

# Beyond Basics- Advanced Topics in Visualization

Nam Wook Kim

Mini-Courses — January @ GSAS  
2018

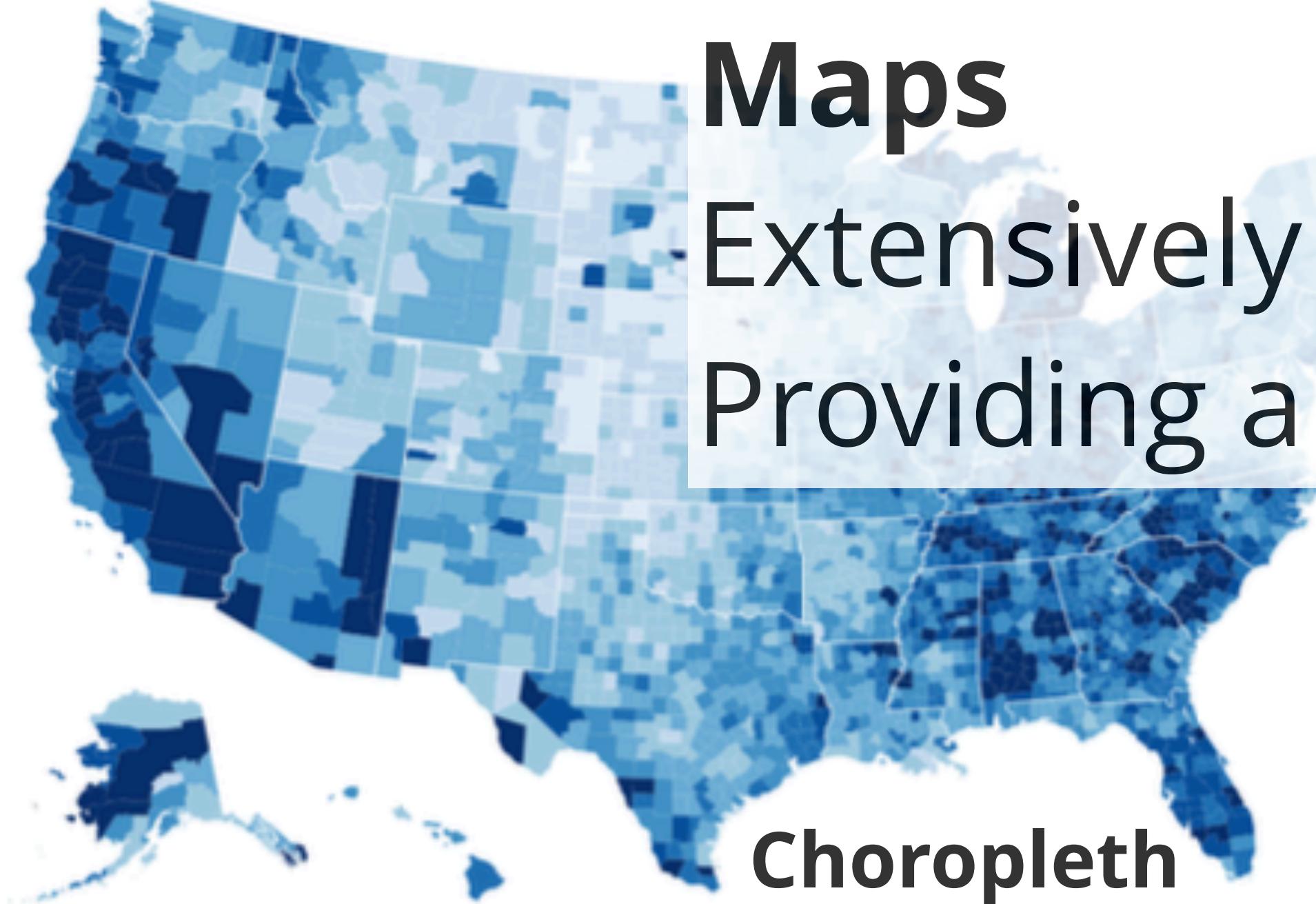
# Topics

- Maps
- Networks & Trees
- High-Dimensional Data
- Text

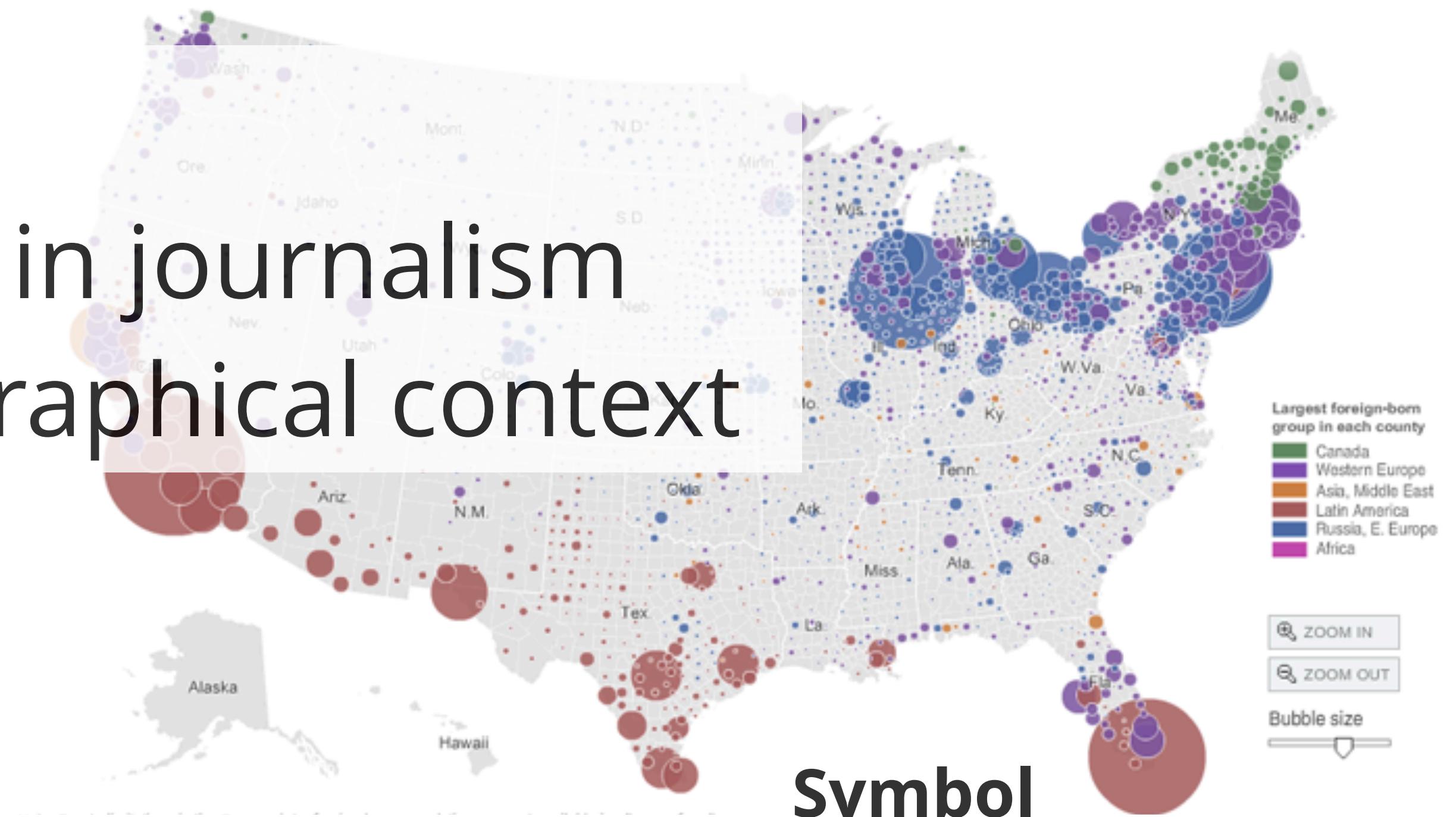
# Maps

# Maps

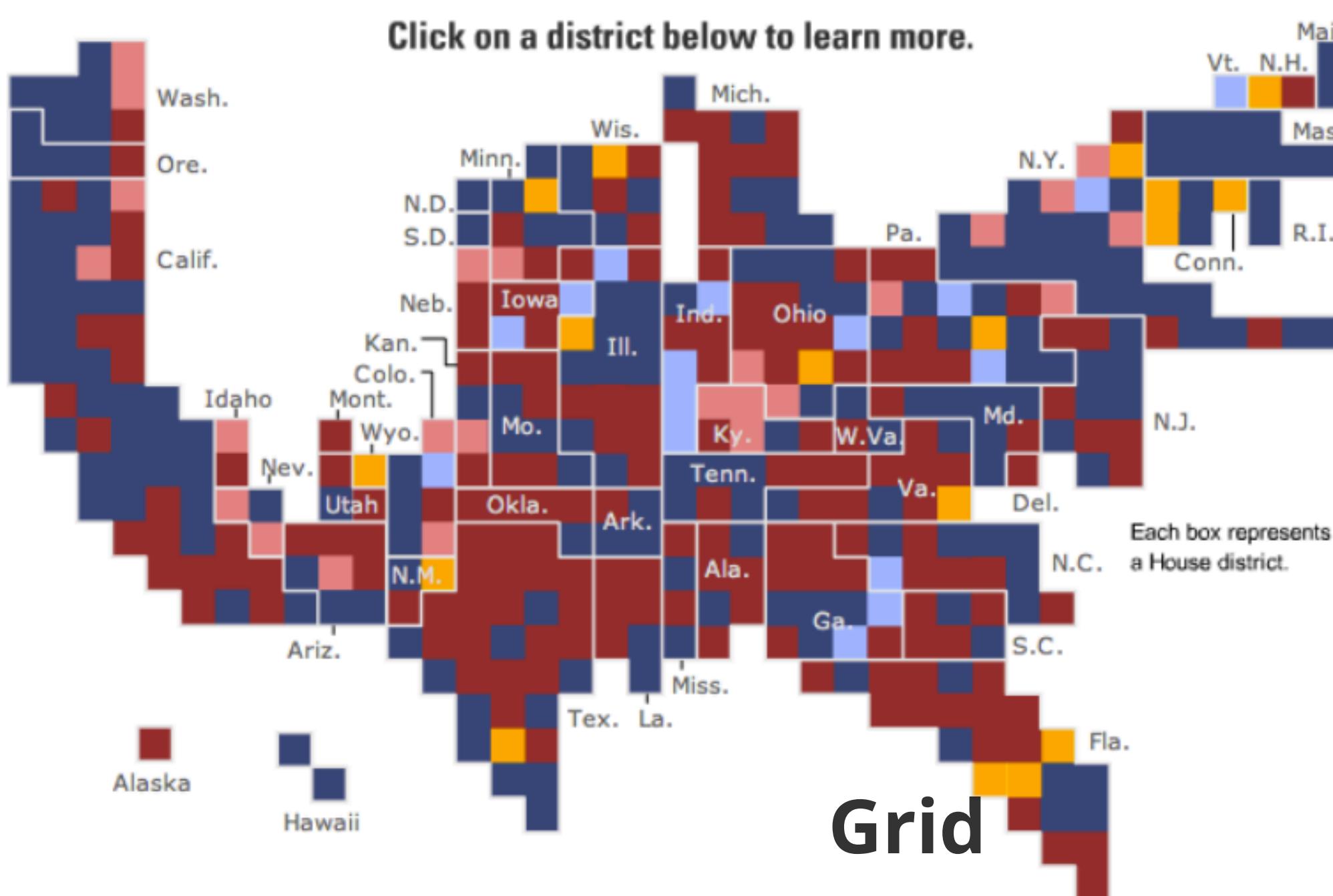
Extensively used in journalism  
Providing a geographical context



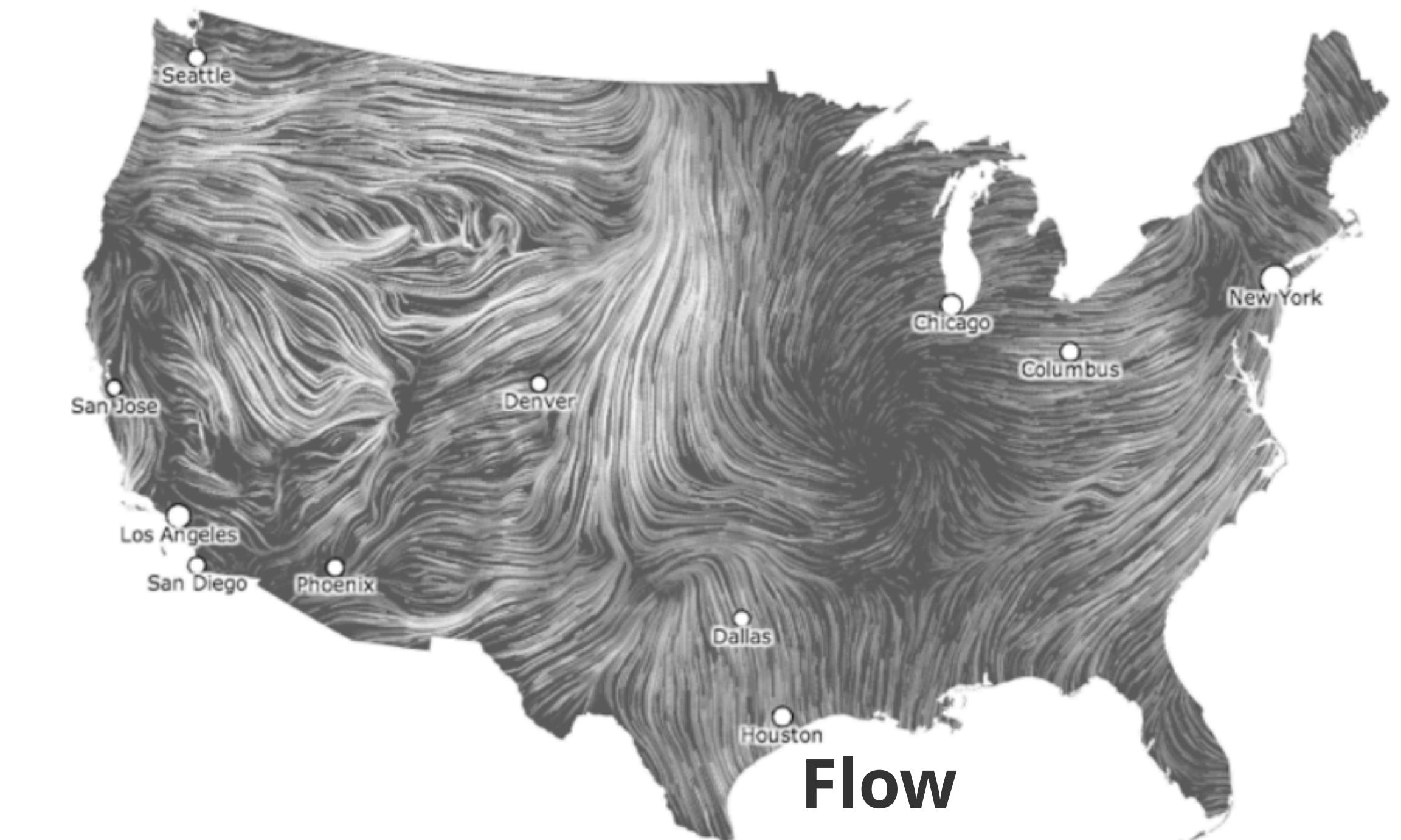
Choropleth



Symbol



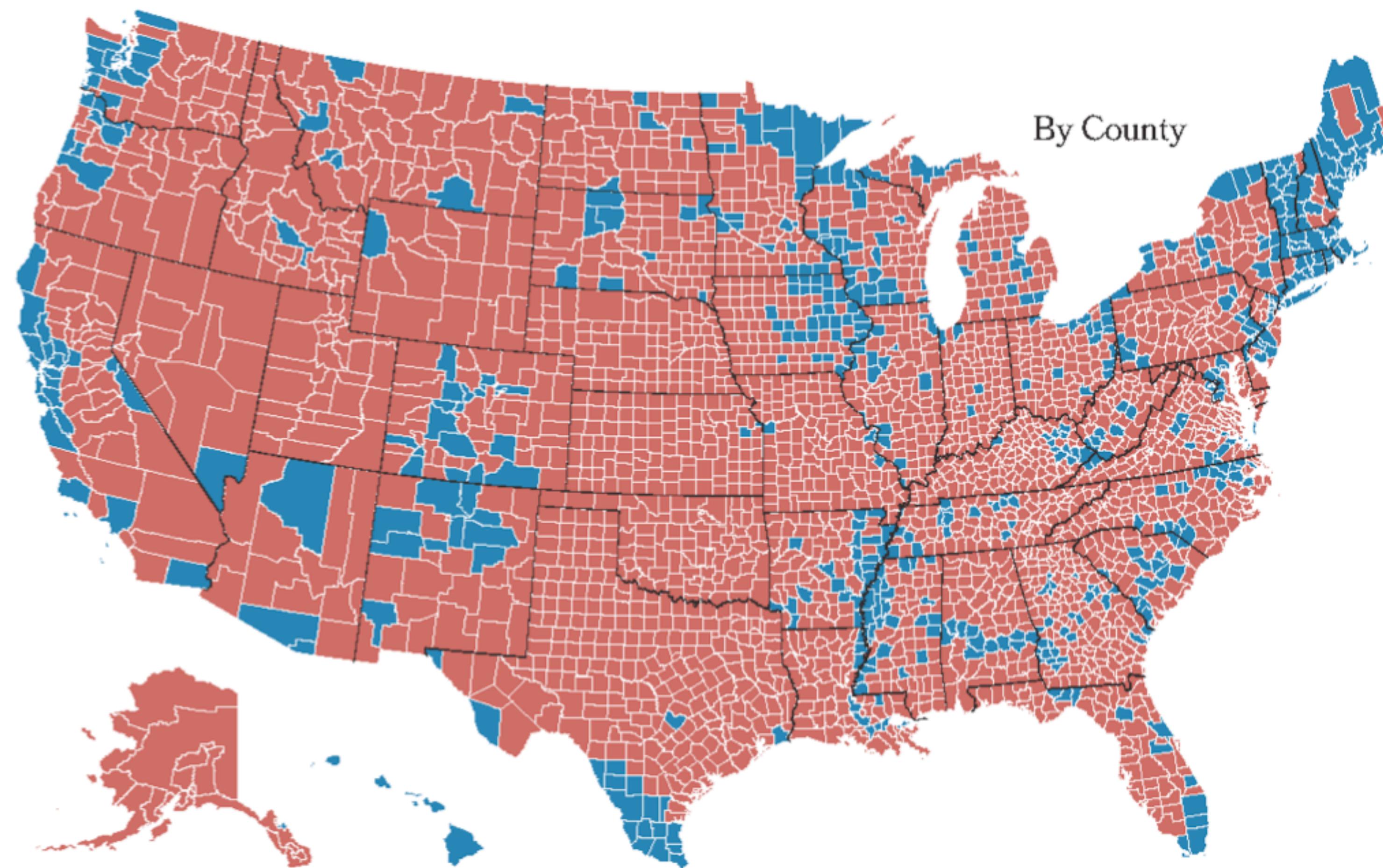
Grid



Flow

# Problem with Choropleth

Majority Vote for Kerry or Bush in 2004 (Binary data)



[Matthew Ericson, NY Times]

