MONASH University

MONASH
INFORMATION
TECHNOLOGY

FIT3179 Data Visualisation

Week 05 – Part 1: Colour

GROUP OF EIGHT AUSTRALIA

MONASH University

VAD chapter 10

Colour

- Colour spaces
- Effective use of colour for data visualisation

Quiz this week: materials of weeks 4 and 5!

Presentations next Week!

Presentation next week

MONASH University

Based on the Allocate+ tutorial class list, the students in the CLAYTON Lab 8 (Thursday 8AM–10AM) will present in Week 6.

All students: Read the instructions on the weekly forum and post your visualisation research and analysis there.

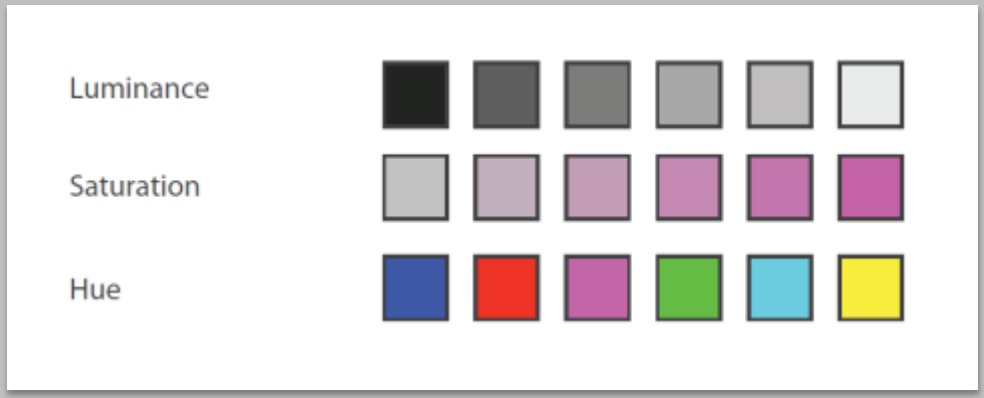
Due date: 1 hour before the lecture starts or the beginning of your weekly lab session, whichever is earlier.

Content: see next slide

Find a partitioned poster or another rather complex multi-component visualisation with an interesting layout and creative use of typography. Analyse the following aspects in a few words:

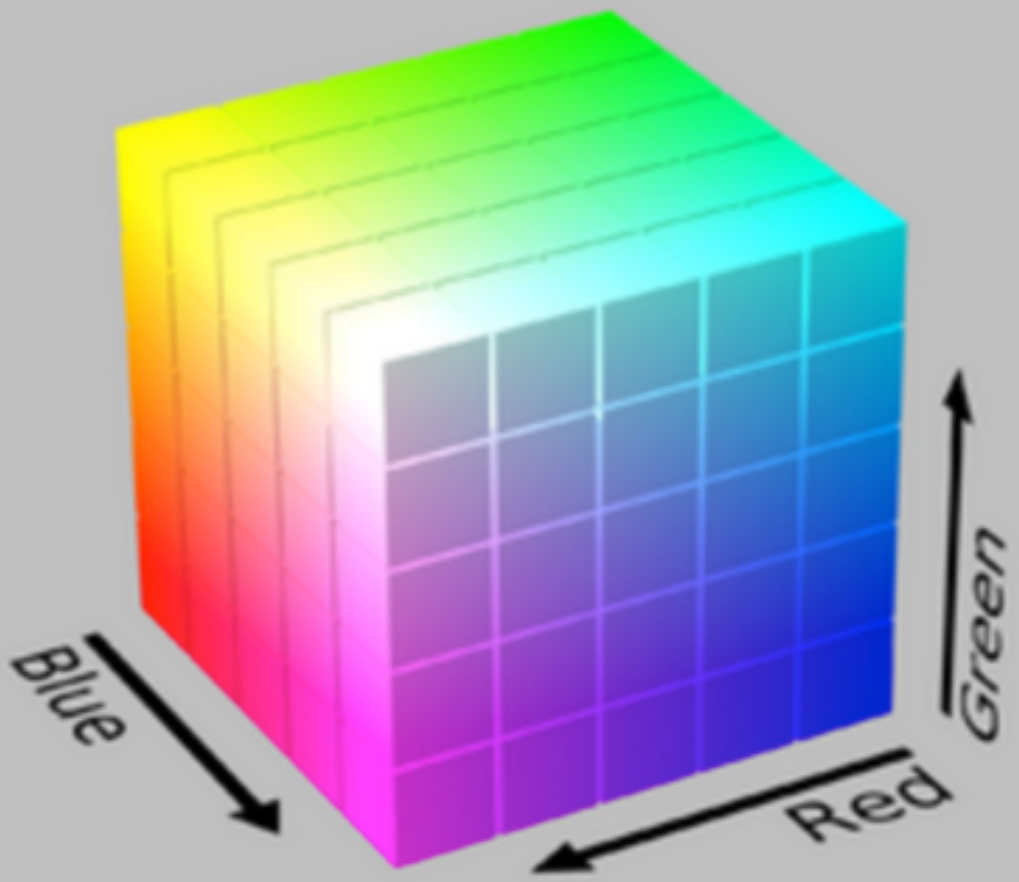
- **Colour**: How is colour used to show quantitative and qualitative information? What can be improved regarding the use of colour?
- **Figure-ground**: Where and how is a a visual hierarchy created with figure-ground? Could the figure-ground contrast be improved?
- **Layout**: Identify the sight lines used. Critique the layout (balance, visual centre, alignment, white space). What could be improved?
- **Typography and label placement**: What kind of typefaces are used? How are weight, size and other type characteristics changed to visualise or highlight information? Can the placement of labels be improved?

