Geographic Data Science - Lecture IV

Mapping Data

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Today

- Visualisation
- Geo-Visualisation
- Mapping data
  - MAUP
  - Choropleths

Visualization

*"Data graphics **visually display measured quantities** by means of the **combined use** of points, lines, a coordinate system, numbers, symbols, words, shading, and color."*

The Visual Display of Quantitative Information. Edward R. Tufte.

[Source]

Visualization

- By **encoding information visually**, they allow to present **large amounts** of numbers in a **meaninful** way.
- If well made, visualizations provide leads into the processes underlying the graphic.

The Visual Display of Quantitative Information. Edward R. Tufte.

Geovisualization

Tufte (1983)

"The most extensive data maps […] place millions of bits of information on a single page before our eyes. No other method for the display of statistical information is so powerful"

MacEachren (1994)

*"**Geographic visualization** can be defined as the use of concrete visual representations –whether on paper or through computer displays or other media–to **make spatial contexts and problems visible**, so as to engage the most powerful **human information processing** abilities, those associated with vision."*

GeoVisualization

- Not to replace the human *in the loop*, but to **augment** her/him.
- Augmentation through engaging the **pattern recognition** capabilities that our brain inherently has.
- Combines cartography, infovis and statistics

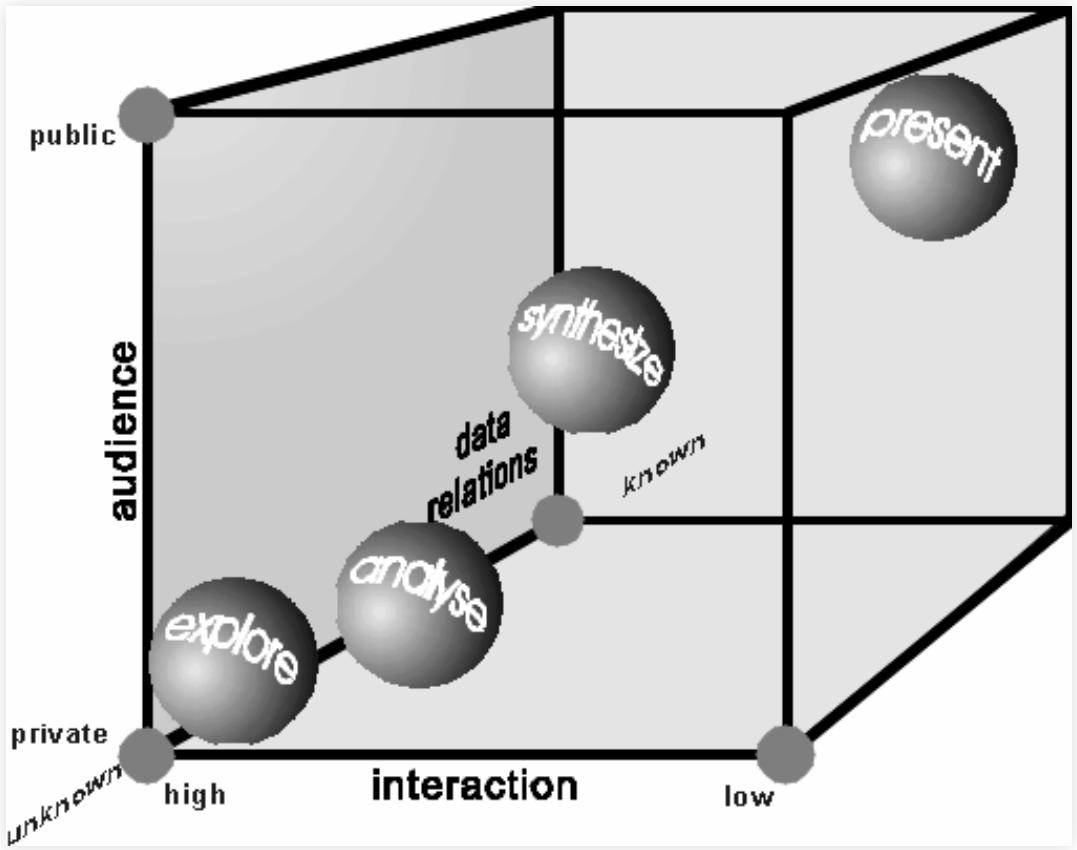
A map for everyone

Maps can fulfill several needs, looking very different depending on the end-goal

MacEachren & Kraak (1997) identify three main dimensions:

