

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.

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[Source]

Visualization

- By encoding information visually, they allow to present large amounts of numbers in a meaningful 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

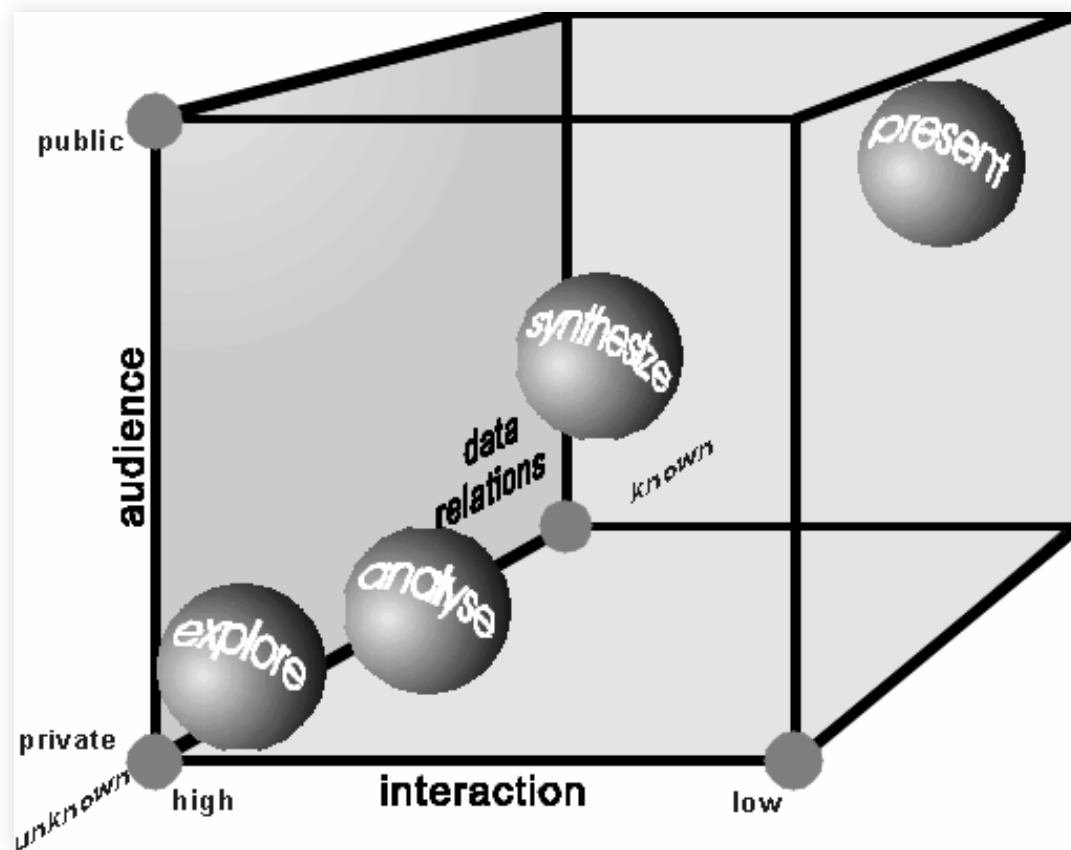
A map for everyone