Colour Spaces



Colour Spaces

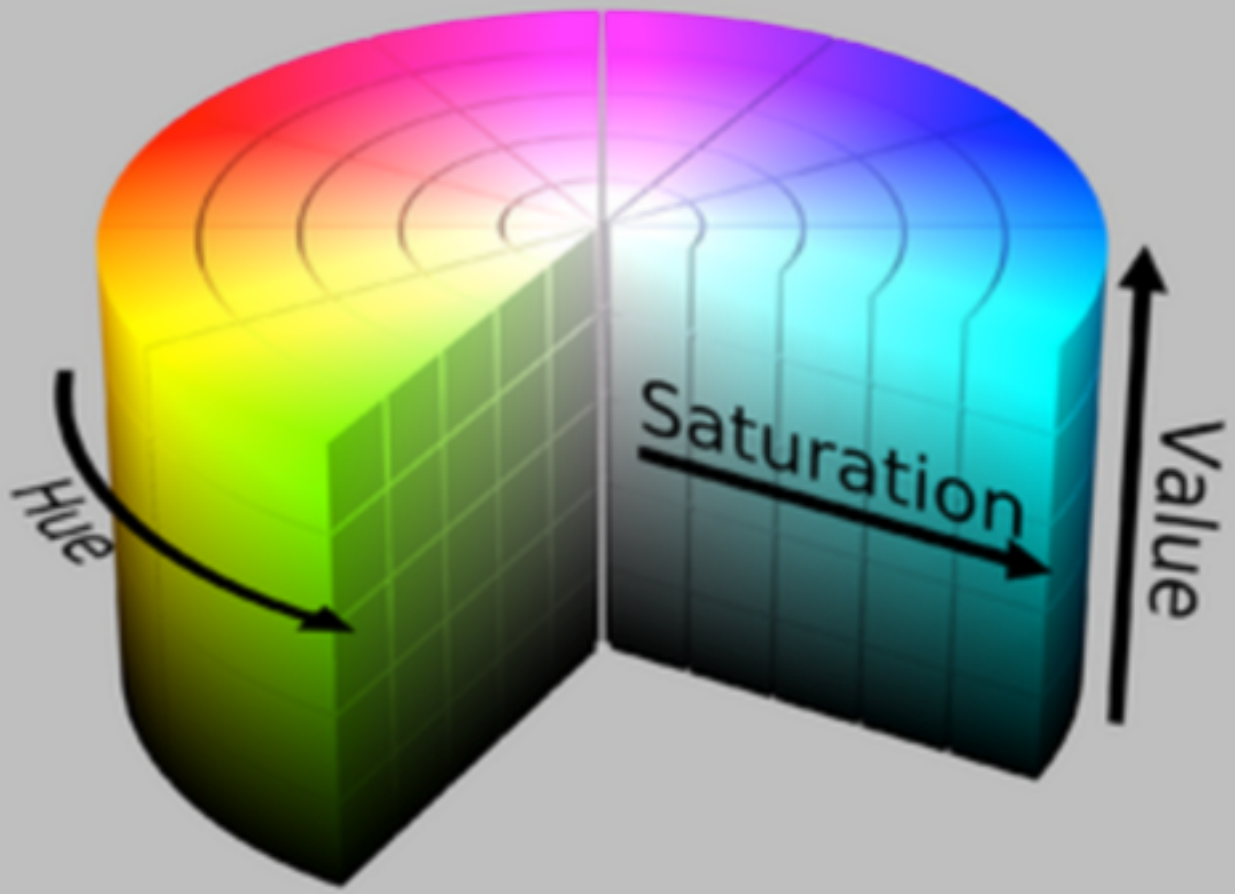
RGB



https://en.wikipedia.org/wiki/HSL_and_HSV

Colour Spaces

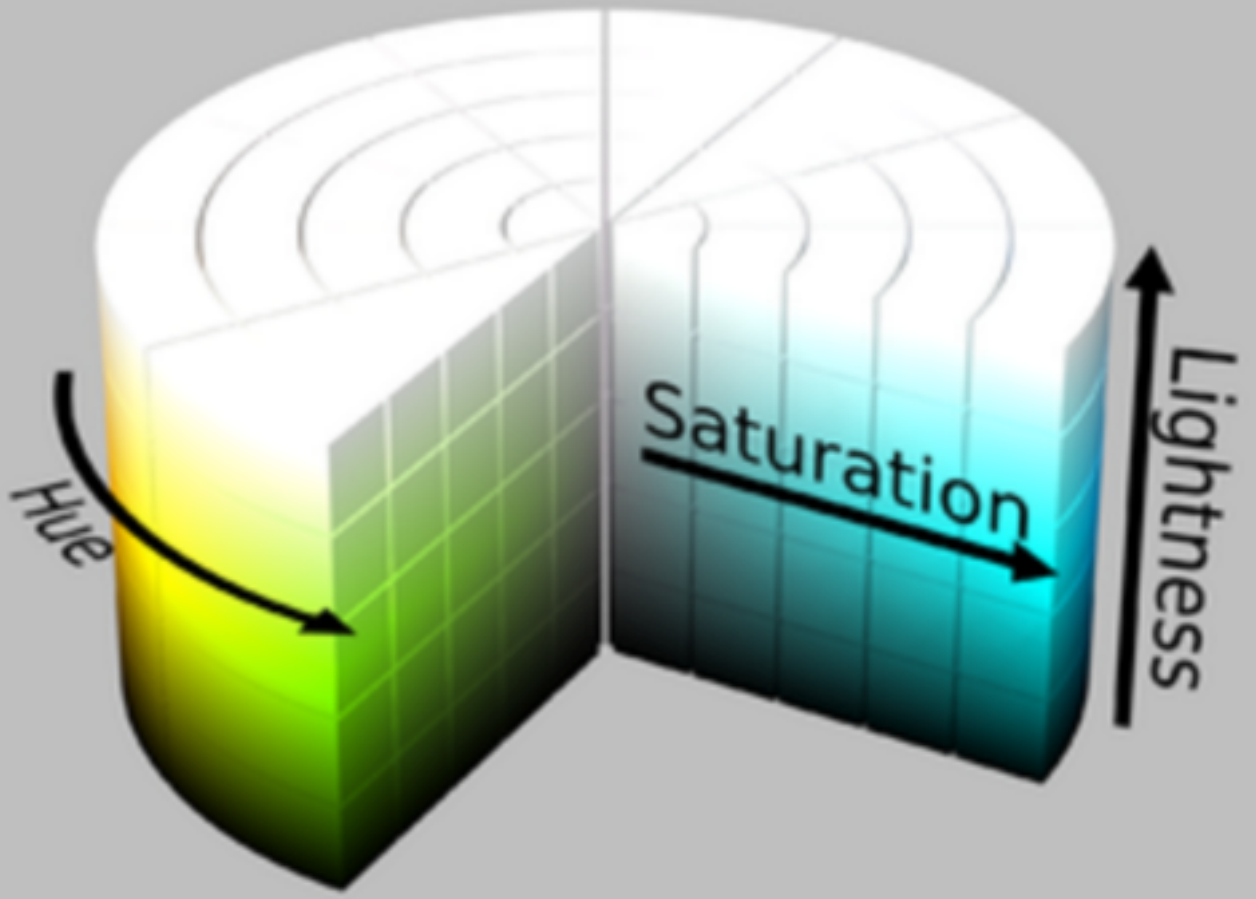
HSV



https://en.wikipedia.org/wiki/HSL_and_HSV

Colour Spaces

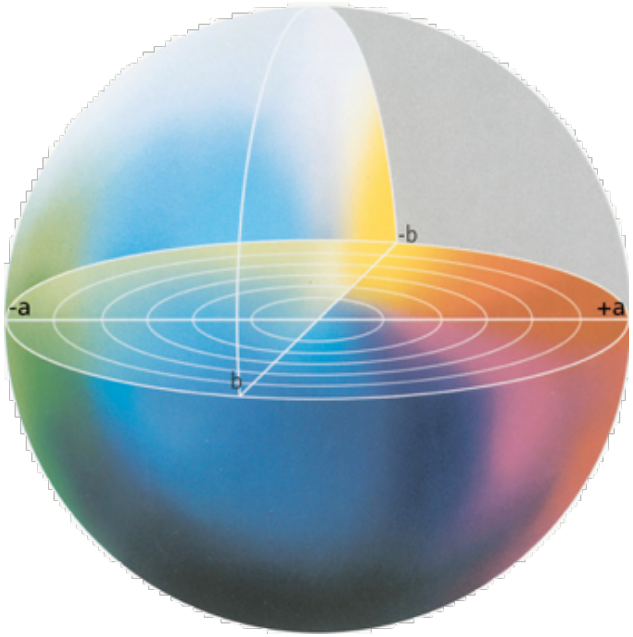
HSL

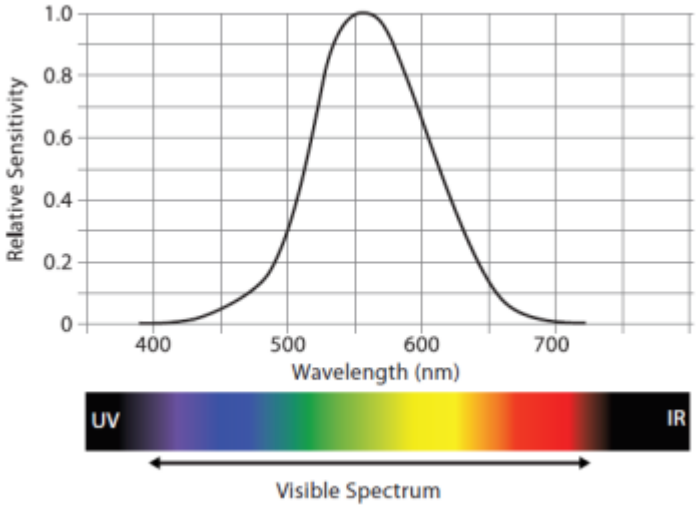


https://en.wikipedia.org/wiki/HSL_and_HSV

L*a*b*: Perceptually Linear Colour space

- L*: luminance axis
- a and b: red-green and blue-yellow axes





Colour Spaces

- RGB, HSV, HSL, XYZ, L*a*b* have 3 axes
- RGB, HSV, HSL, XYZ are not visually equidistant, that is, the numerical mean of two colours is not the visual mean of these colours.
- L*a*b* is visually equidistant.
- HSV and HSL used for colour pickers, because of their intuitive axes.
- XYZ and L*a*b* used for colour management, that is, matching colours between different devices.