- Knowledge of what is being plotted
- Target audience
- Degree of interactivity

MacEachren & Kraak (1997) map cube



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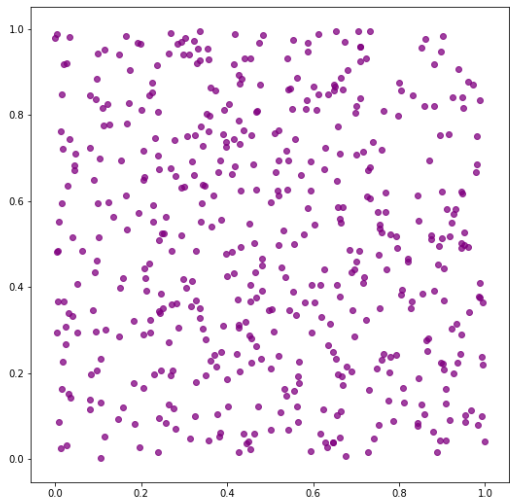
Making good data maps

- “Containers”
- Choropleths

Data “containers”

Modifiable **A**real **U**nit **P**roblem (Openshaw, 1984)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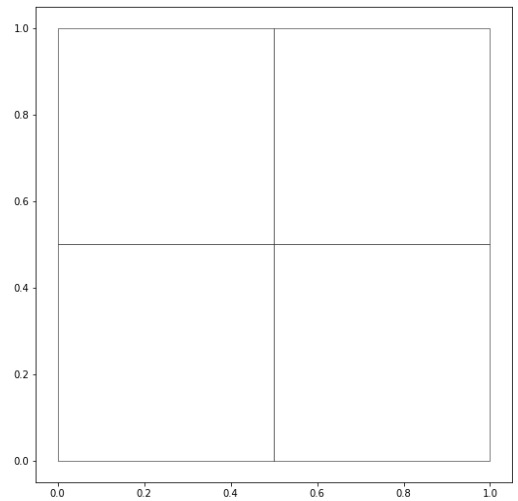
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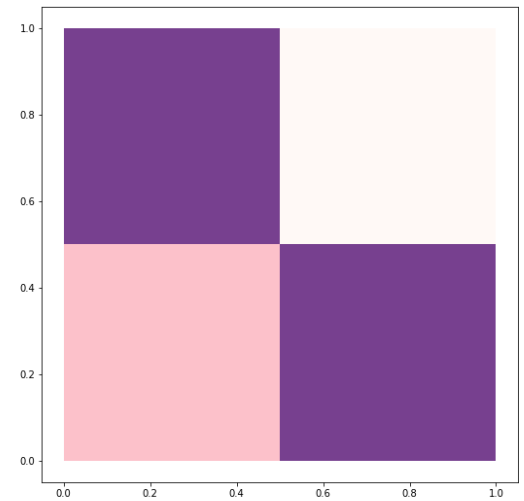
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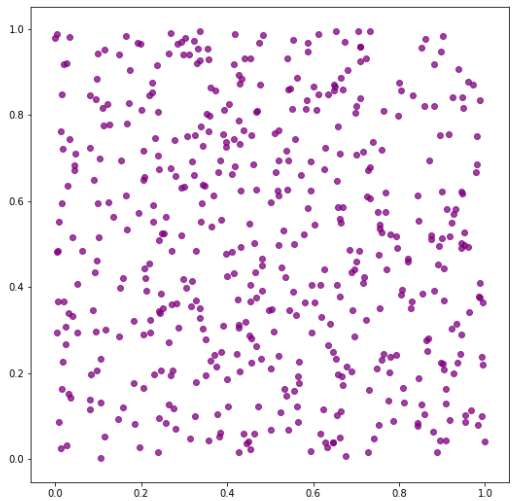
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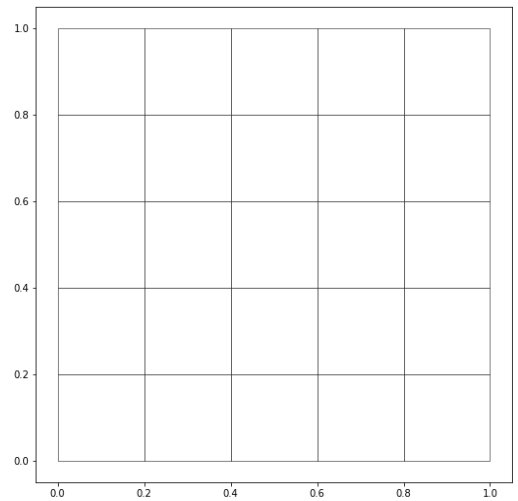
