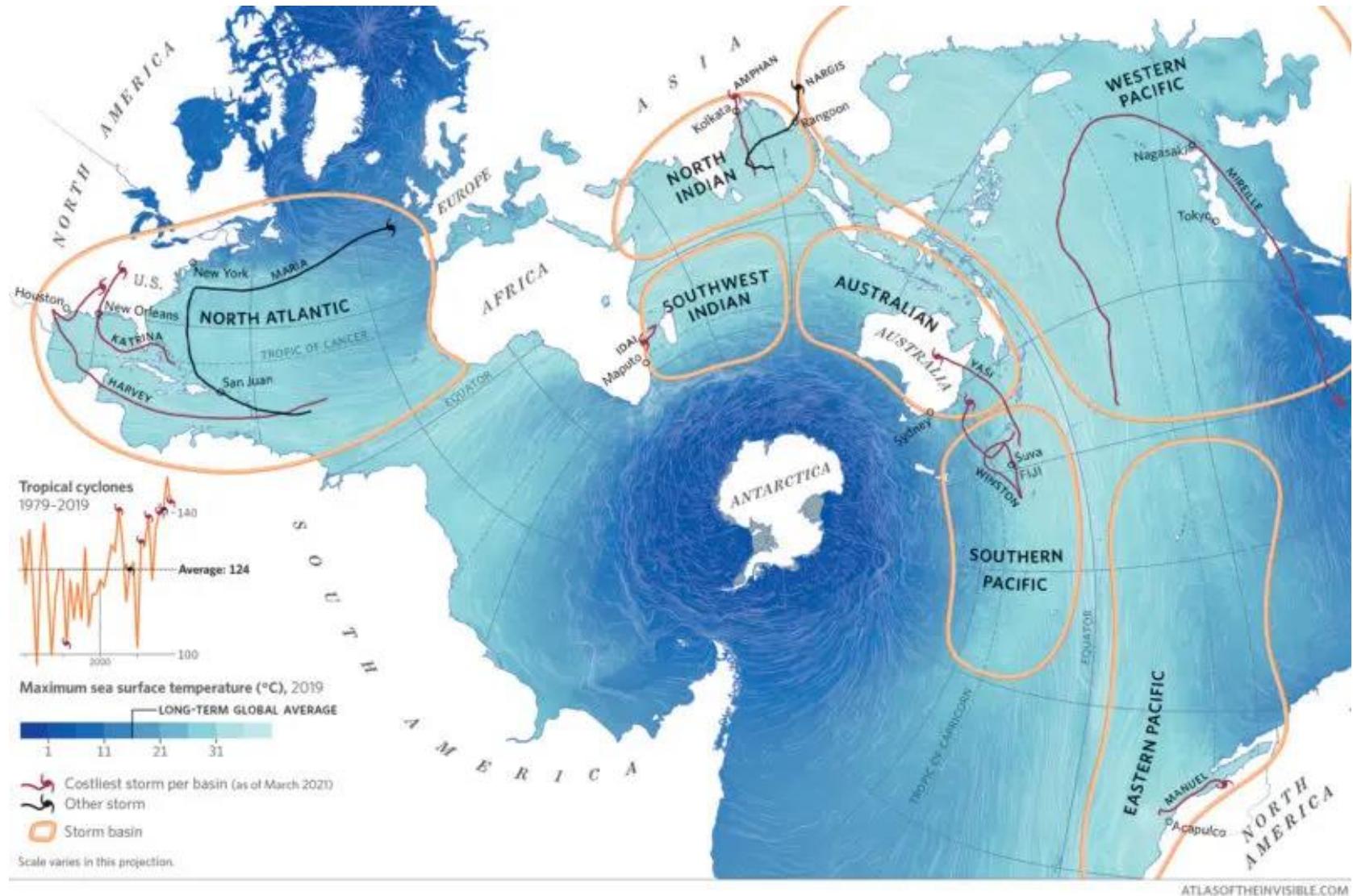


Cartography



Cheshire and Uberti. Atlas Of The Invisible

Cartography



Mentimeter

- Go to www.menti.com.
- Use code: 3499 2571



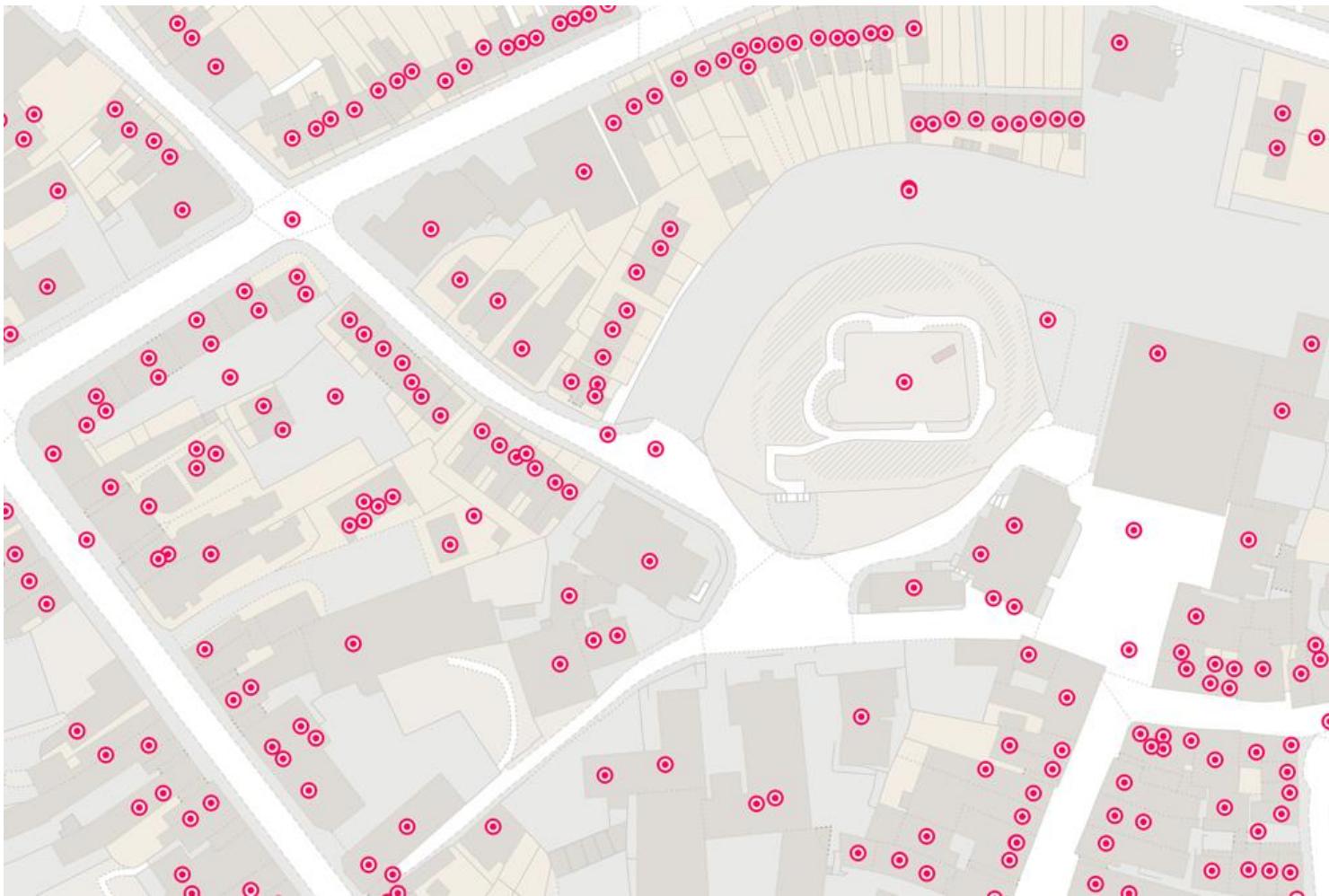
Break

More spatial analysis

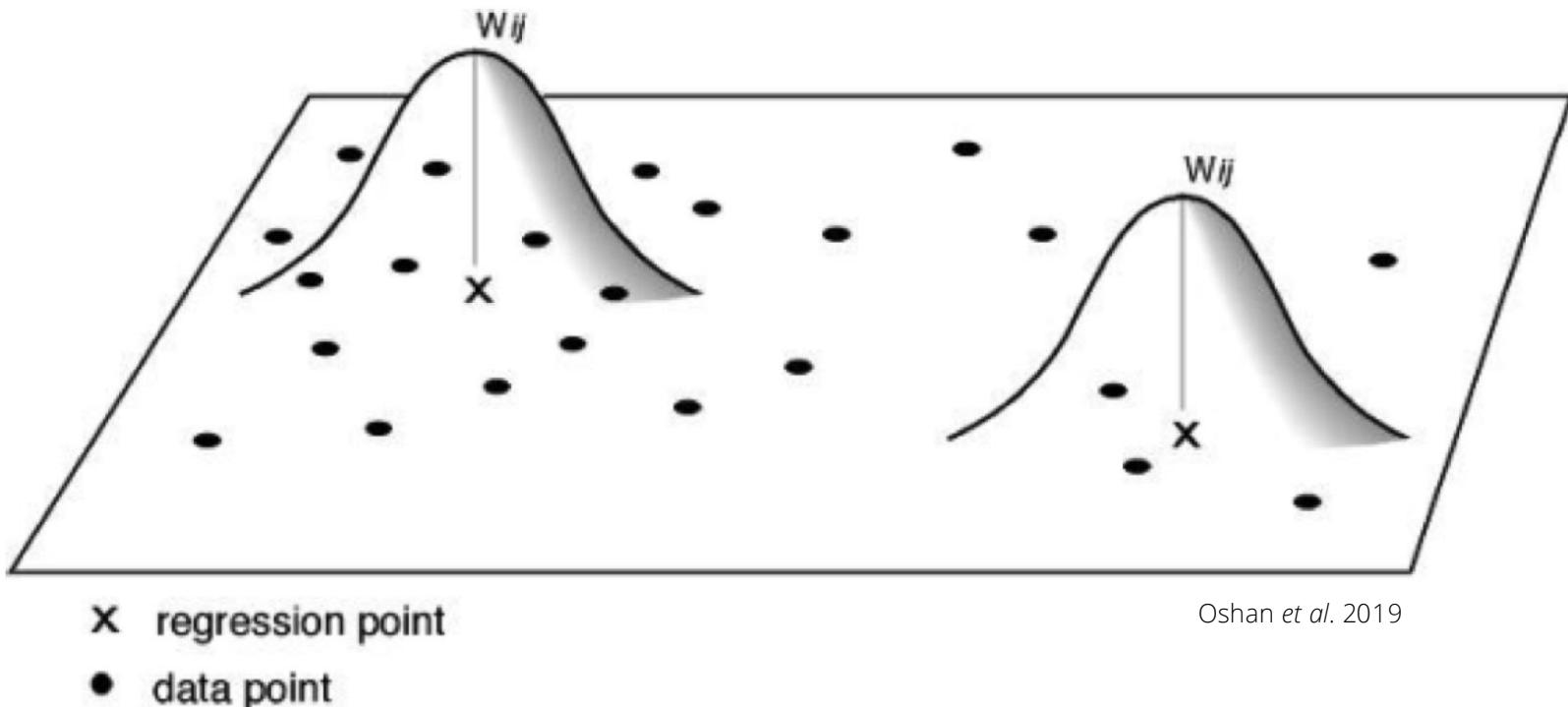
Geocoding

Forename	Surname	Address