CHARTABLE
A blog by Datawrapper

Datawrapper News
Weekly Chart
Changelog
Thoughts & How To's
About Us

May 29, 2018
by Lisa Charlotte Rost

Thoughts & How To's

What to consider when choosing colors for data visualization

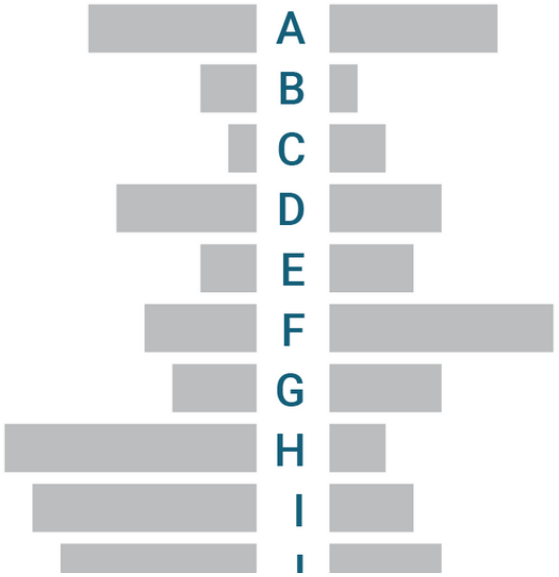
Data Visualisation can be defined as representing numbers with shapes – and no matter what these shapes look like (areas, lines, dots), they need to have a color. Sometimes colors just make the shapes visible, sometimes they encode data or categories themselves. We'll focus mostly on the latter in this article. But we'll also take a general look at colors and what to consider when choosing them:

Mandatory reading: https://blog.datawrapper.de/colors/

Choosing Colour for Data Visualisation

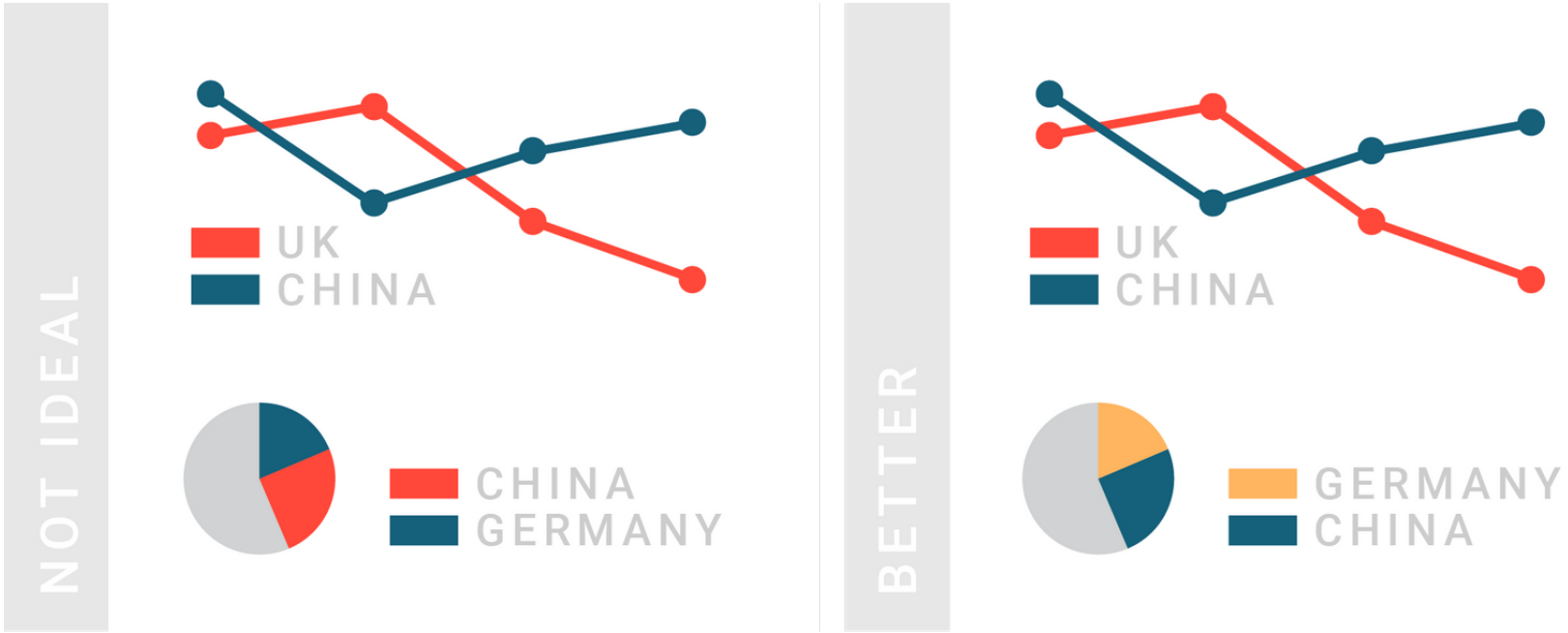
NOT IDEAL

BETTER



Source: Lisa Charlotte Rost, https://blog.datawrapper.de/colors/

Choosing Colour for Data Visualisation



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Choosing Colour for Data Visualisation

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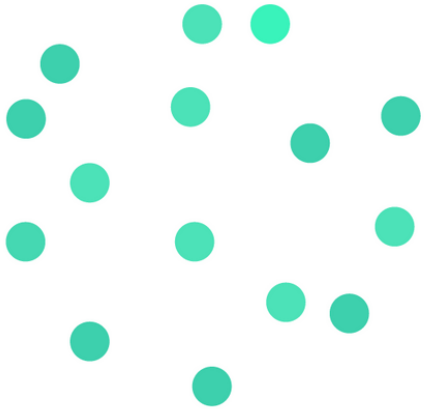

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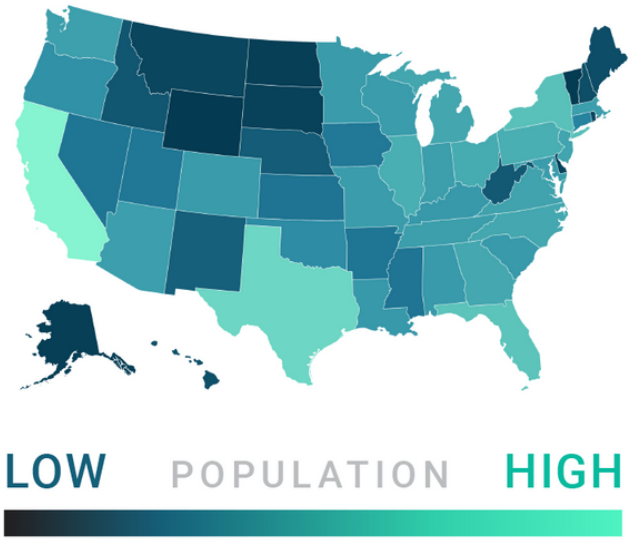
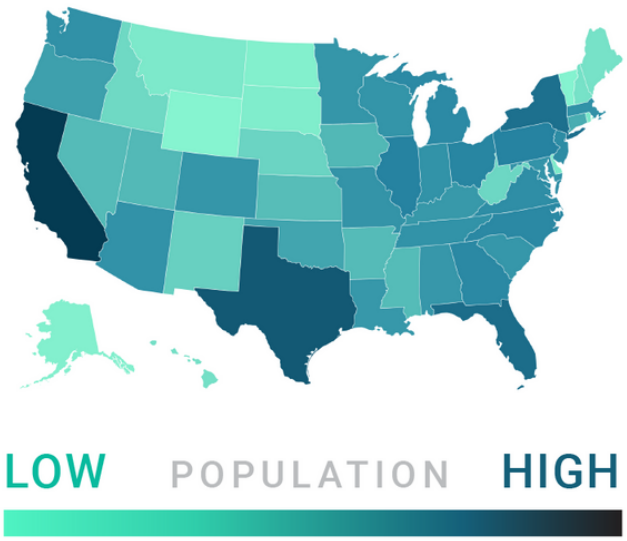


BETTER

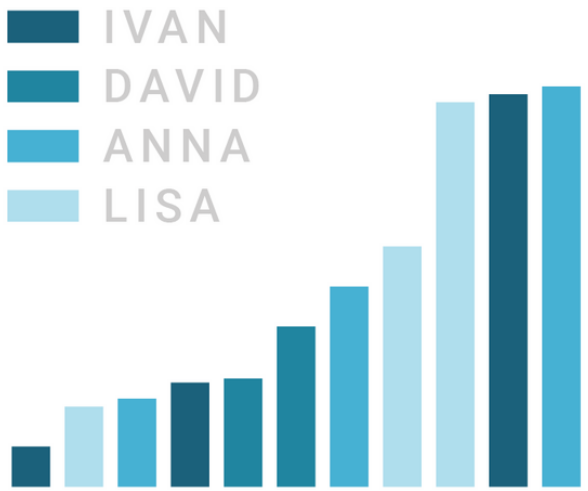


Dark is more confirmed in user study by Schloss, K. B., Gramazio, C. C., Silverman, A. T., Parker, M. L., & Wang, A. S. (2018).
Mapping color to meaning in colormap data visualizations.
IEEE Transactions on Visualization and Computer Graphics, 25(1), 810–819.