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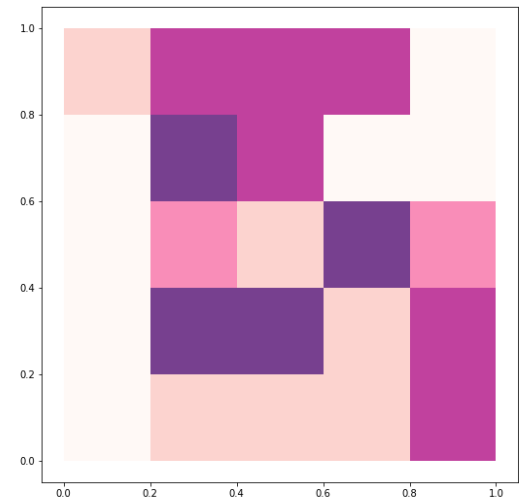
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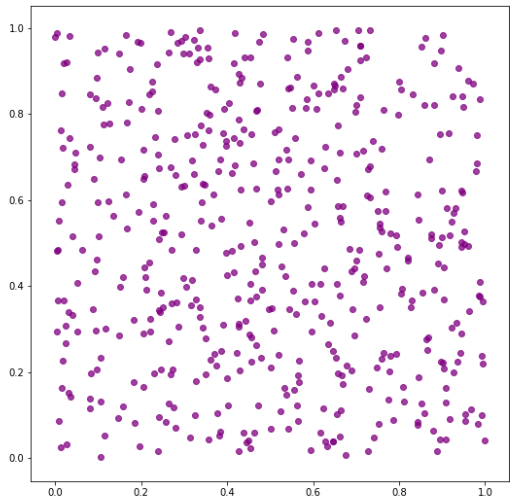
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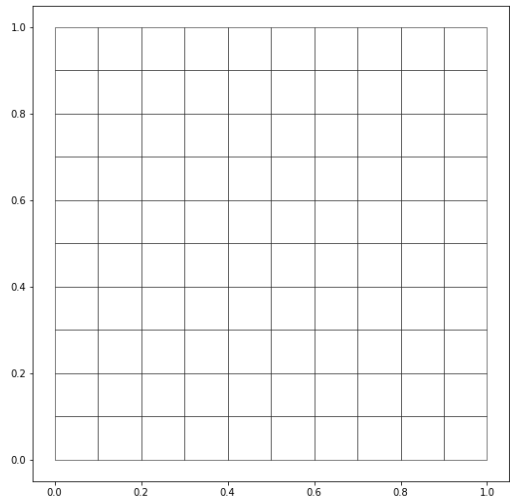
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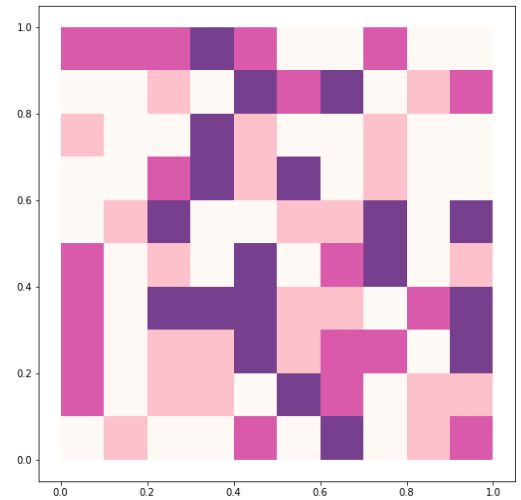
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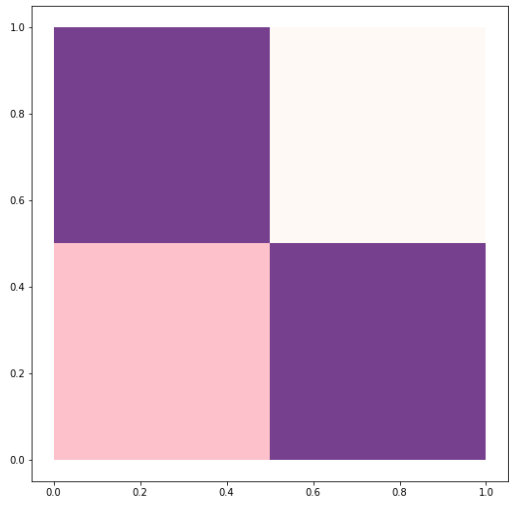
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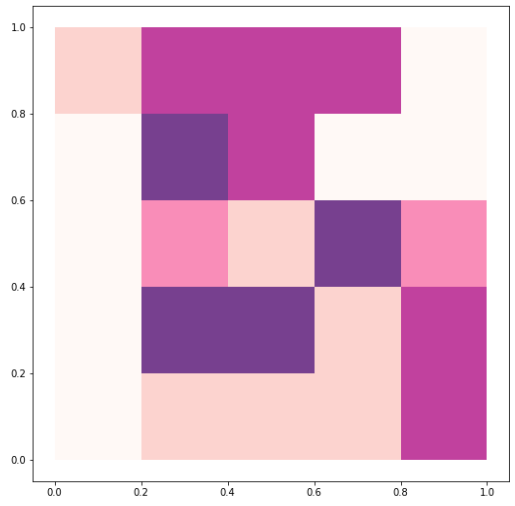
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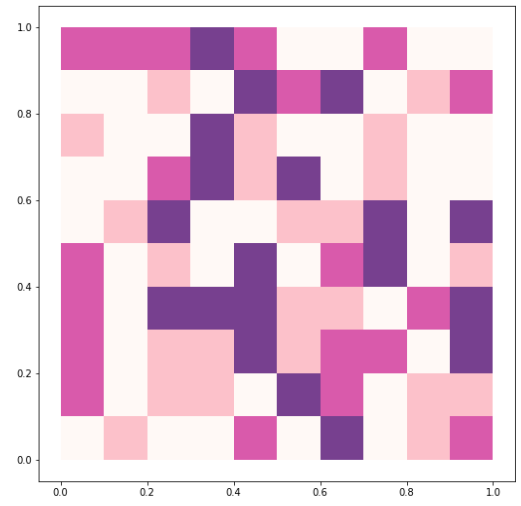
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MAUP