Justin	van Dijk	Flat 18 Terry House SW22NT London

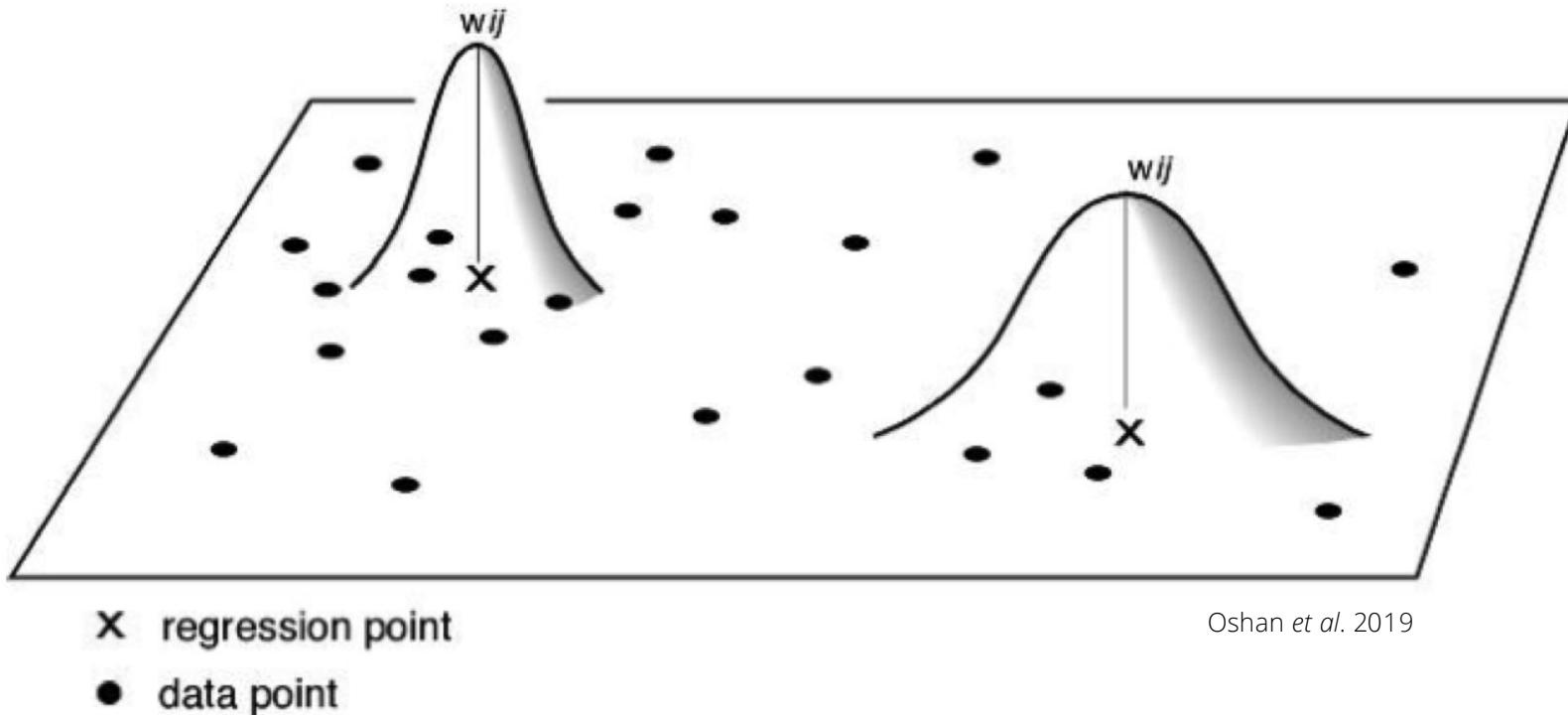
Geocoding



Point location data

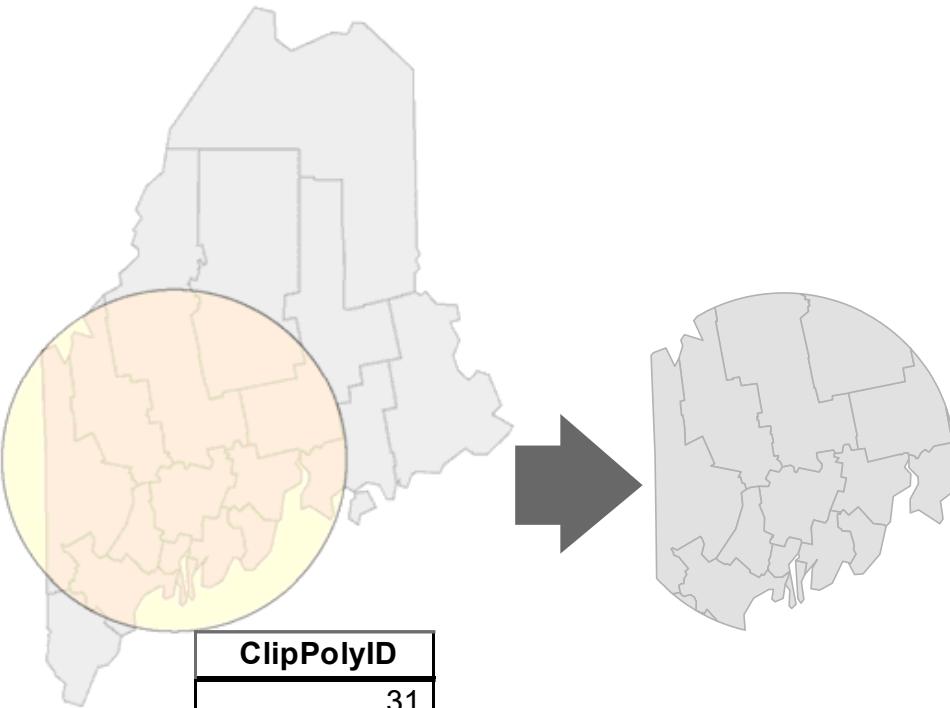


Point location data



Spatial operations

NAME
Androscoggin
Aroostook
Cumberland
Franklin
Hancock
Kennebec
Knox
Lincoln
Oxford
Penobscot
Piscataquis
Sagadahoc
Somerset
Waldo
Washington
York