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



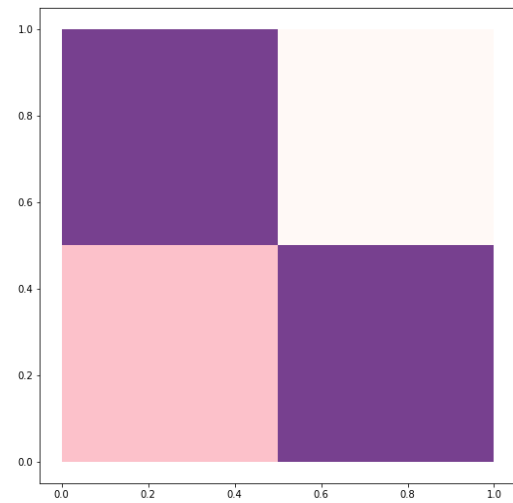
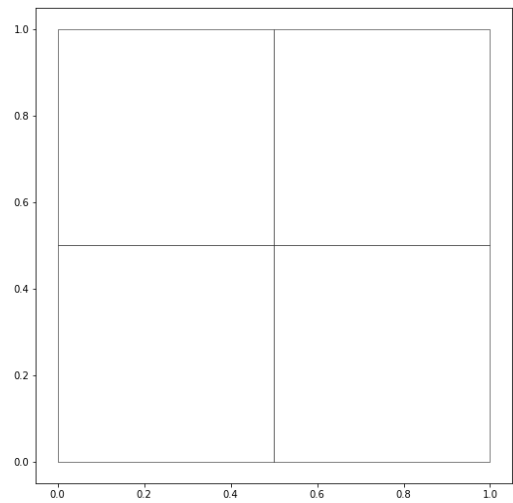
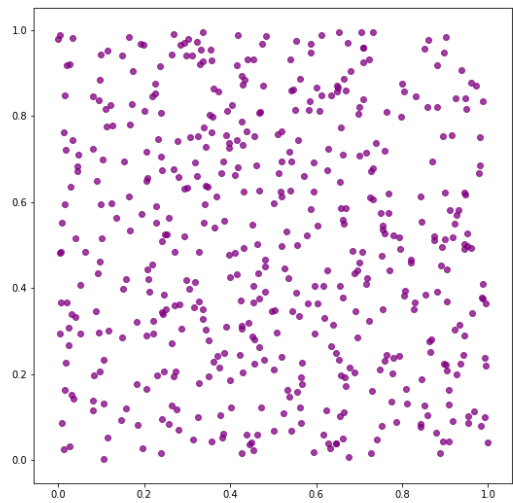
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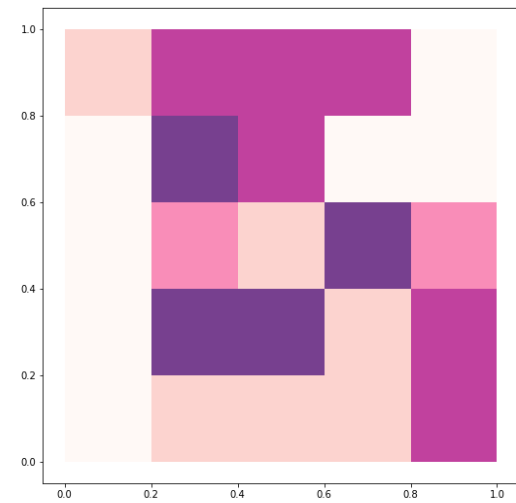
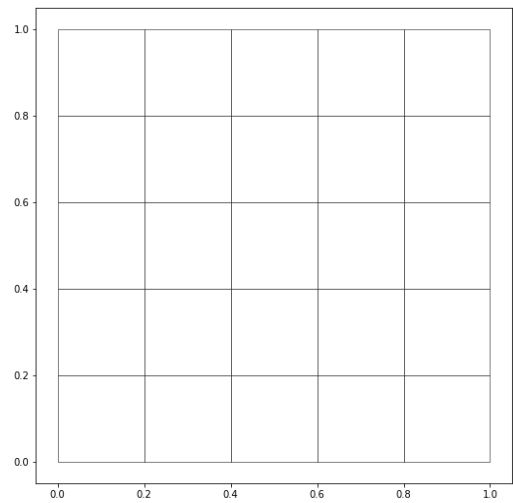
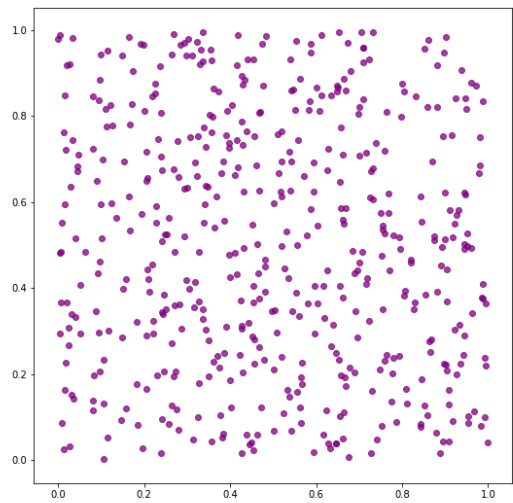
Making good data maps