Scale and **delineation mismatch** between:

- Underlying process (e.g. individuals, firms, shops)
- Unit of measurement (e.g. neighborhoods, regions, etc.)

In some cases, it can **seriously mislead** analysis on aggregated data (e.g. Flint, MI!!!)

Always keep **MAUP** in mind when exploring aggregated data!!!

Choropleths

Choropleths

Thematic map in which values of a variable are encoded using a color gradient of some sort

- Counterpart of the histogram
- **Values** are **classified** into specific **colors**: value –> bin
- **Information loss** as a trade off for **simplicity**

Classification choices

- N. of bins
- How to bin?
- Colors

How many bins?

- Trade-off: detail Vs cognitive load
- Exact number depends on purpose of the map
- Usually not more than 12

How to bin?

Unique values

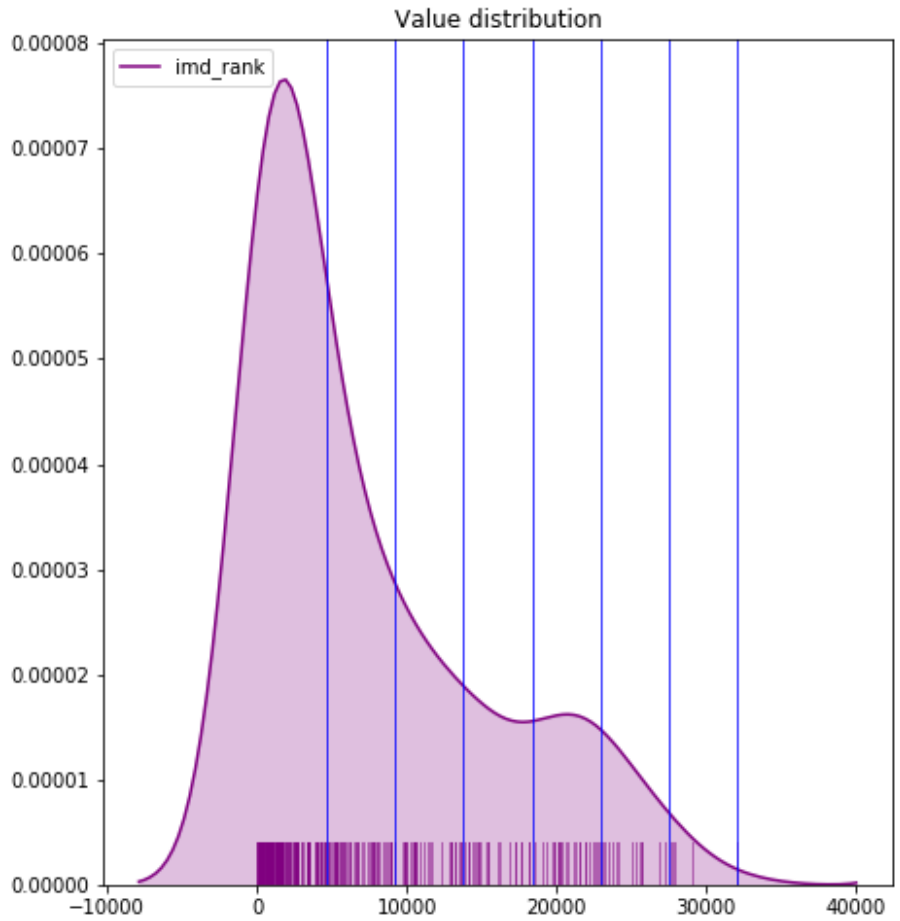
- Categorical data
- No gradient (reflect it with the color scheme!!!)
- Examples: Religion, country of origin…