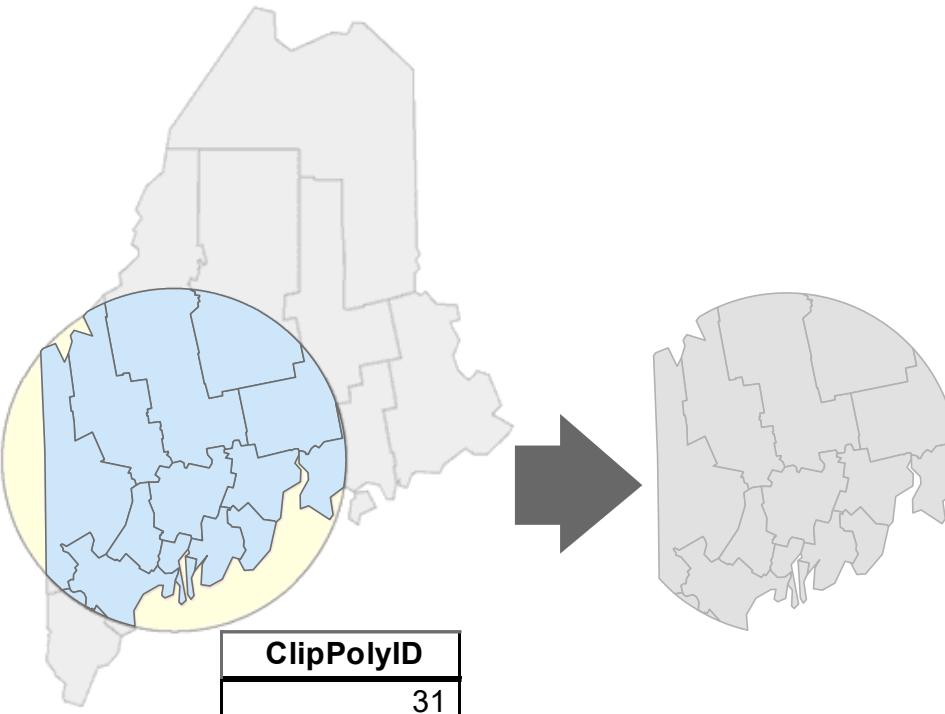


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Somerset
Waldo
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Gimdond, M. 2021. Intro to GIS and Spatial Analysis. [online]
<https://mgimond.github.io/Spatial/introGIS.html>

Spatial operations

NAME
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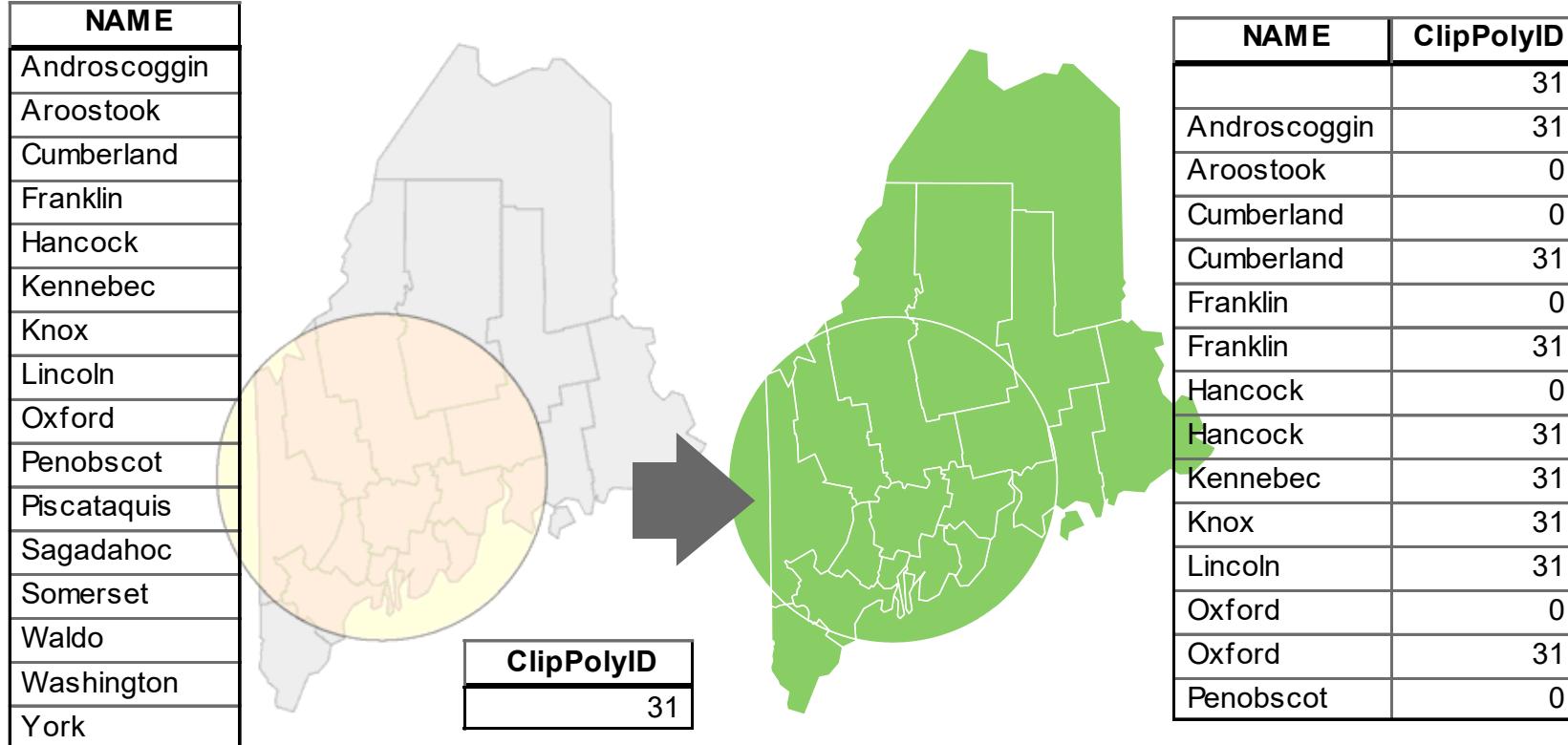


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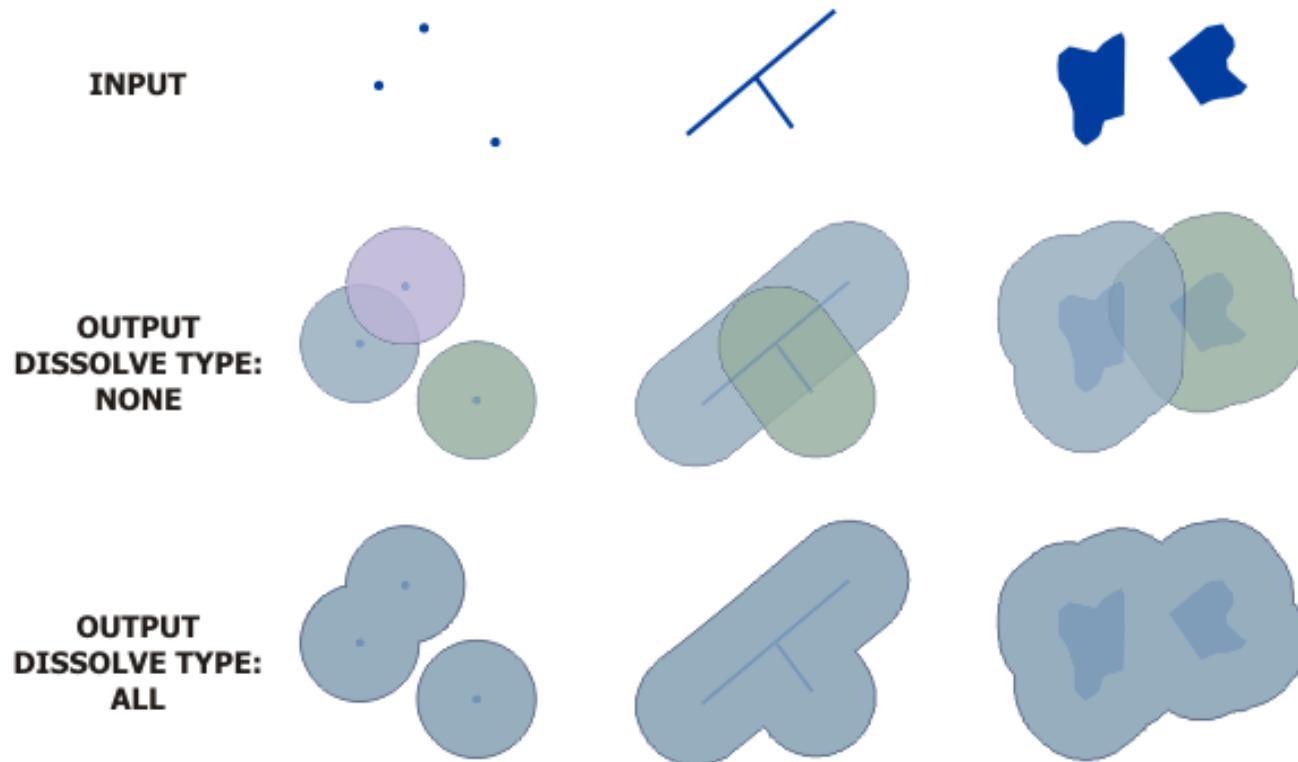
Spatial operations



Gimdond, M. 2021. Intro to GIS and Spatial Analysis. [online]