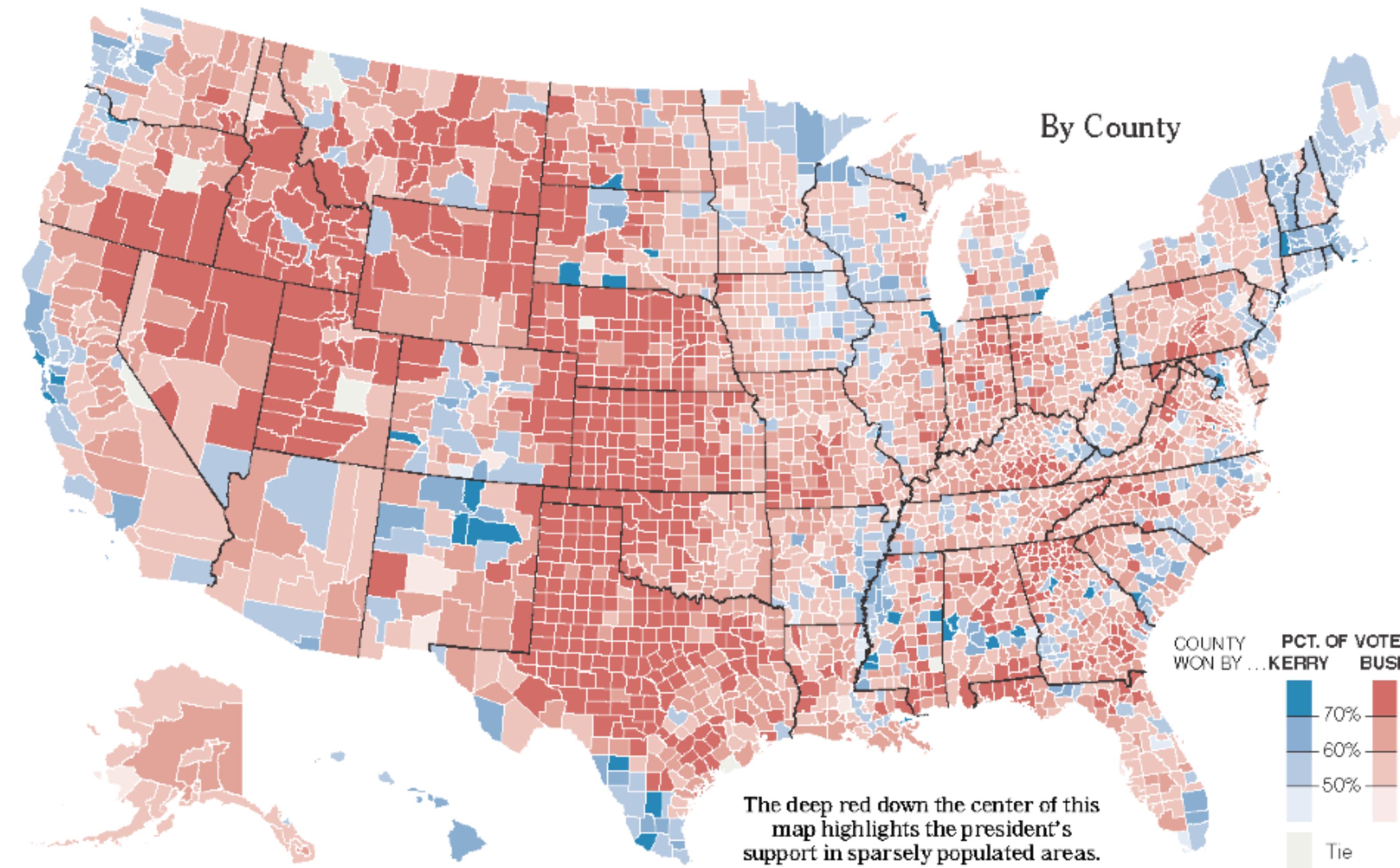
### 2004 Popular Vote



Amount of red and blue shown on map

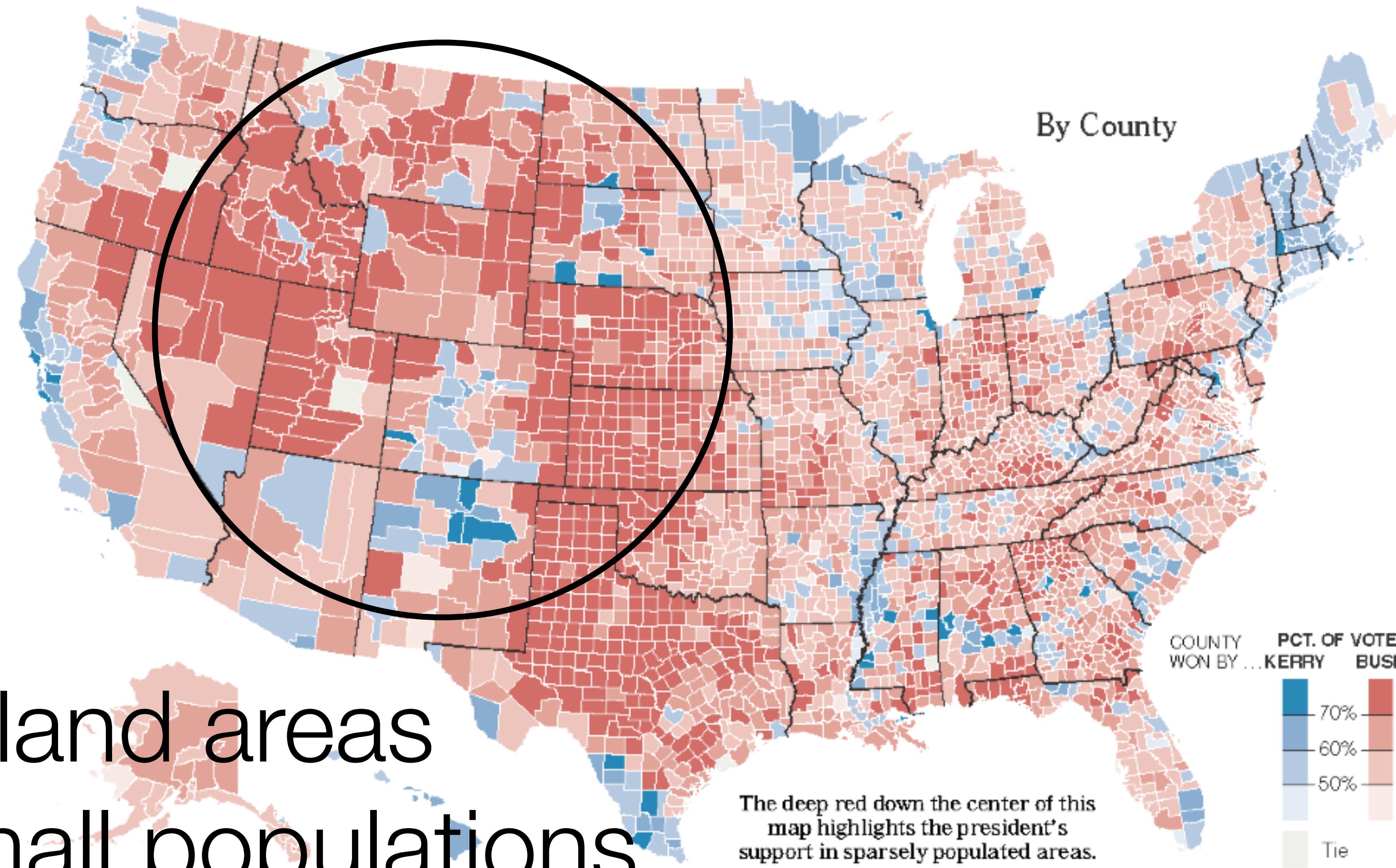


# Take into account for the number of votes.

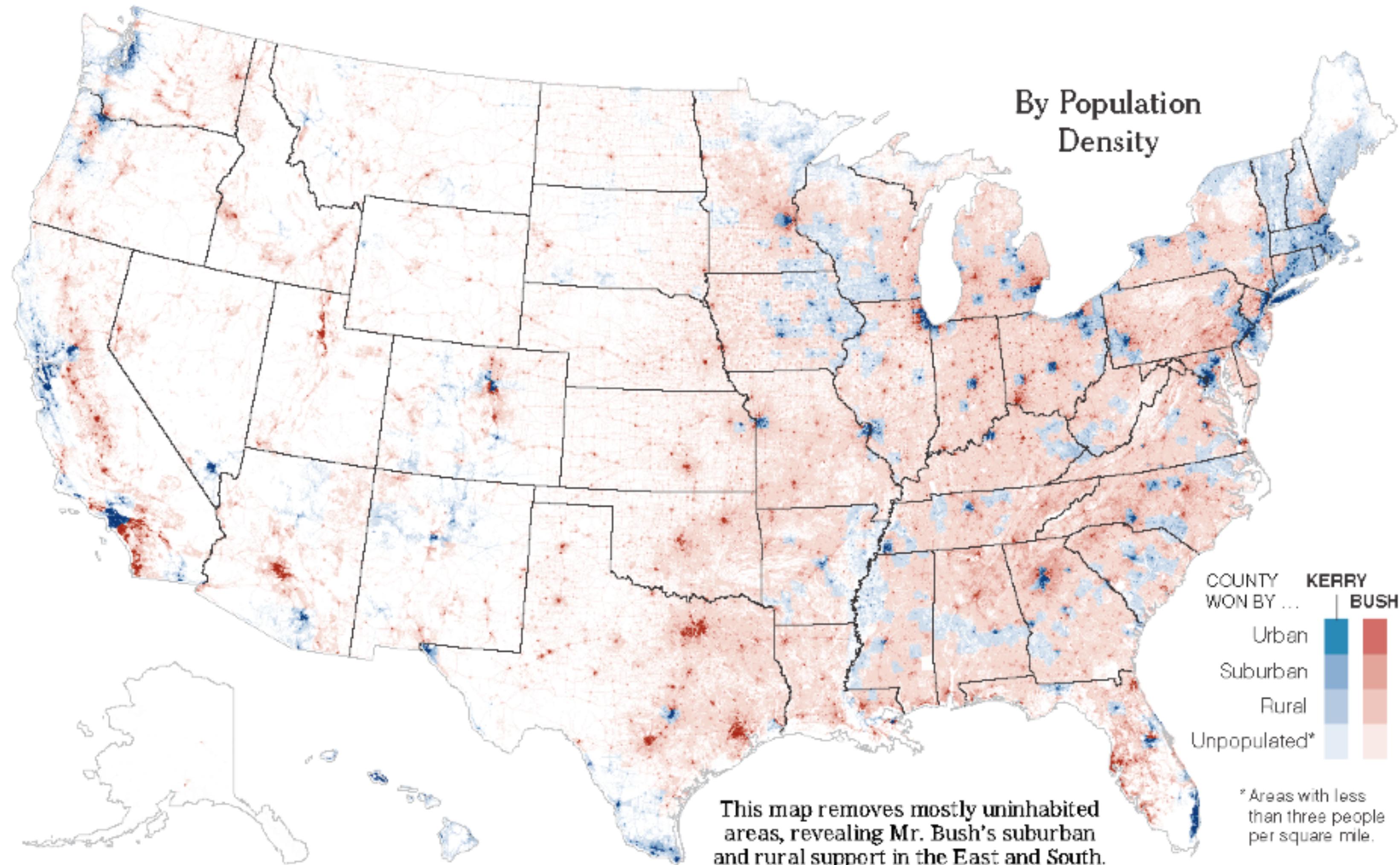


# Take into account for the number of votes.

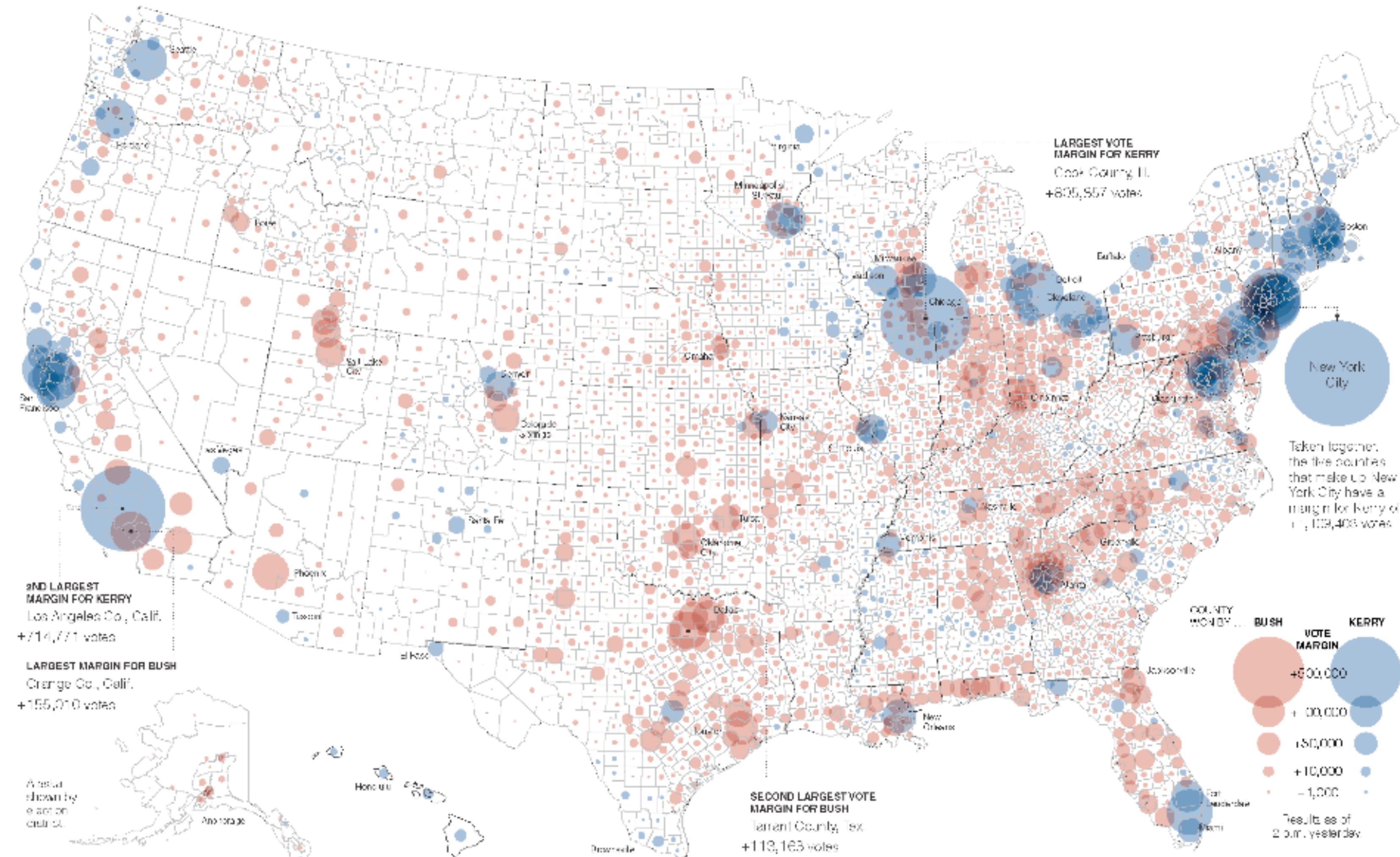
Larger land areas  
with small populations



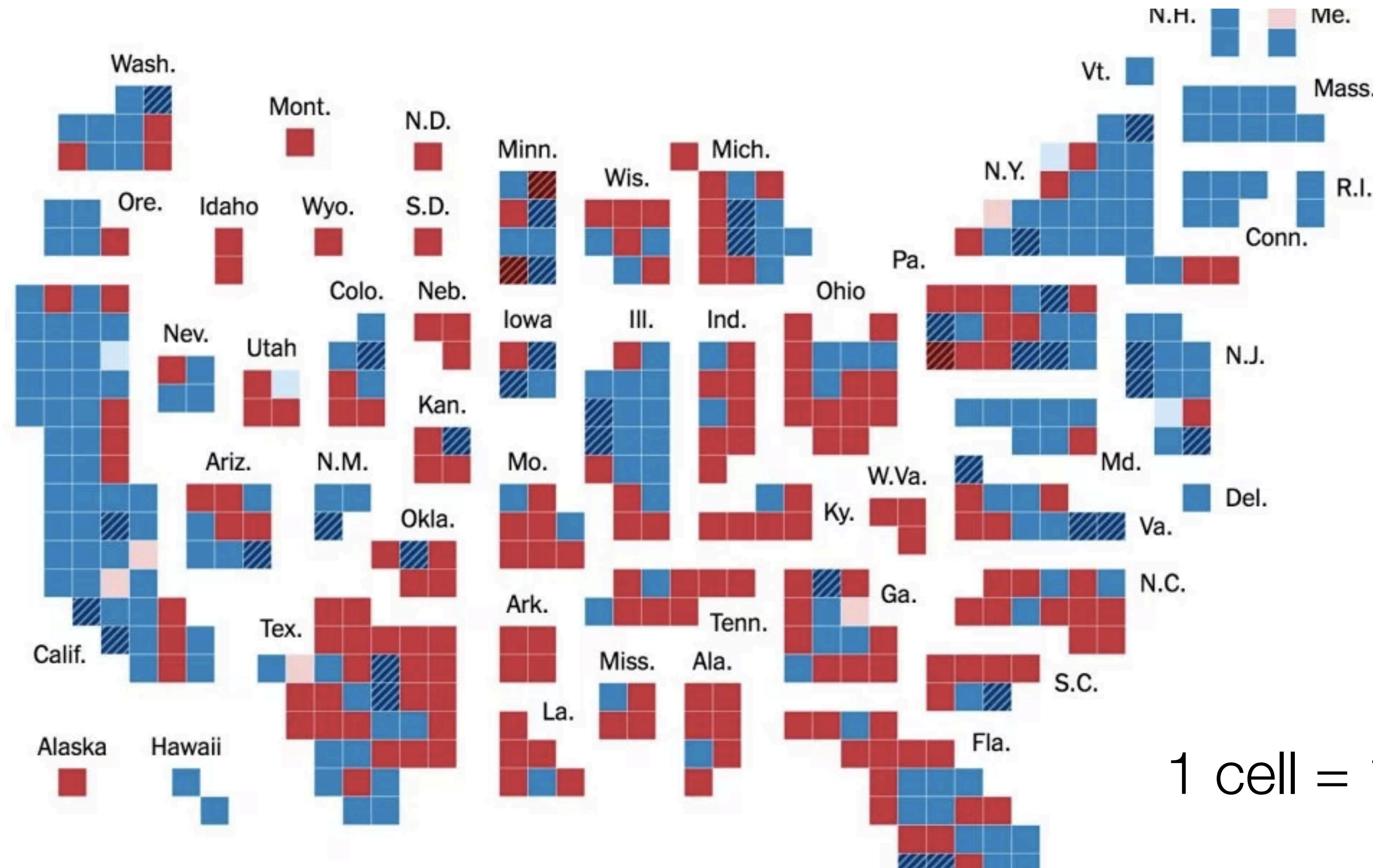
# Take into account for population density



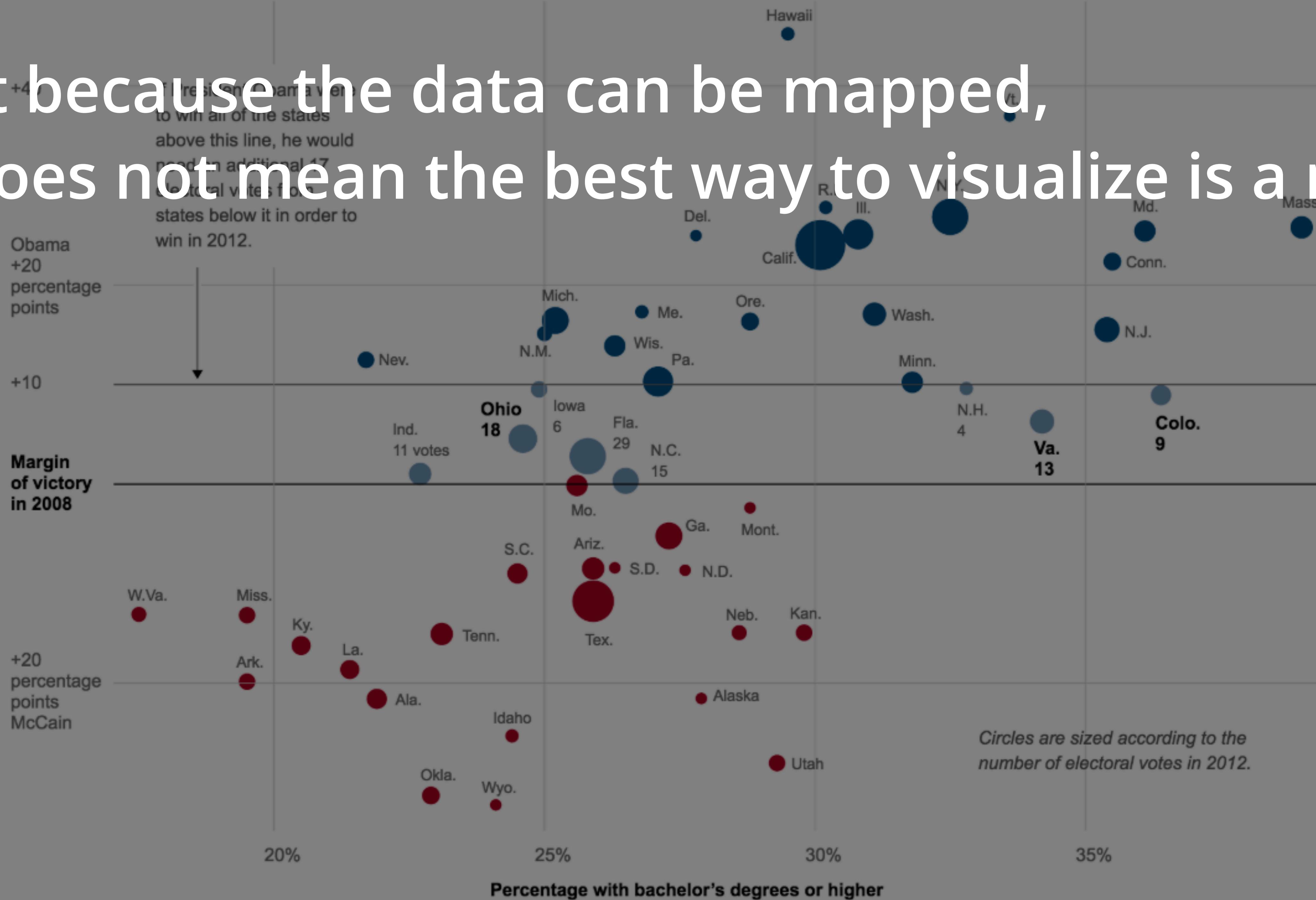
# Symbol Map



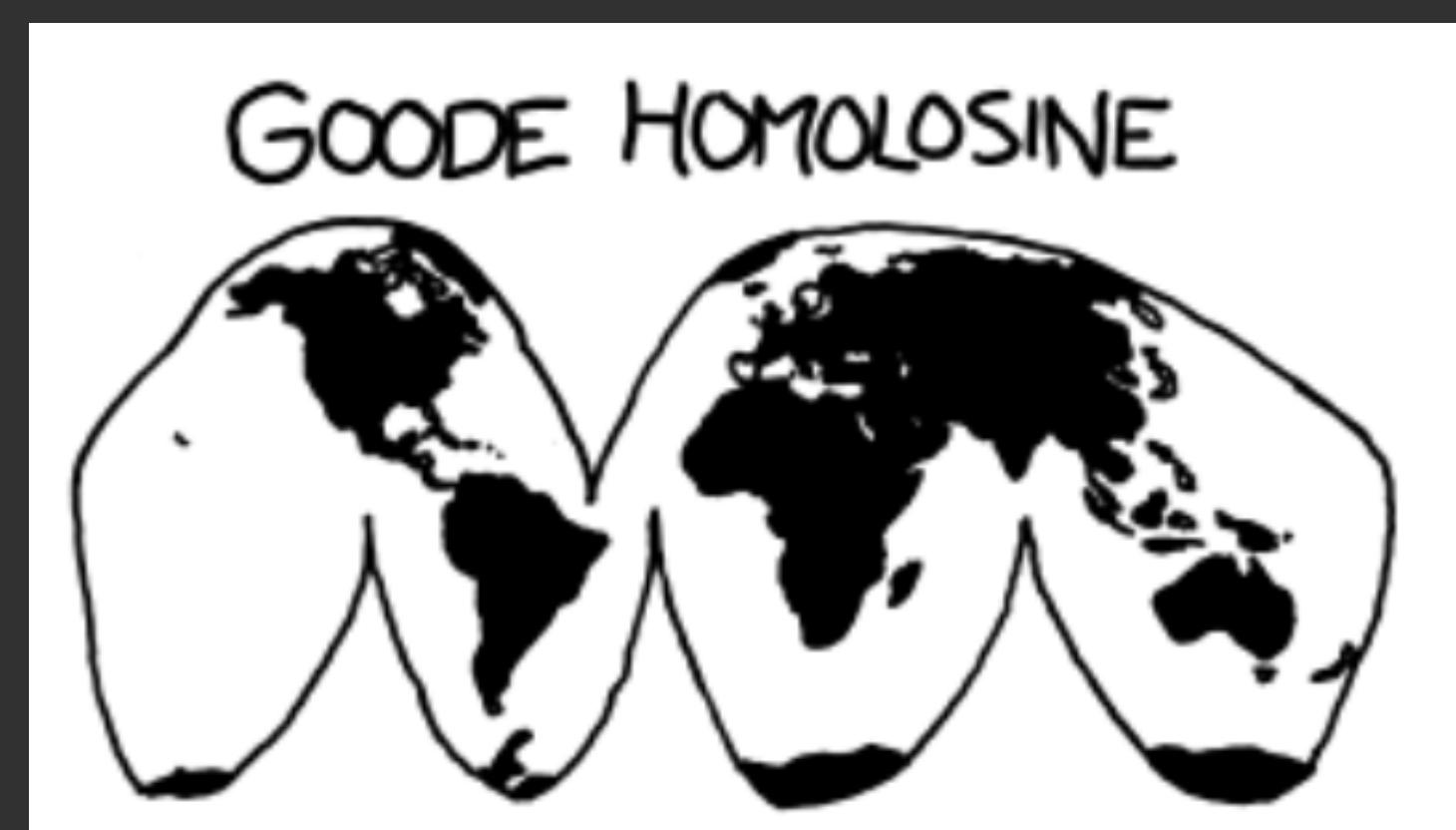
# Cartogram: Grid Map



# Just because the data can be mapped, it does not mean the best way to visualize is a map



# Map Projections



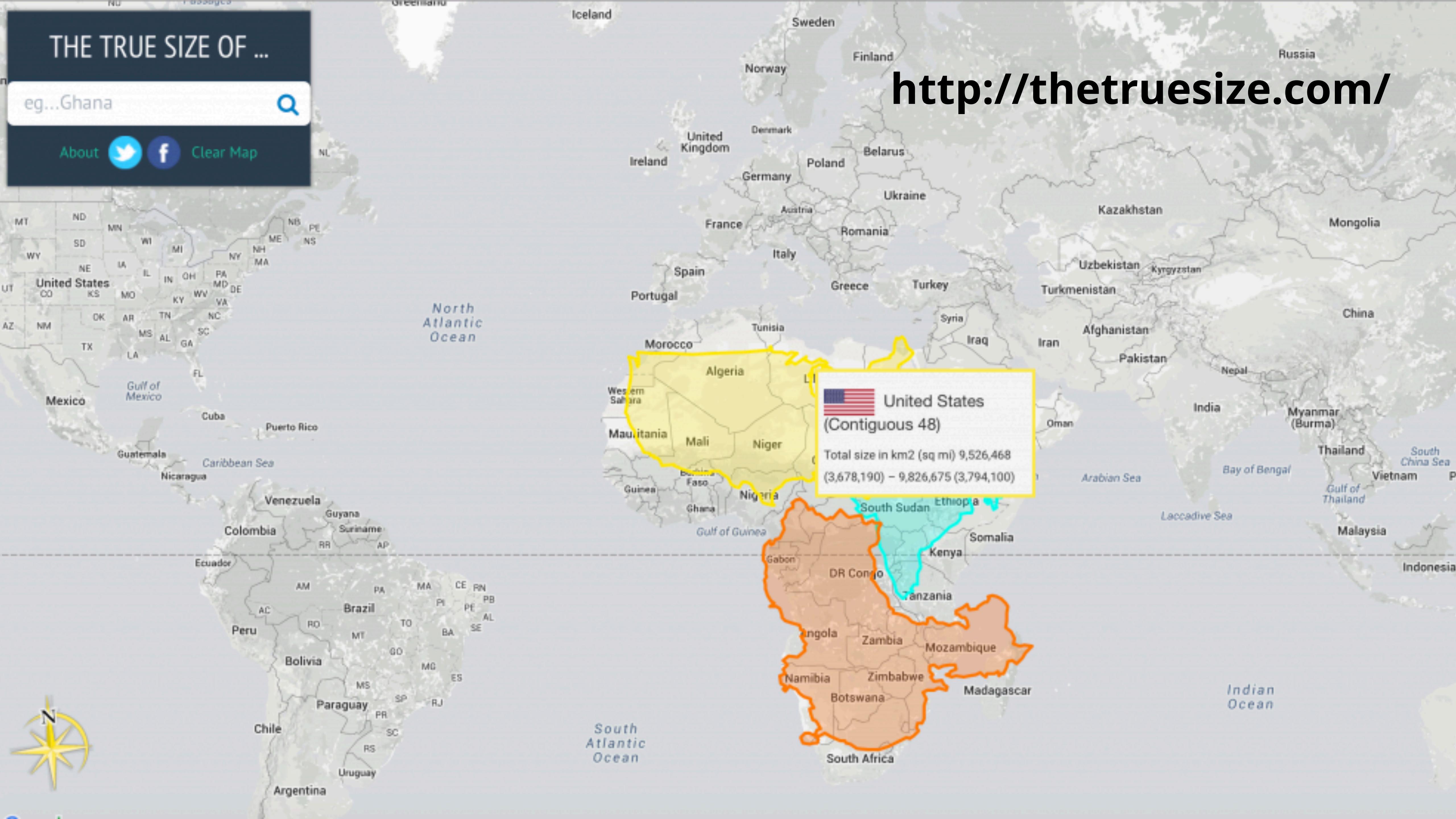
# THE TRUE SIZE OF ...

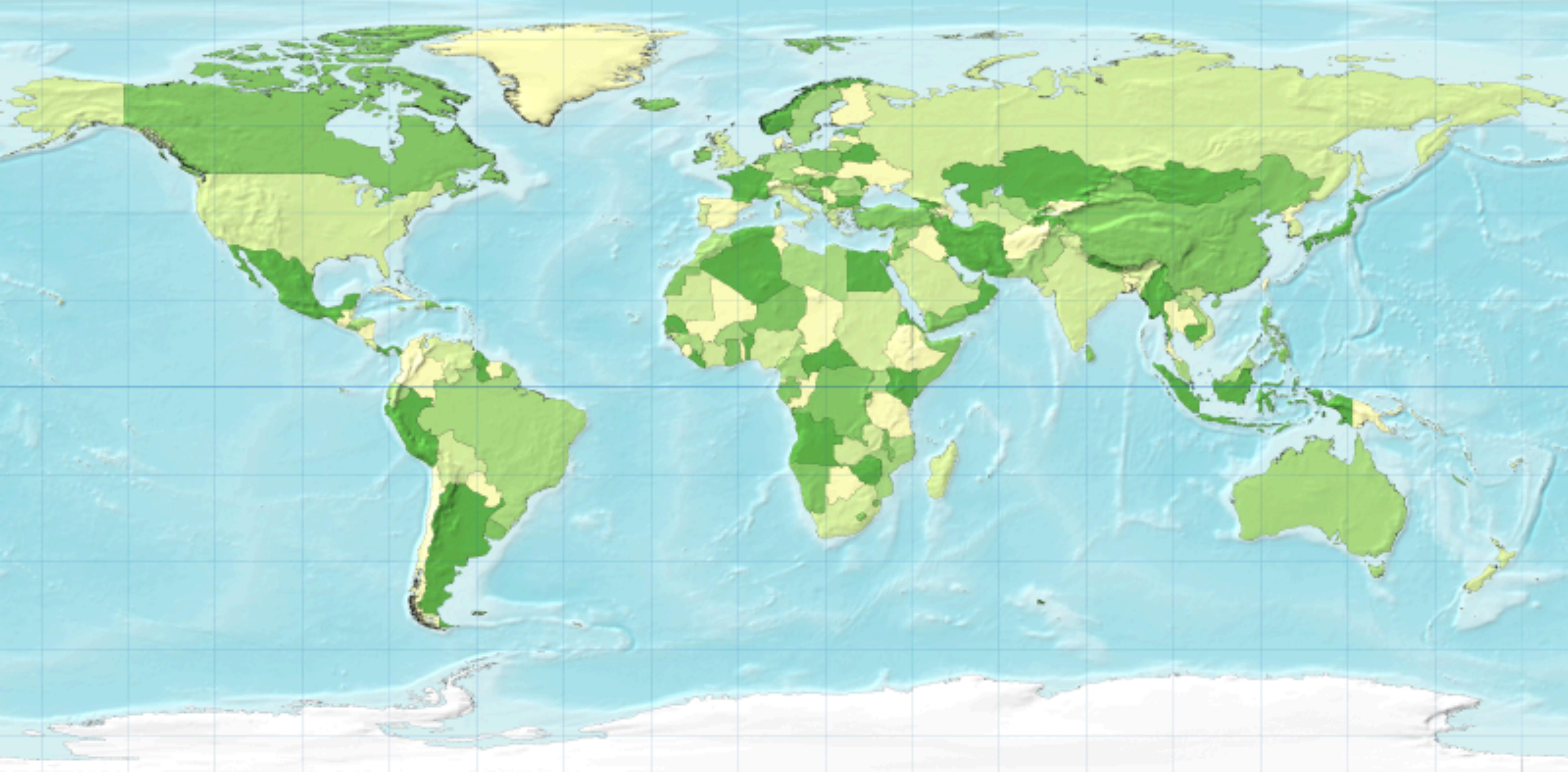
eg...Ghana



About Clear Map

<http://thetruesize.com/>



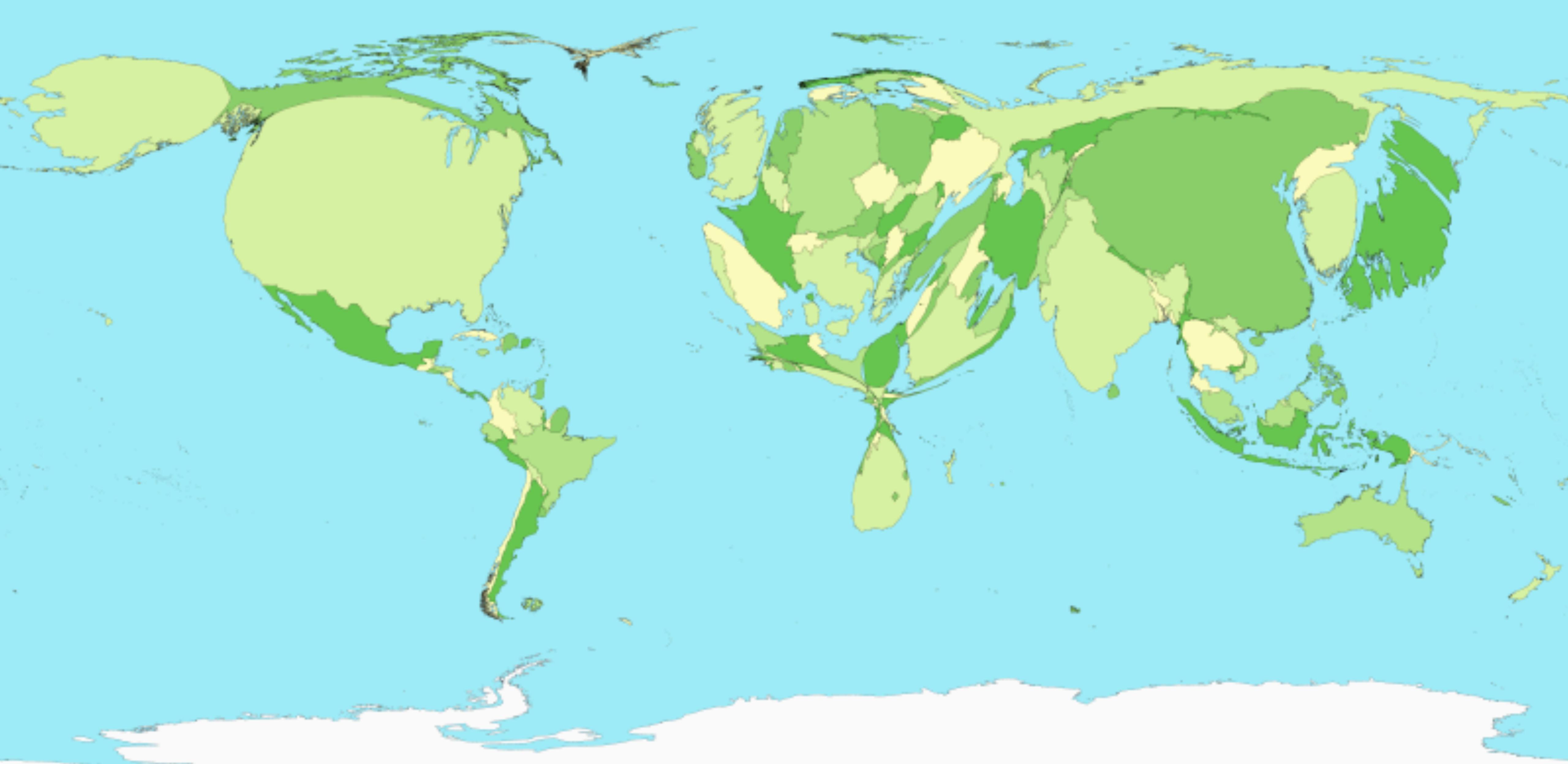


Ordinary map

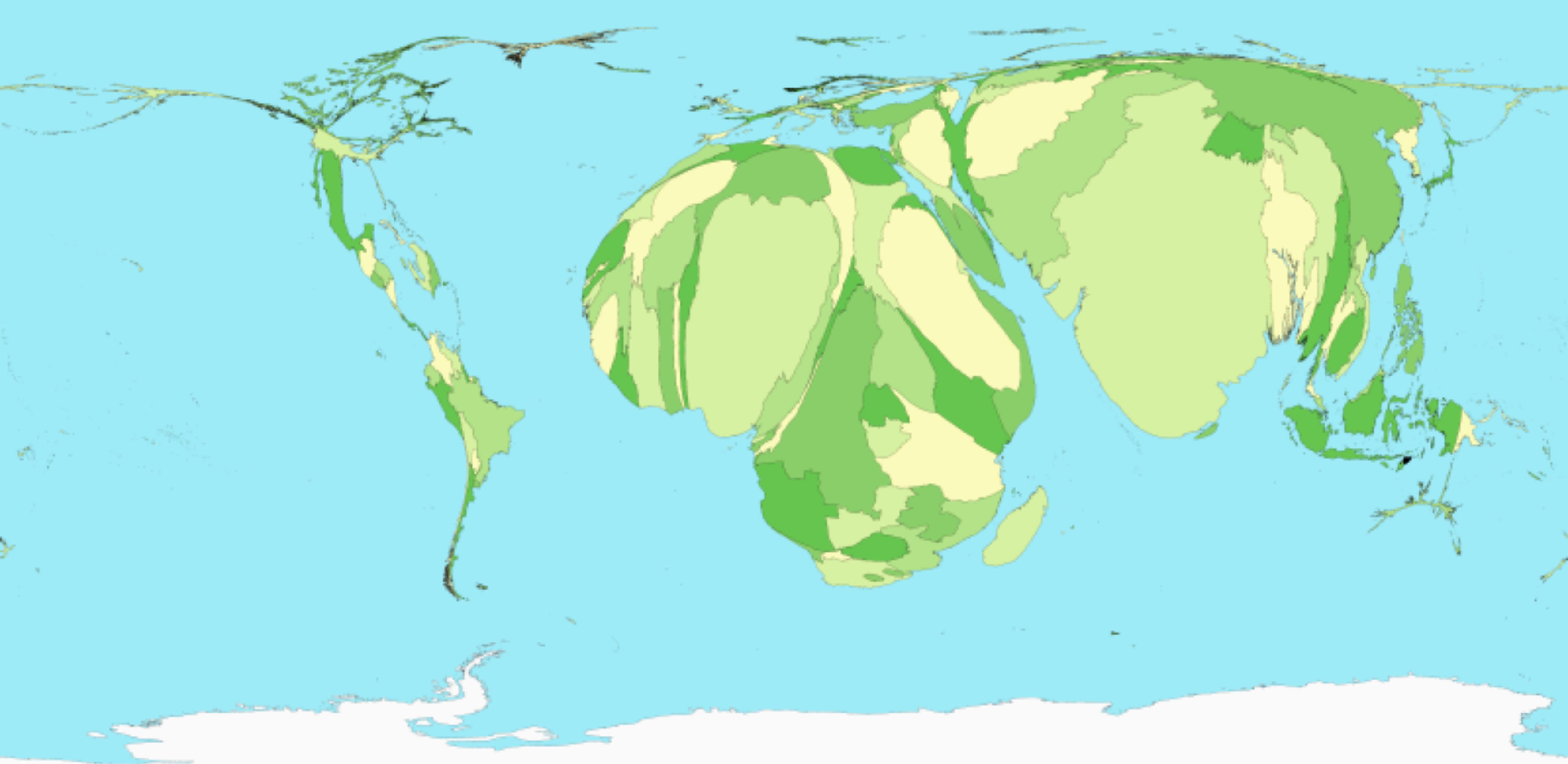
[<http://www-personal.umich.edu/~mejn/cartograms/>]