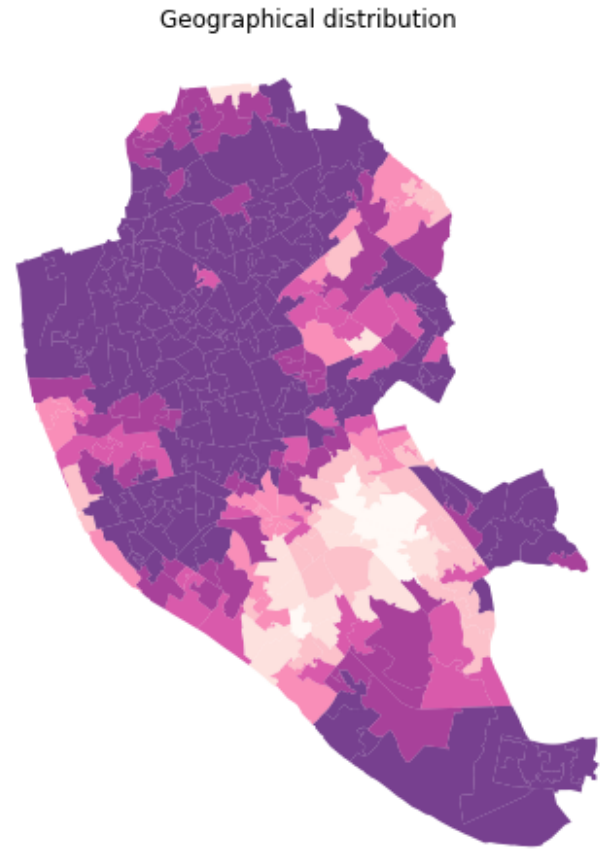
Unique values

Equal interval

- Take the **value** span of the data to represent and split it equally
- **Splitting** happens based on the **numerical value**
- Gives more weight to outliers if the distribution is skewed