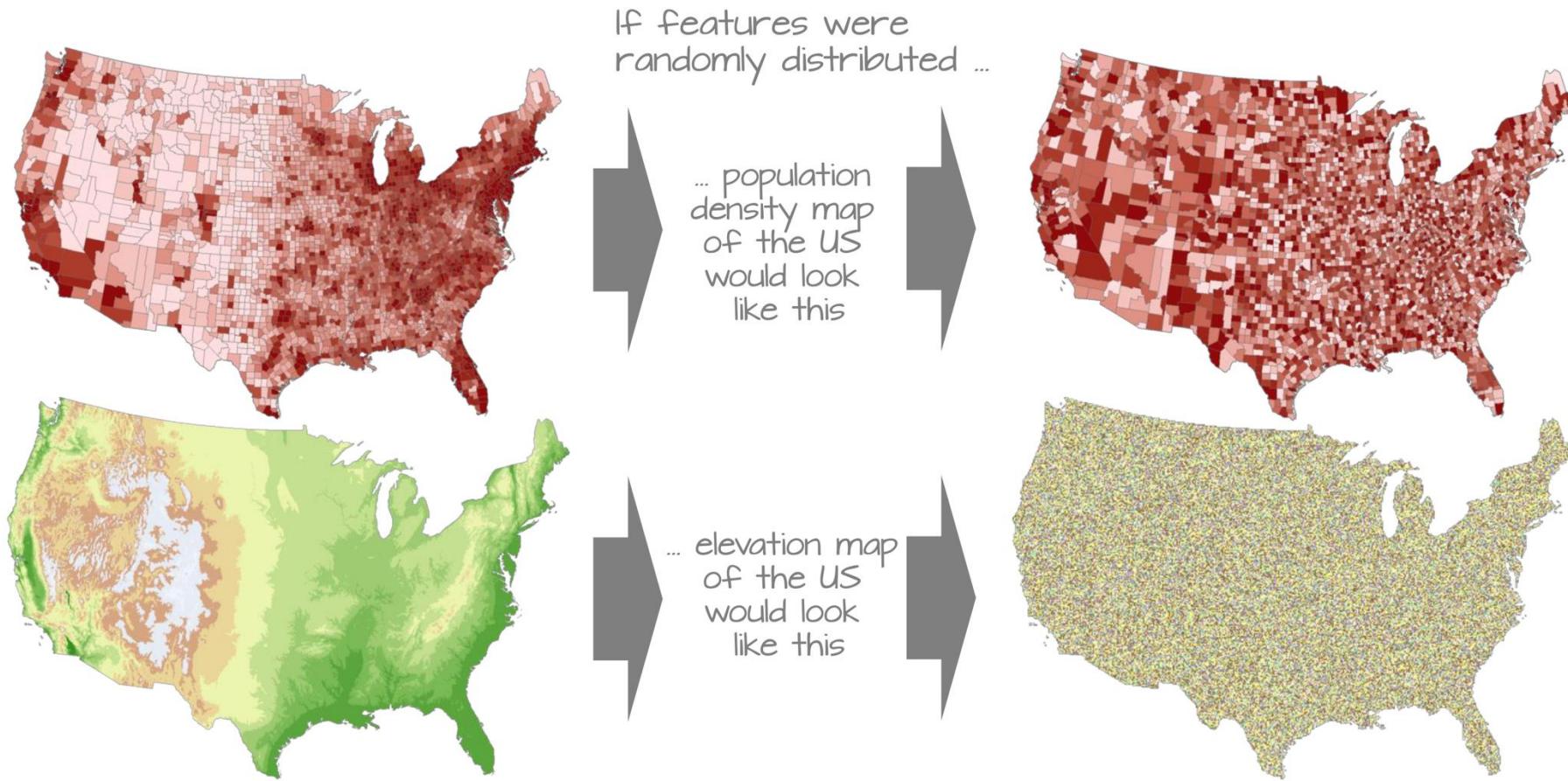
<https://mgimond.github.io/Spatial/introGIS.html>

Spatial operations



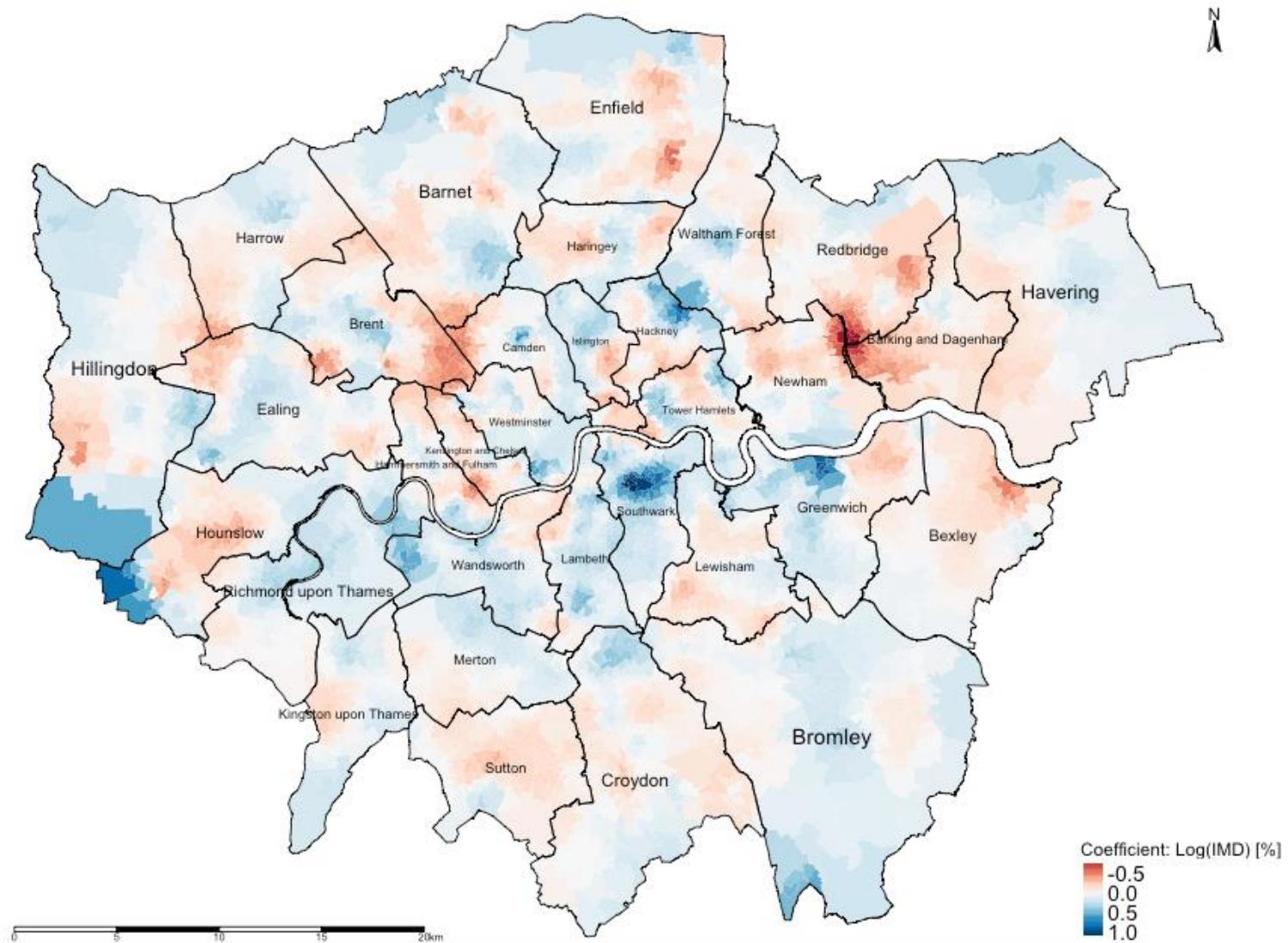
ESRI. 2021. Buffer. [online]
<https://pro.arcgis.com/en/pro-app/latest/tool-reference/analysis/buffer.htm>