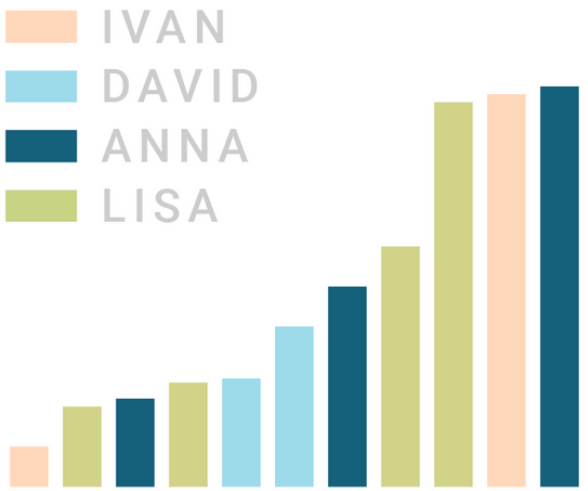
Source: Lisa Charlotte Rost, https://blog.datawrapper.de/colors/

Choosing Colour for Data Visualisation

NOT IDEAL



BETTER



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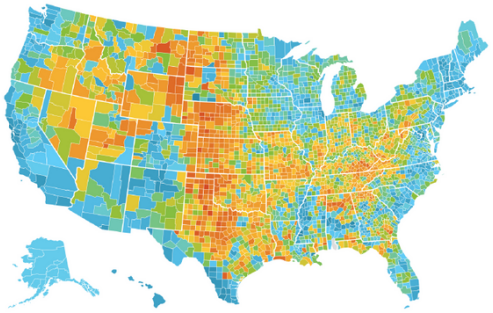
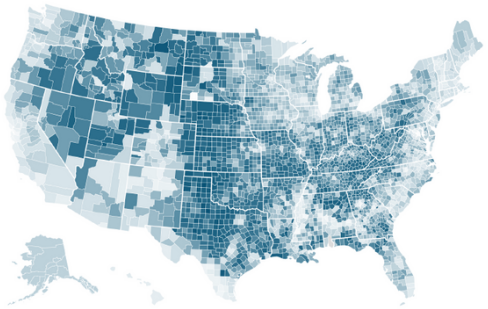


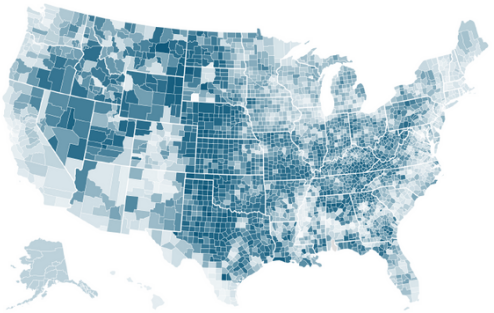
HUE-BASED GRADIENT

BETTER



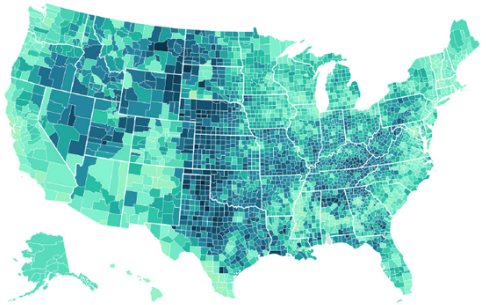
LIGHTNESS-BASED GRADIENT

NOT SO BAD



ONE HUE

EVEN BETTER



TWO HUES

Source: Lisa Charlotte Rost, https://blog.datawrapper.de/colors/

The Evil Rainbow Colourmap

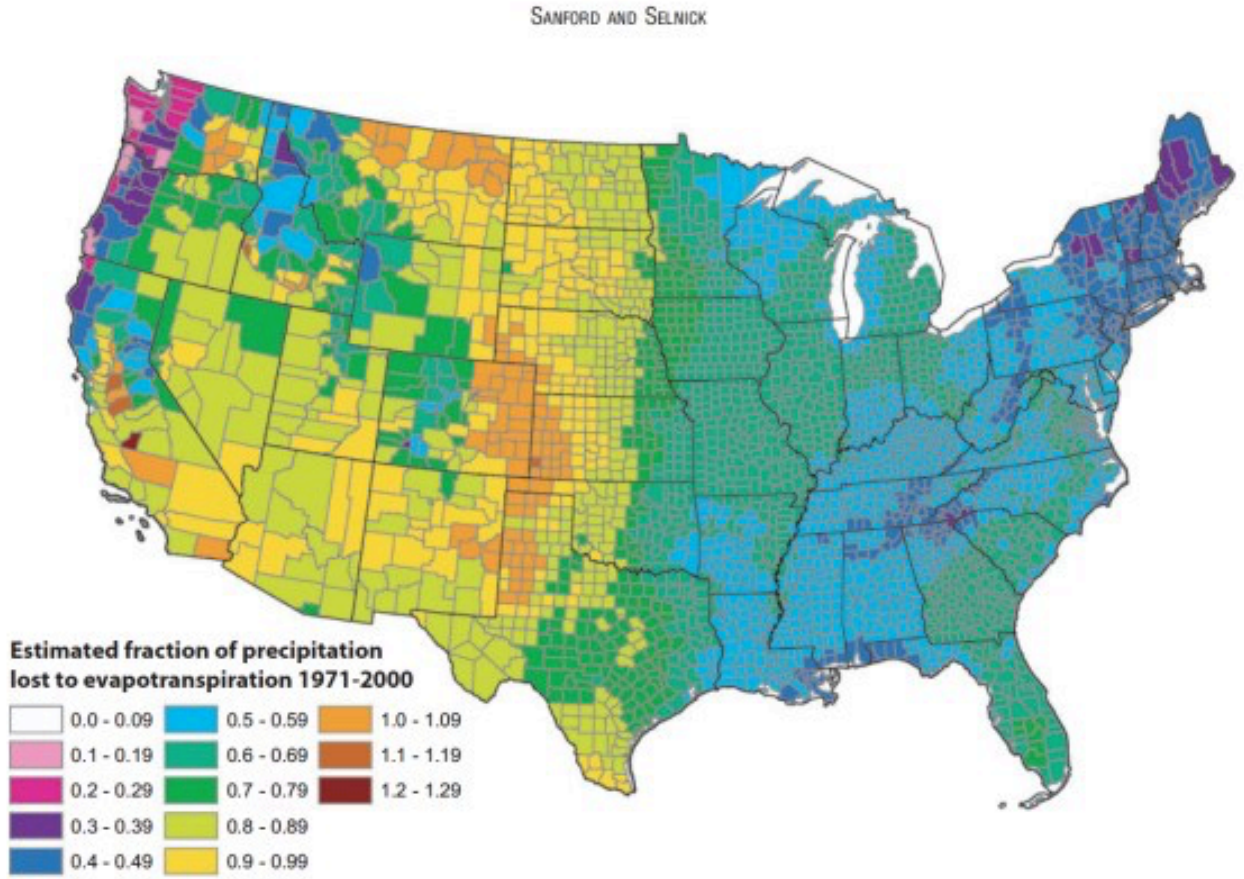
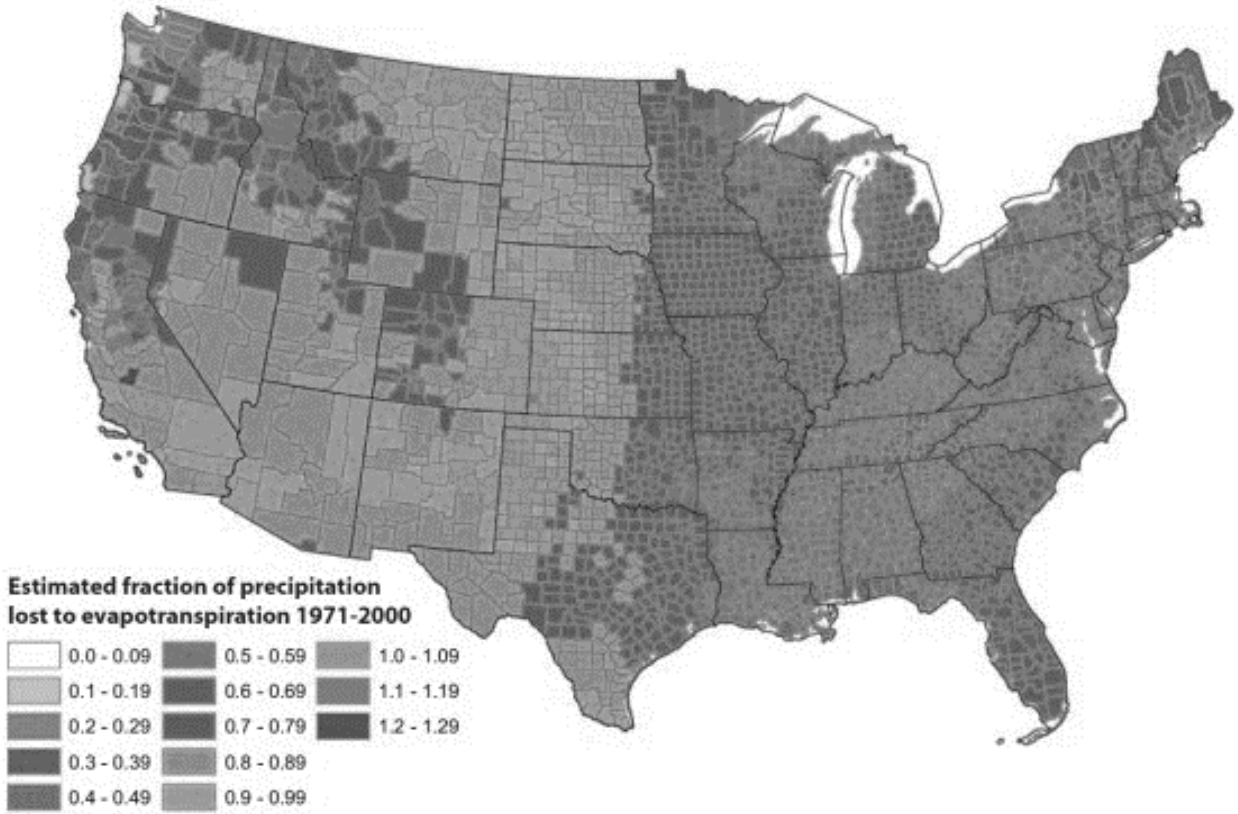