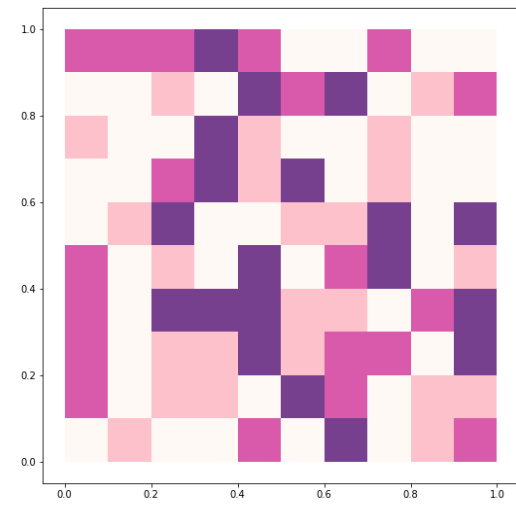
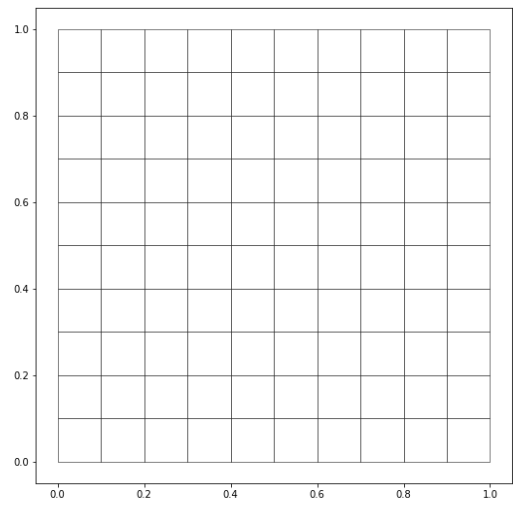
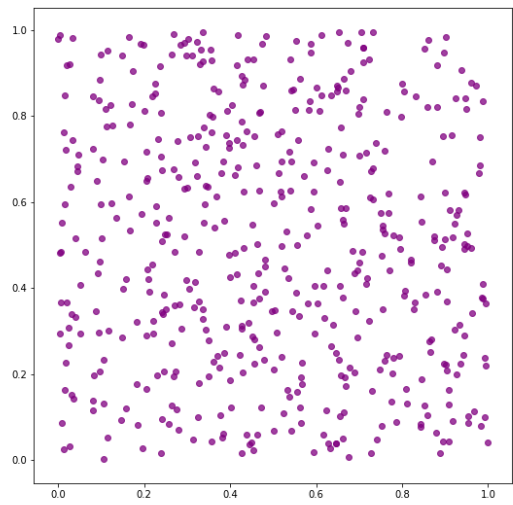
- “Containers”
- Choropleths