Geographically weighted associations

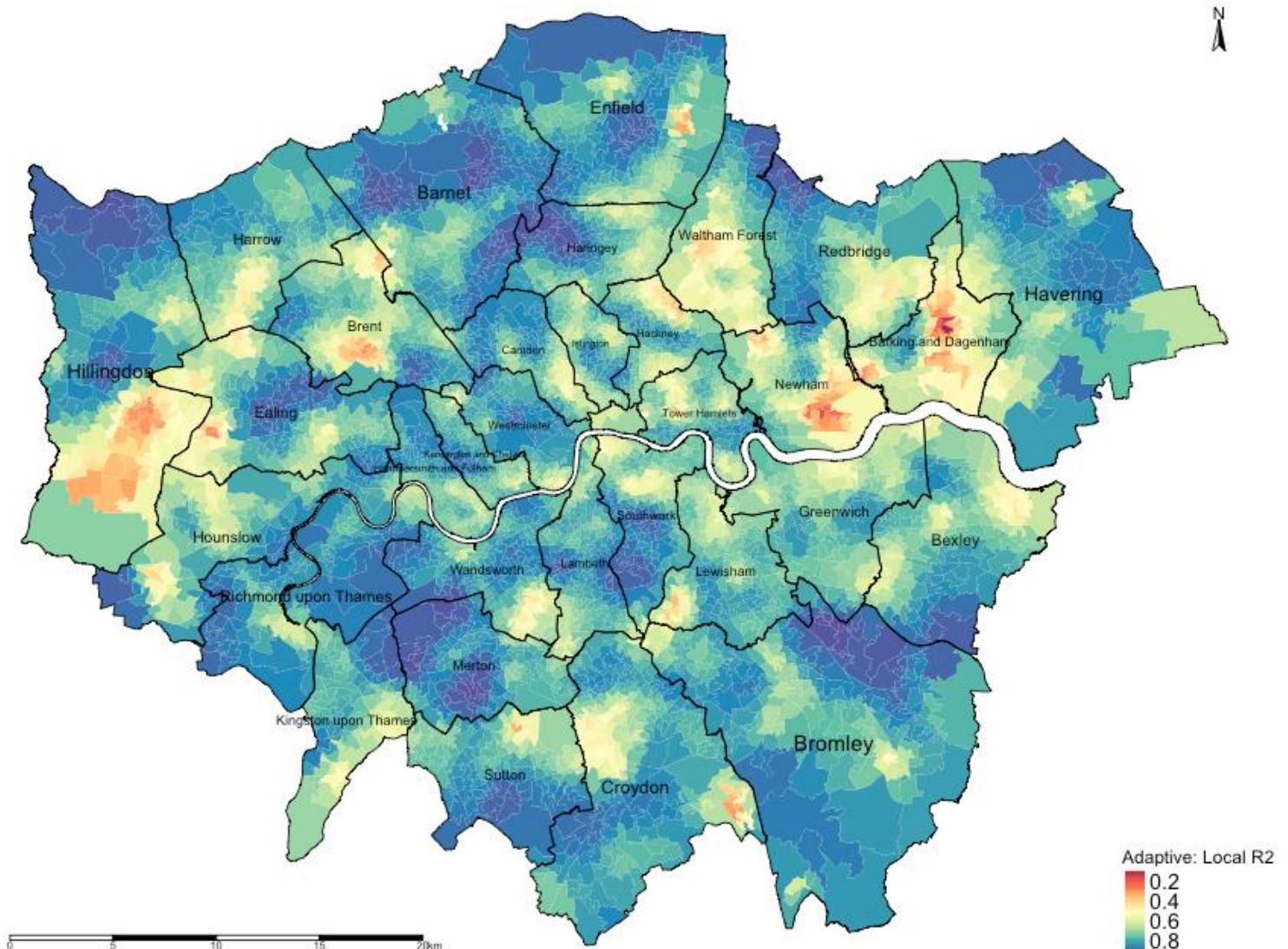


Gimond, M. 2021. Intro to GIS and Spatial Analysis. [online]
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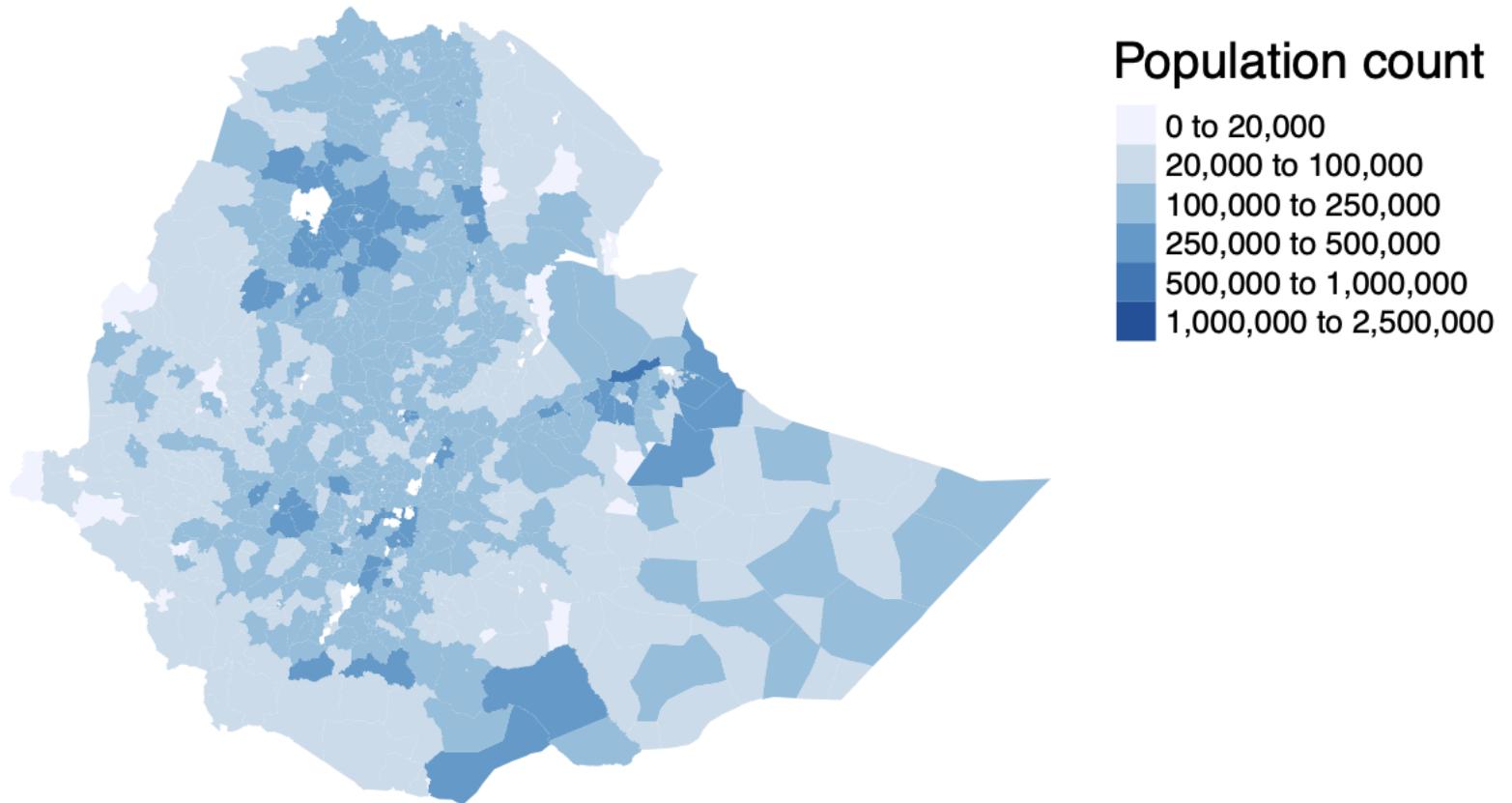
Geographically weighted associations