FIGURE 13. Estimated Mean Annual Ratio of Actual Evapotranspiration (ET) to Precipitation (P) for the Conterminous U.S. for the Period 1971-2000. Estimates are based on the regression equation in Table 1 that includes land cover. Calculations of ET/P were made first at the 800-m resolution of the PRISM climate data. The mean values for the counties (shown) were then calculated by averaging the 800-m values within each county. Areas with fractions >1 are agricultural counties that either import surface water or mine deep groundwater.

https://eagereyes.org/basics/rainbow-color-map

The Evil Rainbow Colourmap



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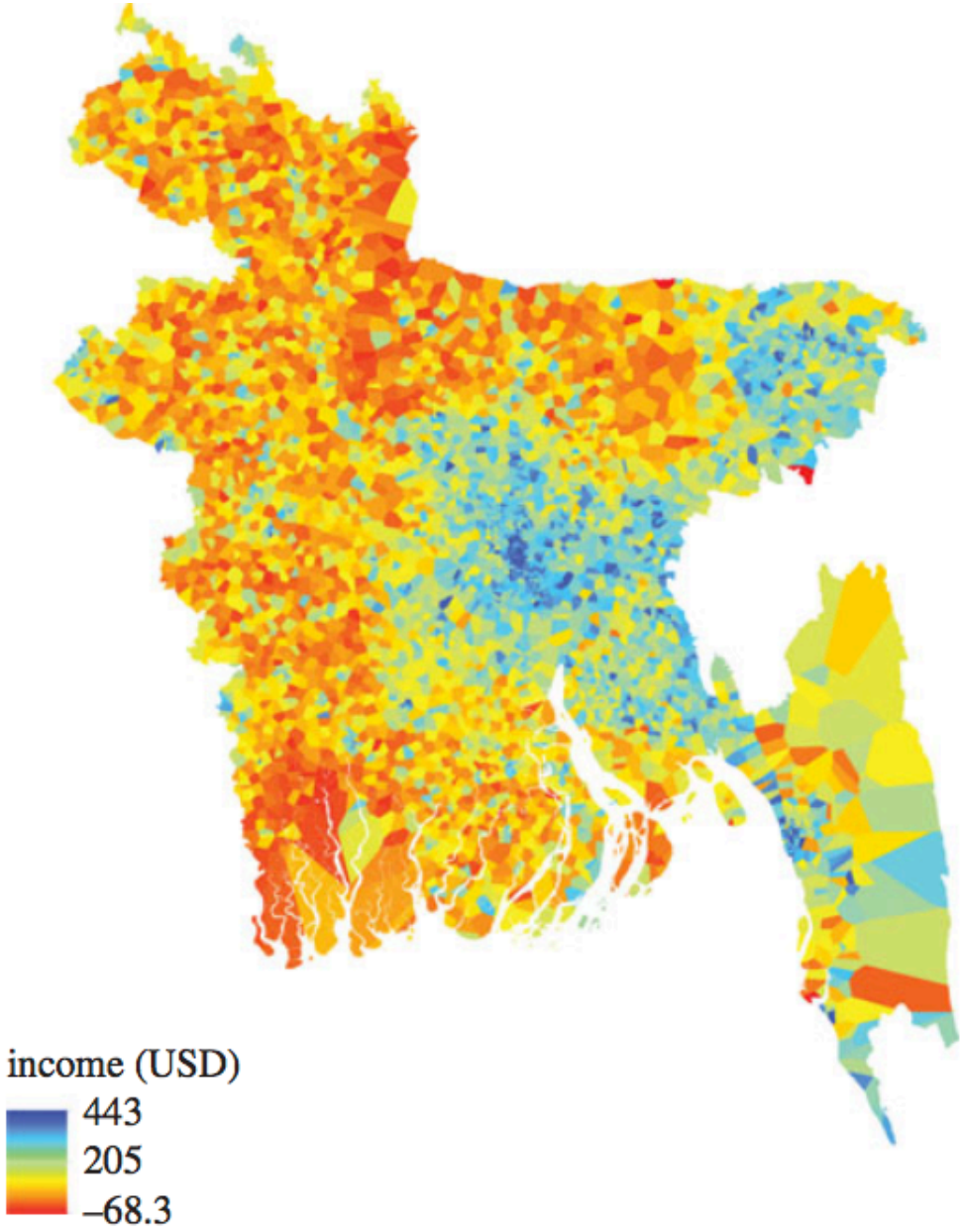
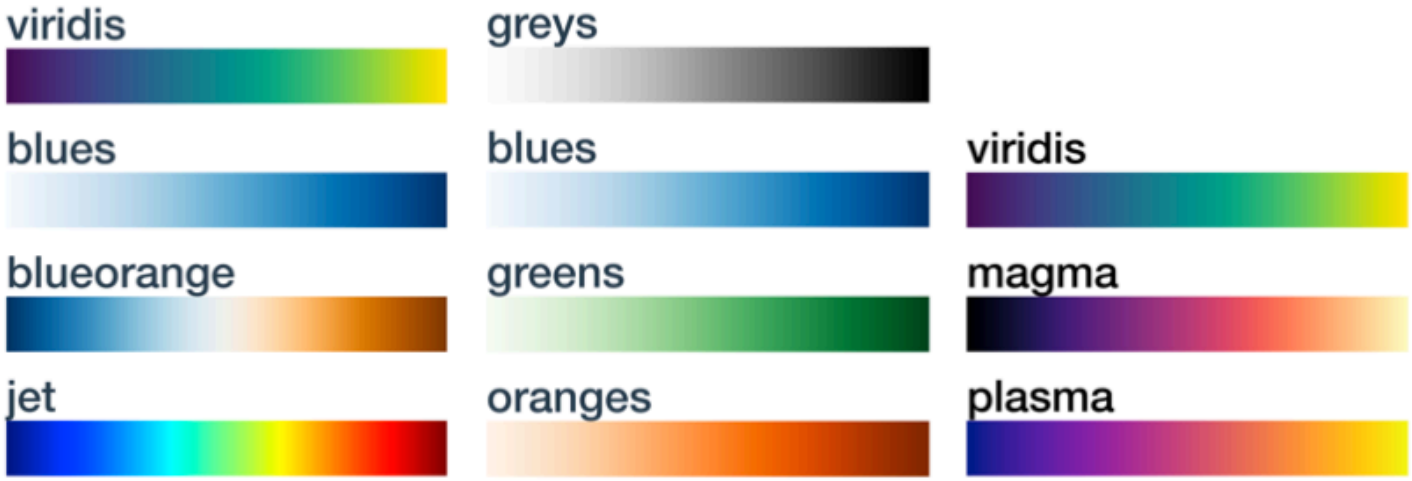
Rainbow colour palette

