Web Mapping & Analysis

Statistical visualisation

Dani Arribas-Bel

Today

- Visualisation
- (Web) Maps
- Choropleths

Visualisation

What?

"Visual representations of datasets designed to help people carry out tasks more effectively"

Munzner (2016)

When?

A human “superpower”:

- *Keep* the human in the loop
- *Augment* memory/internal representation
- *Ask* new questions rather than only *answer* existing ones

Why?

- Bridges **human and machine**
- Relies on **vision** (high-volume, parallel throughput)
- External representations work around **limits** of **internal** cognition/memory

How?

`what-why-how`

↓

`data-task-idiom`

Most ineffective designs are due to a poor match

Domain-specific → Abstract form

How?

Vis is multi-use:

- Exploring
- Checking pre-conceived ideas
- Long-term use in workflows/processes
- Presentation

A tool that serves well for one task can be poorly suited for another

Elements (and limitations)

- Computer (time)
- Human (memory & attention)
- Display (capacity)

Design trade-off’s

- Beauty Vs Elegance
- “No picture can communicate the truth, the whole truth, and nothing but the truth” (Munzner, 2016)
- …

(Web) Maps

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"

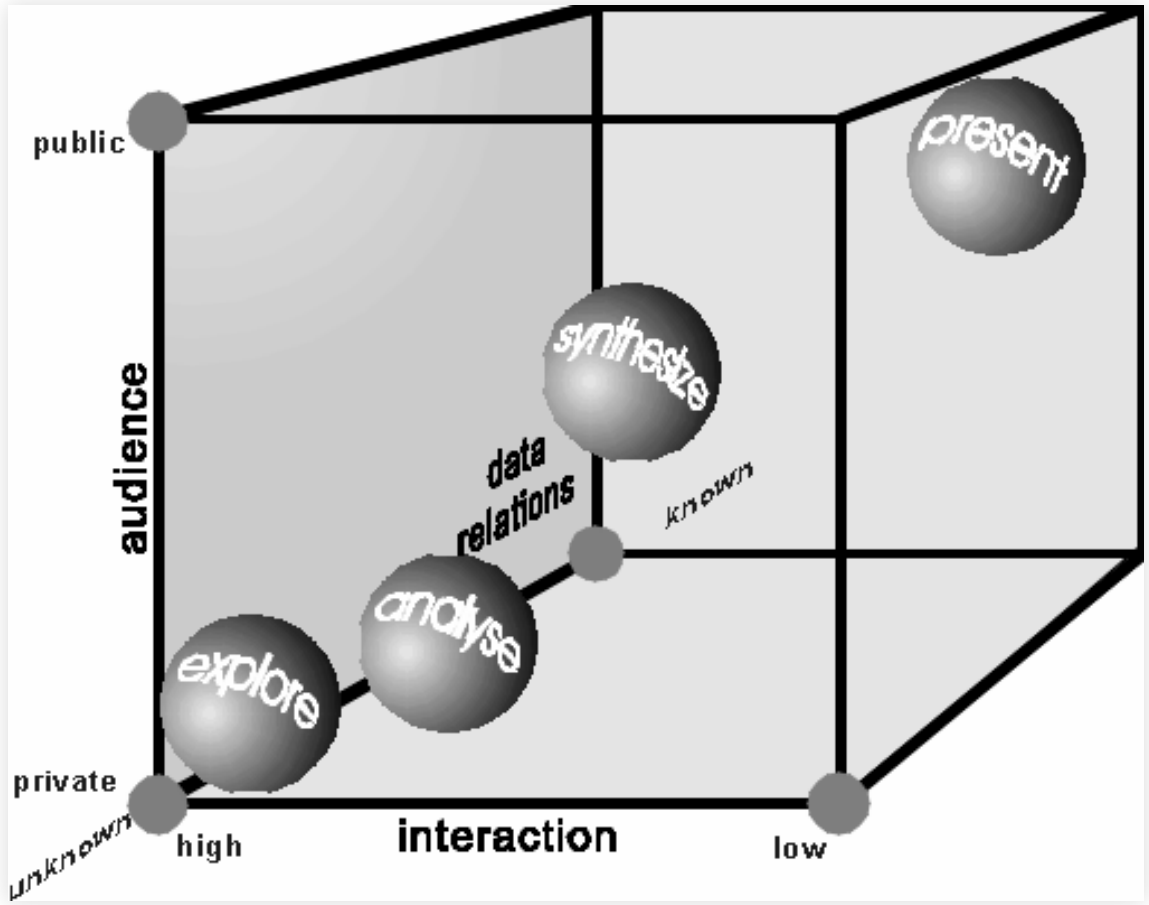
Designing good maps

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

Map Cube



[Source]

Choropleths

Choropleths

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

- Encode **value** using the **color** channel
- Values are **classified** into **groups** (bins)
- **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