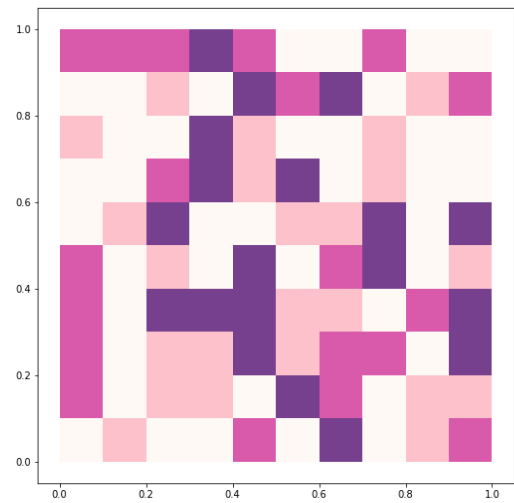
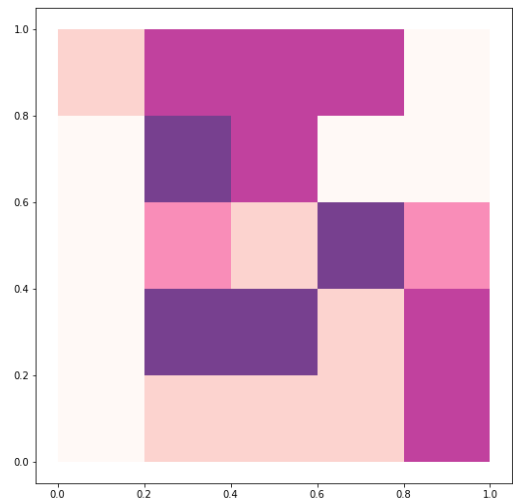
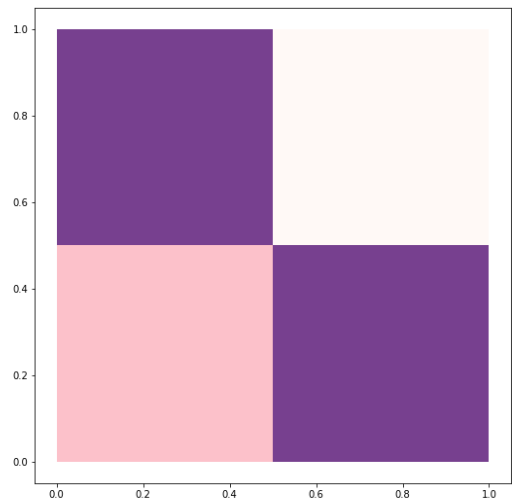
Data “containers”

Modifiable Areal Unit Problem (Openshaw, 1984)