Population



Greenhouse gas emissions



Child mortality

# Problem with Rainbow Colormap

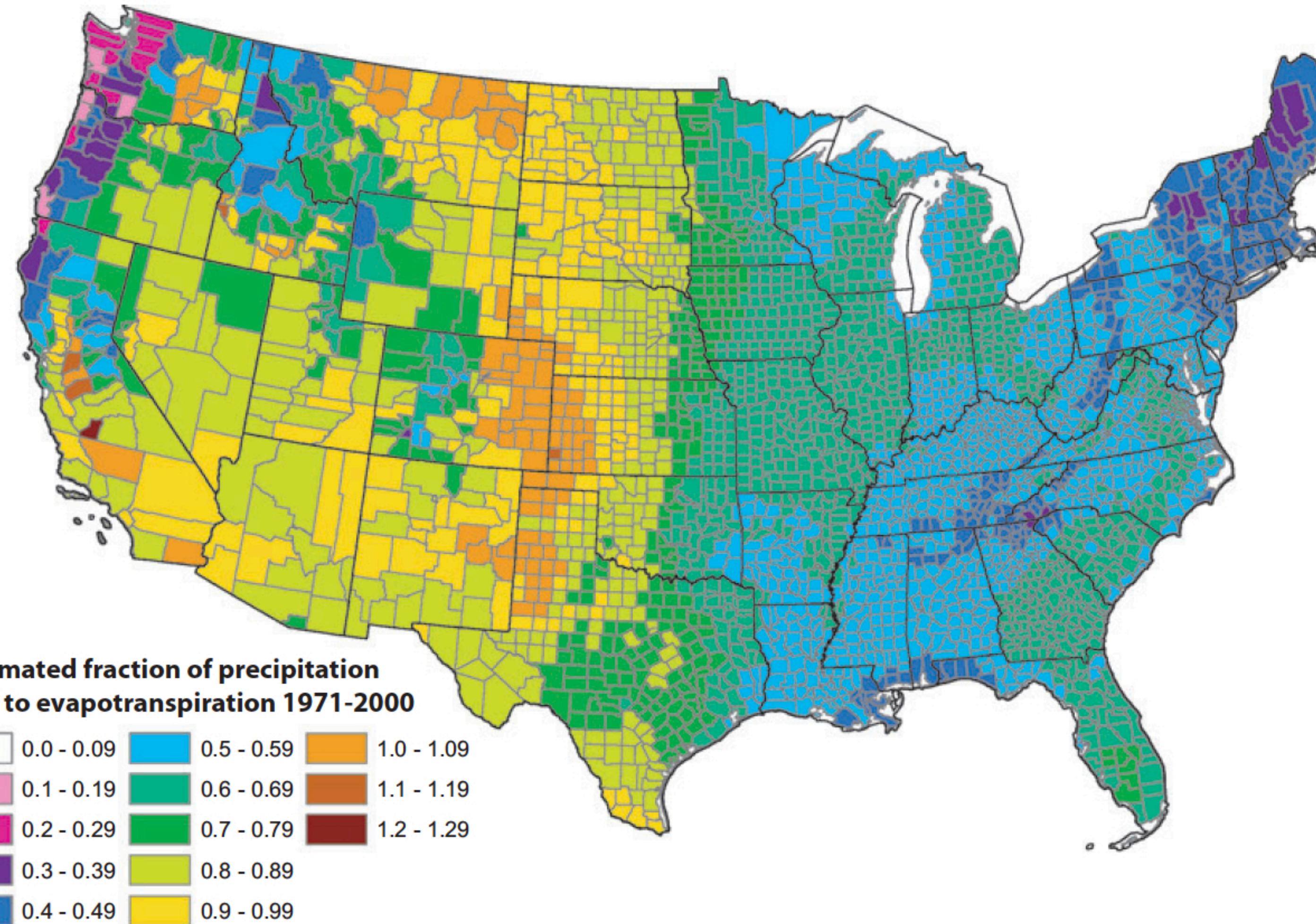
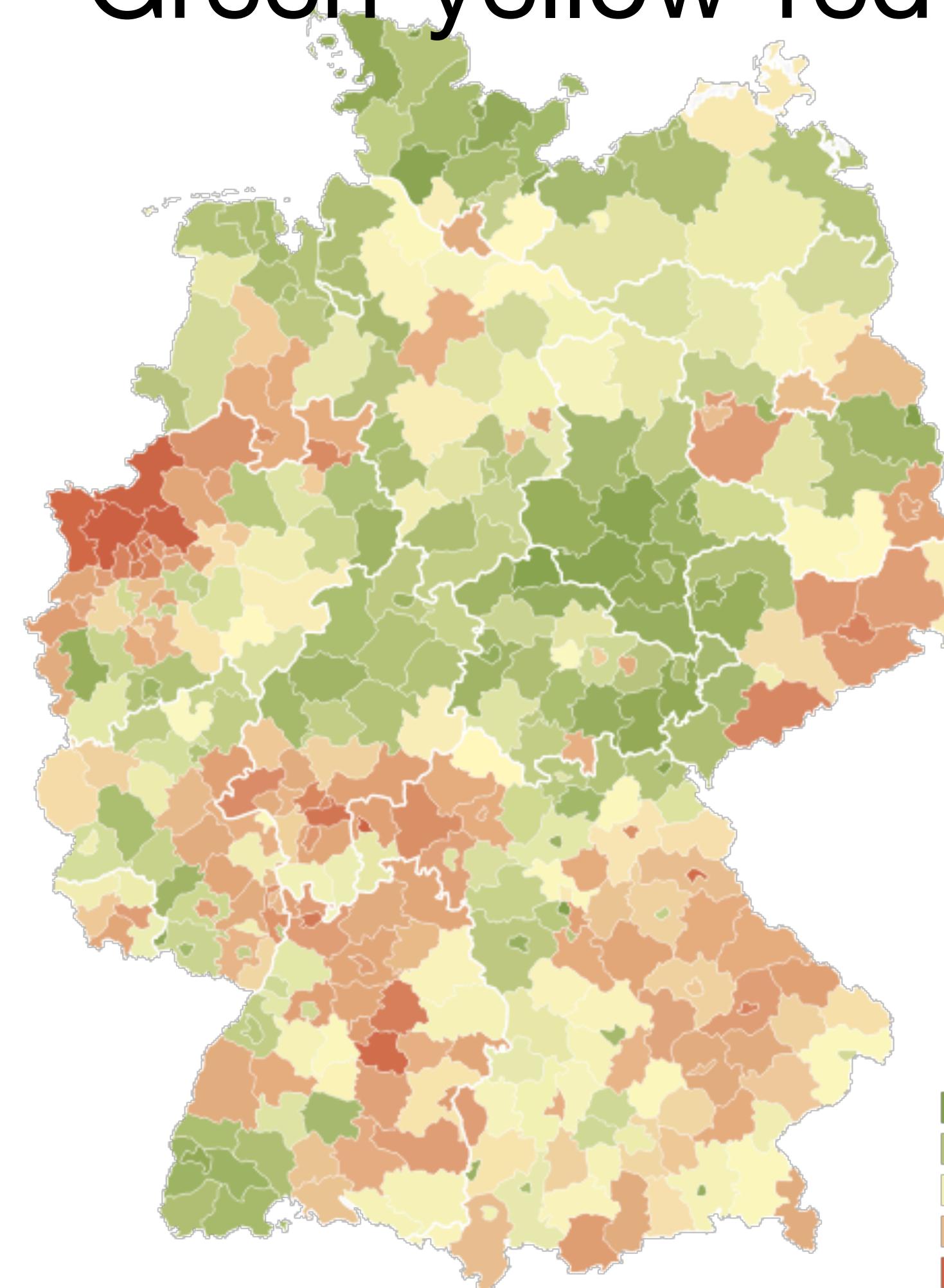


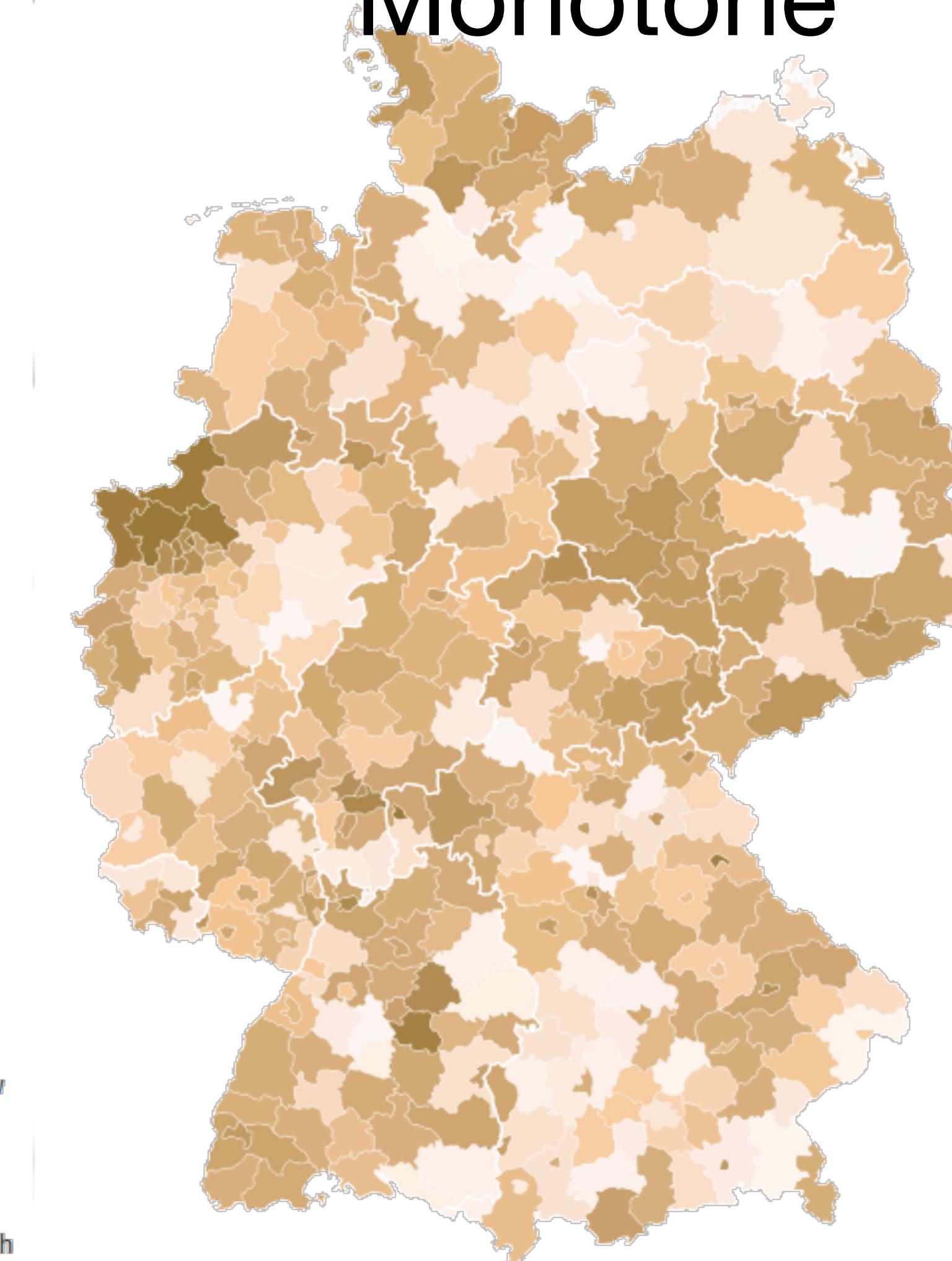
FIGURE 13. Estimated Mean Annual Ratio of Actual Evapotranspiration (ET) to Precipitation ( $P$ ) for the Conterminous U.S. for the Period 1971-2000. Estimates are based on the regression equation in Table 1 that includes land cover. Calculations of  $ET/P$  were made first at the 800-m resolution of 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.

# Color Blindness

Green-yellow-red



Monotone



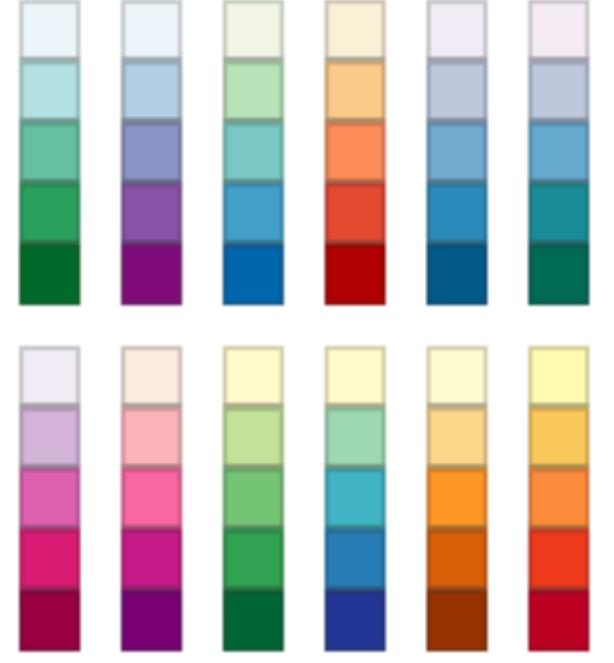
<https://blog.datawrapper.de/colorblind-check/>

Number of data classes: 3

Nature of your data:  sequential  diverging  qualitative

Pick a color scheme:

Multi-hue:



Single hue:



Only show:

 colorblind safe 
 print friendly 
 photocopy safe 

Context:

 roads 
 cities 
 borders 

Background:

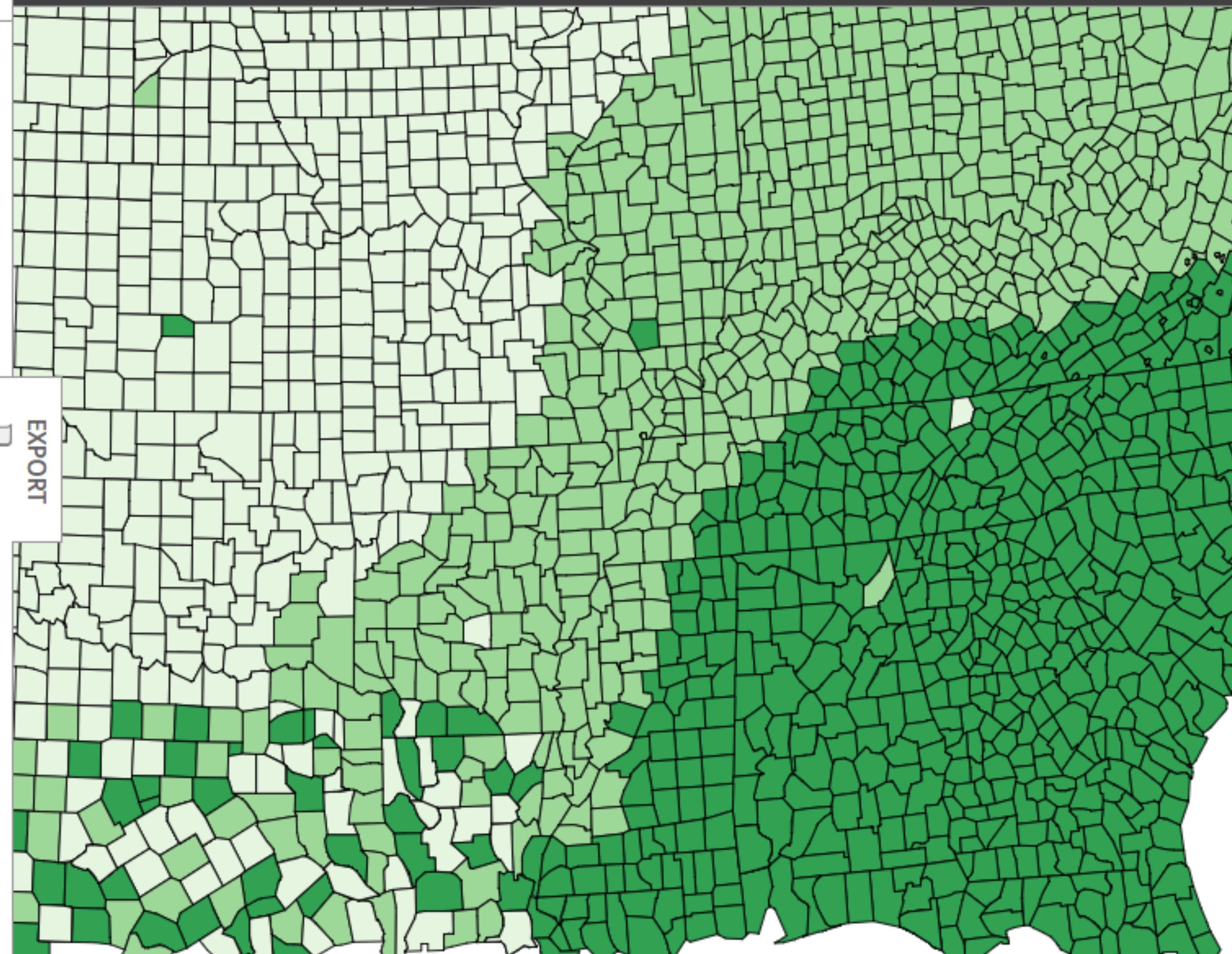
 solid color 
 terrain 

color transparency

[how to use](#) | [updates](#) | [downloads](#) | [credits](#)

# COLORBREWER 2.0

color advice for cartography



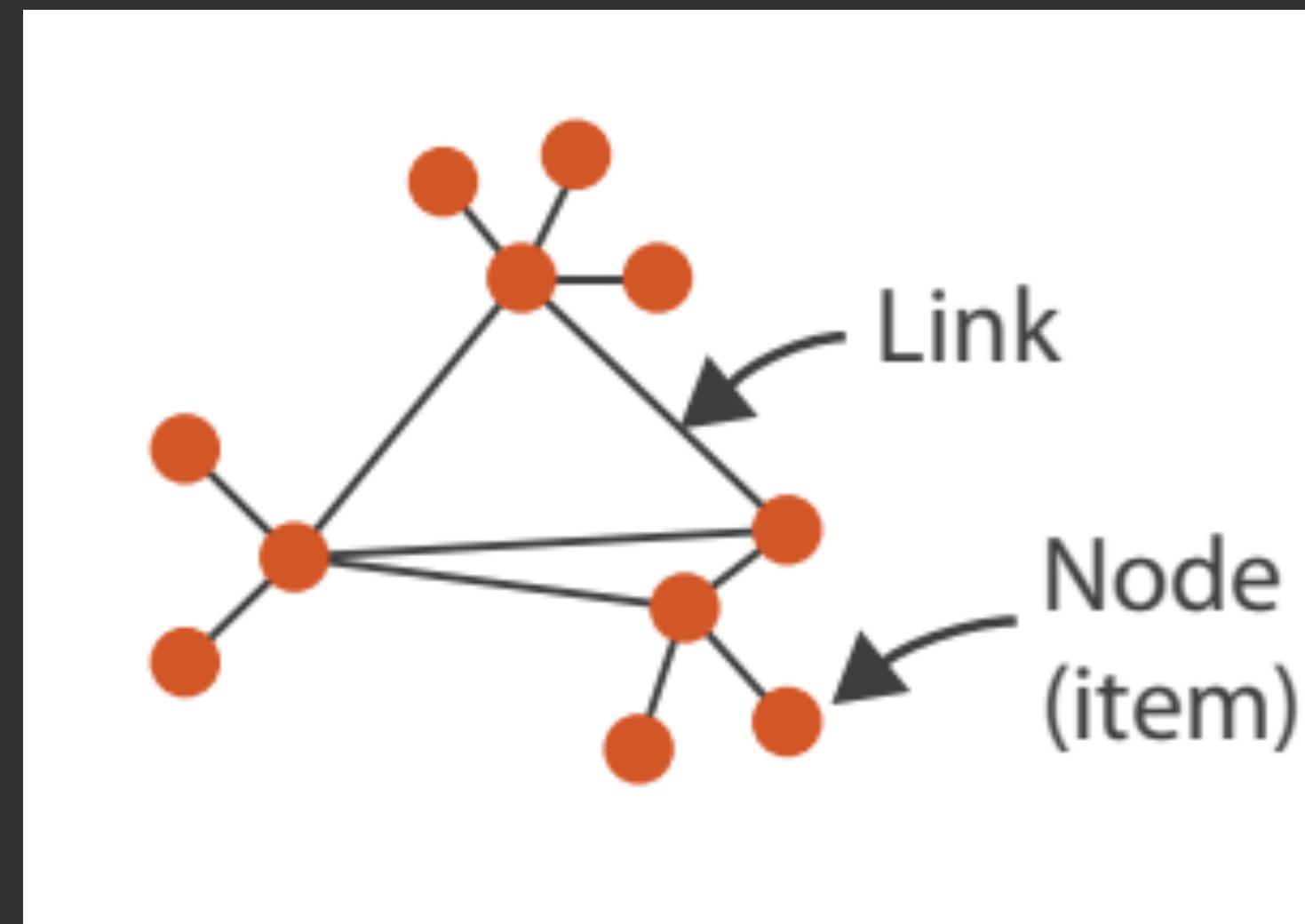
# Networks & Trees

# Networks

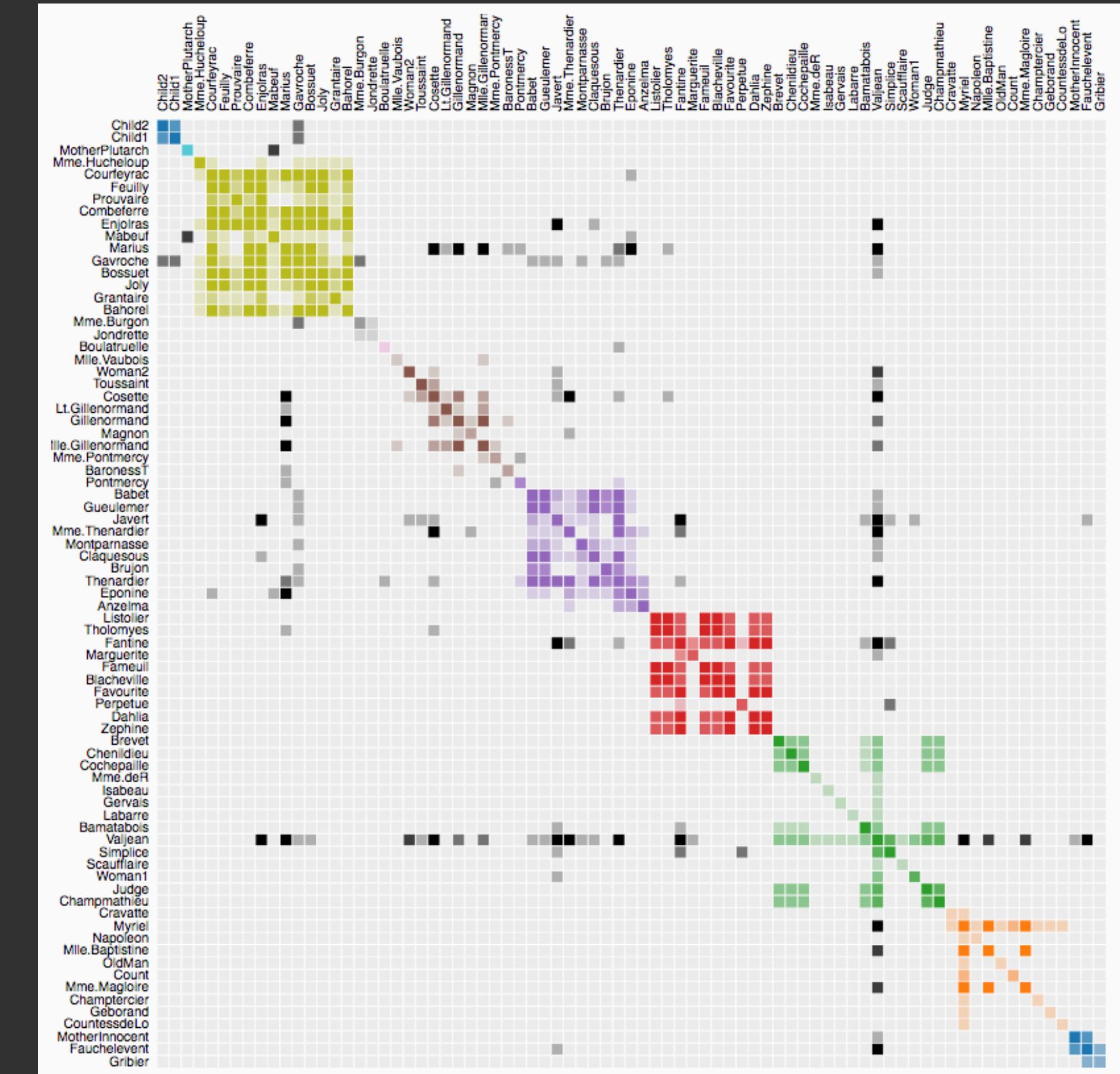
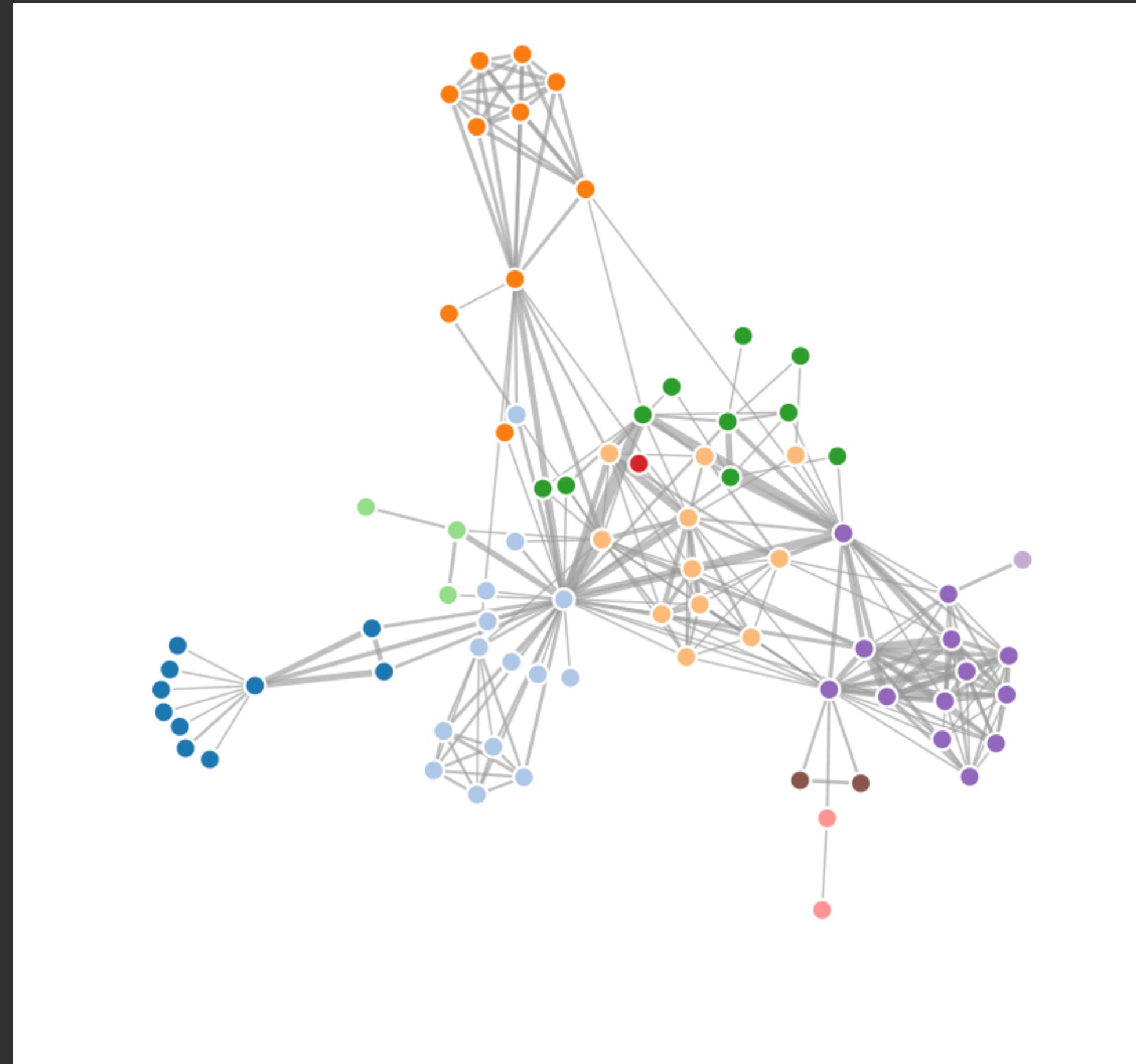
Model **relations** among data

