MY472 – Week 8: Data Visualisation

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MY472: Data for Data Scientists

15 November 2021

Course

1. Introduction to data
2. The shape of data
3. Introduction to scraping
4. Advanced scraping
5. Working with APIs
6. (Reading week)
7. Textual data
8. Data visualisation
9. Creating and managing databases
10. Interacting with online databases
11. Cloud computing

Outline

1. Introduction
2. Some principles of data visualisation
3. ggplot2
4. Coding session

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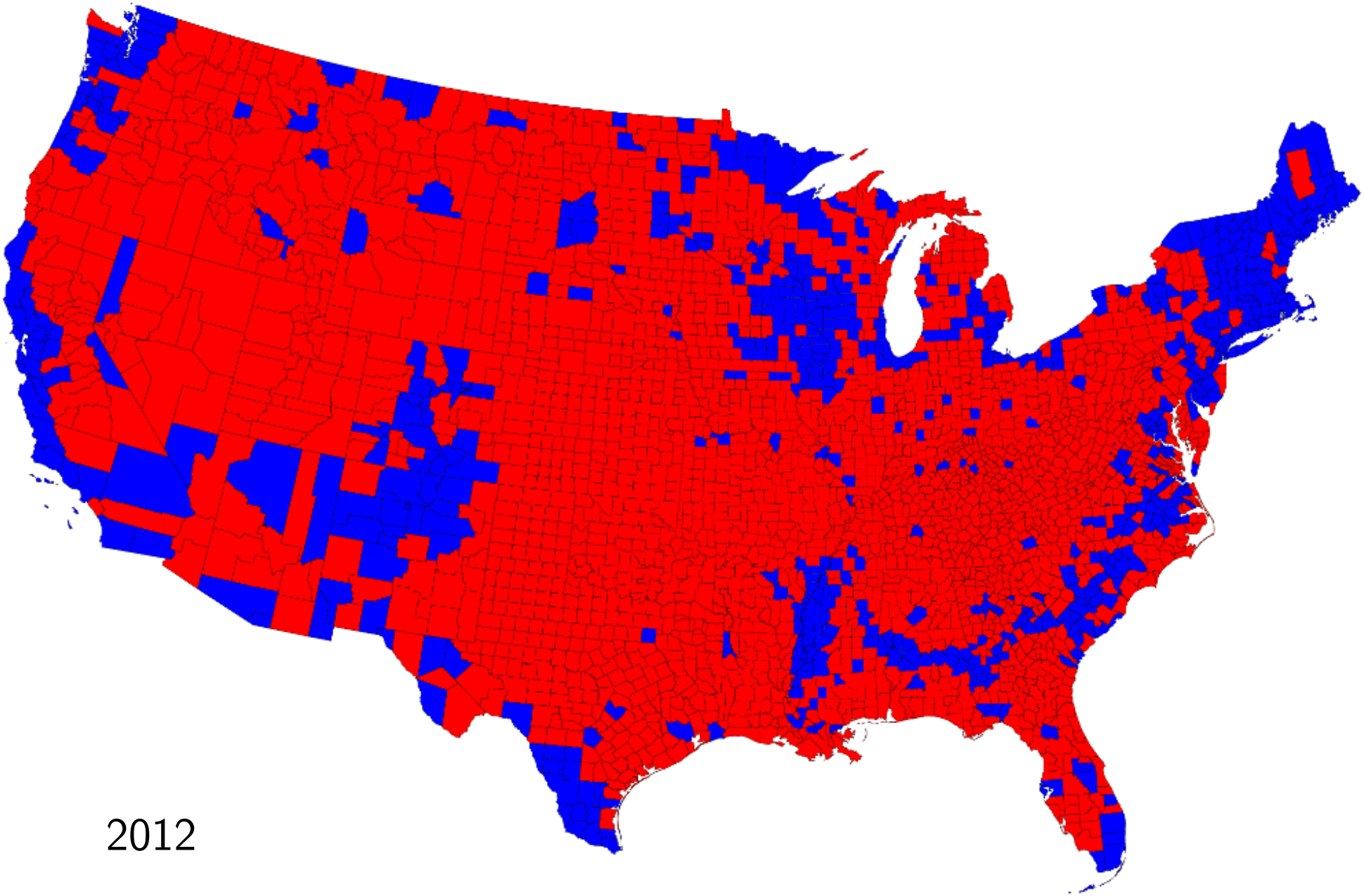
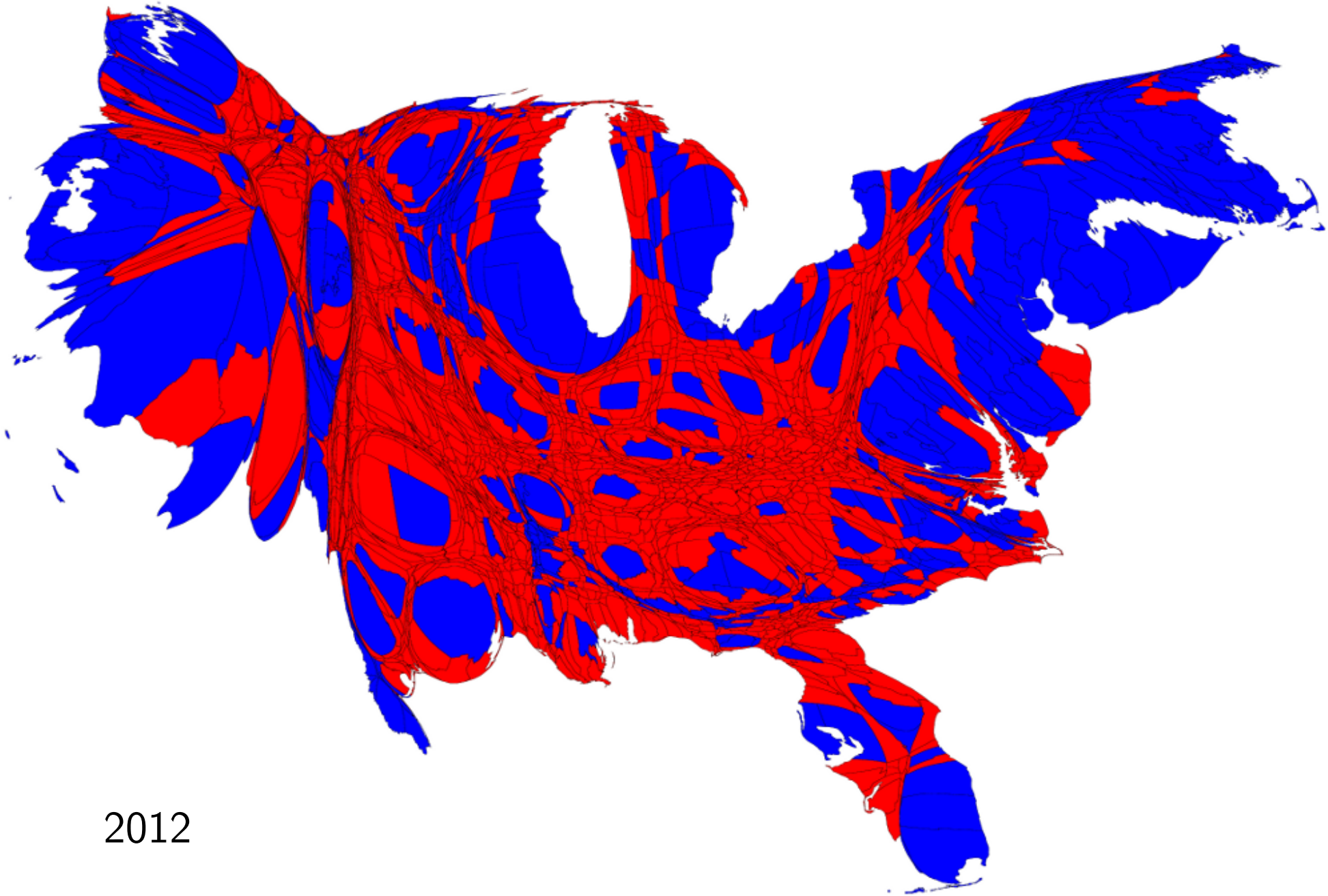
Why visualisation can be helpful: Anscombe examples