equal_interval

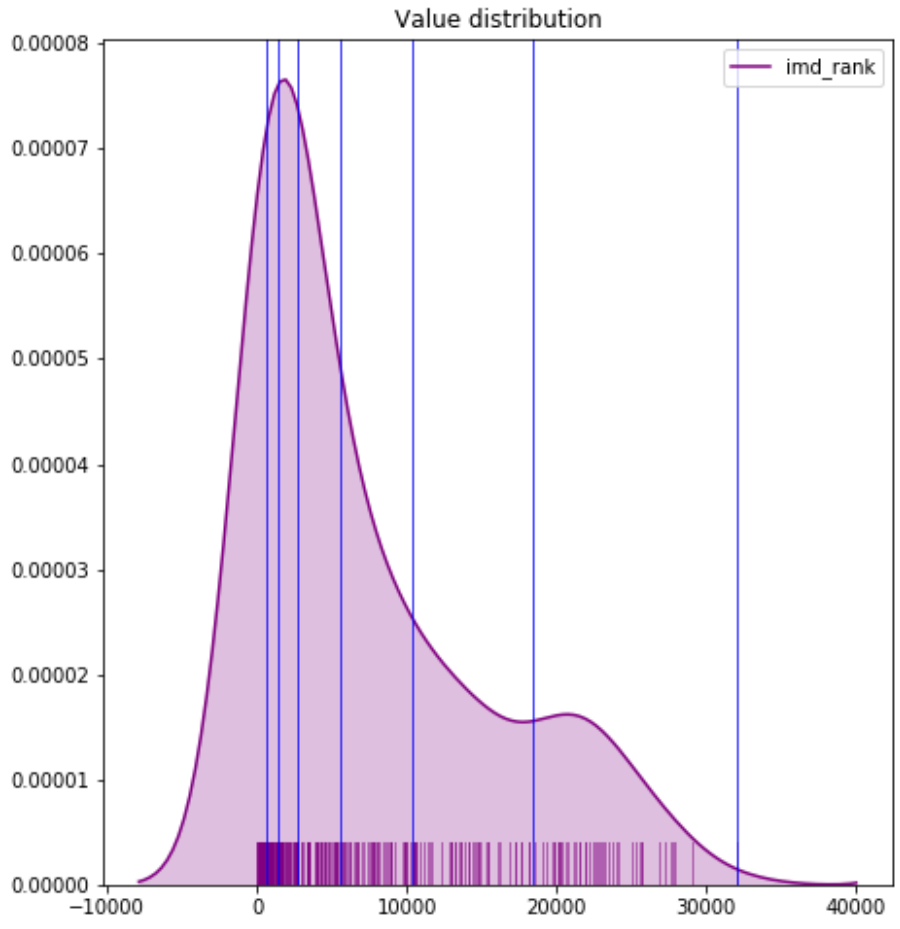




Quantiles

- Regardless of numerical values, split the distribution keeping the same amount of values in each bin
- **Splitting** based on the **rank** of the value
- If distribution is skewed, it can put very different values in the same bin

quantiles


Value distribution
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0.00007
0.00006
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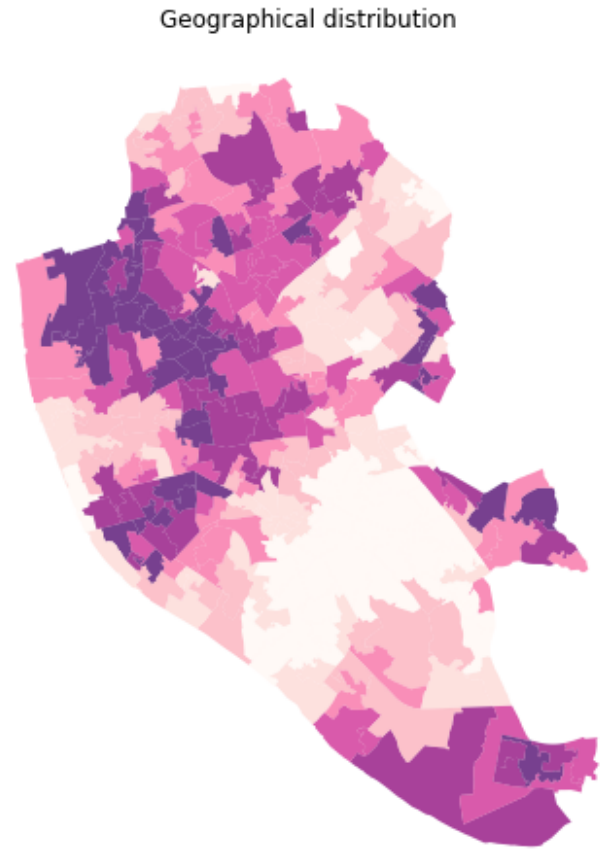
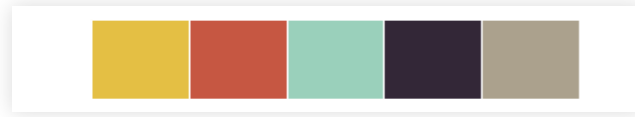
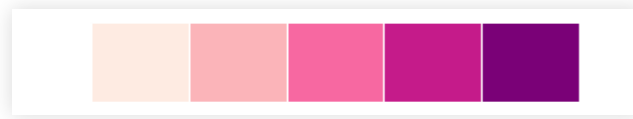
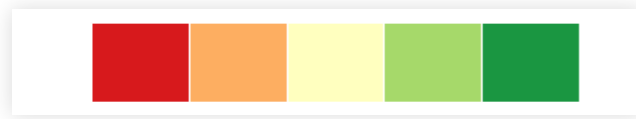

Geographical distribution

Other

- Fisher-Jenks
- Natural breaks
- Outlier maps: box maps, std. maps…

Color schemes

Align with your purpose

- **Categories**, non-ordered 
- Graduated, **sequential** 
- Graduated, **divergent** 

TIP: check ColorBrewer for guidance

Tips

- Think of the purpose of the map
- Explore by trying different classification alternatives
- Combine (Geo)visualisation with other statistical devices

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