**Nodes** and **links**

Node and link **attributes**



# Node-Link Diagram vs Matrix Diagram



Les Misérables Character Co-occurrence

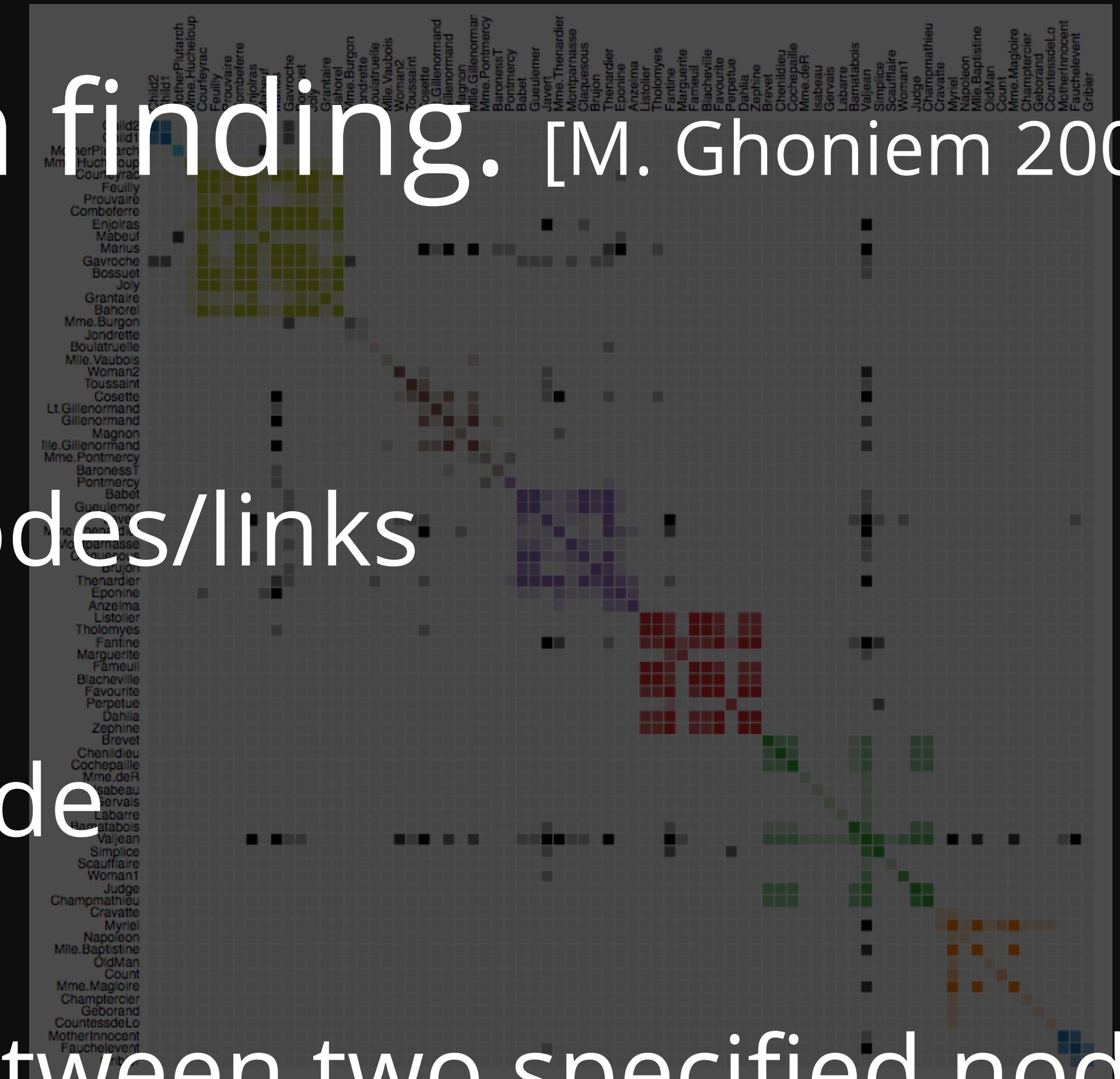
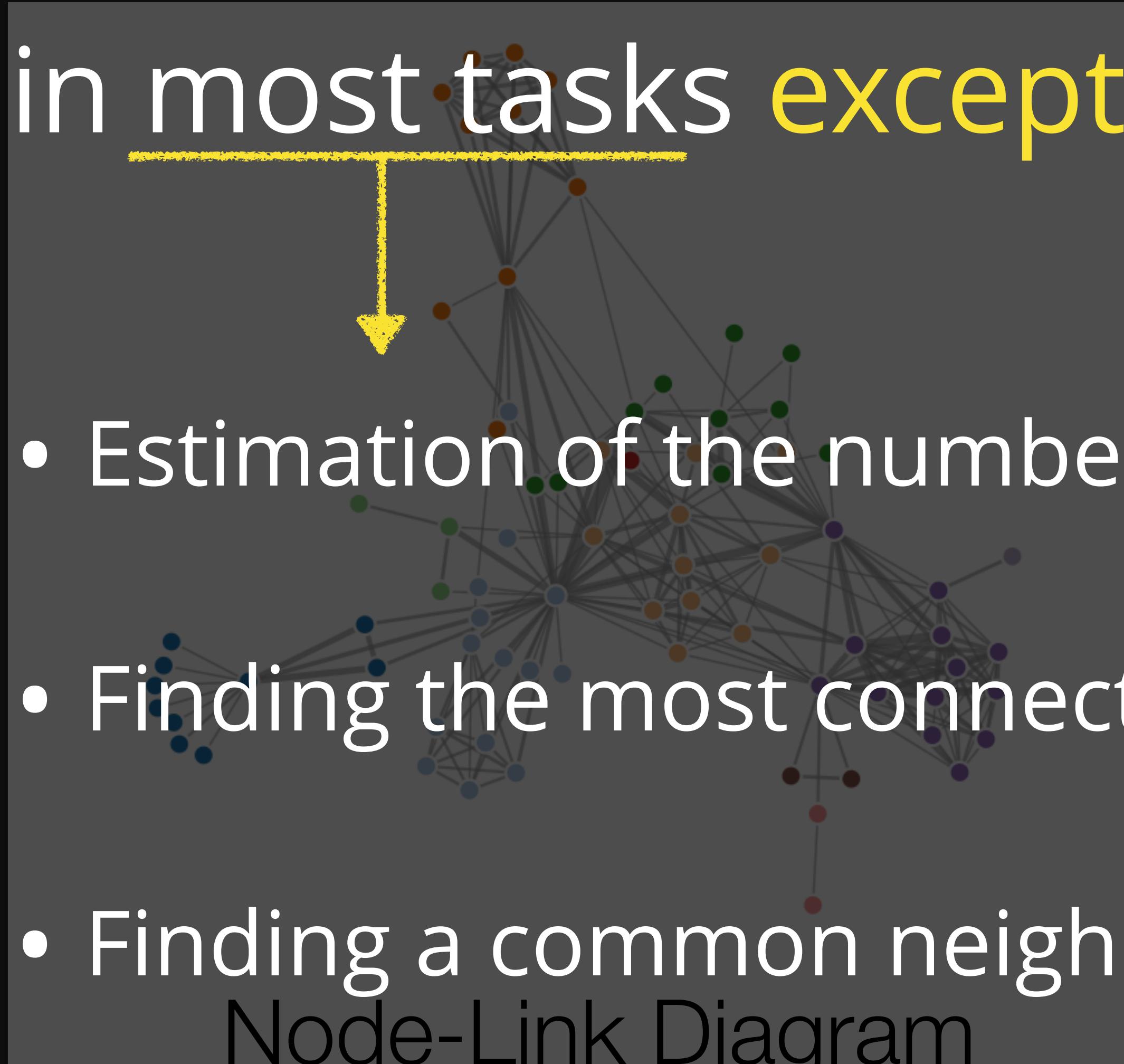
# Matrix diagram is found more readable

in most tasks except path finding.

- Estimation of the number of nodes/links
- Finding the most connected node
- Finding a common neighbor between two specified nodes

Node-Link Diagram

Matrix Diagram

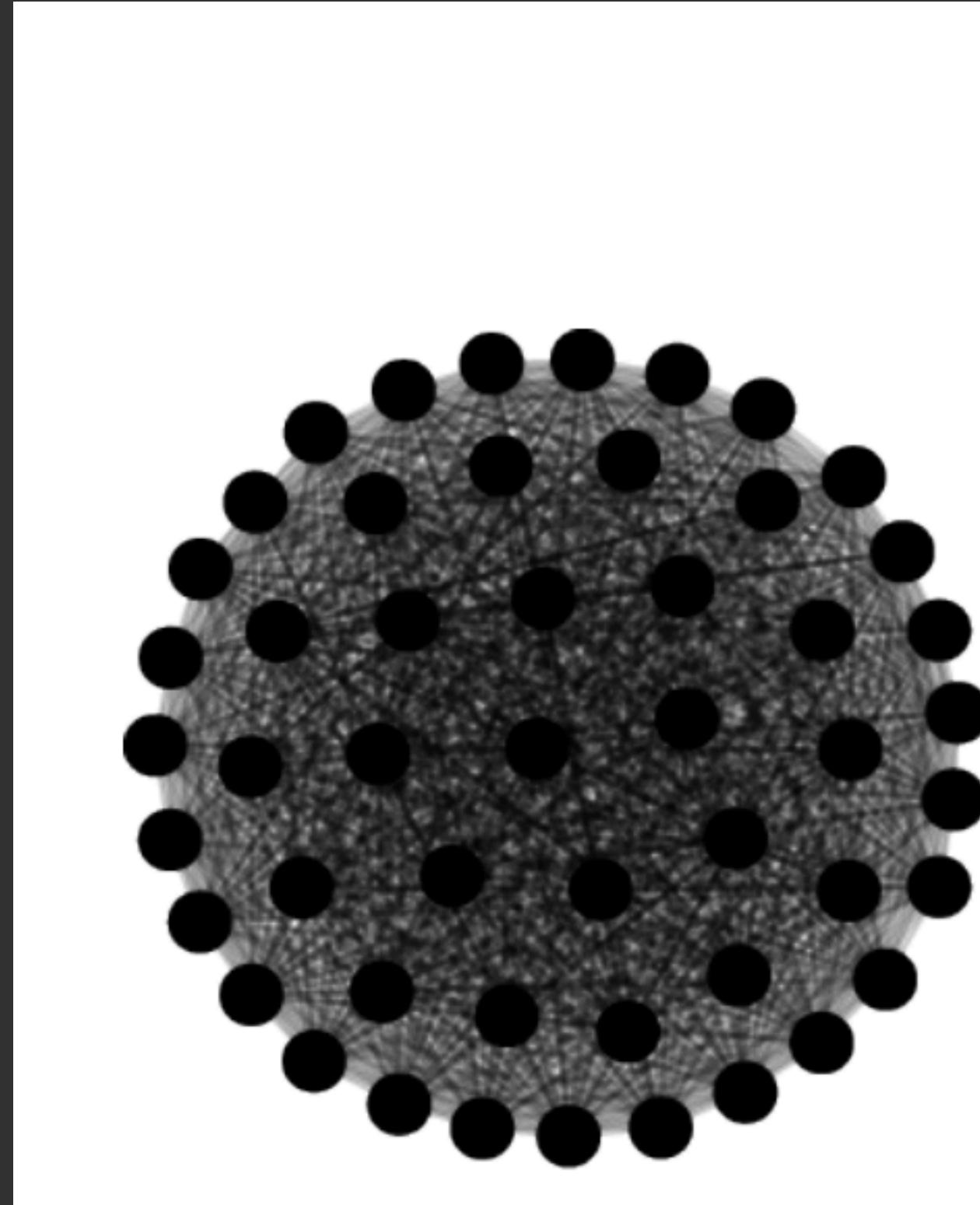


# Problem with node-link diagram

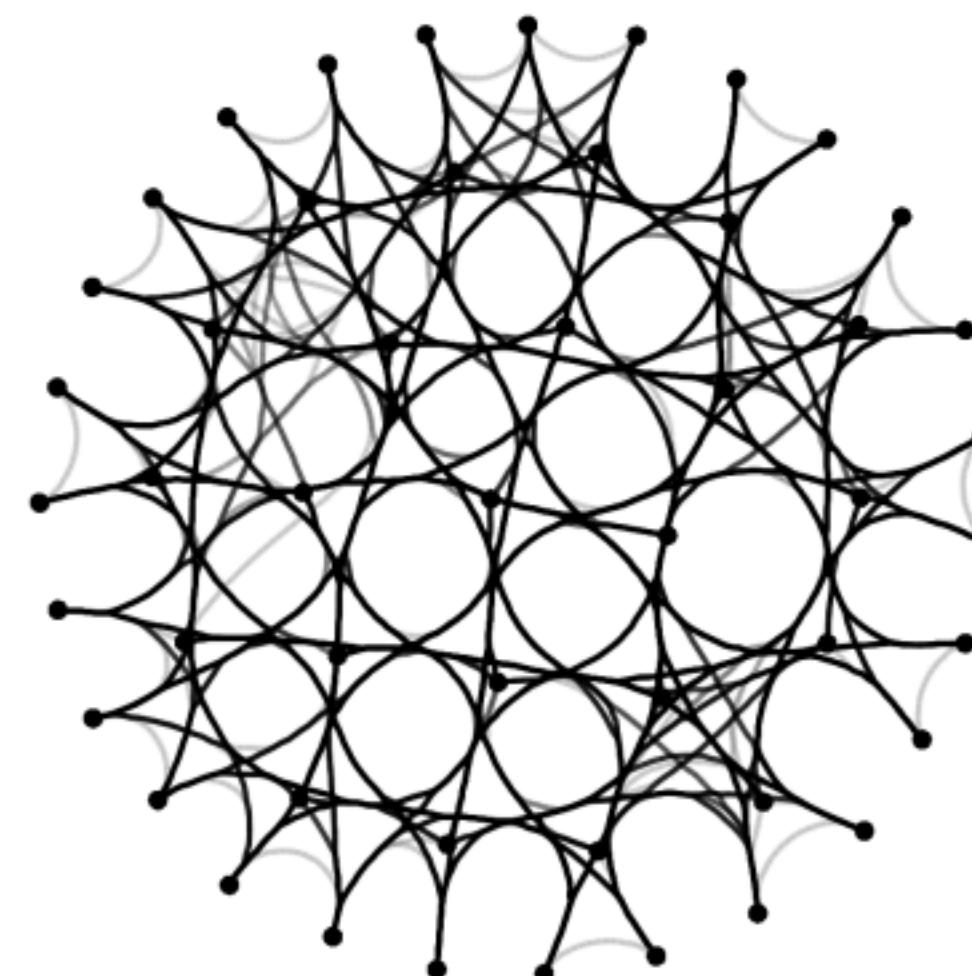
A giant **hairball**: clutter when the number of nodes and links becomes too high

[A. Nocaj 2015]

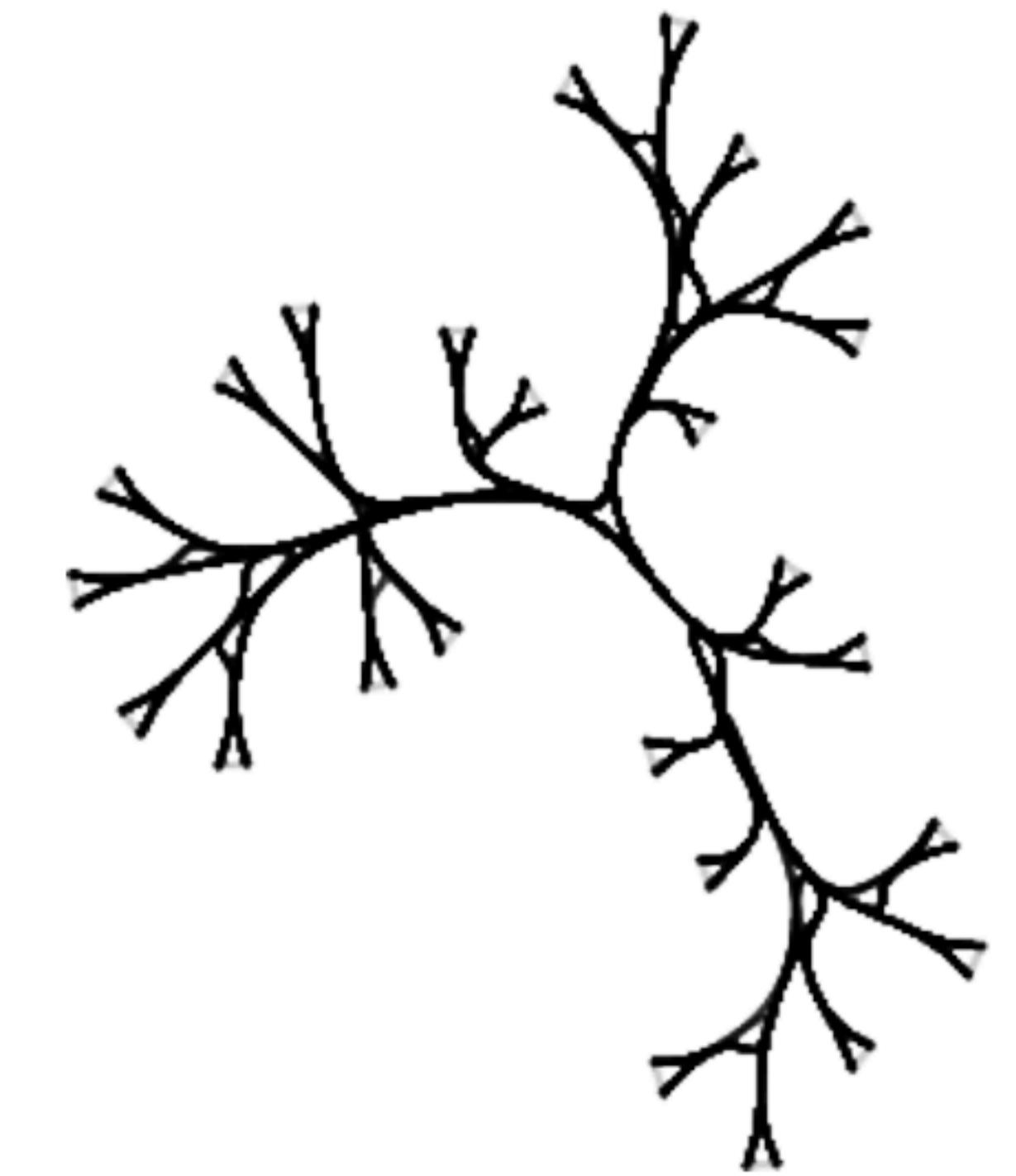
Original Network



Edge Bundling

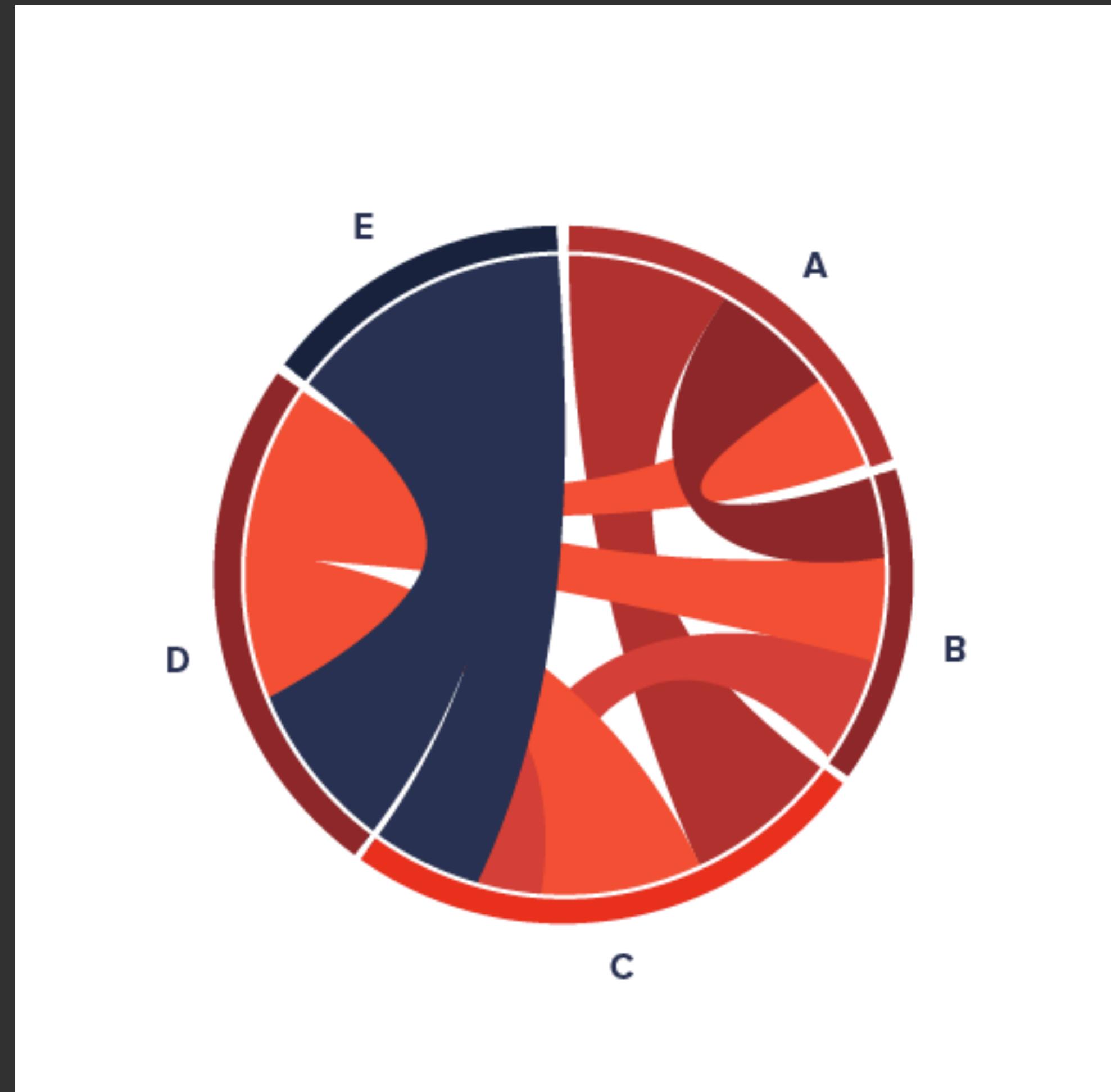


Confluent Drawing

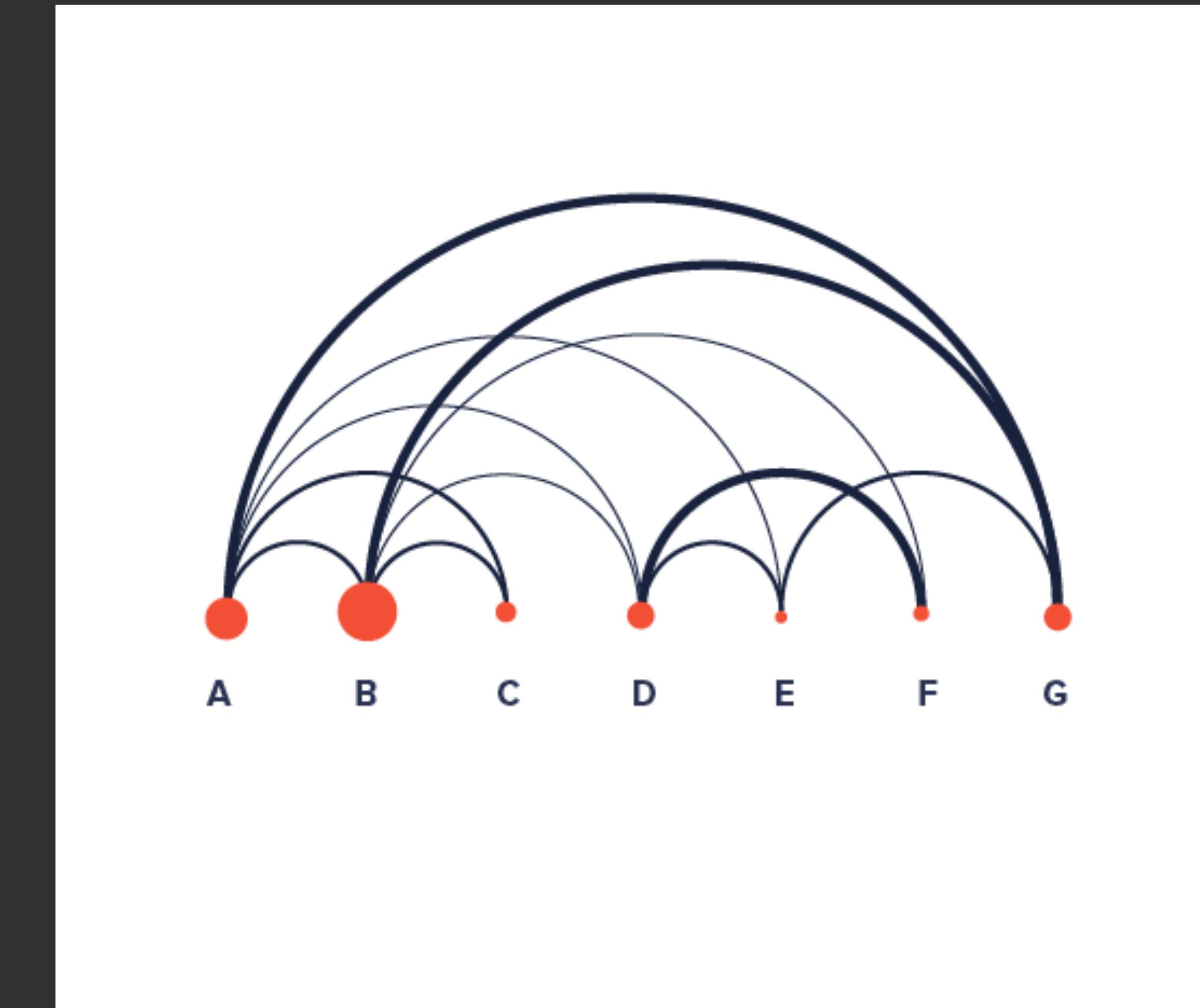


[B. Bach 2017]