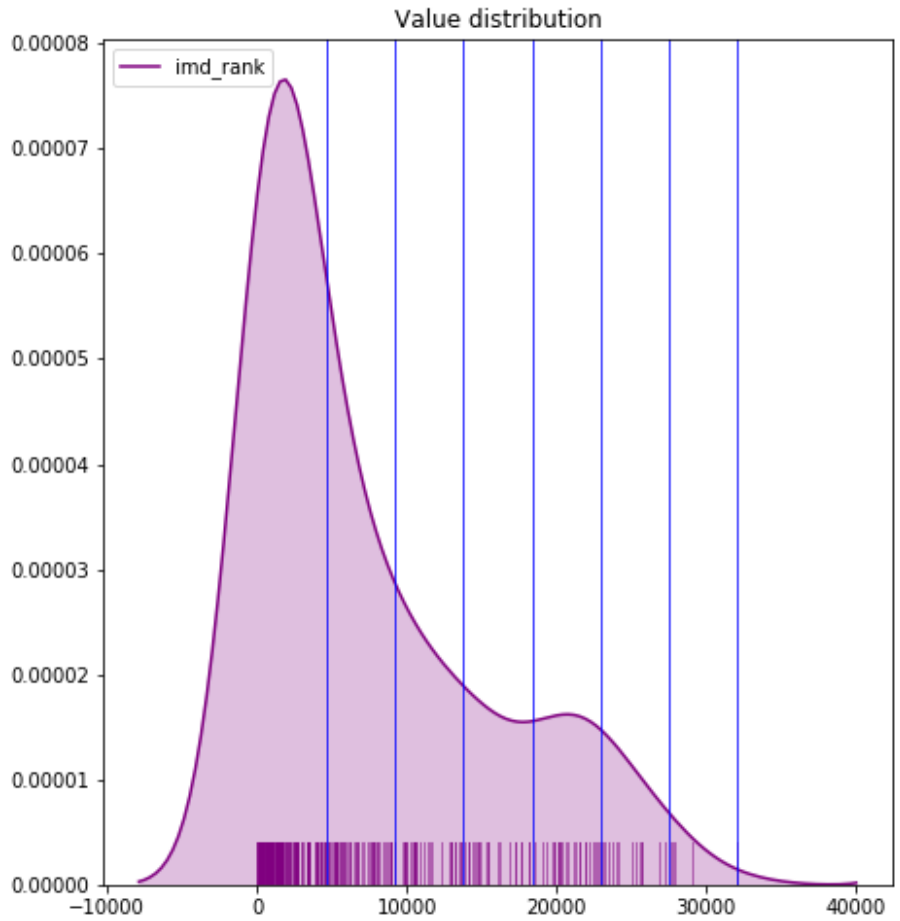
- Categorical data
- No gradient (reflect it with the color scheme!!!)
- Examples: Religion, country of origin…