`01-anscombe.Rmd`

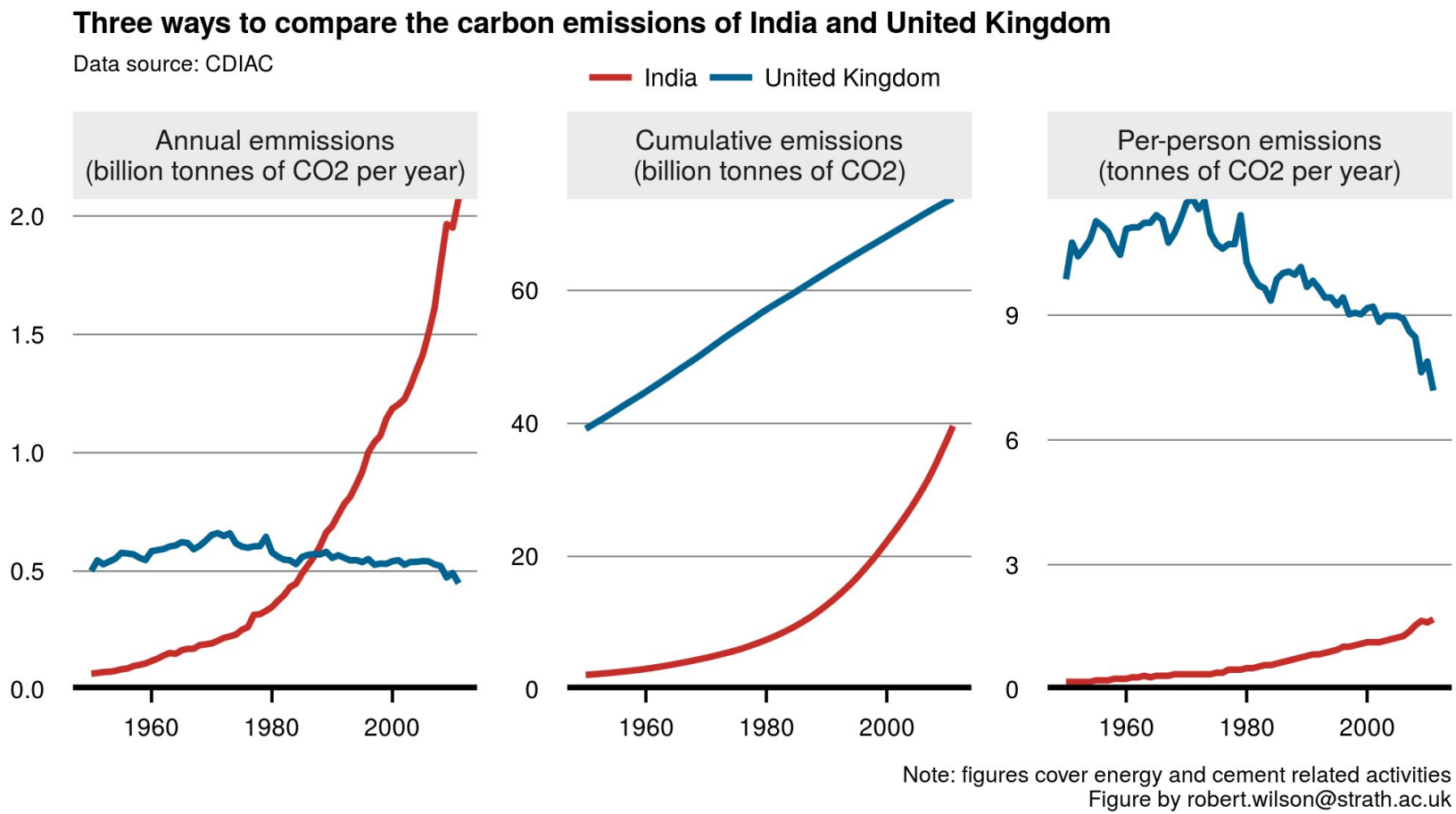


Source: Mark Newman (Michigan)



2012

Source: Mark Newman (Michigan)



Source: New York Times

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Principles by Edward Tufte

- Show the data
- Avoid distorting what the data have to say
- Allow viewer to compare
- Serve a clear purpose: description, exploration, tabulation or decoration
- Be closely integrated with the statistical and verbal descriptions of the dataset
- Graphics can reveal data (e.g. Anscombe Quartet)

General guidelines

- Maximize data-to-ink ratio
- Avoid misleading decisions
  - Y axis starts at 0
  - Comparison of areas is hard
  - Use comparable units
  - Erase chart junk
- Use text to inform and contextualise. Add annotations
- Appropriate use of scales (x/y axes, color, size, shape...)
- Use small multiples to facilitate comparisons
- Always cite your sources

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What is the grammar of graphics?

The grammar of graphics.

A statistical graph is a mapping from data to aesthetic attributes (color, shape, size) of geometric objects (points, lines, bars). The plot may also contain statistical transformations of the data and is drawn on a specific coordinate system. Faceting can be used to generate the same plot for different subsets of the data. It is the combination of these independent components that make up a graphic.

Hadley Wickham, *ggplot2, page 3*

Data visualisation with ggplot2

Why **ggplot2**?

- Based on "Grammar of Graphics" (Wilkinson, 1999)
  $\rightarrow$ consistent, modular, and very flexible
- Sensible defaults for quick exploratory plots
- But also easy to customize, extend
- Excellent online resources

Grammar

Source: Thomas Lin Pedersen [link]

Grammar

data	Data to visualise, for ggplot2 in a ‘tidy‘ format
(aesthetic) mapping	Mapping variables in the data to components of the graphic such as axes
stats	Statistical transformations of the data, e.g. binning or averaging
scales	Translation/mapping of e.g. categorical variables such as political party to shapes or colours
geom	Geometric objects that are drawn to represent the data: bars, lines, points, etc.
facets	Breaking up the data into subsets, to be displayed independently on a grid
coordinates	Coordinate system; provides axes and gridlines to make it possible to read the graph
theme	Parts that do not follow from the data: Background colours, fonts, etc.

Online resources

- Main documentation page: https://ggplot2.tidyverse.org/
- Book by Hadley Wickham, Danielle Navarro, and Thomas Lin Pedersen: https://ggplot2-book.org/
- R Graph gallery for ggplot2 https://www.r-graph-gallery.com/ggplot2-package.html
- Two recent video workshops by Thomas Lin Pedersen, video 1, video 2, and the repo with associated exercises
- StackOverflow, tag: ggplot2 https://stackoverflow.com/questions/tagged/ggplot2

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Coding session

`02-ggplot2-basics.Rmd`

`03-scales-axes-legends.Rmd`