# Alternatives. Are these better?



Chord Diagram

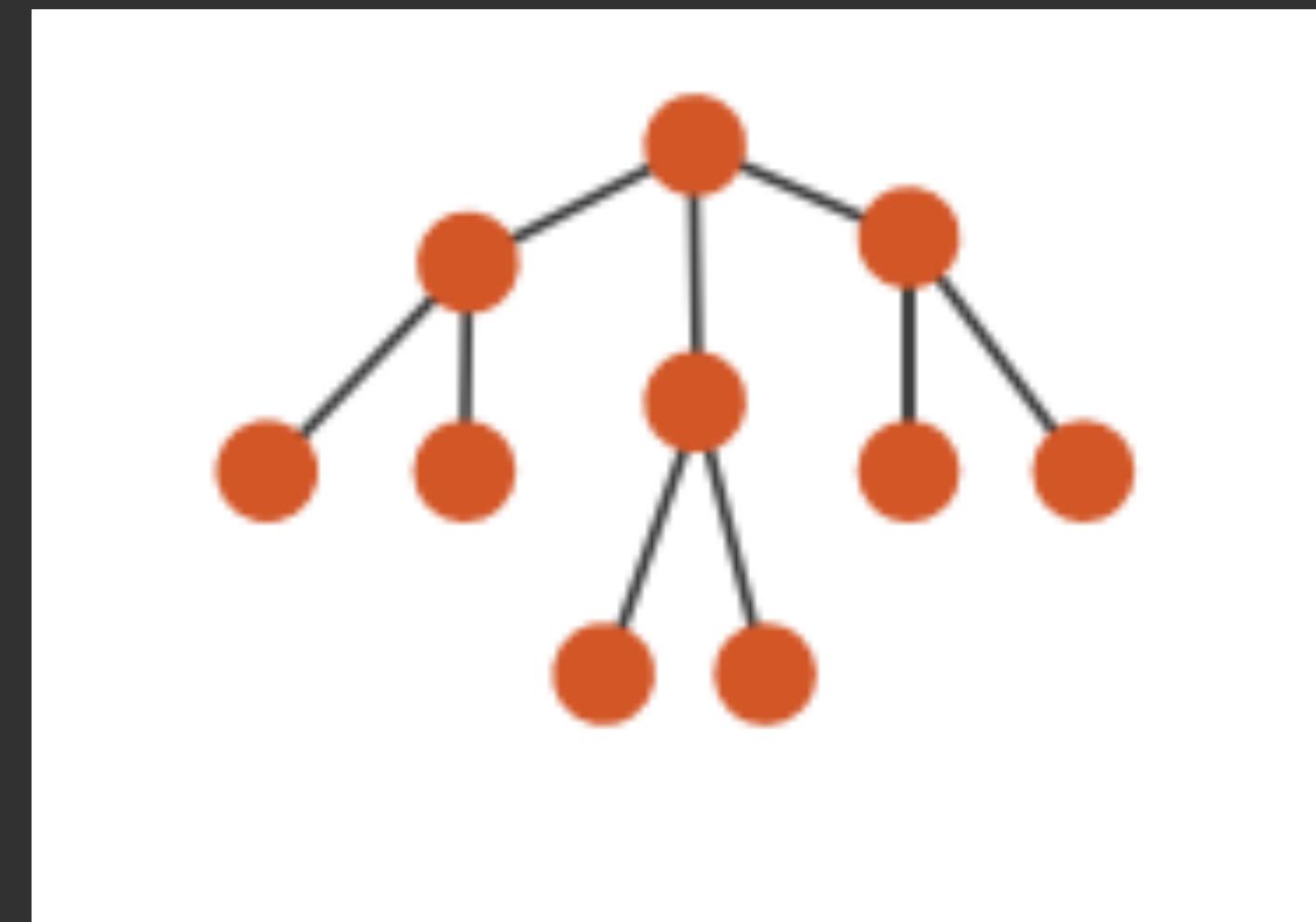


Arc Diagram

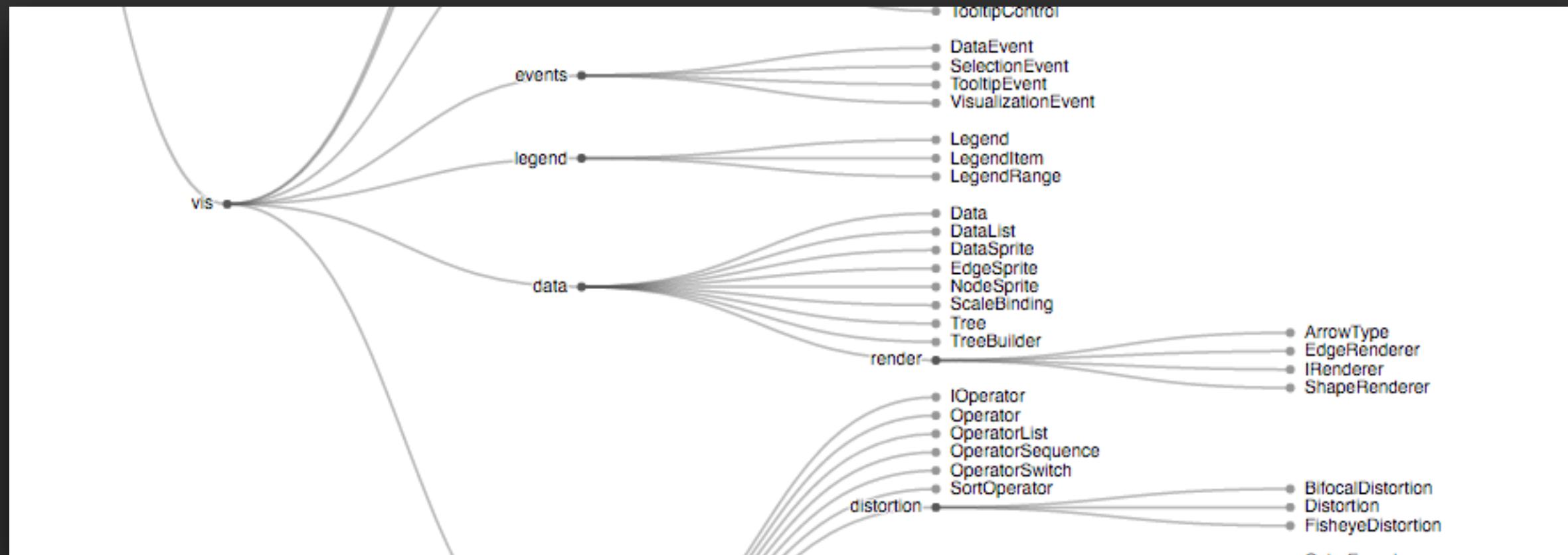
# Trees

Graphs with hierarchical structure

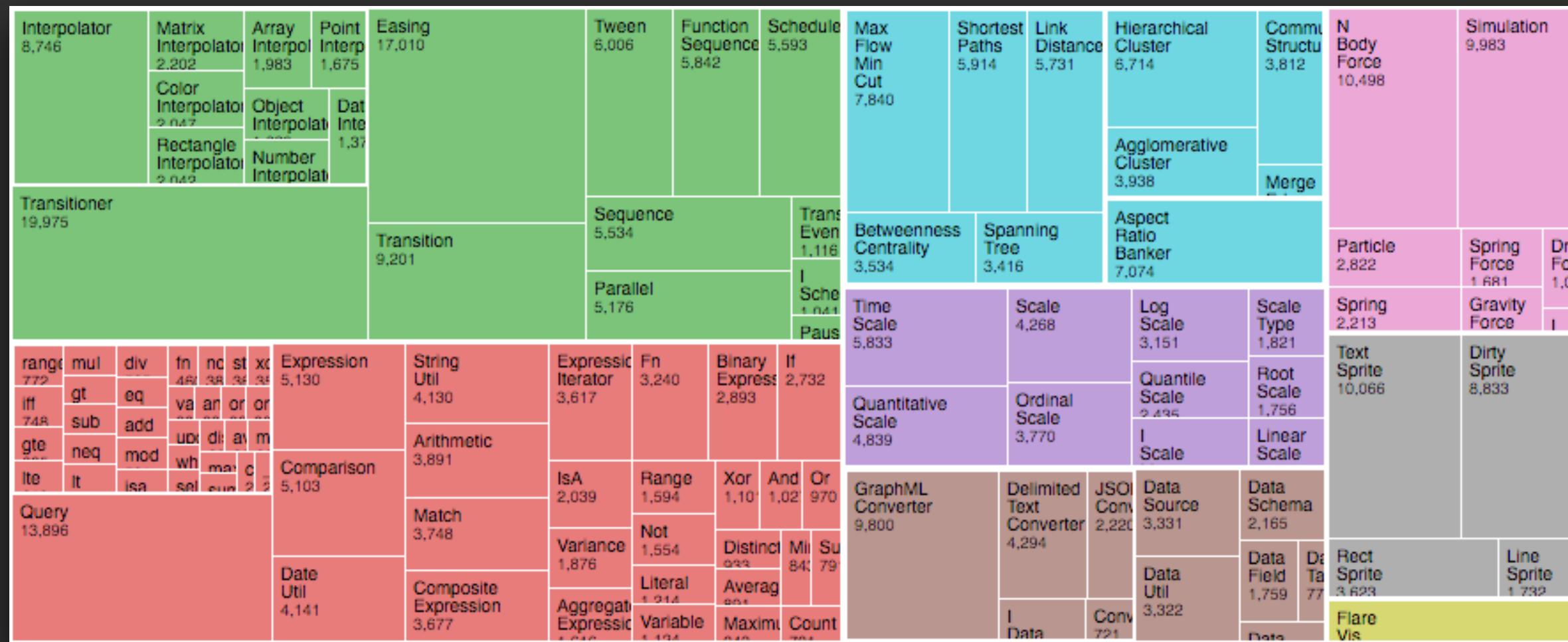
Nodes as parents and children



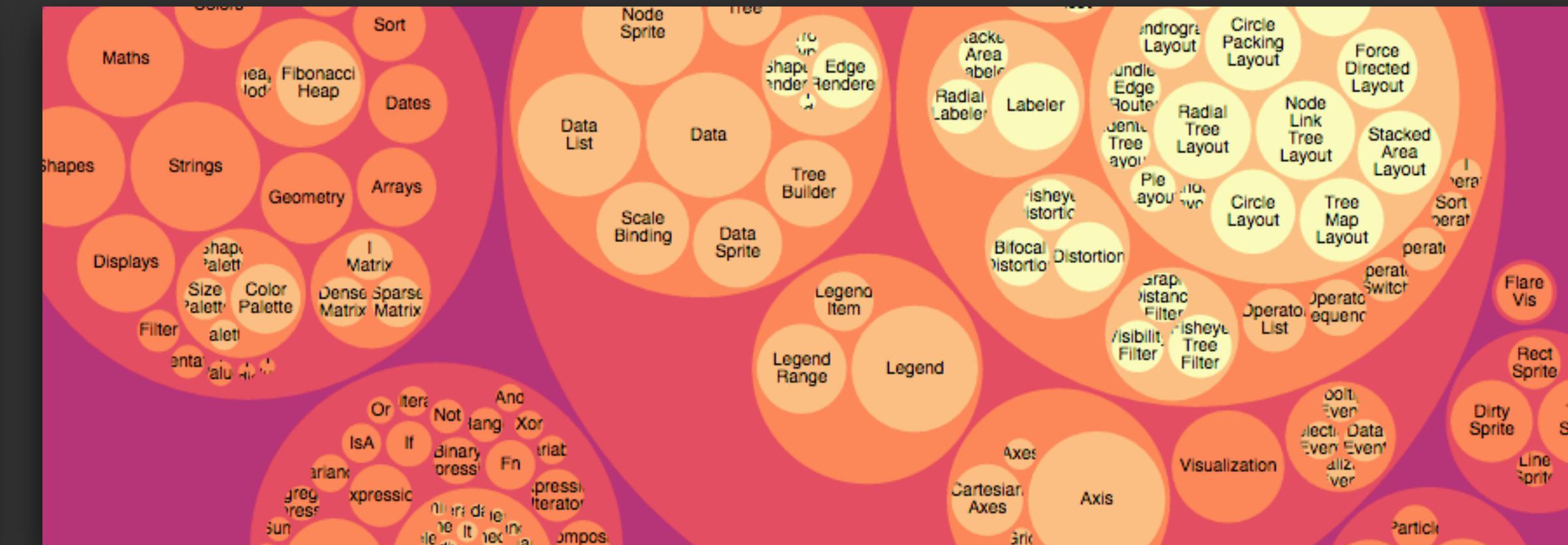
# Dendogram



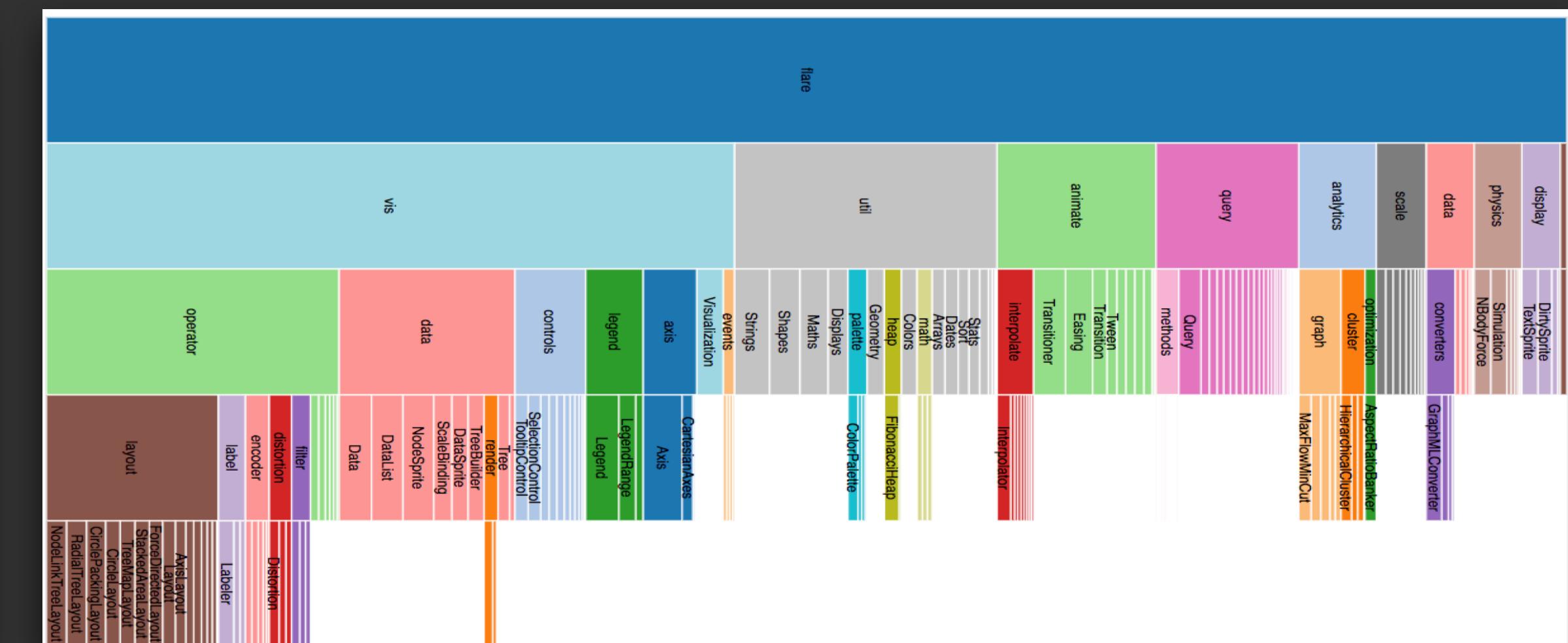
# Treemap



# Circle Packing

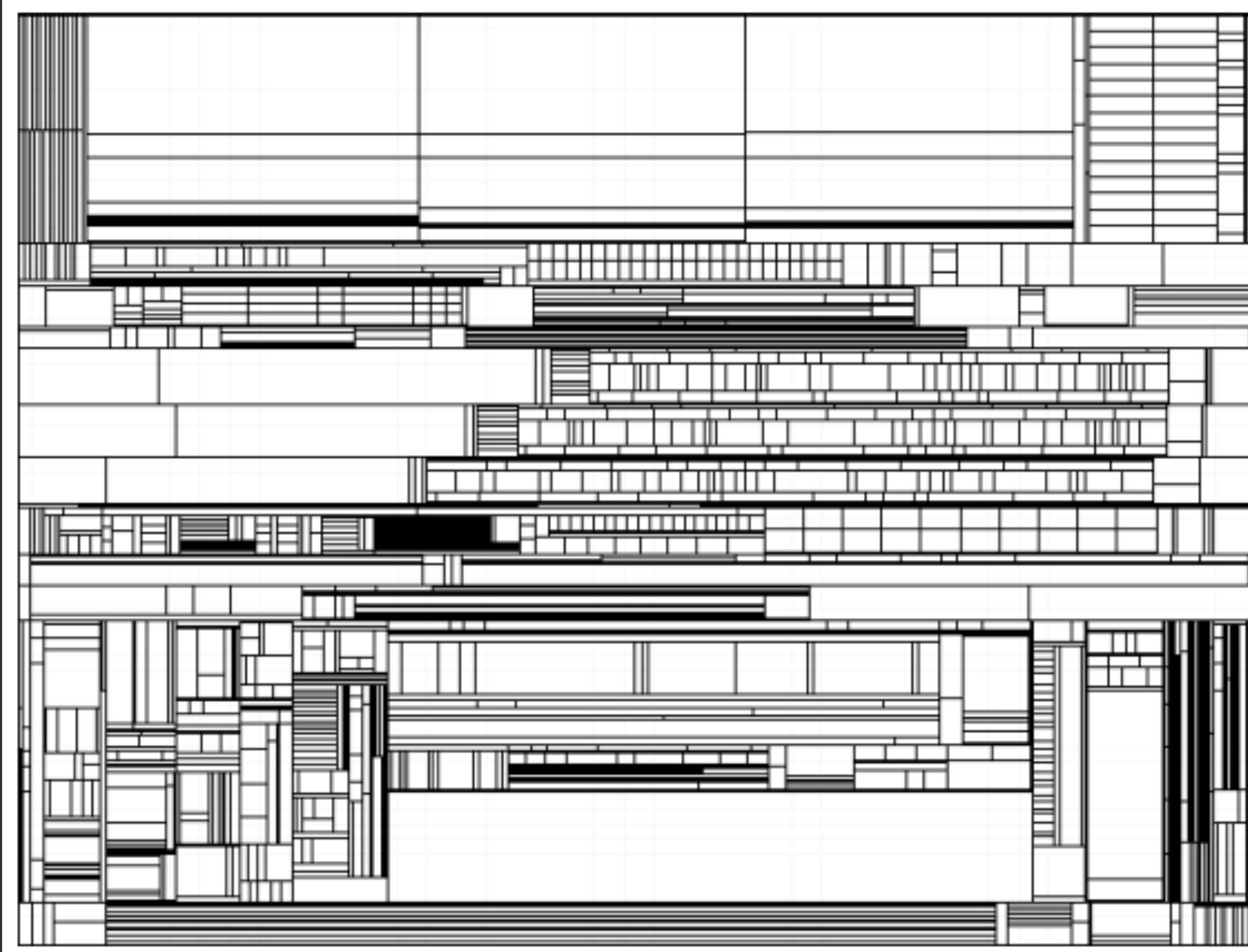


# Icicle

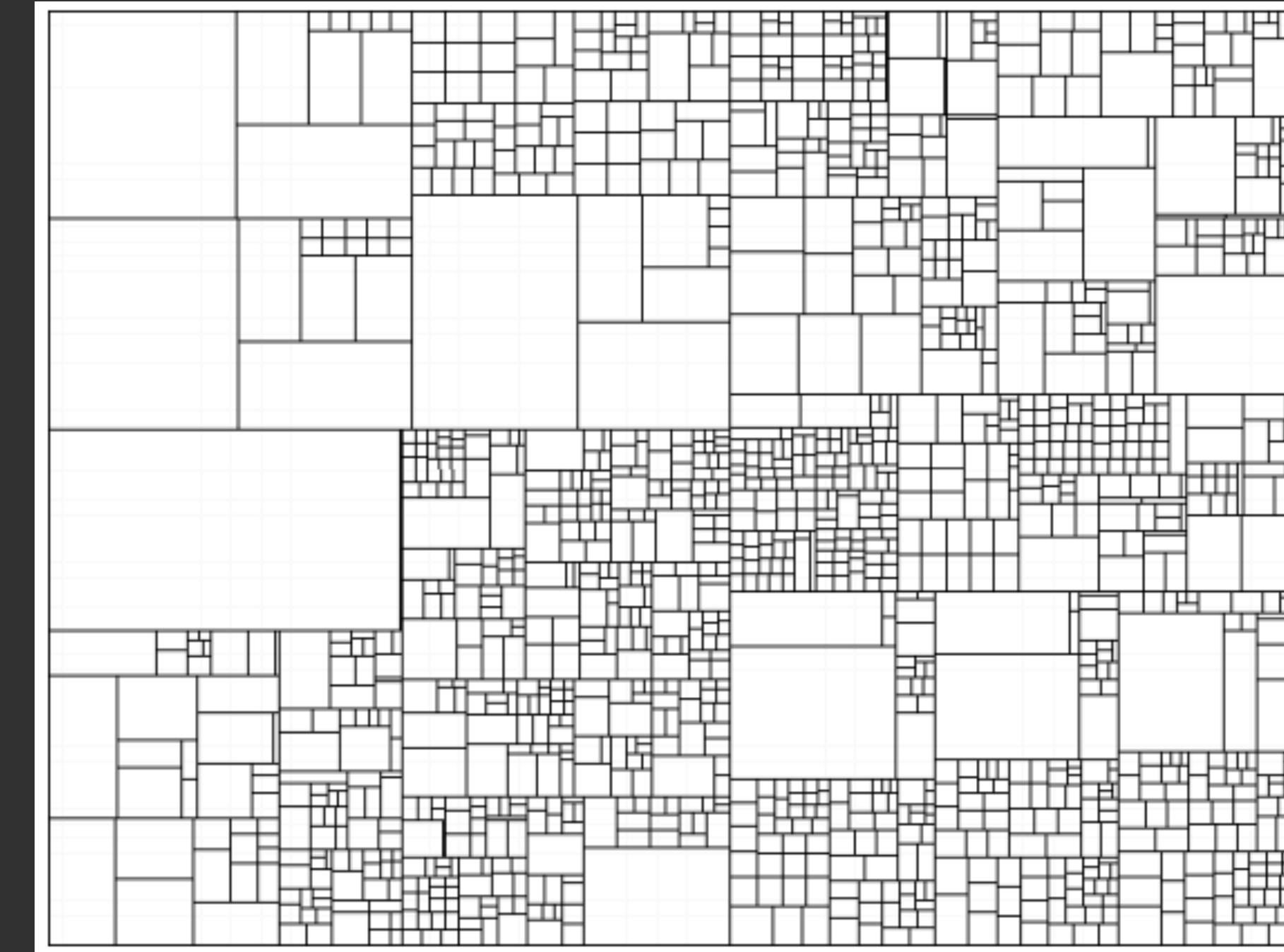


# Squarified Treemaps

“The original treemap method often gives thin, elongated rectangles. As a result, rectangles are difficult to compare and to select.” — M. Bruls et al 2000

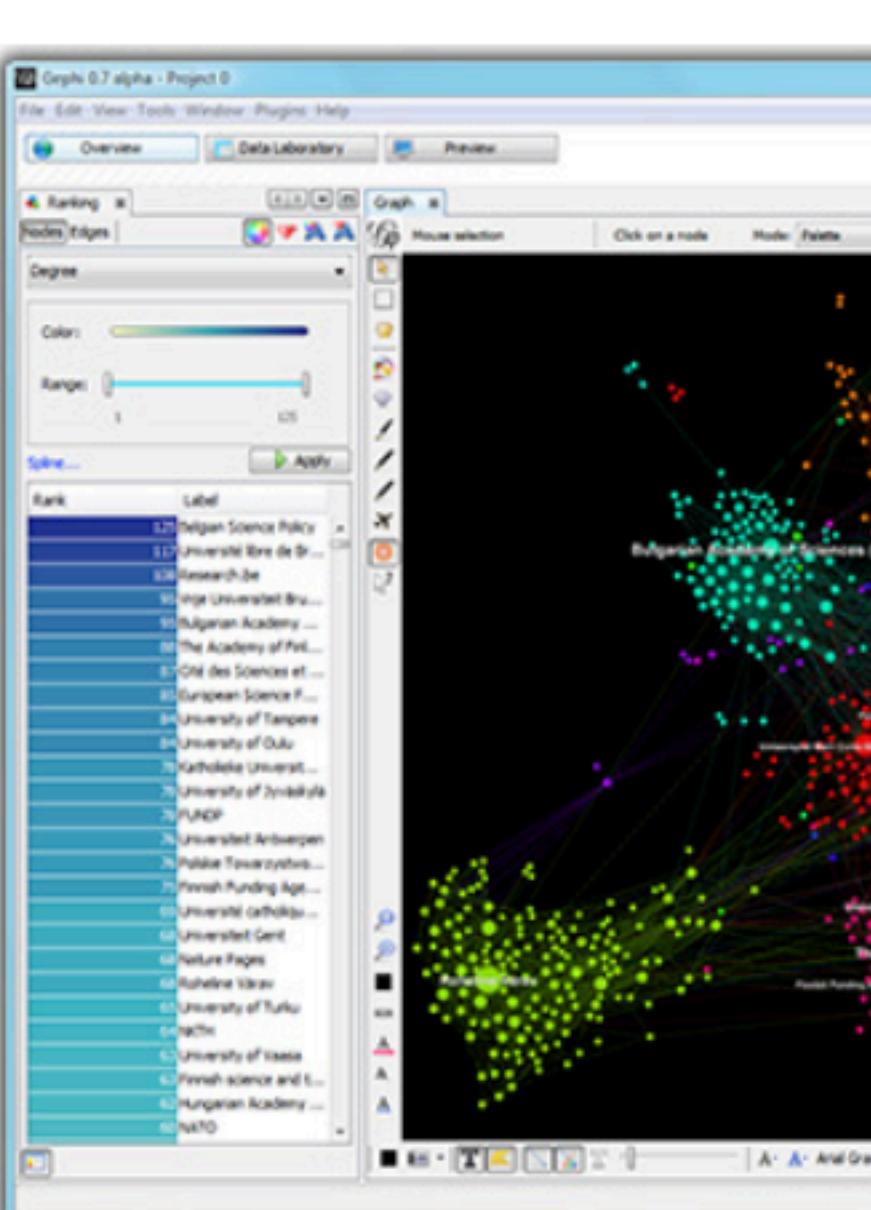


Before



After

# Tools for Graph Analysis



**Gephi** makes graphs **handy**

**The Open Graph Viz Platform**

Gephi is the leading visualization and exploration software for all kinds of graphs and networks. Gephi is open-source and free.

Runs on Windows, Mac OS X and Linux.

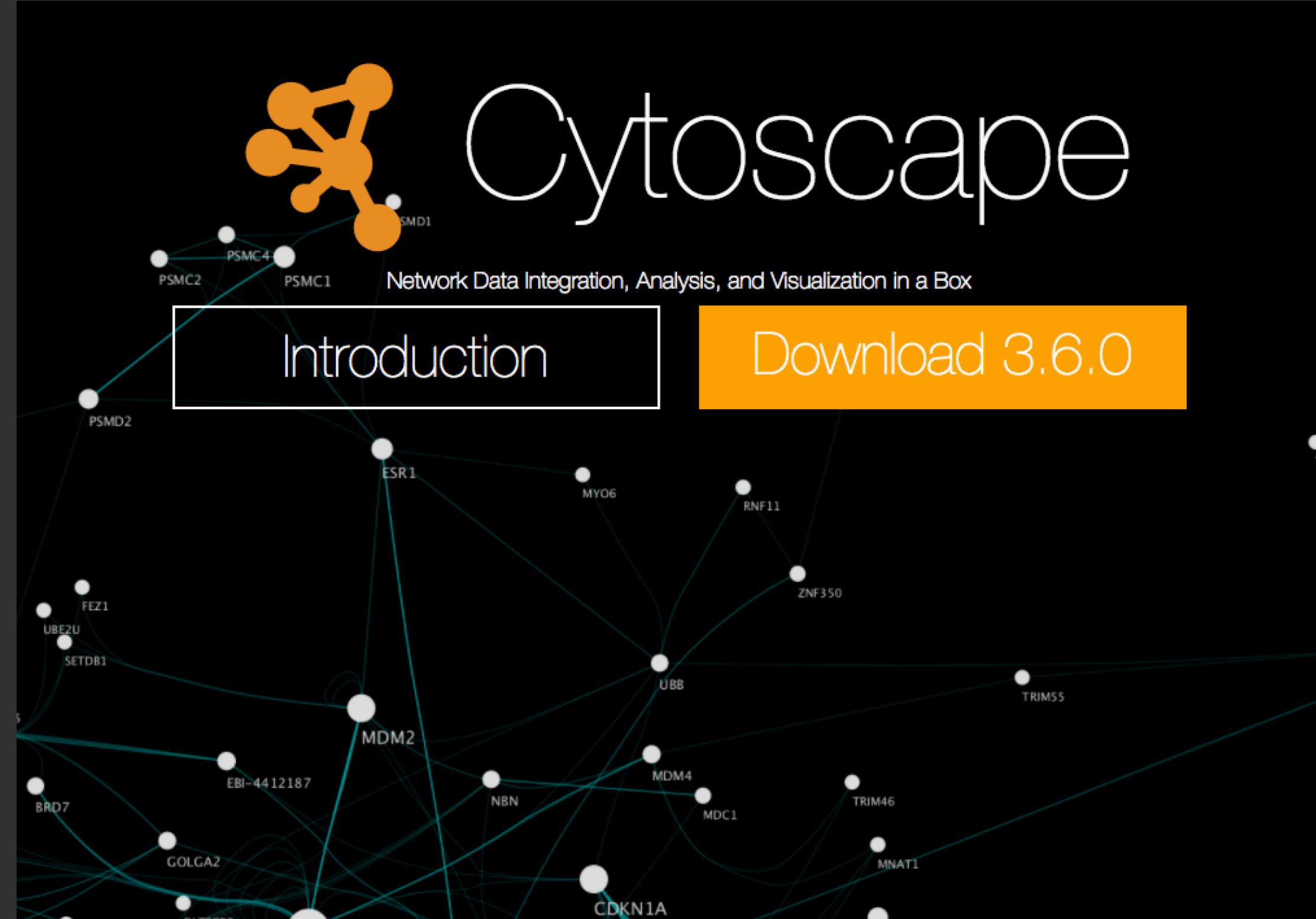
[Learn More on Gephi Platform »](#)

**Download FREE Gephi 0.9.2**

[Release Notes](#) | [System Requirements](#)

► [Features](#)   ► [Screenshots](#)  
► [Quick start](#)   ► [Videos](#)