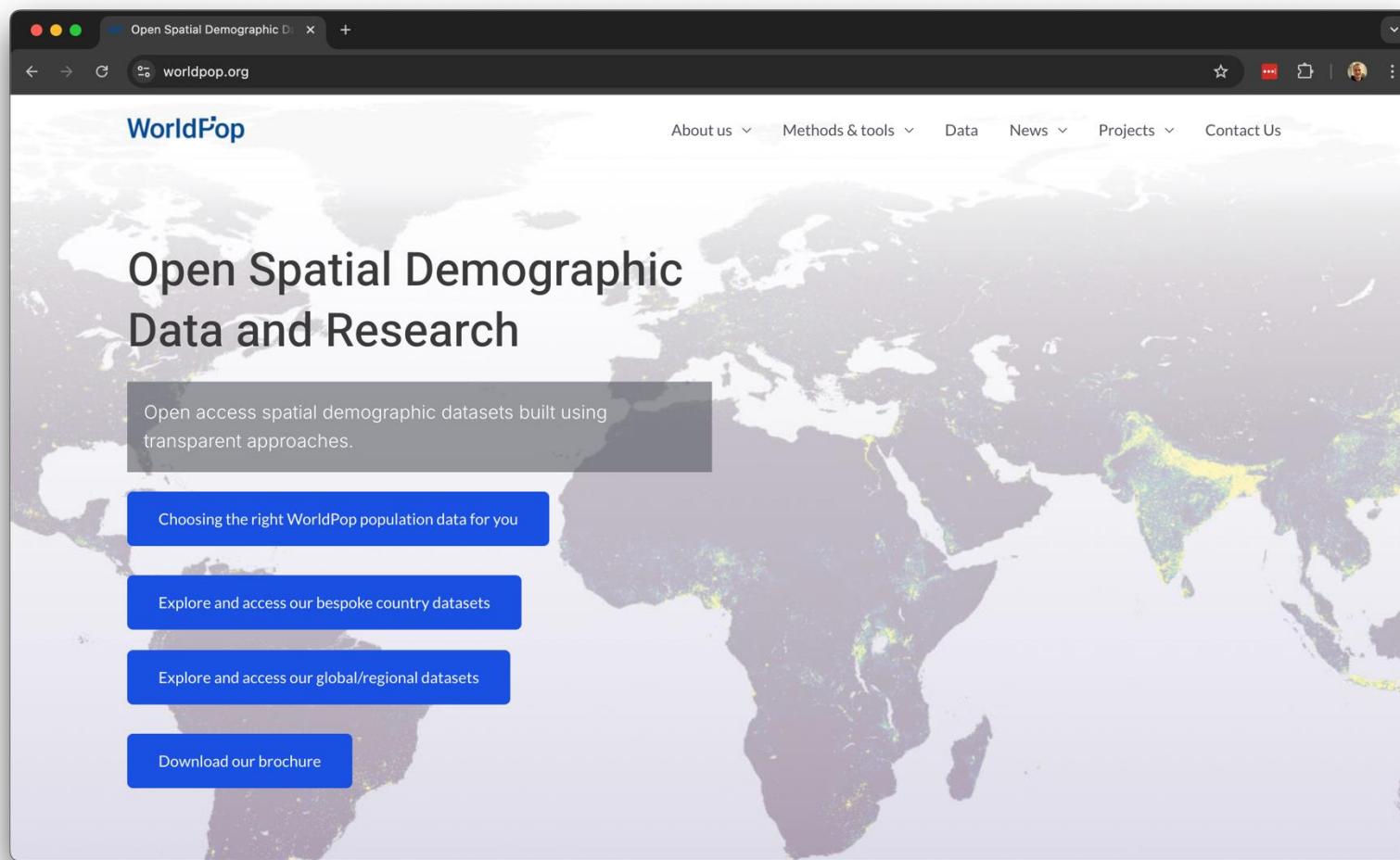
Geographically weighted associations



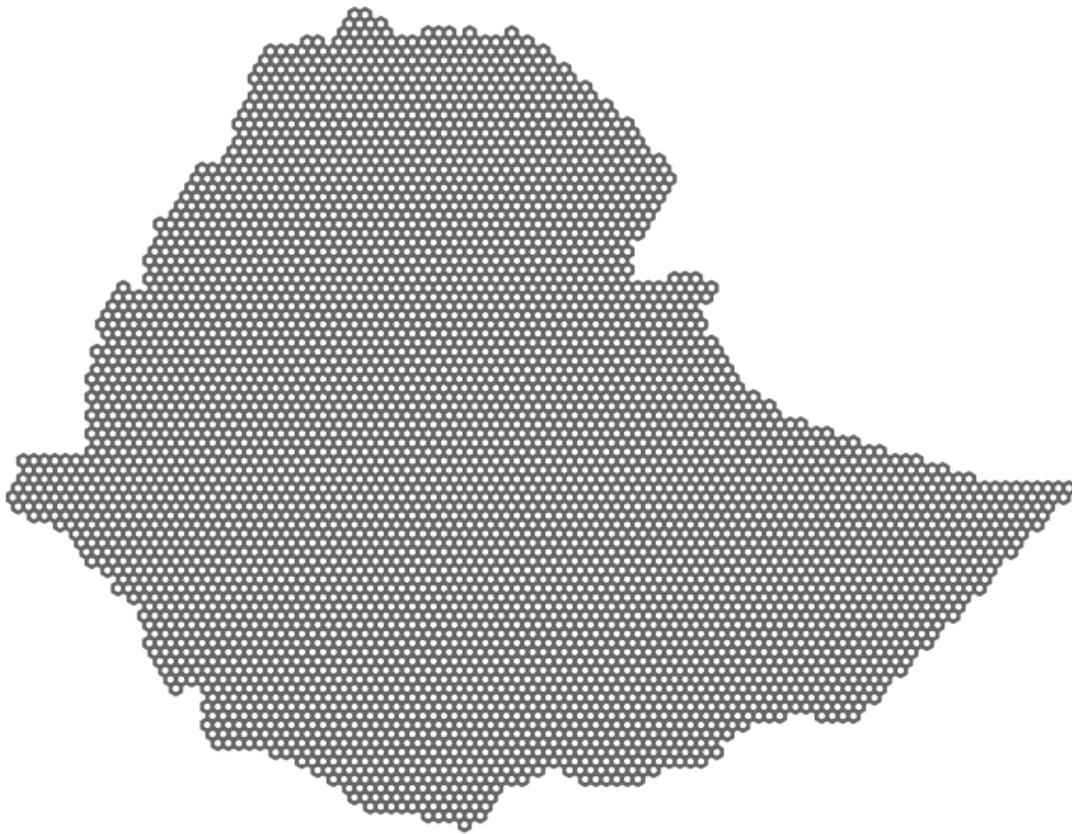
Raster data



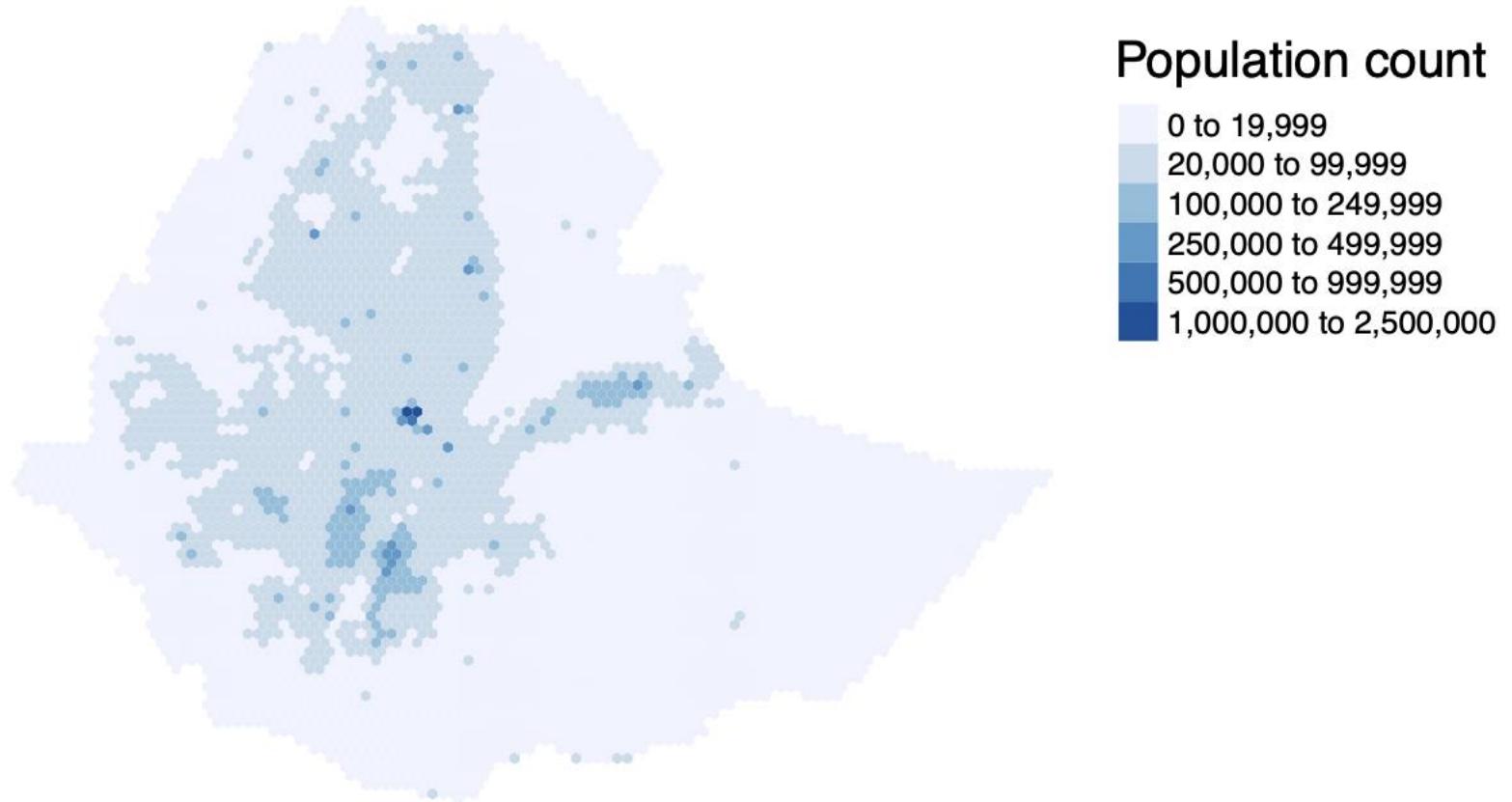
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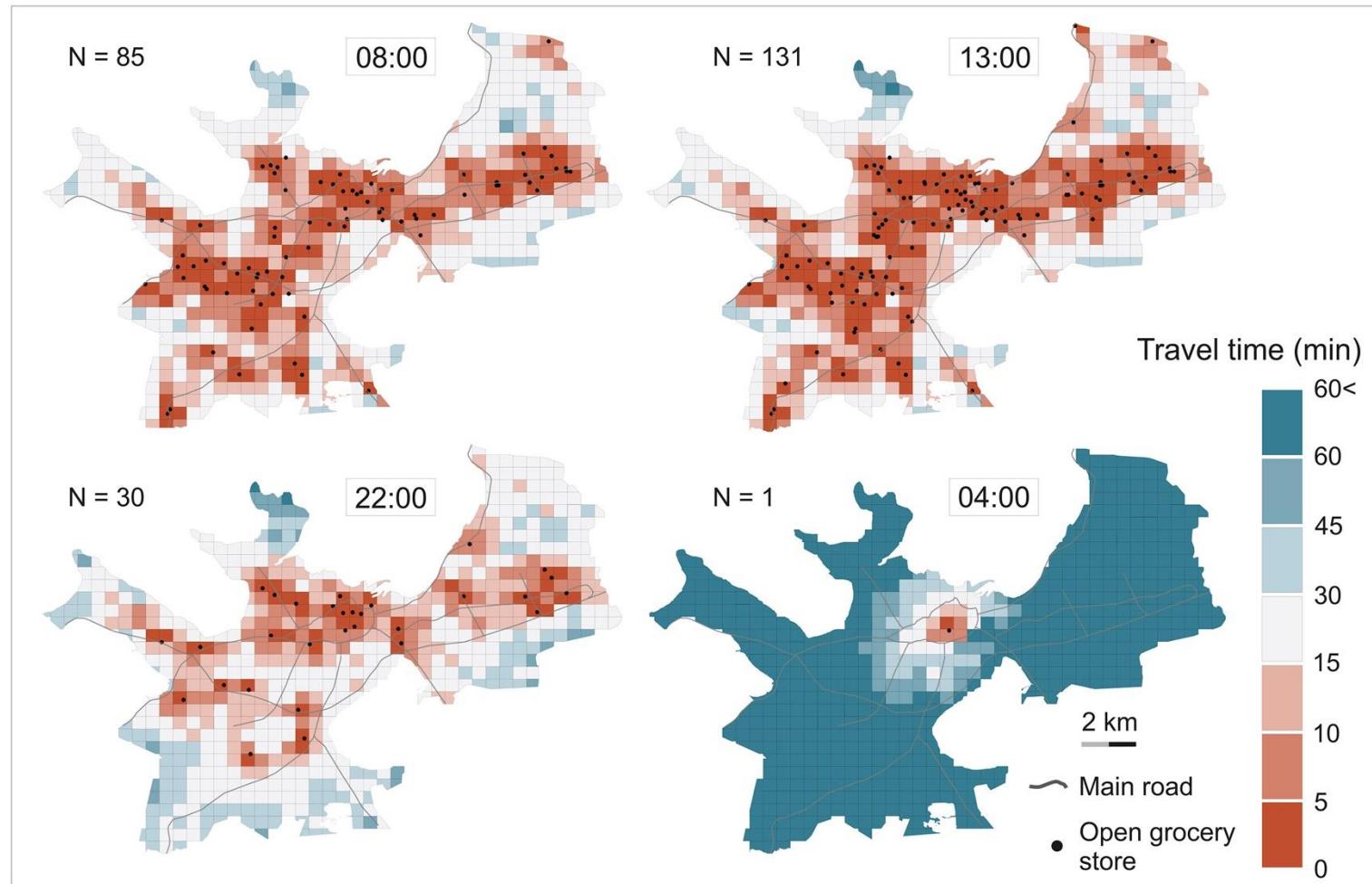
Raster data