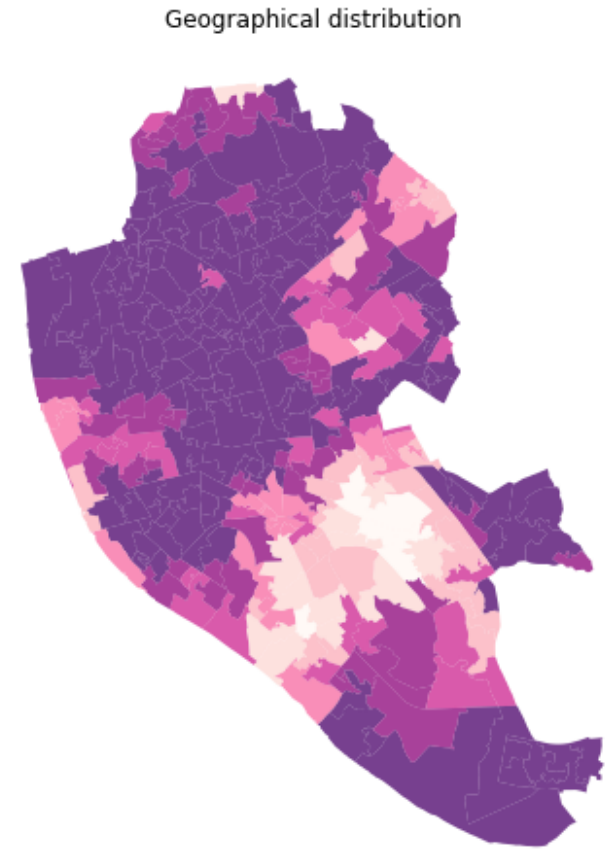
Unique values

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

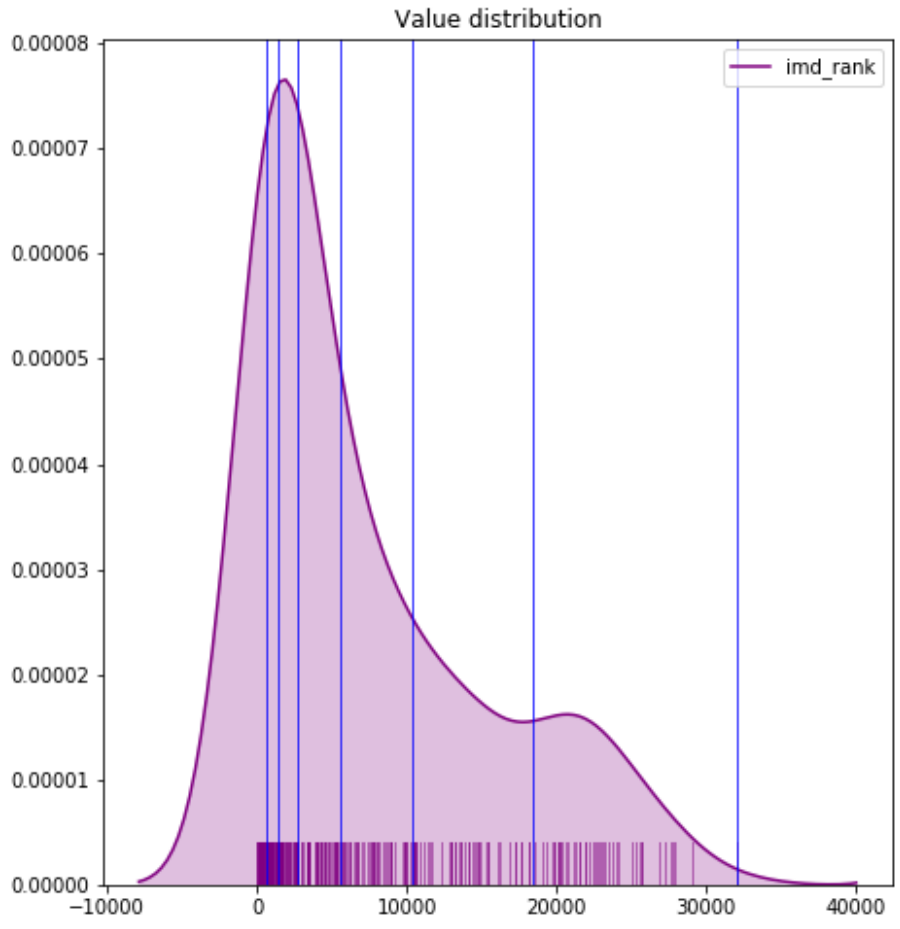


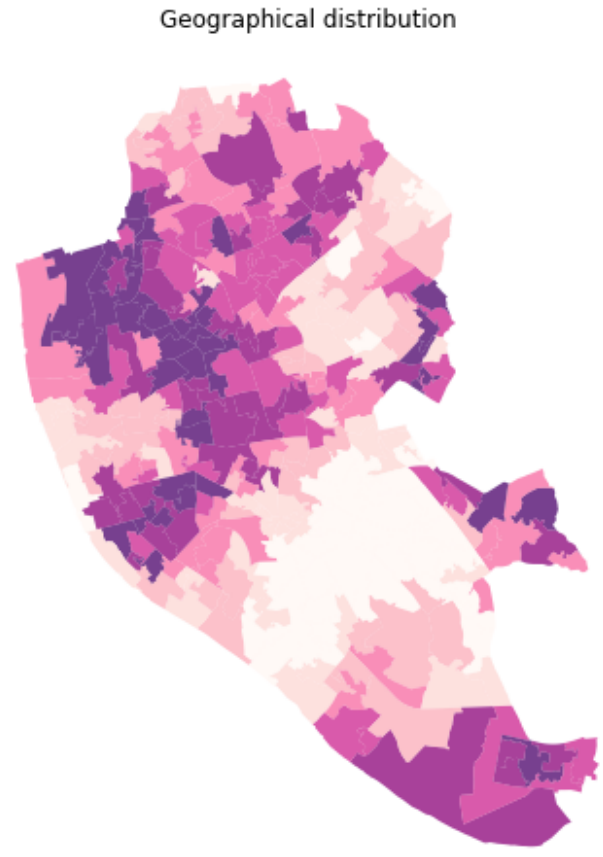


Quantiles

- 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
imd_rank
0.00008
0.00007
0.00006
0.00005
0.00004
0.00003
0.00002
0.00001
0.00000
−10000
0
10000
20000
30000
40000

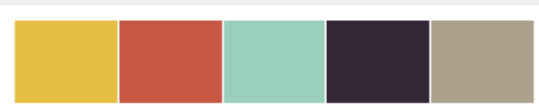

Geographical distribution

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