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

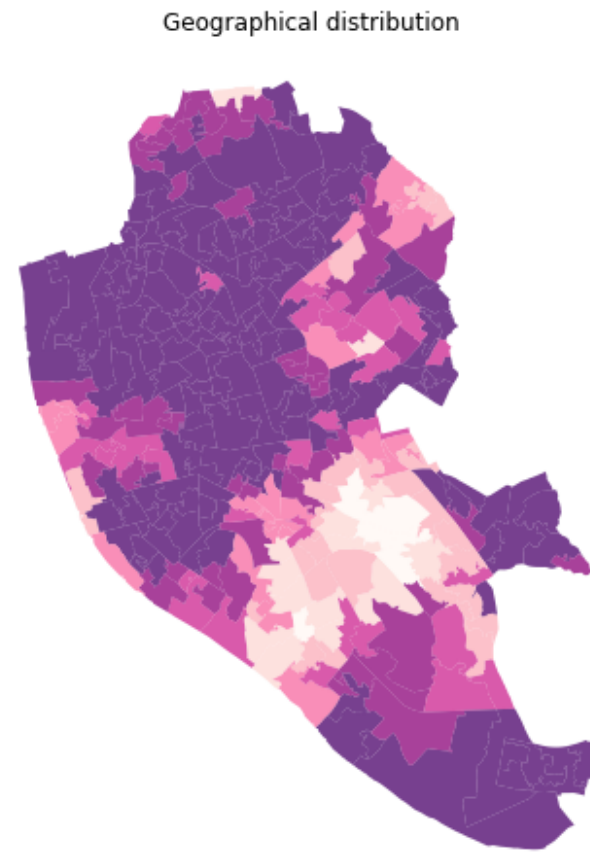
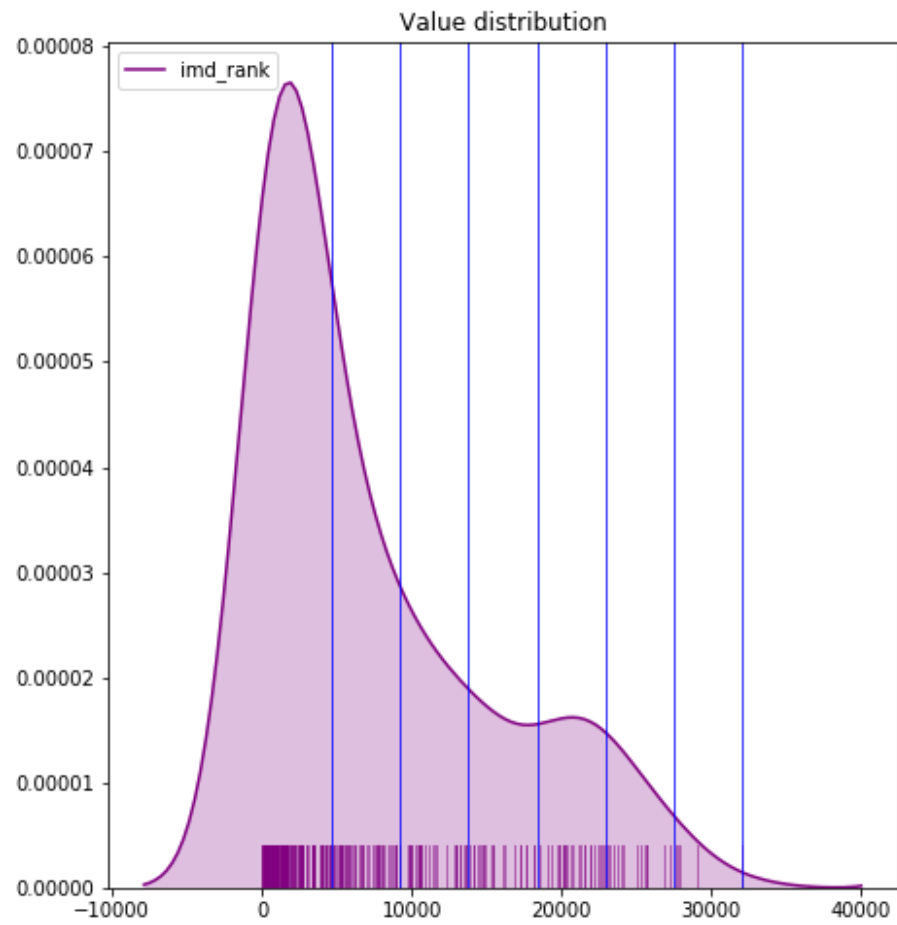
- Categorical data
- No gradient (reflect it with the color scheme!!!)
- Examples: Religion, country of origin...