Gephi



**Cytoscape**

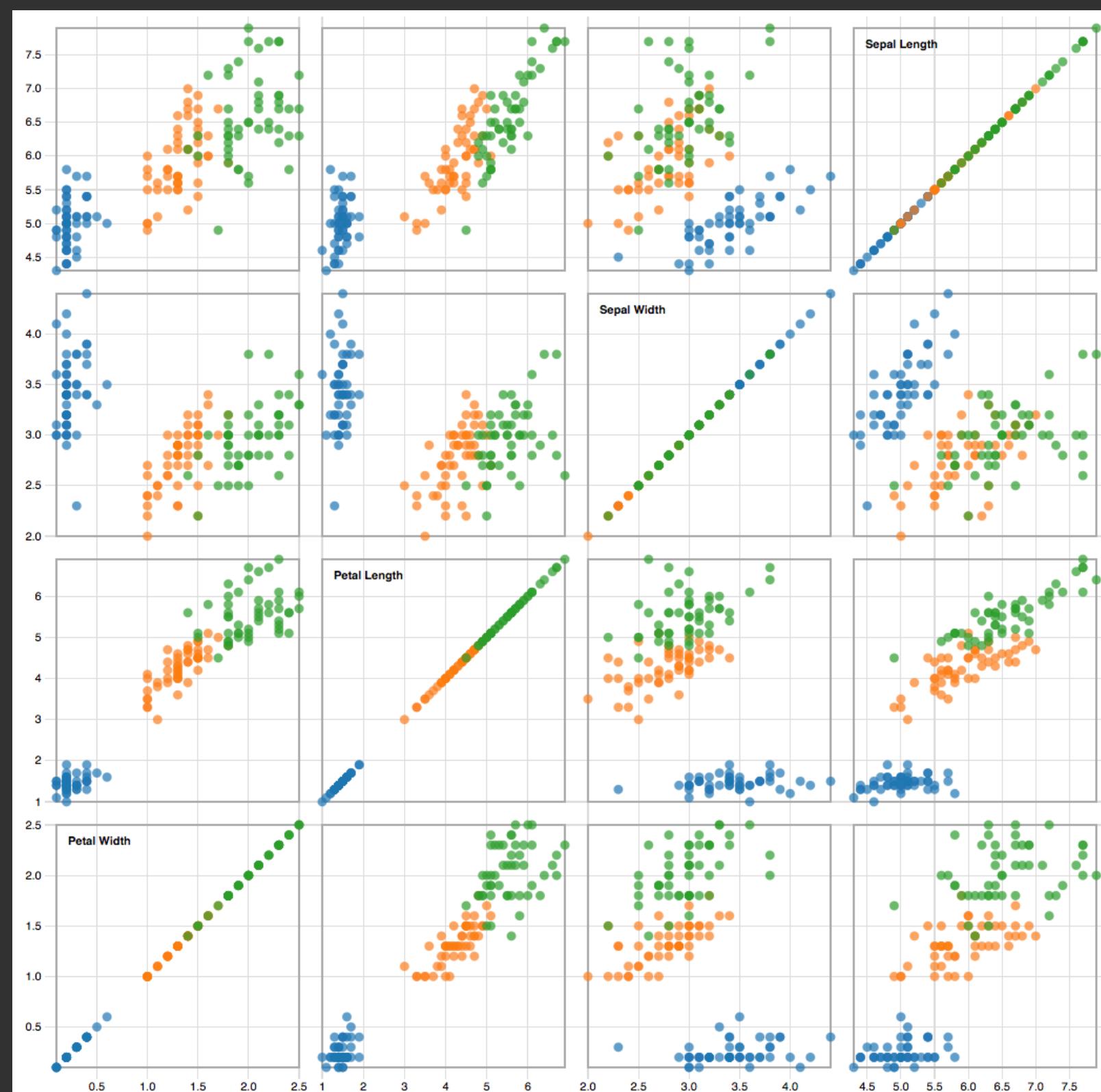
Network Data Integration, Analysis, and Visualization in a Box

**Introduction**

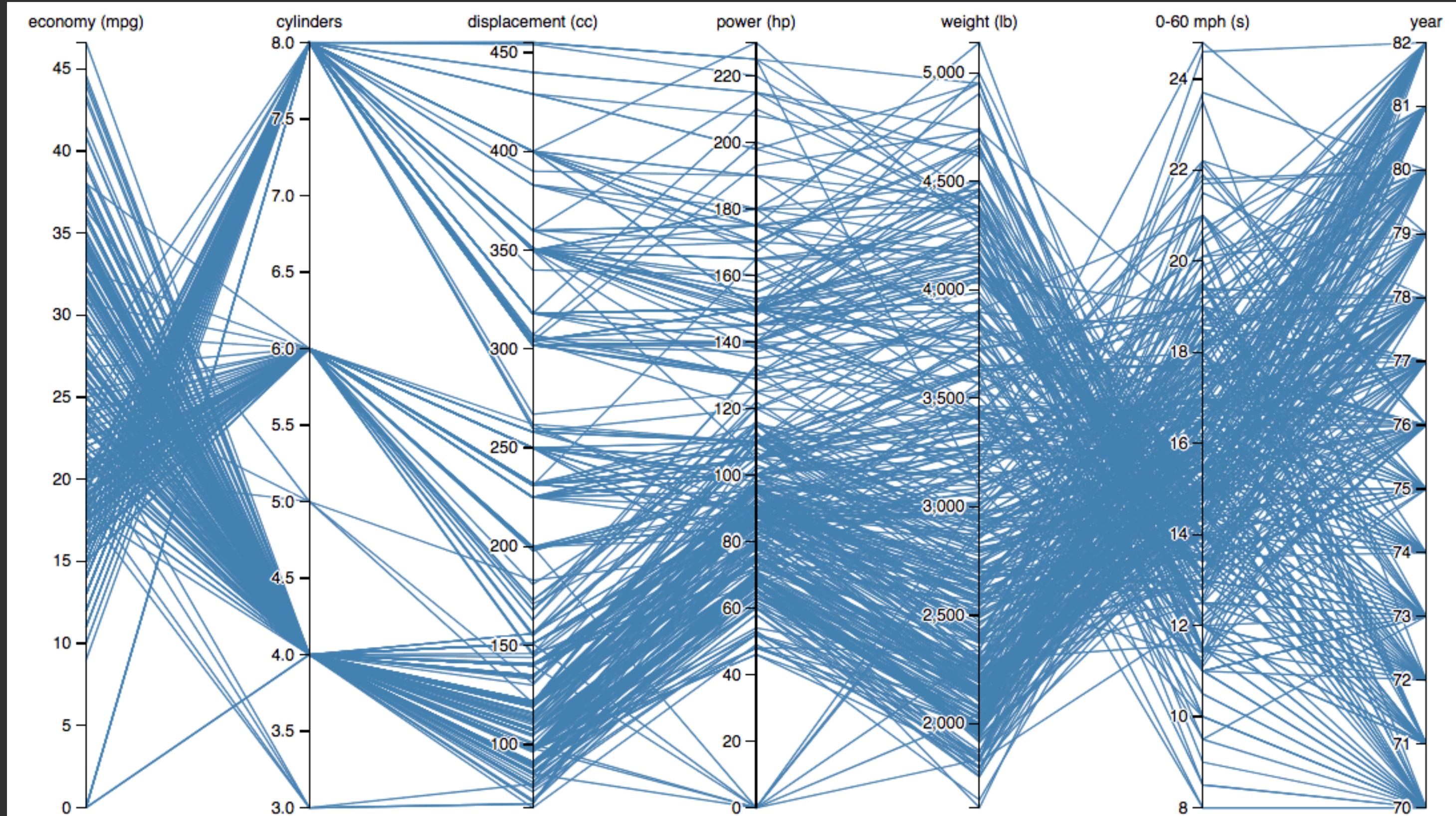
**Download 3.6.0**

Cytoscape

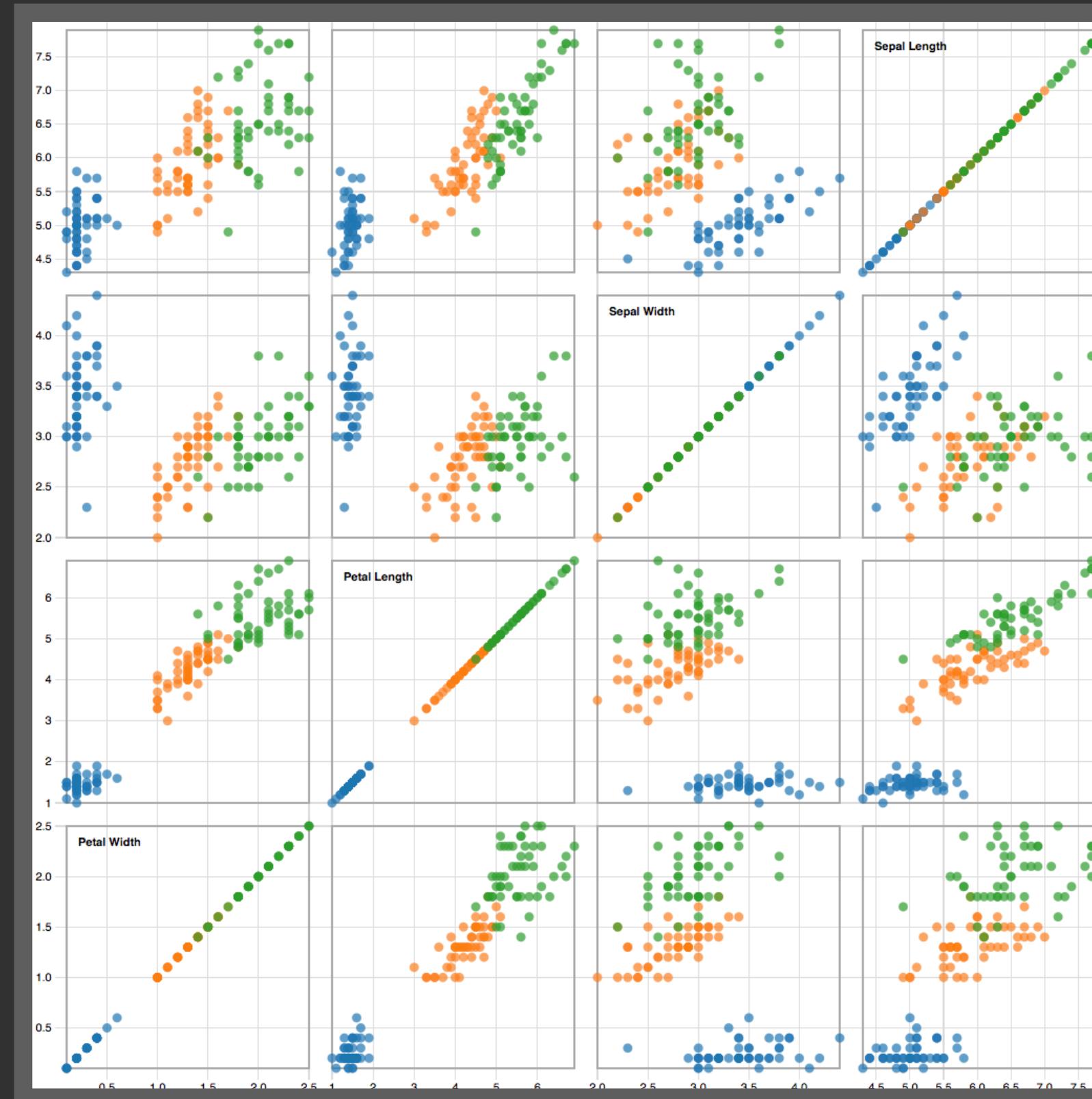
# High-Dimensional Data



# Scatterplot Matrix

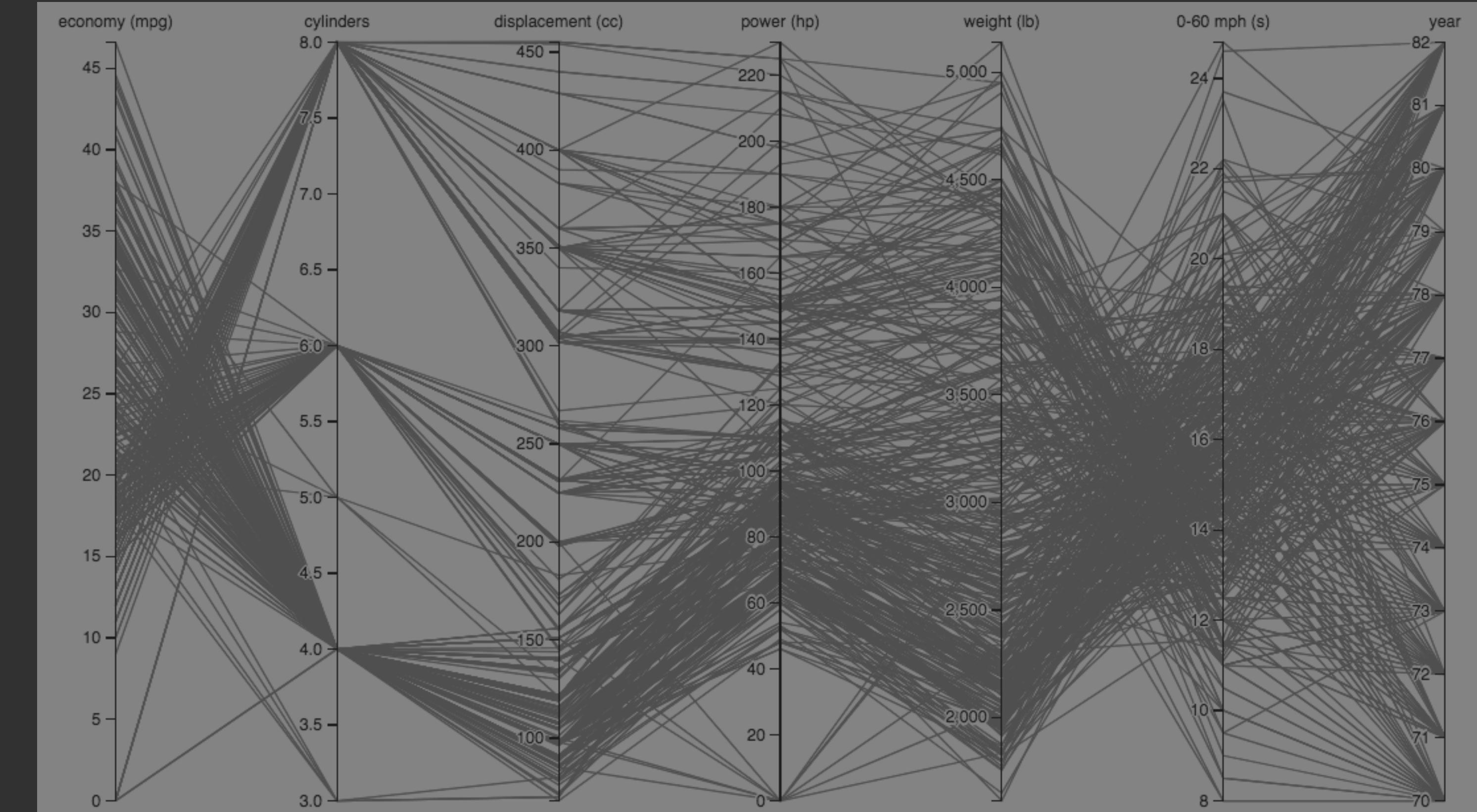


# Parallel Coordinates



## Scatterplot Matrix

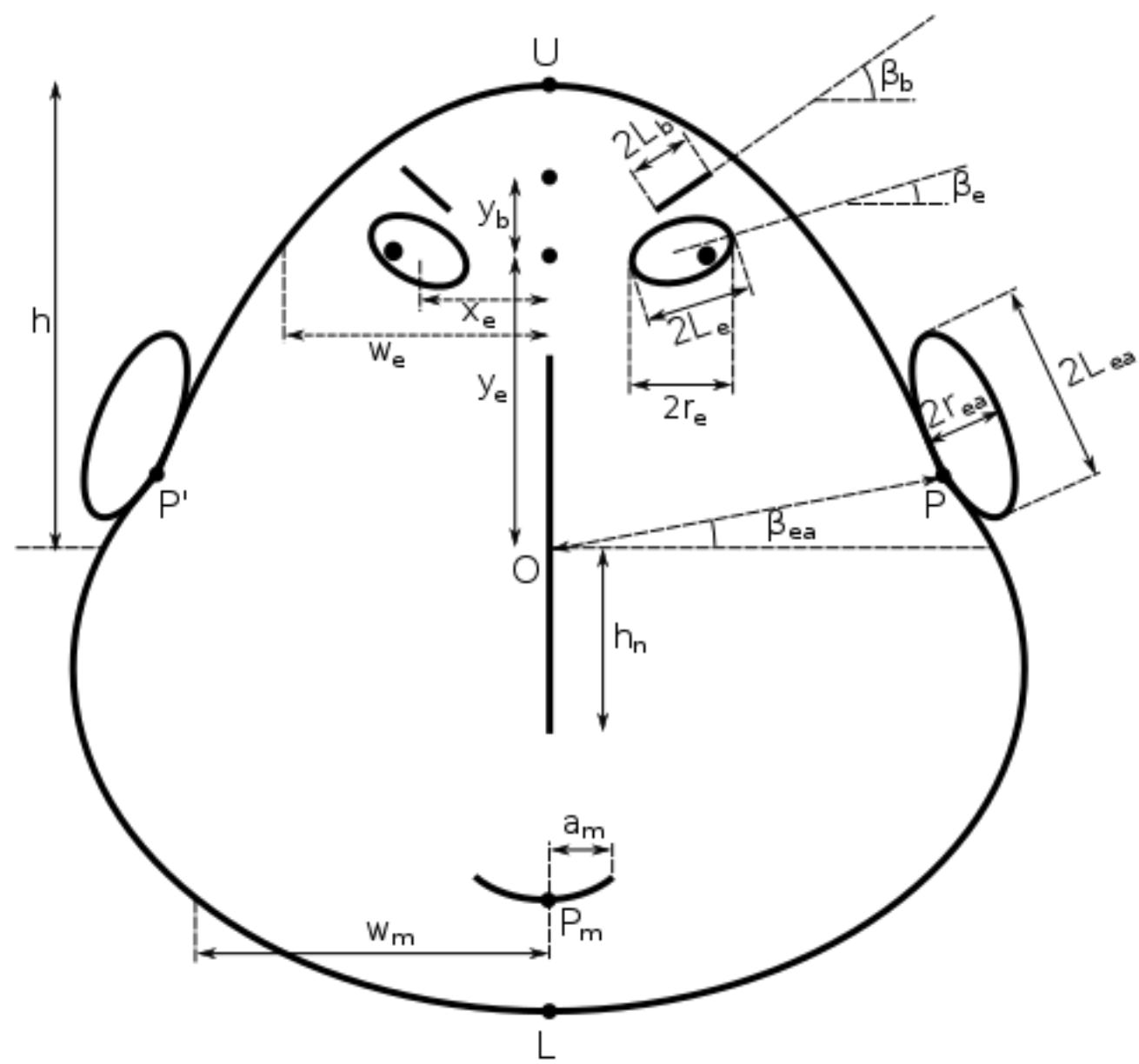
Winner for analyzing correlations between multiple variables



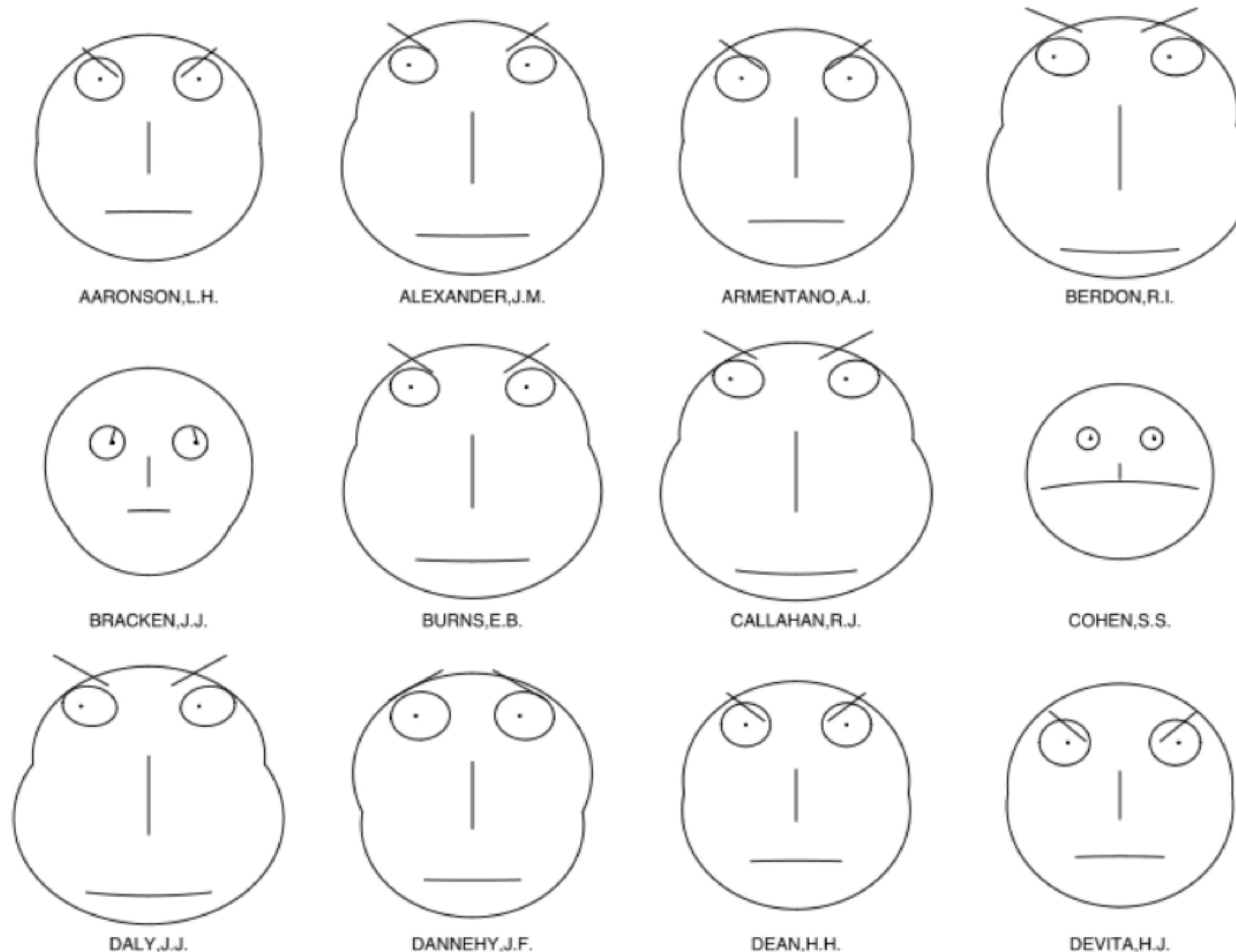
## Parallel Coordinates

[L. Harrison 2014]

# Chernoff Faces

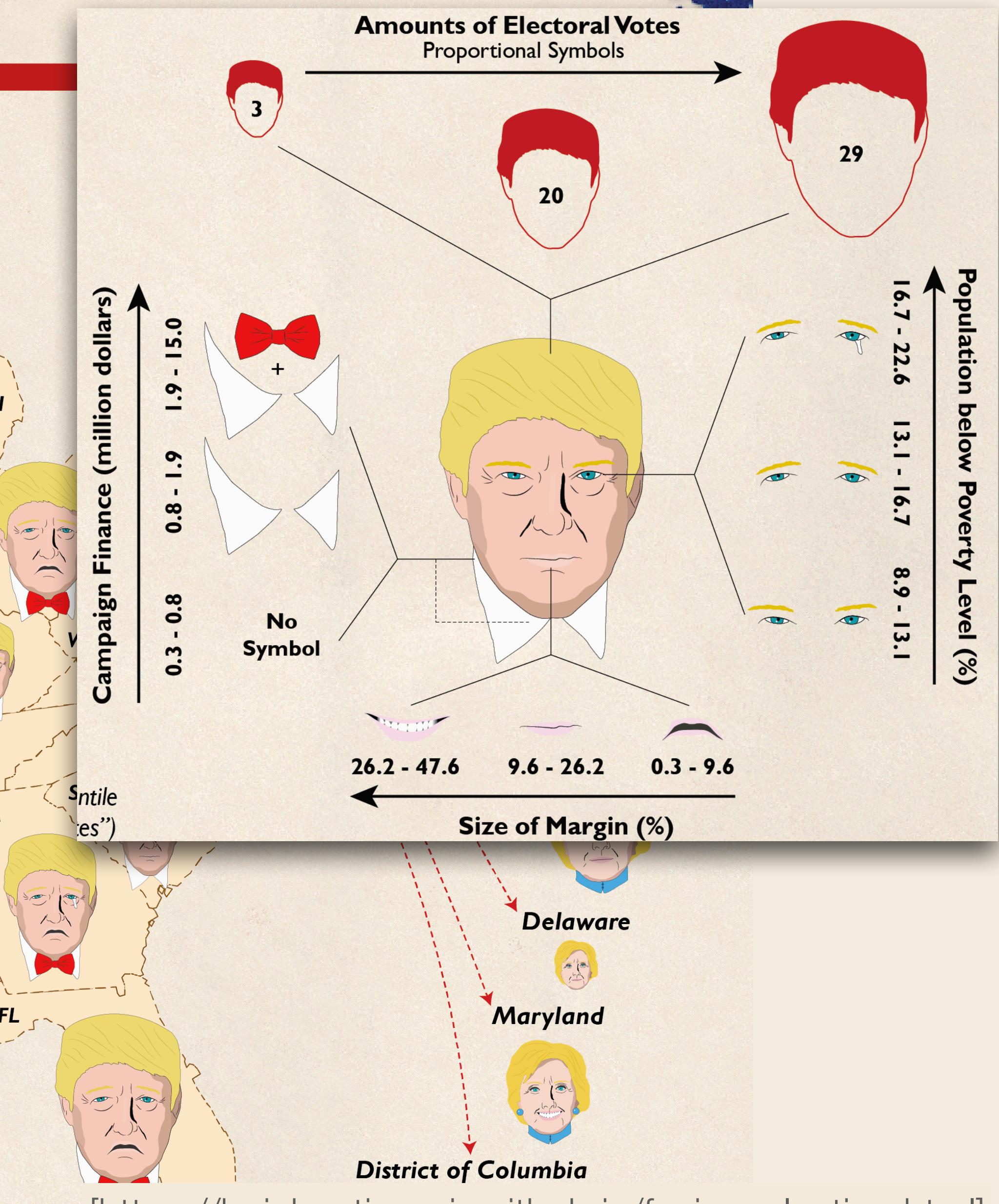
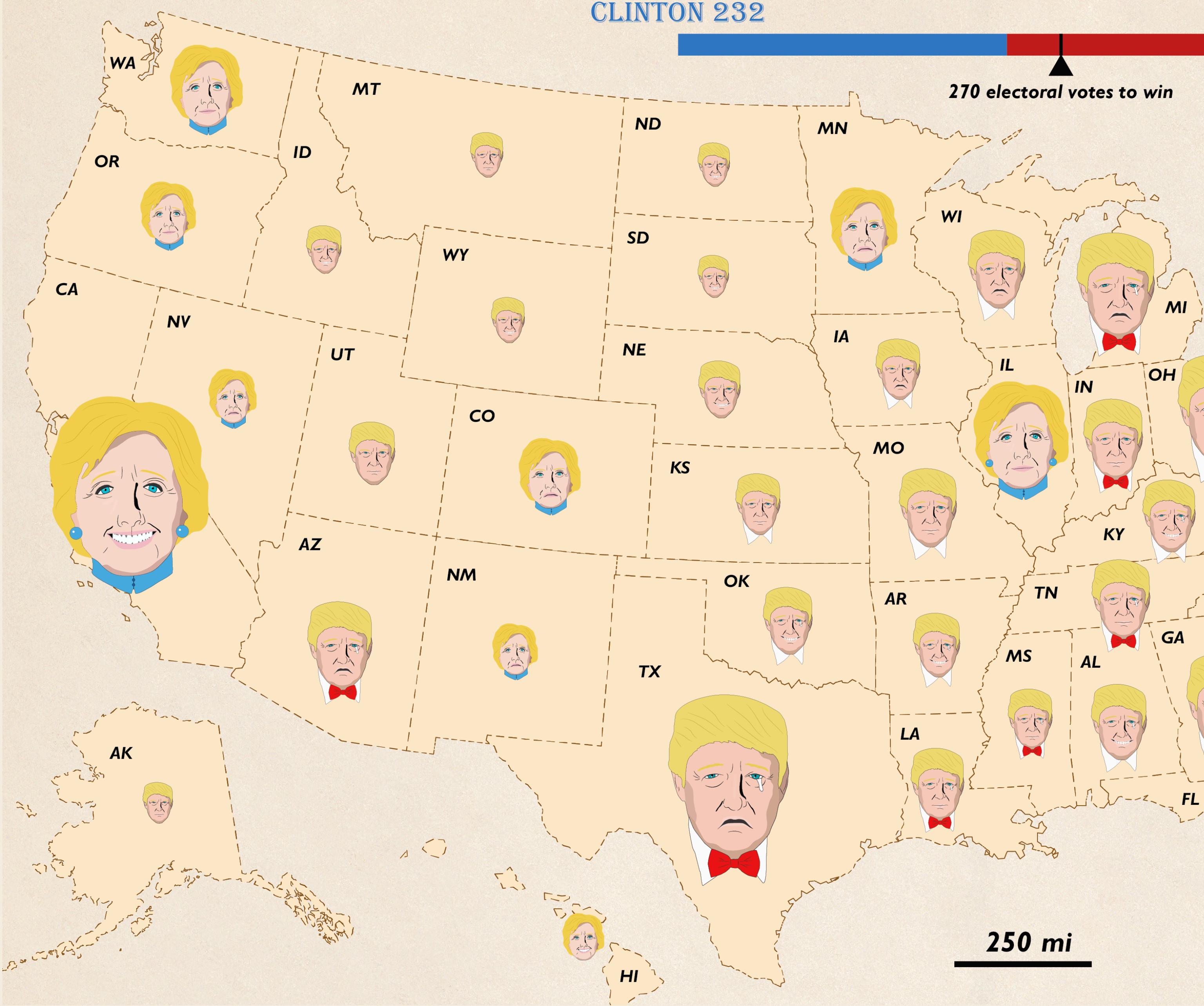


Lawyers' ratings of twelve judges



[[https://en.wikipedia.org/wiki/Chernoff\\_face](https://en.wikipedia.org/wiki/Chernoff_face)]

# FACING THE YEAR 2016 PRESIDENTIAL ELECTION



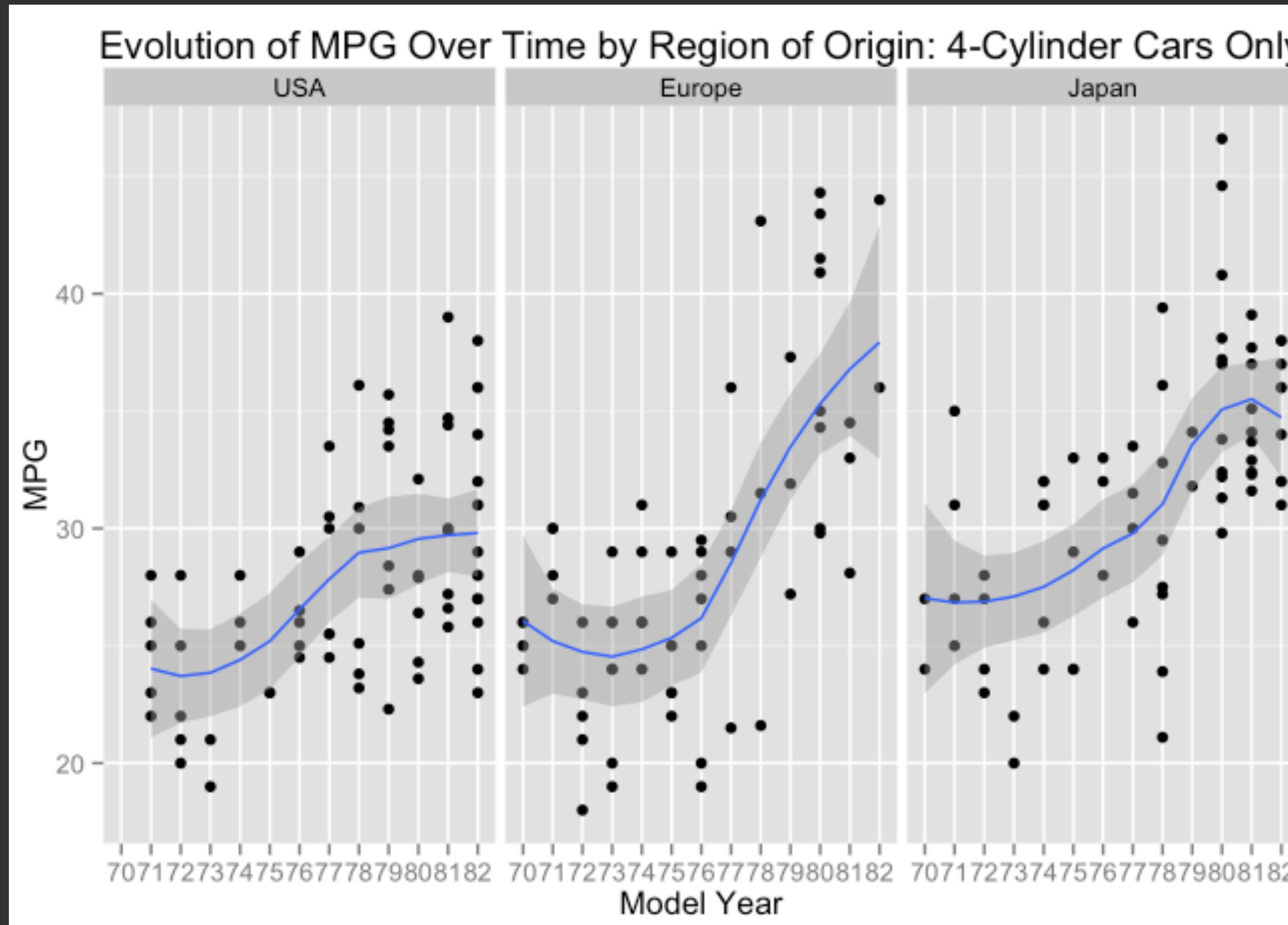
# Don't overload visual encodings



Five visual variables  
in a single chart!