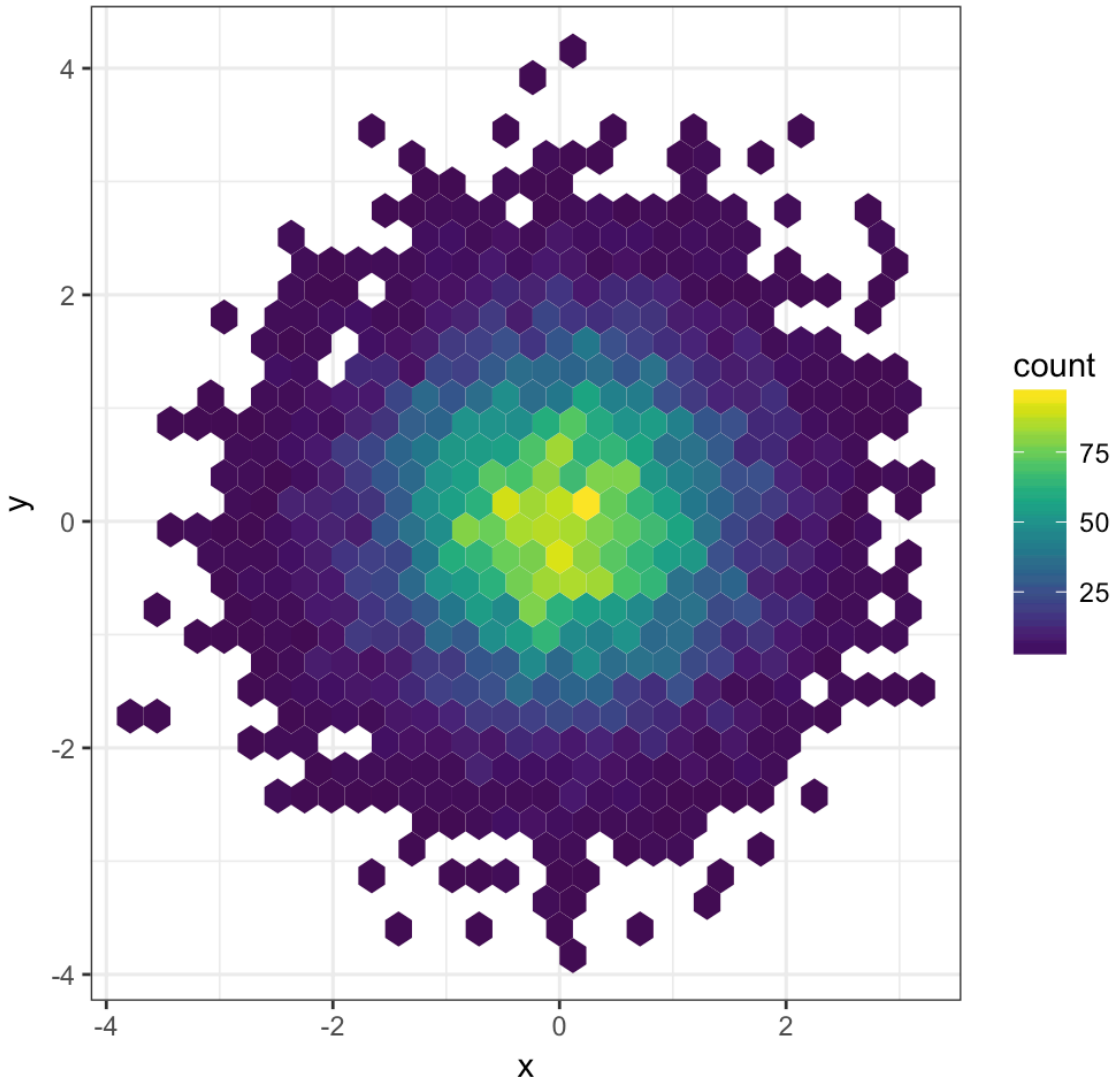


The Evil Rainbow Colourmap

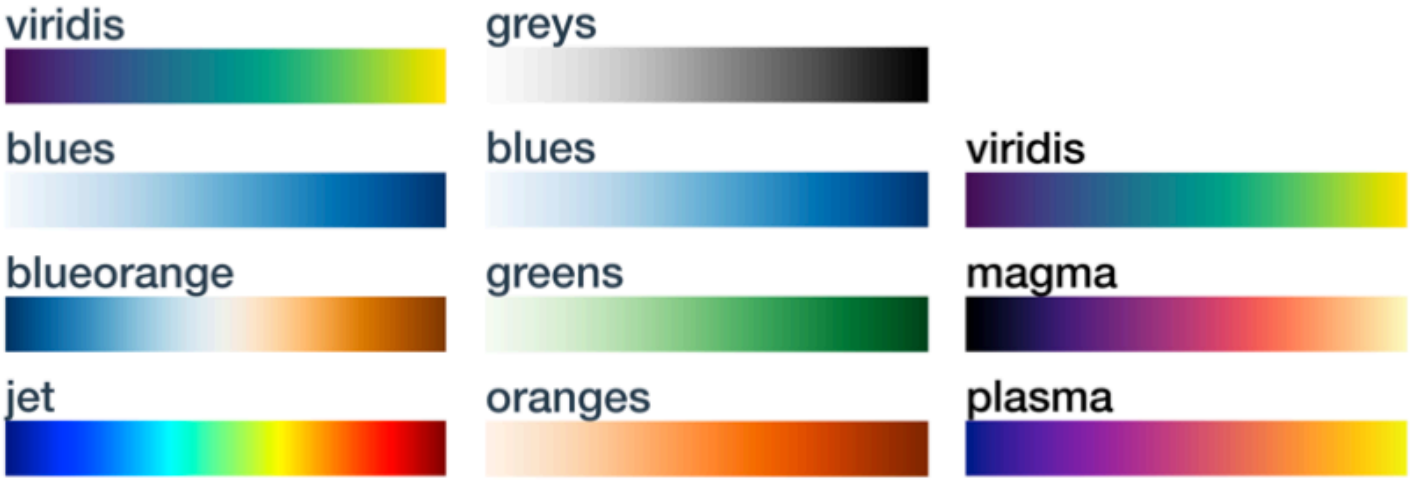


Liu, Y., & Heer, J. (2018).
Somewhere over the rainbow: An empirical assessment of quantitative colormaps.
In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (p. 598). ACM.