Raster data

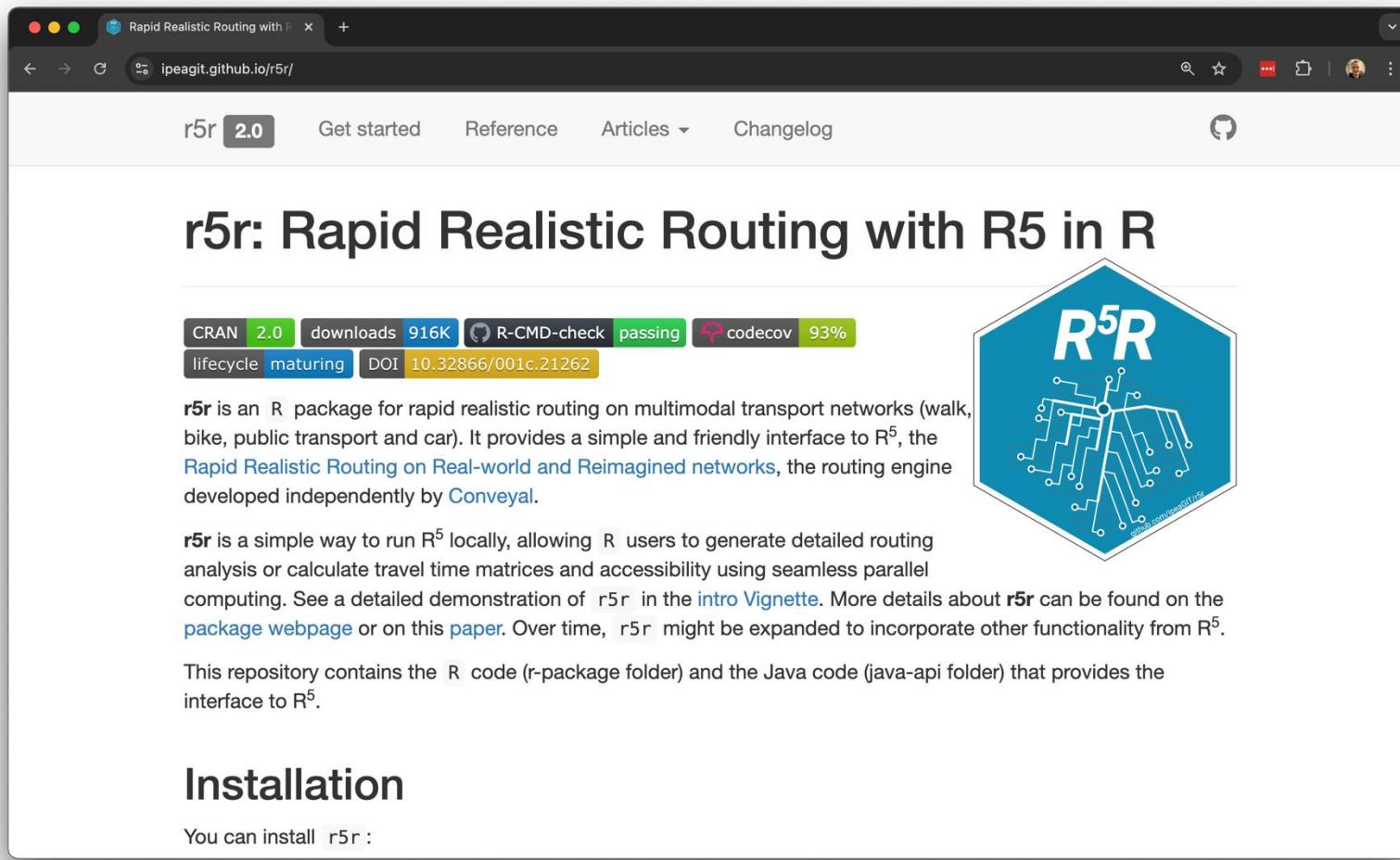


Accessibility analysis



Järv et al. 2018

Accessibility analysis



The screenshot shows a web browser displaying the GitHub repository page for `r5r`. The page title is "r5r: Rapid Realistic Routing with R5 in R". The top navigation bar includes links for "Get started", "Reference", "Articles", and "Changelog". A GitHub icon is in the top right corner.

Key statistics displayed include:

- CRAN 2.0
- downloads 916K
- R-CMD-check passing
- codecov 93%
- lifecycle maturing
- DOI 10.32866/001c.21262

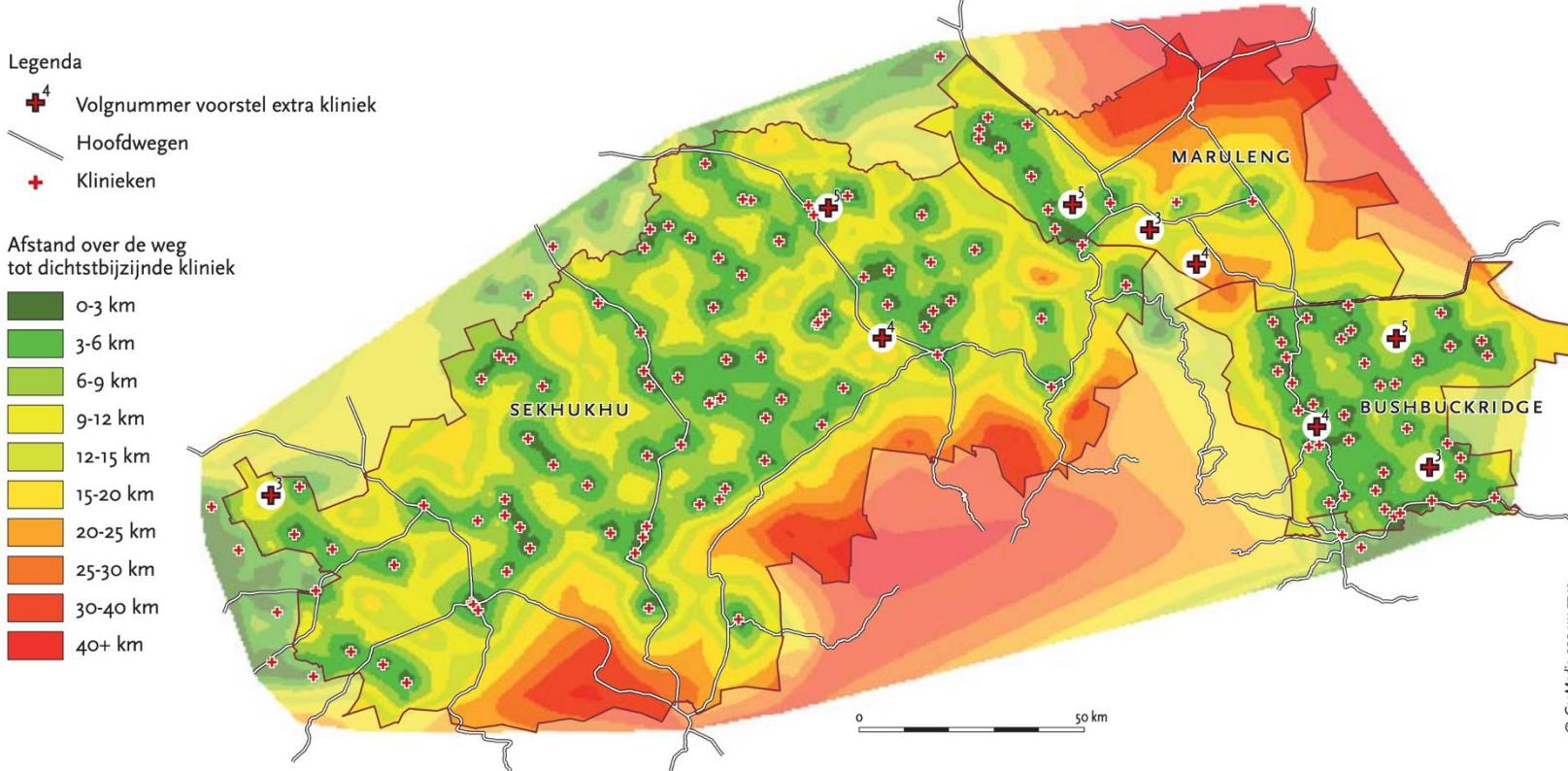
The main text describes `r5r` as an R package for rapid realistic routing on multimodal transport networks. It highlights its simplicity and friendly interface to `R5`, the routing engine developed by Conveyal. The text also mentions the introduction vignette, the package webpage, and a related paper.