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

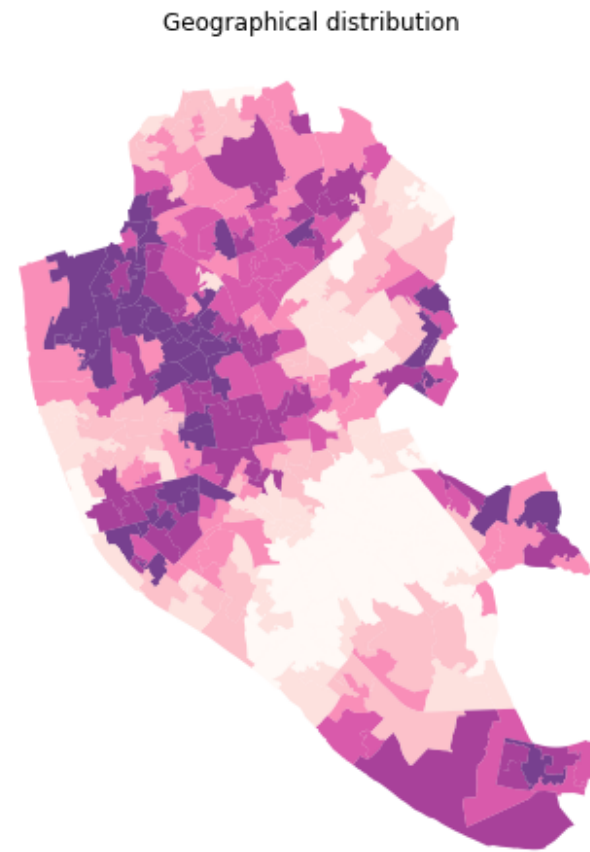
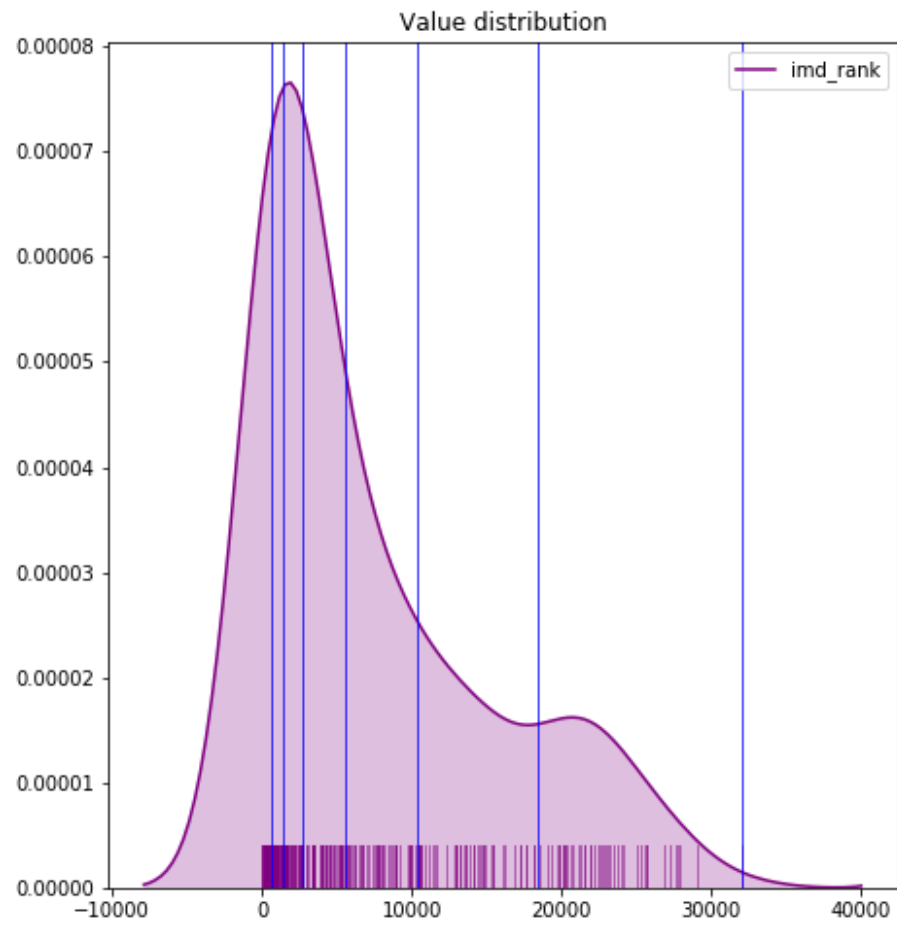
equal_interval



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



Other

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

Color schemes

Align with your purpose

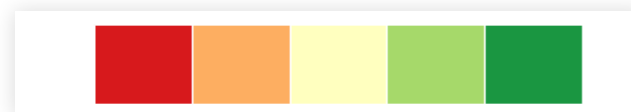
- Categories, non-ordered



- 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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