Viridis colour palette



The Evil Rainbow Colourmap



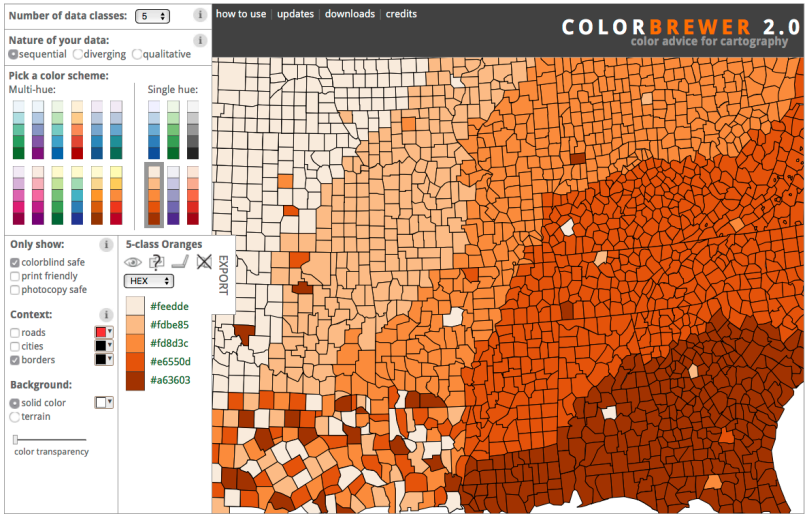
Single hue: performs well over larger scale ranges, but smaller differences are difficult to read. Good when only using 5 to 7 different colours.

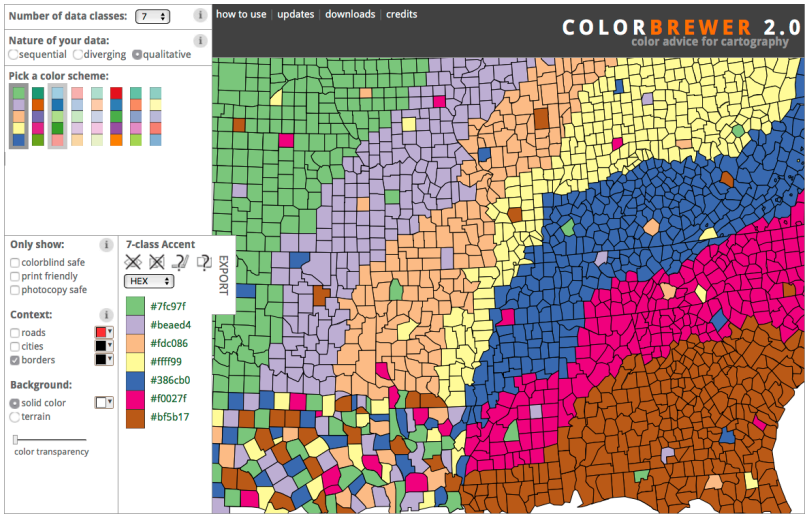
Color gradients ramping in luminance and hue perform well, particularly Viridis. Good for mapping scalar fields.

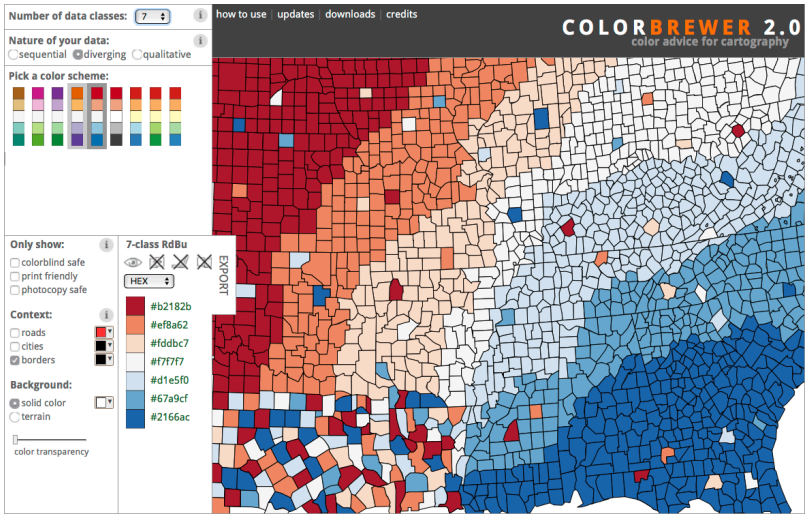
Rainbow colormap (*jet*) is worst overall and “should be jettisoned”. (The same applies very likely also to the *turbo* colormap recently introduced by a Google engineer.)

Liu, Y., & Heer, J. (2018).
Somewhere over the rainbow: An empirical assessment of quantitative colormaps.
In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (p. 598). ACM.