Origin: Shape  
Acceleration: Size  
X-axis: Horsepower  
Y-axis: Miles per Gallon  
Size: Acceleration

# Use facets or small multiples



[David K. Smith]

[Andrew Gelman]

# Dimension Reduction

Mapping from high-dimensional space to two or three dimensions

[<https://distill.pub/2016/misread-tsne/>]

## How to Use t-SNE Effectively

Although extremely useful for visualizing high-dimensional data, t-SNE plots can sometimes be mysterious or misleading. By exploring how it behaves in simple cases, we can learn to use it more effectively.



Text

# Tag Clouds: Word Count

**September 10, 2009**

TEXT

## **Obama's Health Care Speech to Congress**

Following is the prepared text of President Obama's speech to Congress on the need to overhaul health care in the United States, as released by the White House.

Madame Speaker, Vice President Biden, Members of Congress, and the American people:

When I spoke here last winter, this nation was facing the worst economic crisis since the Great Depression. We were losing an average of 700,000 jobs per month. Credit was frozen. And our financial system was on the verge of collapse.

As any American who is still looking for work or a way to pay their bills will tell you, we are by no means out of the woods. A full and vibrant recovery is many months away. And I will not let up until those Americans who seek jobs can find them; until those businesses that seek capital and credit can thrive; until all responsible homeowners can stay in their homes. That is our ultimate goal. But thanks to the bold and decisive action we have taken since January, I can stand here with confidence and say that we have pulled this economy back from the brink.

I want to thank the members of this body for your efforts and your support in these last several months, and especially those who have taken the difficult votes that have put us on a path to recovery. I also want to thank the American people for their patience and resolve during this trying time for our nation.

But we did not come here just to clean up crises. We came to build a future. So tonight, I return to speak to all of yo



# Tag Clouds

# Strengths

# Getting overview and initial query formation.

# Weaknesses

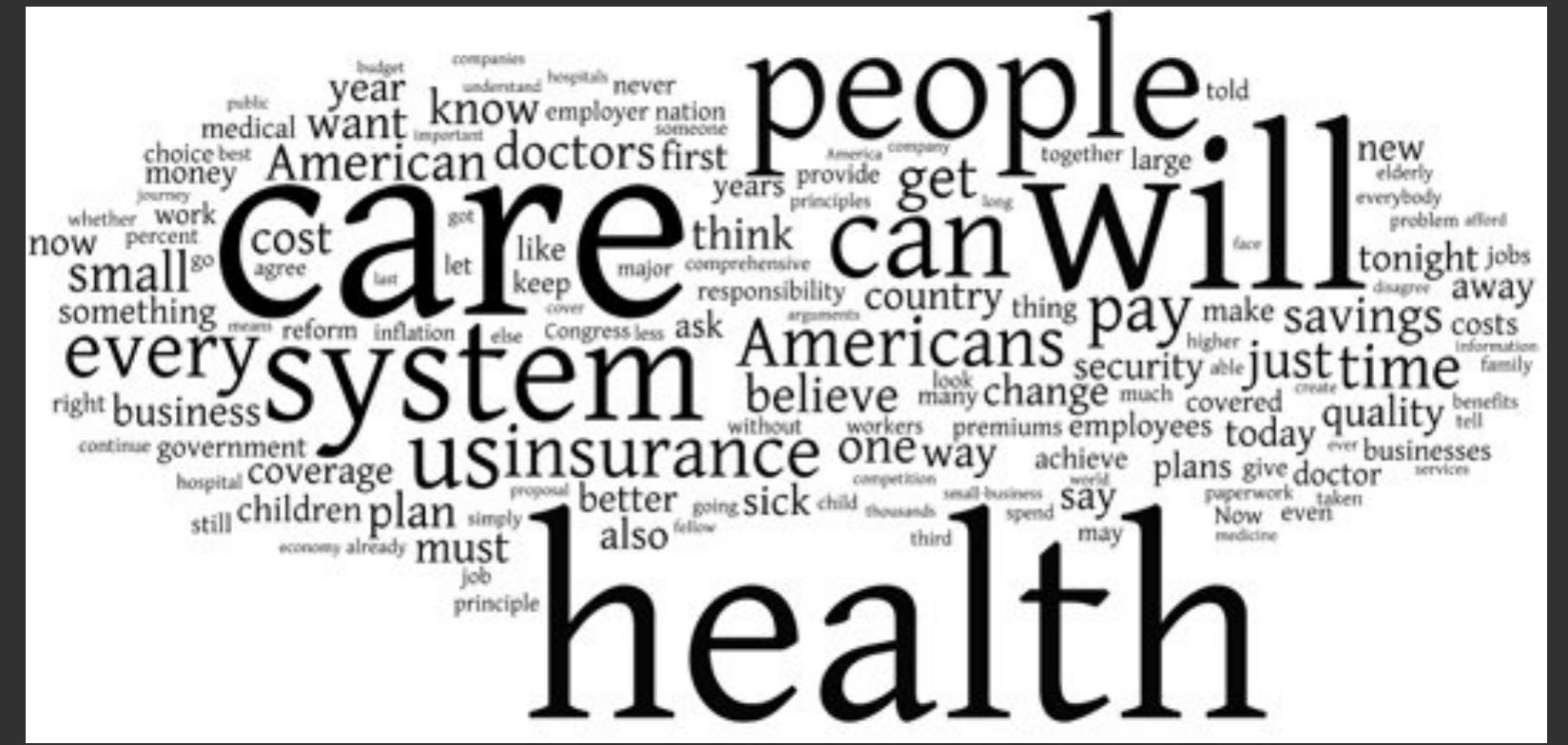
# Sub-optimal visual encoding (size vs. position)

# Inaccurate size encoding (long words are bigger)

May not facilitate comparison (unstable layout)

# Term frequency may not be meaningful

Does not show the structure of the text



[http://www.edwordle.net/]

# EdWordle

EdWordle is a tool for editing “word clouds” based on the Wordle. The initial word cloud can be generated from the input text or read from an existing one. You can re-font, re-colore, resize, move, rotate, add and delete words to create custom visualizations.

EdWordle's main benefit is that it allows a neighborhood-preserving editing process, which keeps words at predictable and close locations during and after the editing process. Like Wordle, the images you create with Wordle are yours to use however you like. You can save them to your own desktop to use as you wish.

Create Now »

Some examples created by others and you can further edit them



[Edit it!](#)



Edit i



Ed



Edit

# Word Tree: Word Sequences [Wattenberg et al.]



if love be rough with you , be rough with love .  
if love be blind , love cannot hit the mark .  
if love be blind , it best agrees with night .

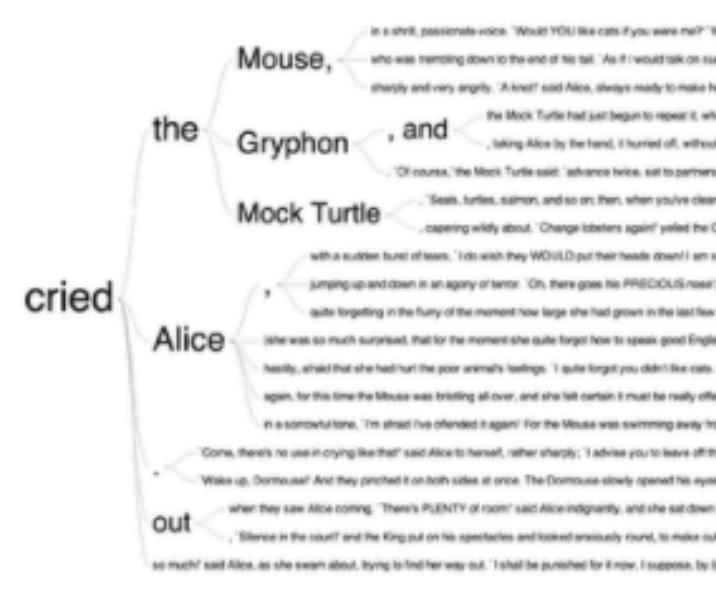
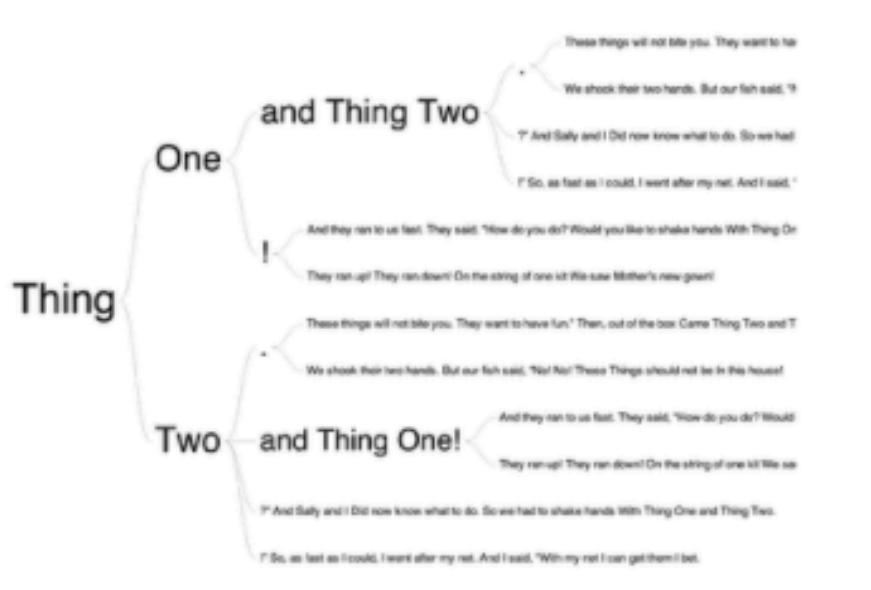
**if love be**

rough with you , be rough with love .

**blind**,

love cannot hit the mark .  
it best agrees with night .

# word tree



# **Obama's Inauguration Speech**

the Administration finally went against its own rhetoric, and pursued diplomacy as in Saab City, and Iran is handing out money left and right in southern Lebanon America's enemies than any strategic choice that we have made in decades preceding arguments we hear from those who have failed to demonstrate how the Administration have failed to present is an overarching strategy to the people. In addition to freeing up resources to take the fight to al Qaeda, ending Taliban, which has rebuilt its strength since we took our eye off of Afghanistan. Above all, unity that had no al Qaeda here. Maybe that is why he ~~consistently~~ fails to understand that, and that's what I will do when I am the nominee of the Democratic Party - because since the brigades we have in Iraq today, we can remove all of them 18 months. After this deployment, we're in Iraq. We can responsibility remove 1 to 2 combat brigades each month. It will start with the number from has. In the year since President Bush announced the surge - the bloodiest year of the war for America and I will offer a status break from the politics and policies of the past. Moreover, to let Iraqis vote in elections. The threats of a new century have ended the era of war and strategy, and yet America regime that threatens the peace with weapons of mass murder." Recalling the pain of 9/11, he evidence that Iraq had those capabilities, or weapons of mass destruction. There was not hard in the stress of our crisis." At the time the President uttered those words, there was no hard reason of mass destruction. There was not any evidence that Iraq was responsible for the attacks of September 11, or trying to focus on a source of fear, and confront a vast hope. There are just two ways in which a shift in strategy away al Qaeda, whose recruitment has jumped and whose leadership enjoys a safe-haven in Pakistan - a thousand miles, and it will ultimately make us safer. In order to end this war responsibly, I will immediately begin to remove our troops a targeted strike on the terrorists who carried out the 9/11 attacks, and the same three individuals that supported an invasion a reconciliation. We will engage with every country in the region - and the UN - to support the stability and territorial integrity in Washington who spent too little time reading the intelligence reports, and too much time reading public opinion. The lesson by this will be easy. But I do know that we can only begin to make these changes when we end the mindset that focuses and prudent plan that will end a war nearly seven years after it started. My plan to end this war will finally put pressure resources to deal with nearly every other national security challenge we face. This is why the judgment that matters most as he did last year - that we could never leave Iraq because violence was up, and then argue this year that we can't be safer because of this war? And that is why Senator McCain can argue - as he did last year - that we cannot Now we know what we'll hear from these like John McCain who support open-ended war. They will argue that leaving will have to make tactical adjustments, leaving to our commanders on the ground, to ensure that our interests in a stable with-enhancing the threat military in the history of the world. As Commander in Chief, I will begin by giving a military overwatched by a region - and the UN - to support the stability and territorial integrity of Iraq. And as we will launch a major humanitarian initiative to support a tell Iraq's leaders that we'll stay as long as it takes, they take as long as they want. We need to send a different message. We will help in this end this war will finally put pressure on Iraq's leaders to take responsibility for their future. Because we've learned that when we end and whose leadership enjoys a safe-haven in Pakistan - a thousand miles from Iraq. The central front in the war against terror is not General Petraeus has himself acknowledged, the Iraqis are not achieving the political progress needed to end their civil war. Beyond will catalog the reasons why we waged a war that didn't need to be fought, but few stand out. In 2002, when the fateful decisions about of approach - an approach that puts the onus on the Iraqis, and that relies on more than just military power - that is needed to stabilize

## **Obama War Speech**

## The Cat in the Hat

for the past 30 years, I have looked in the mirror every morning and asked myself: "If today were the last day of my life, would I want to do exactly what I am about to do today?"

If it has made all the difference in my life. My second story is about love and loss. I was lucky -- I found what I loved to do early in life. No one has ever escaped it. And that is as it should be, because Death is very likely the single best invention of Life. It is No one has ever escaped it. And that is as it should be, because Death is very likely the single best invention of Life. It is was one of the bibles of my generation. It was created by a fellow named Stewart Brand not far from here in Menlo Park, and he brought me Story to be so dramatic, but it is quite true. Your time is limited, so don't waste it living someone else's life. And that is as true for your work as it is for your loves. Your work is going to fill a large part of your life, and if you spend your whole life in service to other people or some cause or some church or some belief system, you may never have the chance to do the work that makes your life.

So you have to trust that the dots will somehow connect in your future. You have to trust in something -- your gut, destiny, y life and no idea how college was going to help me figure it out. And here I was, spending all of the money my parents had saved their entire

# **Steve Jobs Stanford Commencement Speech**

## Alice in Wonderland

The image is a collage of several screenshots from a Twitter search interface. The search term 'arnicas' is visible at the top of each screen. The results show a variety of tweets from different users, many of whom are using the '@' symbol or the 'arnicas' hashtag. Some users mentioned include Youdaman, mathieuens, jmarca, tokumin, JanWillemTulp, mertz\_stefanie, DataPointed, and others. The tweets contain a mix of text, images, and links, typical of a social media search interface.

# **Bob Dylan's Blowin' in the Wind**

dtree/

for

sharing

the

your

posting

so

much

!

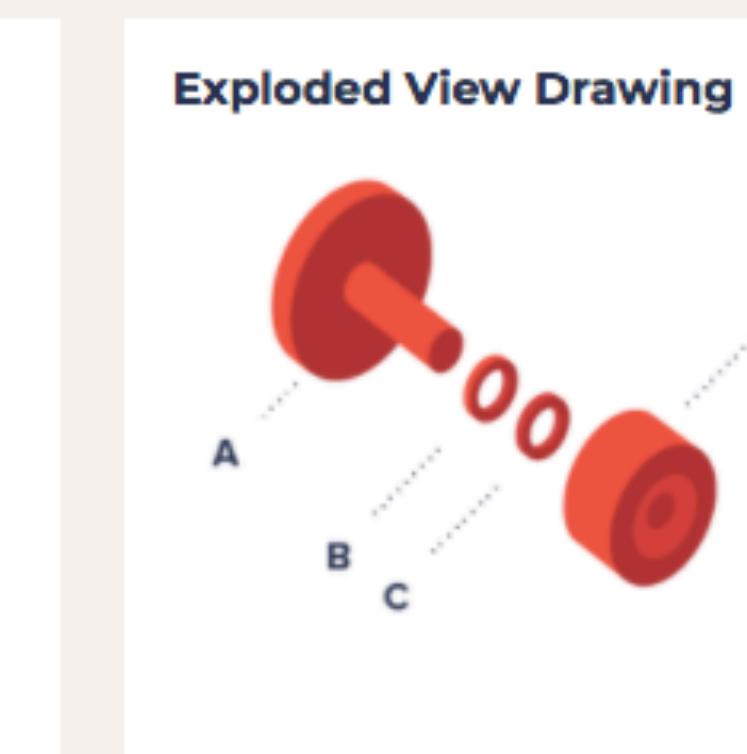
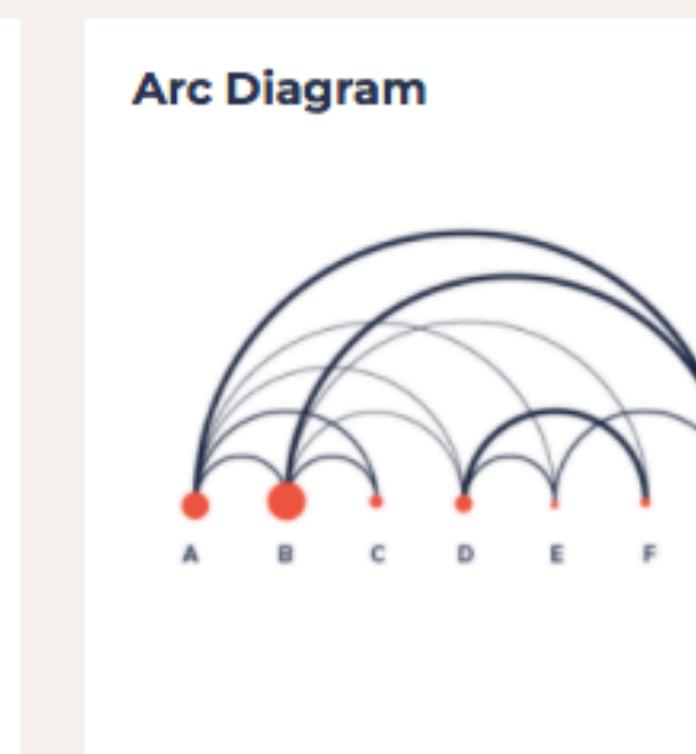
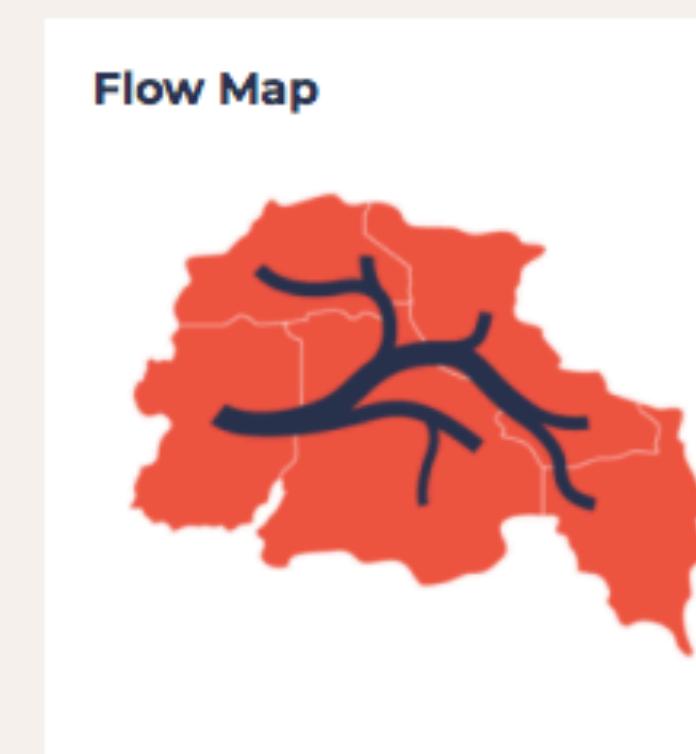
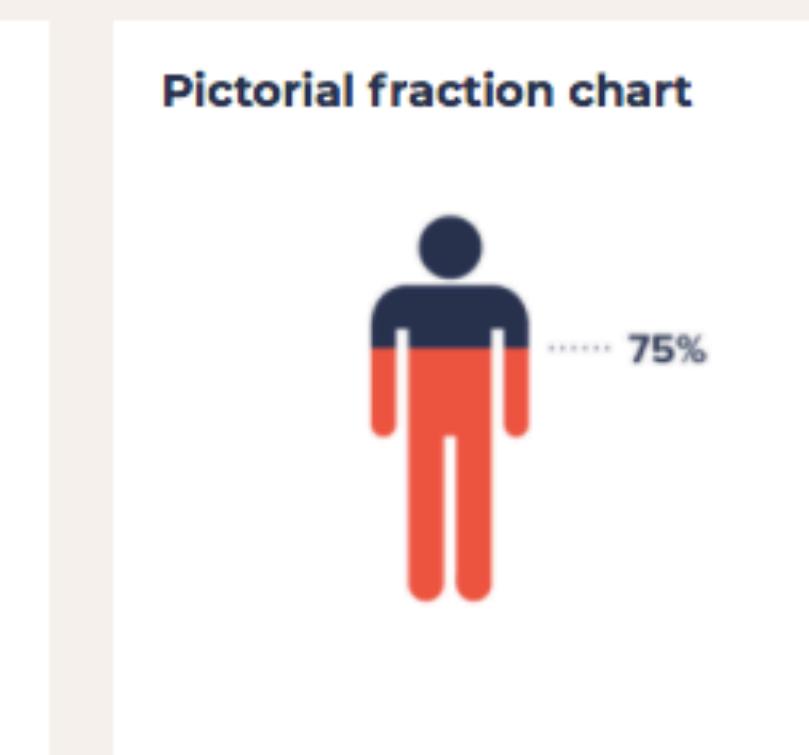
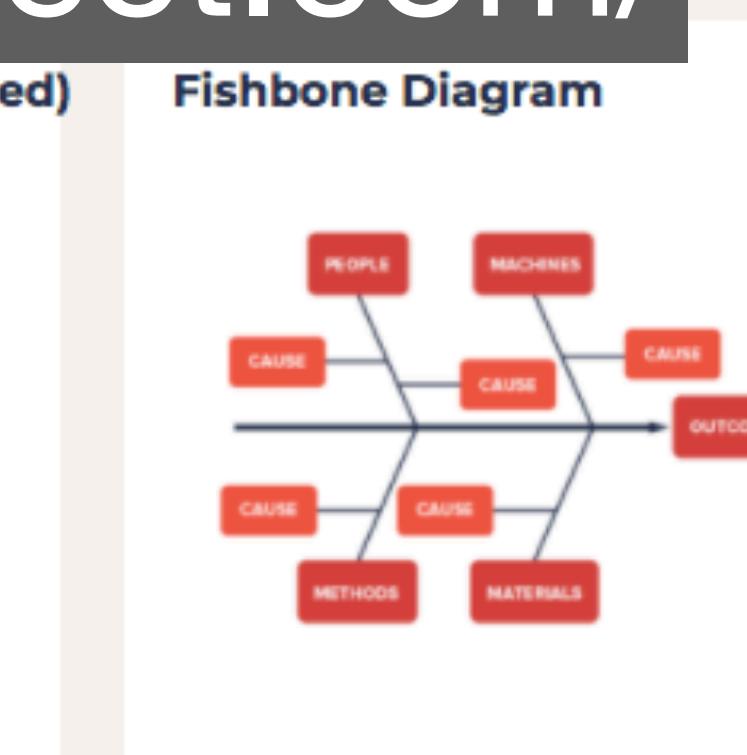
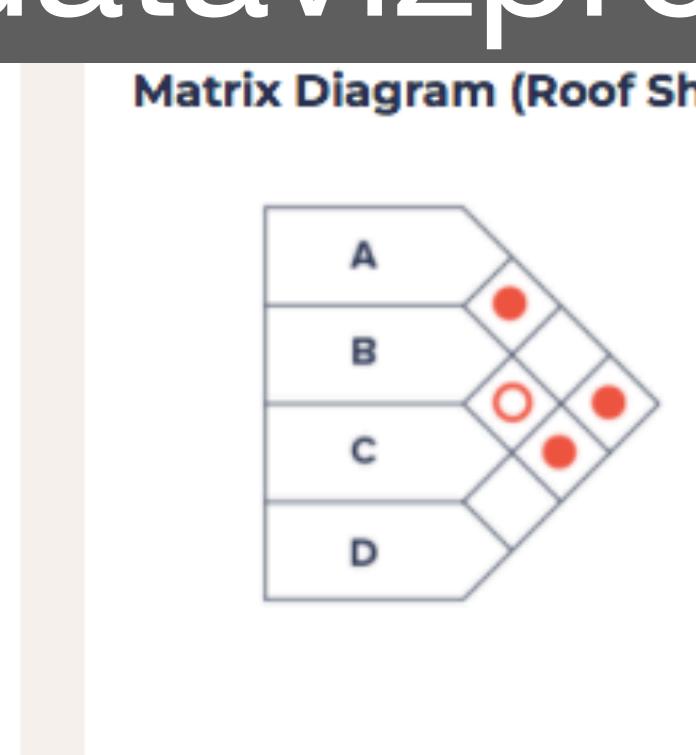
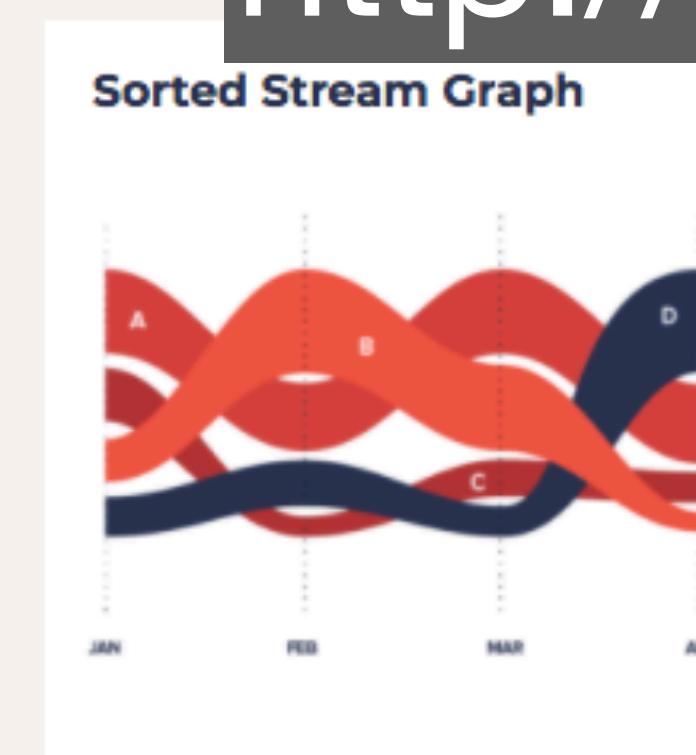
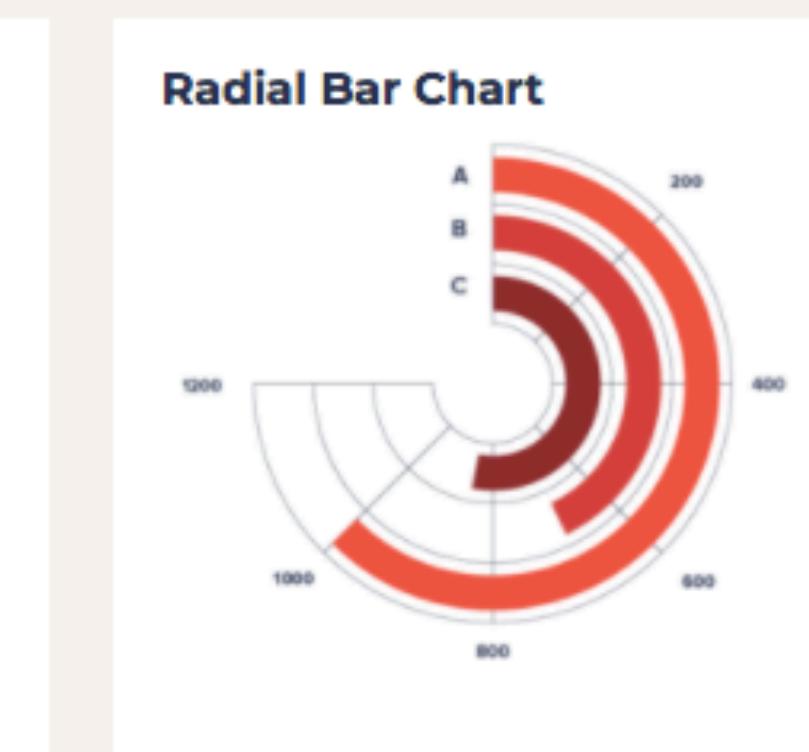
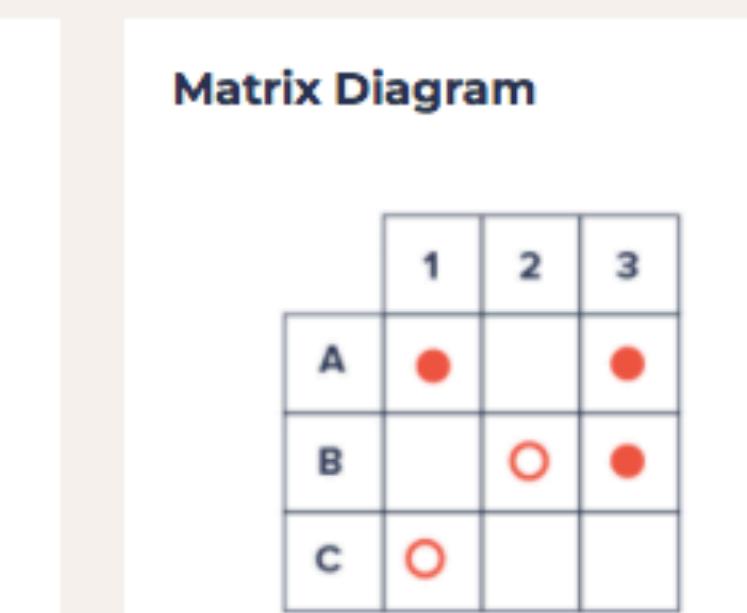
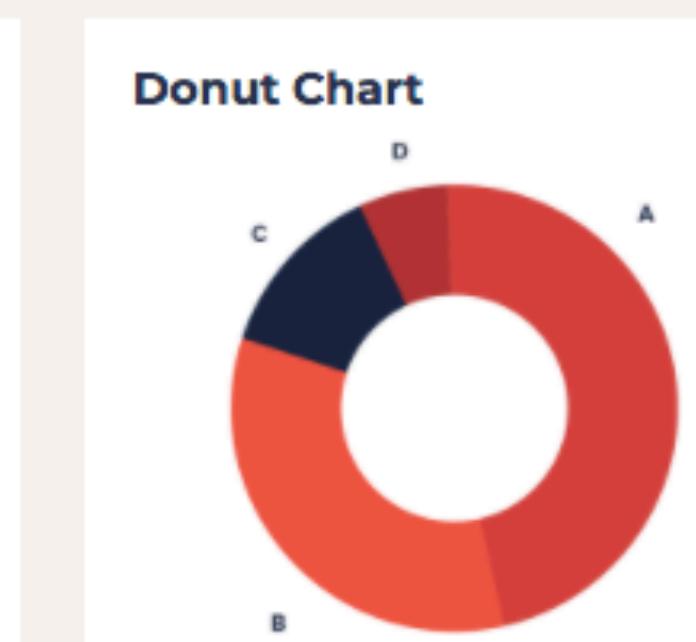
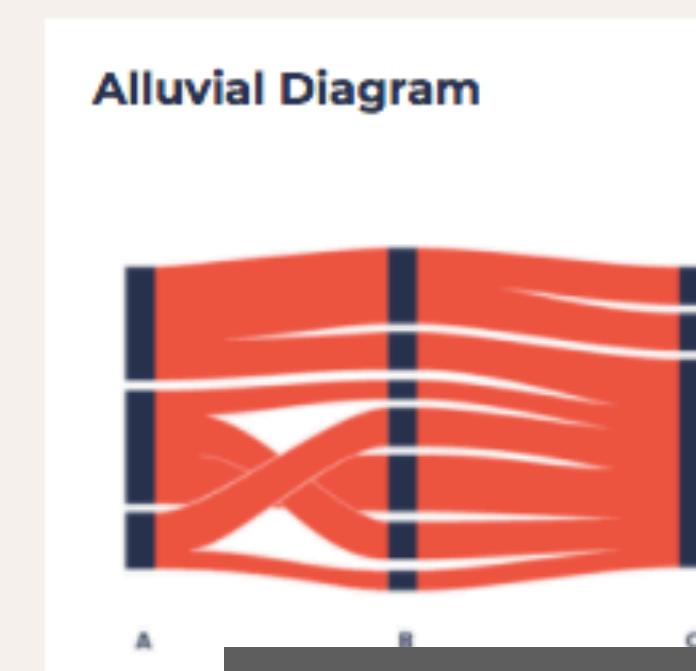
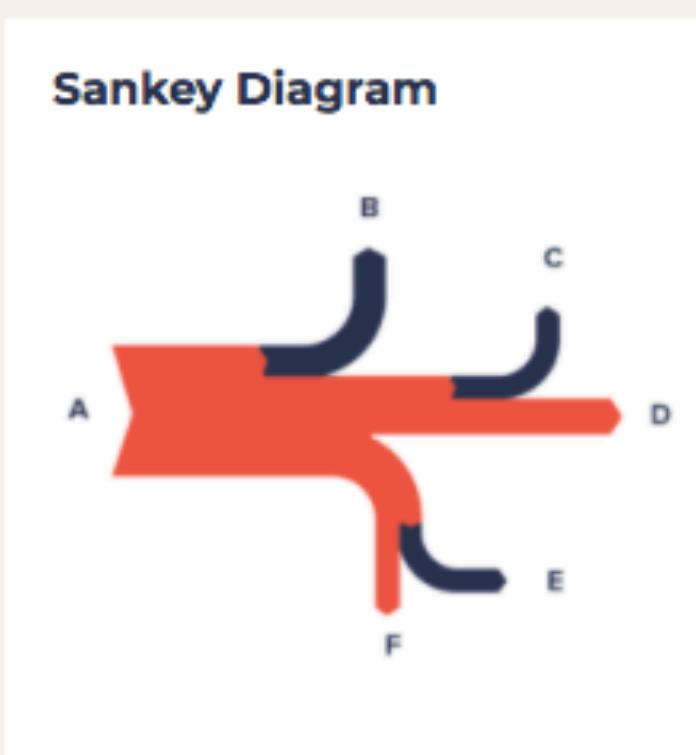
all