The repository contains R code (r-package folder) and Java code (java-api folder) for the interface to `R5`.

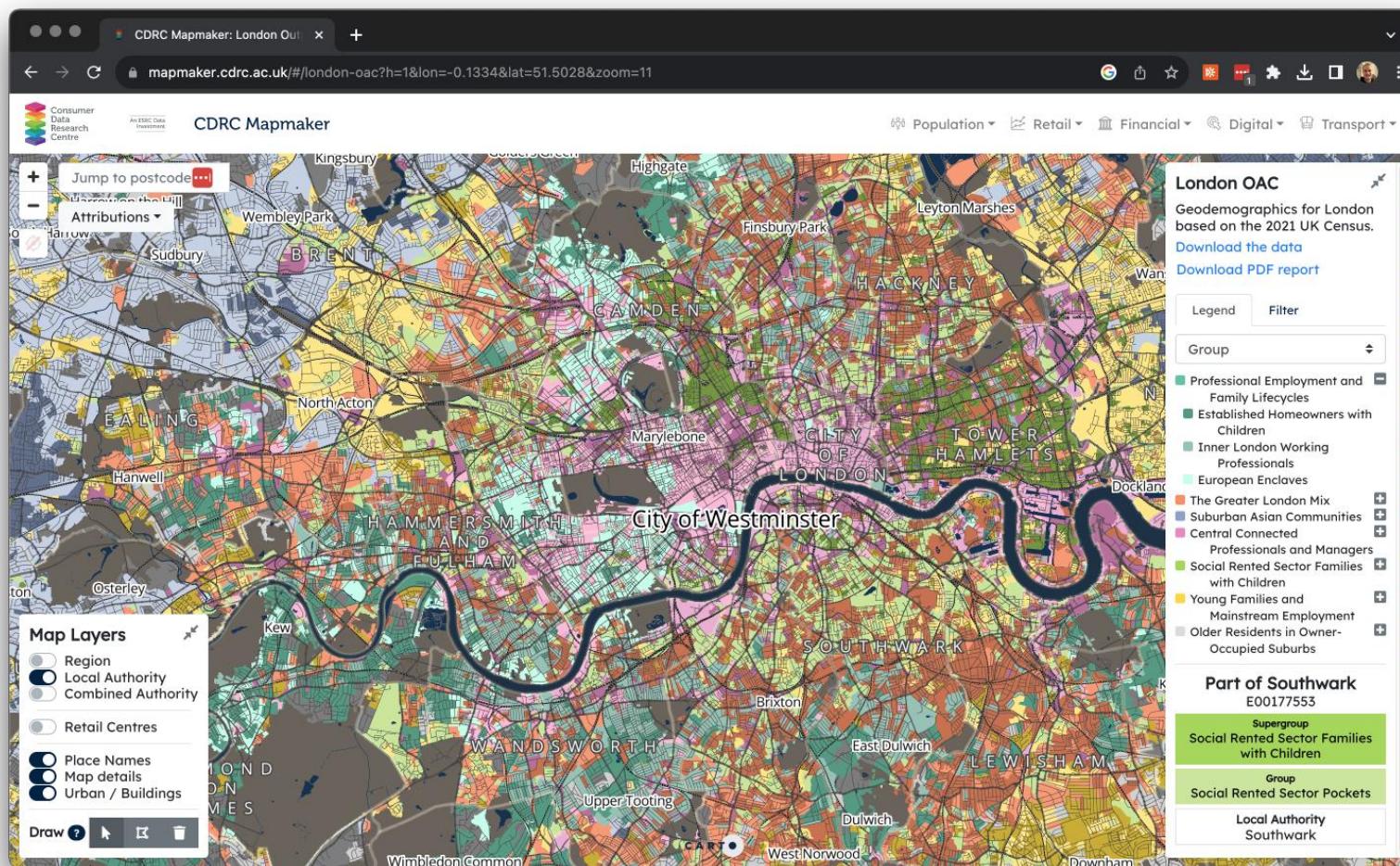
Installation

You can install `r5r`:

Accessibility analysis



Geodemographic classification



2021 London Output Area Classification on mapmaker.cdrc.ac.uk

Novel data sources

Traditionally, quantitative datasets in geography and the social sciences:

- Are collected for a specific purpose, following a careful study and design.
- Contain very detailed information on a particular topic.
- Are of high quality and of known provenance.

Novel data sources

Traditionally, quantitative datasets in geography and the social sciences are:

- Expensive to produce (e.g., Census, longitudinal surveys).
- Of limited spatial granularity (privacy preserving).
- Infrequently updated.

Novel data sources

- New sources of data: the digital exhaust.
- Diverse in quality and resolution.
- Arguably: higher spatial granularity, higher temporal granularity.
- Many geographical questions and applications although geographers are often not the ones providing answers.

Novel data sources



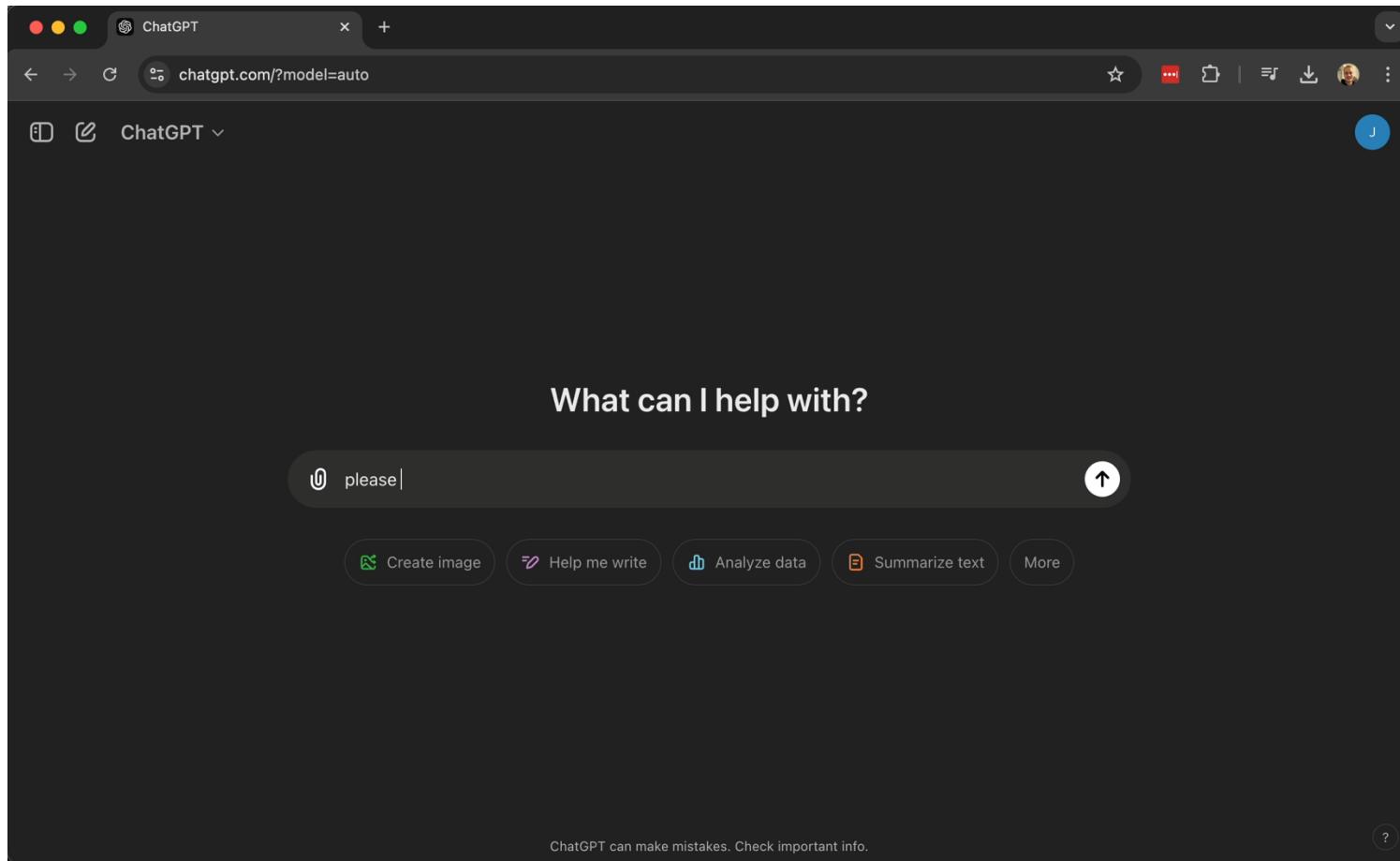
Summary

Summary

- Maps are important tools to effectively convey spatial heterogenous information.
- At least two things are required: GIScience and GISystems.
- Essential to think about how to present your data.
- There is no one map to rule them all.
- Lots more quantitative spatial analysis out there.

Module summary

Quantitative methods



Further support

- Attend the GEOG0018 Drop-In Support session on Thursday December 12th.
- Attend the GEOG0018 Drop-In Support session on Thursday January 9th [Online].
- Teaching staff will not respond to e-mails with coding questions.
- Teaching staff will not be available during the winter closure and any period of annual leave.

Questions

Justin van Dijk

j.t.vandijk@ucl.ac.uk





Happy winter break!