Sequential, diverging and qualitative colour schemes



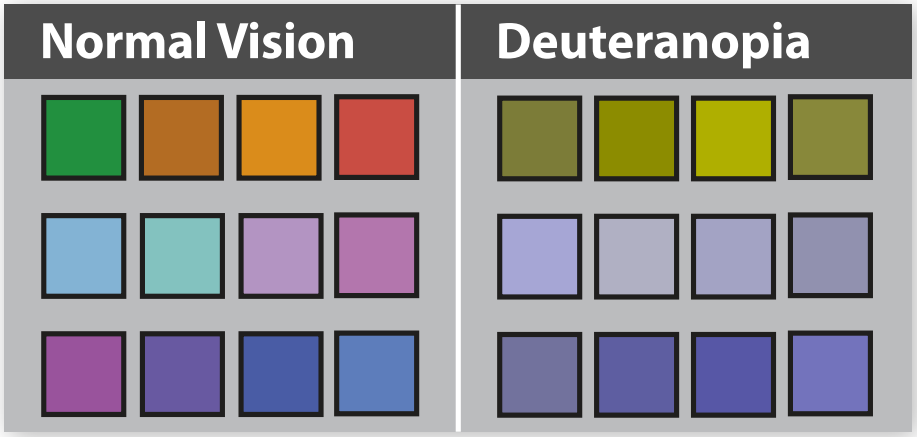




http://colorbrewer2.org

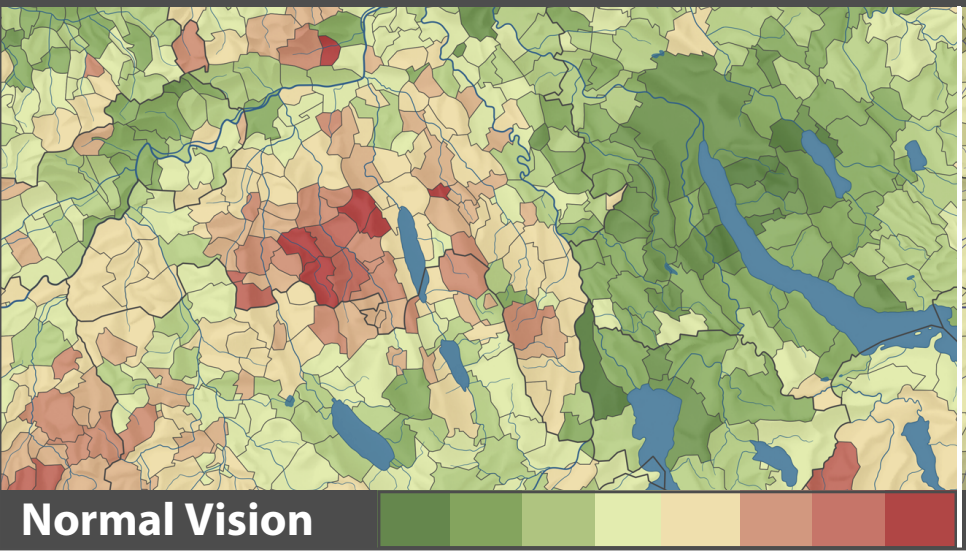
Colour for the colour vision impaired

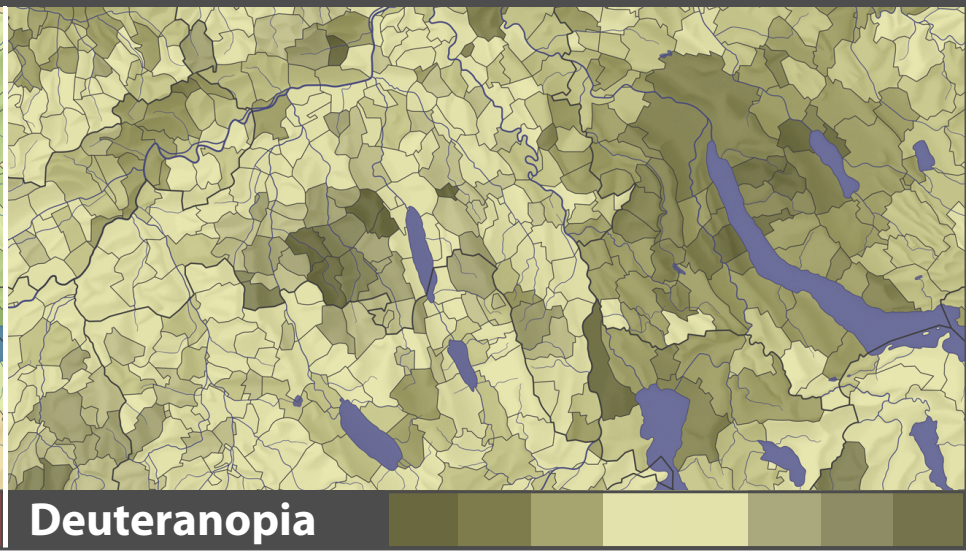
- 8% of all men have a color vision deficiency
- They mainly confuse red and green (deuteranopia and protanopia)



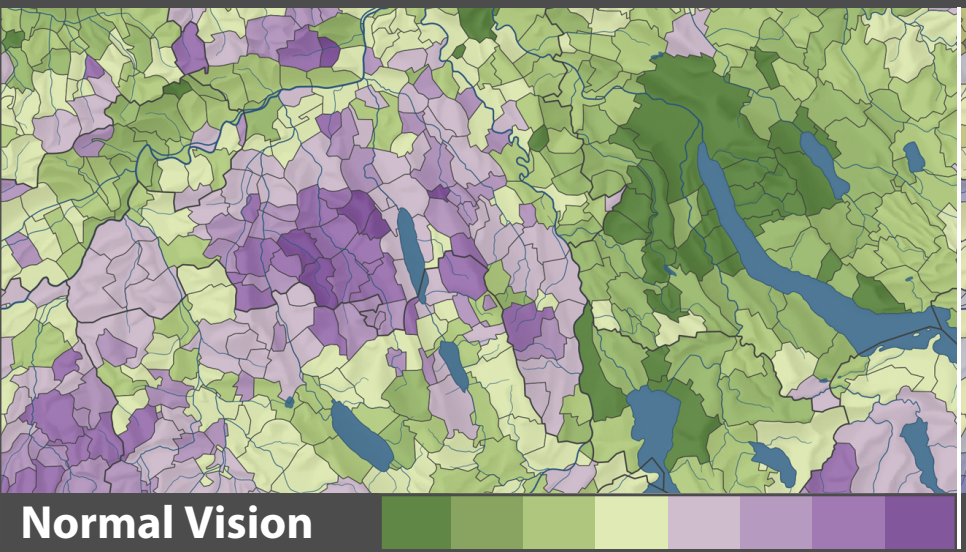
Colour for the colour vision impaired

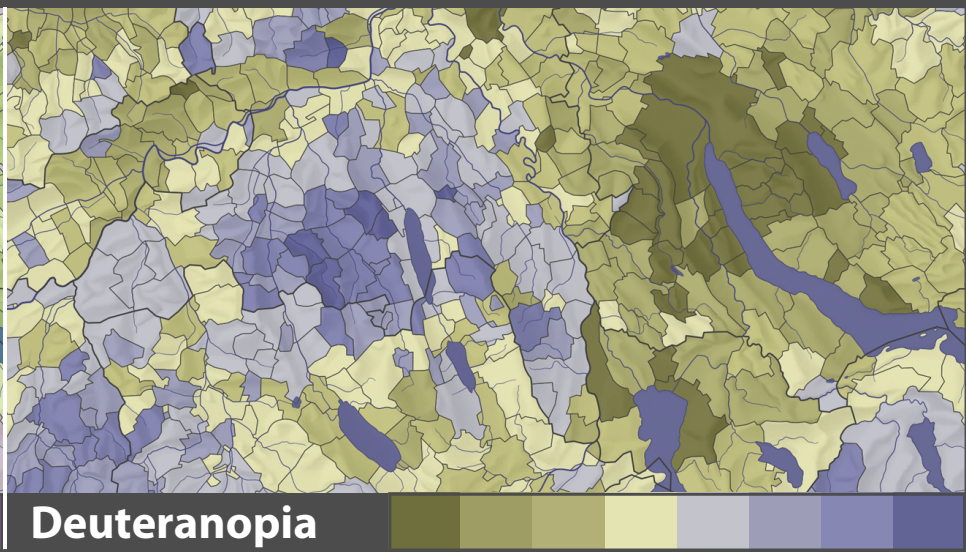
Diverging Red-Green Color Scheme



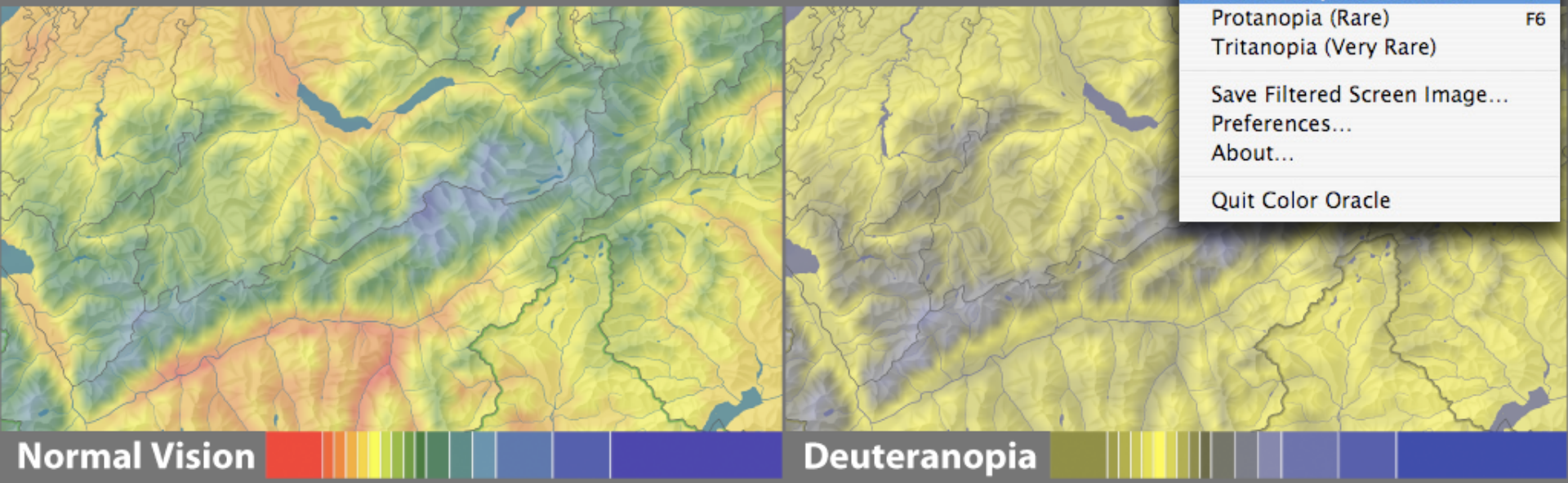


Diverging Purple-Green Color Scheme





Spectral Color Scheme



Normal Vision
✓ Deuteranopia (Common) F5
Protanopia (Rare) F6
Tritanopia (Very Rare)
Save Filtered Screen Image...
Preferences...
About...
Quit Color Oracle