very much

everyone

## Paste Text

# Other Visualizations



# THE GRAPHIC CONTINUUM

[Jonathan Schwabish 2014]

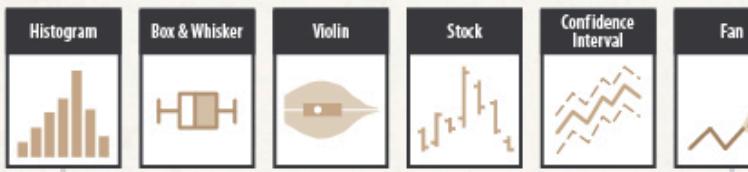
The Graphic Continuum shows several ways that data can be illustrated individually or combined to show relationships. Use of various shapes, chart types, and colors can help identify patterns, tell stories, and reveal relationships between different sets and types of data. Bar charts, or histograms, for example, can illustrate a distribution of data over time, but they also can show categorical or geographic differences. Scatterplots can illustrate data from a single instance or for a period, but they also can be used to identify a distribution around a mean.

This set of charts does not constitute an exhaustive list, nor do the connections represent every possible pathway for linking data and ideas. Instead, the Graphic Continuum identifies some presentation methods, and it illustrates some of the connections that can bind different representations together. The six groups do not define all possibilities: Many other useful, overlapping data types and visualization techniques are possible.

This chart can guide graphic choices, but your imagination can lead the way to other effective ways to present data.

## DISTRIBUTION

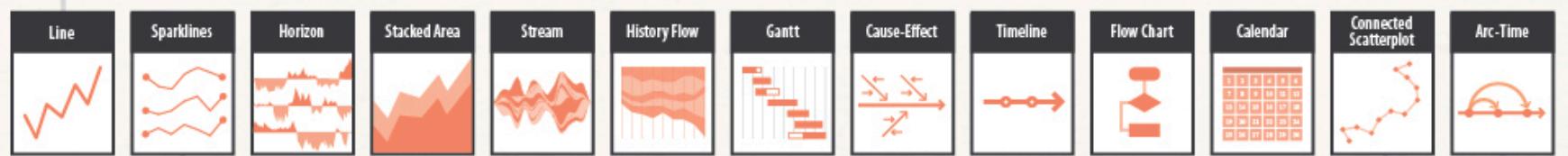
Graphical representations of the distribution of data



A Fan Chart  
combines a line chart for observed past data with ranges for possible future values

## TIME

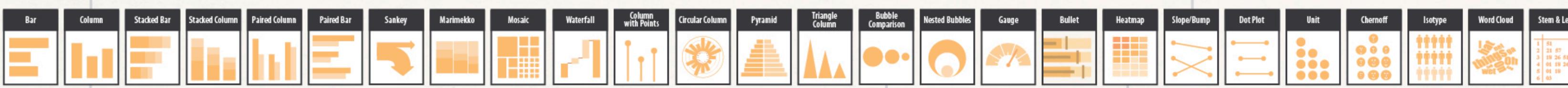
Track changes over time



A Slope or  
Bump Chart  
connects categories  
across a vertical axis  
instead of showing all  
points

## COMPARING CATEGORIES

Compare values across categories



## PART-TO-WHOLE

Visualizations that relate the part of a variable to its total



## GEOSPATIAL

Relate data to its geography



A Heatmap uses  
color to show  
high-frequency  
data; a Treemap  
uses rectangles  
to show  
part-to-whole  
relationships

A Map with  
Geodesics  
modifies  
geographic frame  
of reference

A Bubble Map  
uses circles for  
geographic encoding

A Heatmap  
uses color to show  
high-frequency  
comparisons; a  
Bubble Map  
uses the size of  
shapes to illustrate  
correlations

An Arc-Time  
Chart presents  
comparisons  
across time; the  
Arc-Connection  
Chart shows  
connections  
between  
observations

A Circle-Packing  
diagram illustrates a  
hierarchy; a Dorling  
Map uses circles of  
the size of areas  
of a map to show  
a geographic  
distribution

## RELATIONSHIP

Illustrates correlations or relationships between variables



# Financial Times Visual Vocabulary

Inspired by the Graphic Continuum by Jon Schwabish and Severino Ribecca

Deviation Correlation Change v Time Ranking Distribution Part to whole Magnitude Spatial Flow

<https://ft-interactive.github.io/visual-vocabulary/>

## Change v Time

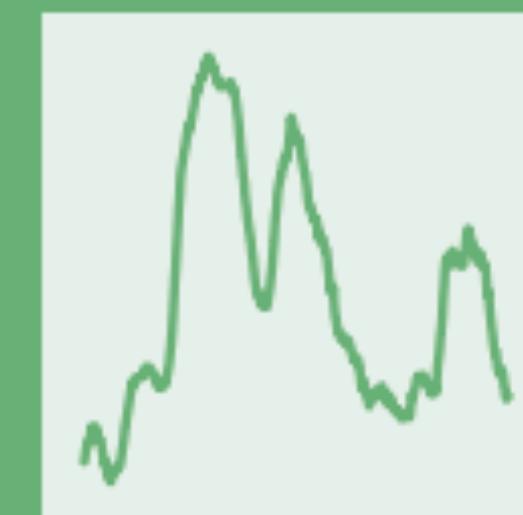
Give emphasis to changing trends. These can be short (intra-day) movements or extended series traversing decades or centuries: Choosing the correct time period is important to provide suitable context for the reader

### Examples of use

Share price movements, economic time series

### Chart types

line



column-timeline



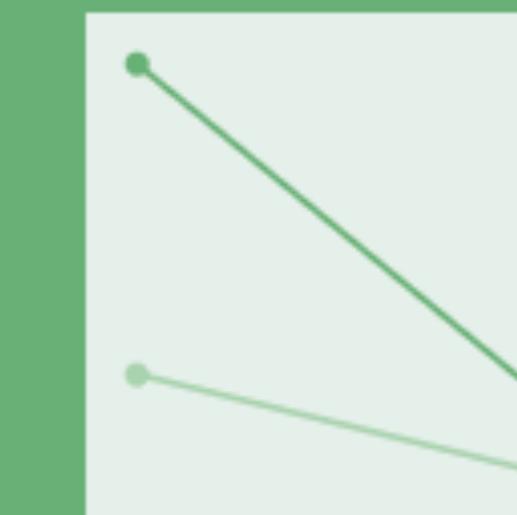
column-line-timeline



stock-price



slope



area

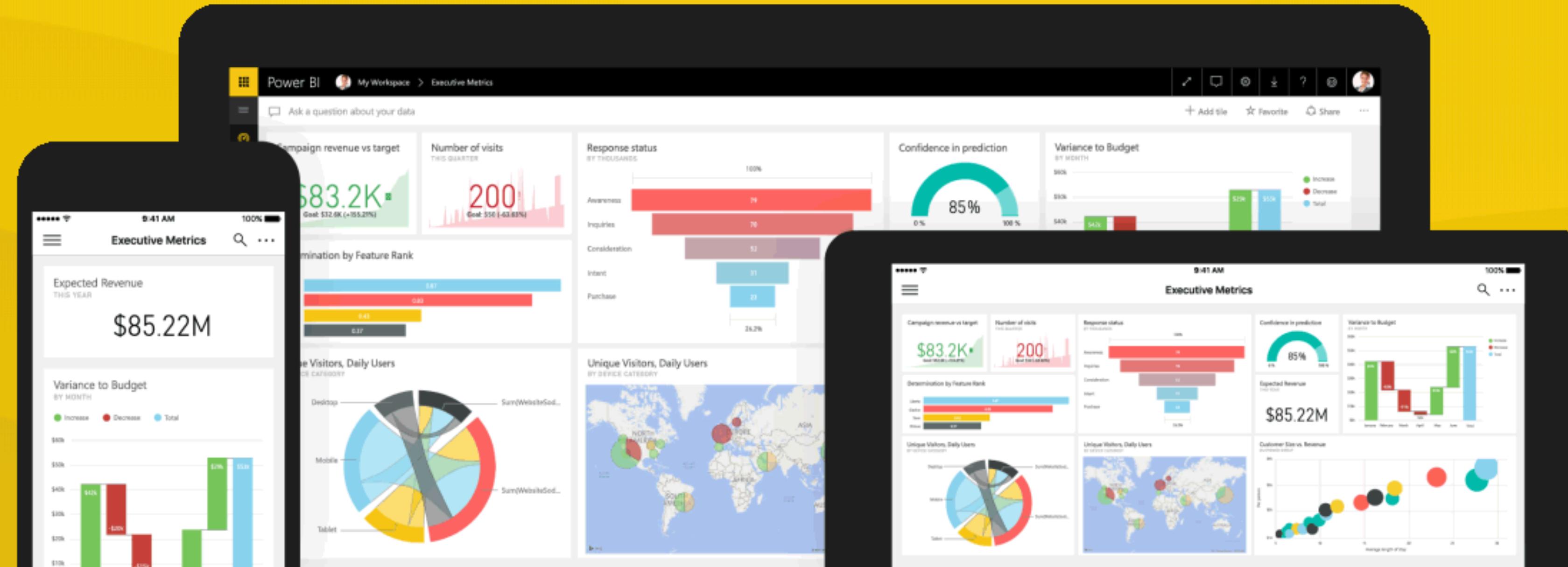


# Tools

# Business intelligence like never before

Go from data to insights in minutes.  
Any data, any way, anywhere. And all in one view.

# PowerBI



New version of Power BI Report Server is now available. Publish Power BI reports on-premises connecting to any data. [Learn more](#)

# Chart Studio

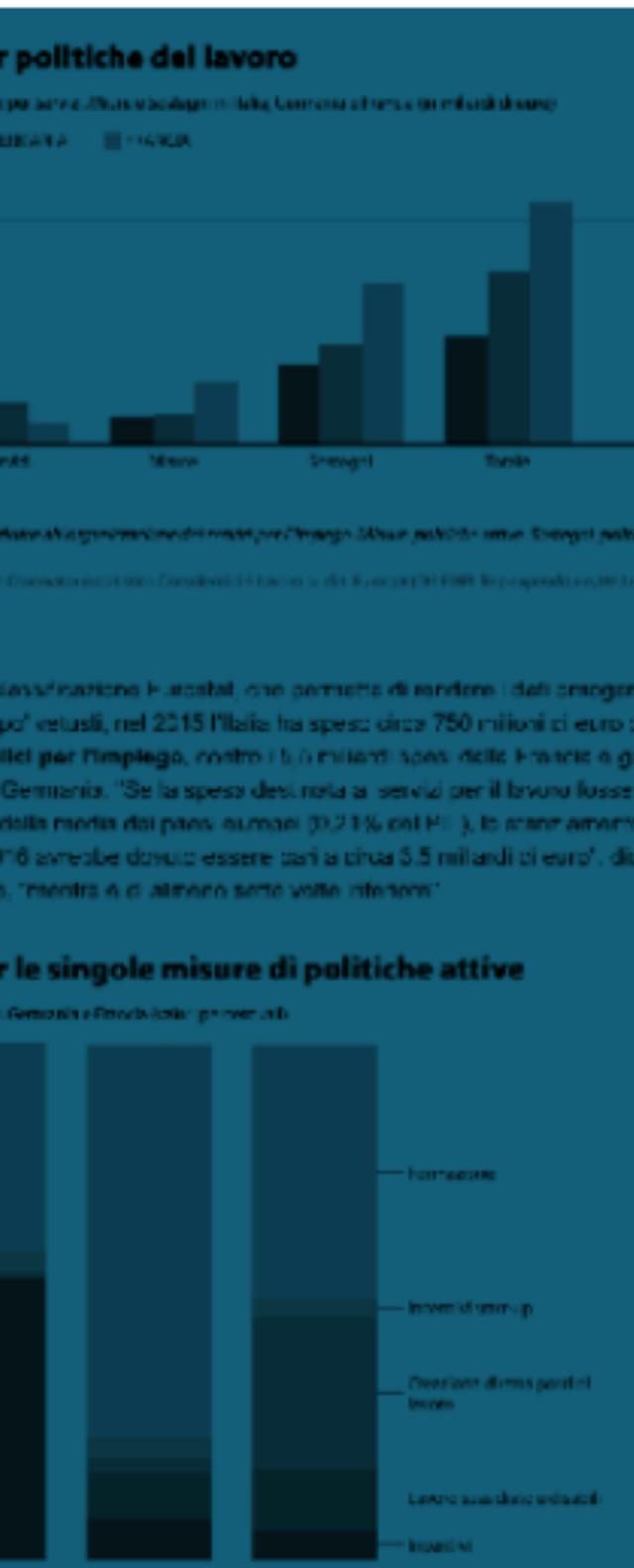
The world's most sophisticated editor for creating D3.js and WebGL charts.

No coding required.

**GET STARTED**

# Plotly





# Enrich your stories with charts, in seconds

# Datawrapper

[CREATE A CHART](#)
[CREATE A MAP](#)

Det går frem av rapporten fra «Danmarks Statistik» at det er store forskjeller i kriminalitet mellom innvandrere, og spesielt etterkommerne, enn for personer med dansk opprinnelse, sier fullmektig Jens Bjerre i Dansk statistikk.

**GOES ITS SURVEY**, which kept some workers at home. Additionally, the “retail apocalypse” of announced store closings meant that more jobs than normal left the economy during the month. This month, the disappointing March number was revised down from 98,000 to 79,000. But the April jobs report provides a bounce back in part because of warmer weather and fewer layoffs. The Labor Department reported gains in hospitality, mining, healthcare, and finance. Including the revisions for the February and March reports, an average of 174,000 jobs were added per month over the last three months.

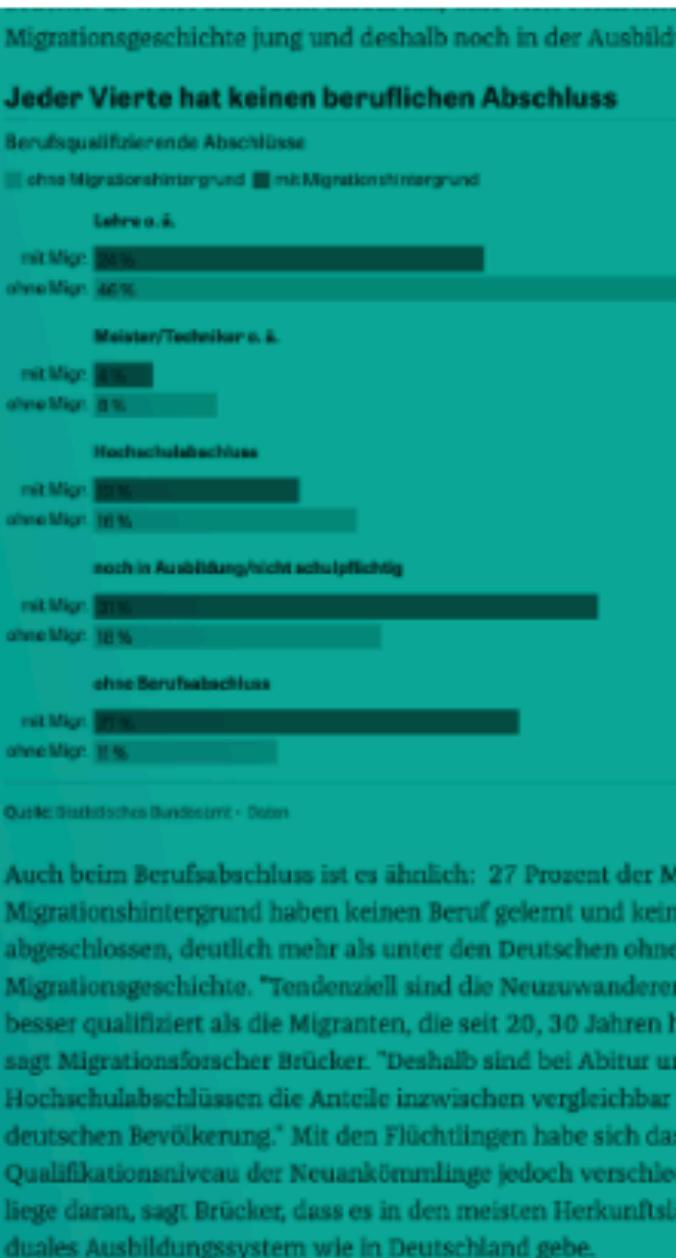
## Monthly Changes in U.S. Employment (Non-Farm), 2006-2017



Source: Bureau of Labor Statistics | Get The Data | Embed

The Atlantic

## 3. An interest-rate hike in June now looks more likely.

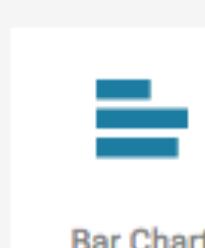


## Migranten und ihre Kinder verdienen weniger



## Datawrapper makes it easy to create beautiful charts.

See for yourself how different newsrooms use our charts:



Bar Chart



Split Chart



Stacked Bars



Dot Plot

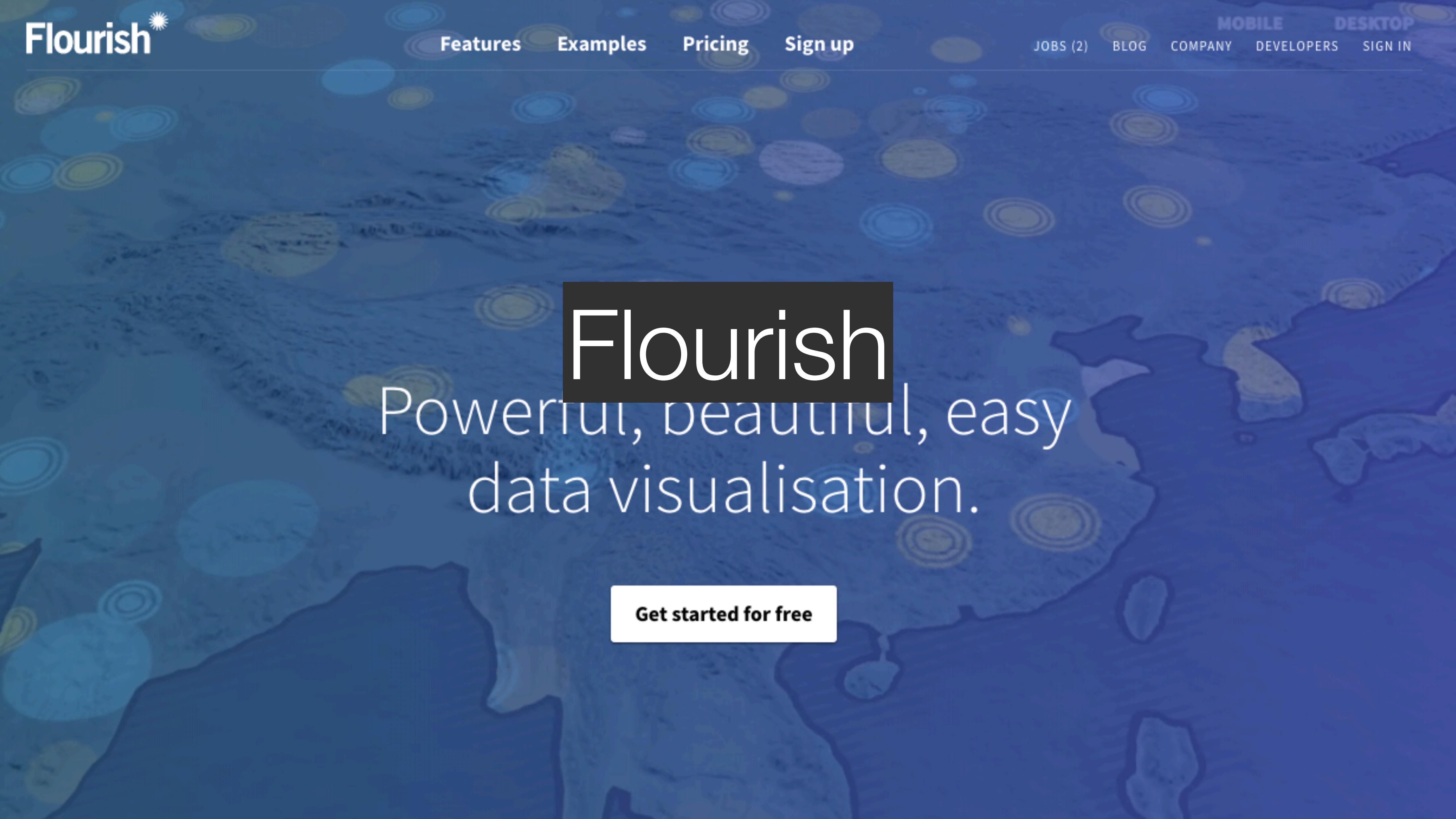
### Evolución de la población mundial

En millones de habitantes

Asia África América Latina y Caribe Europa América del Norte (excepto México) Oceania

11000

Previsión 2050  
9.773 millones



Flourish  
Powerful, beautiful, easy  
data visualisation.

**Get started for free**



# Turn your data into knowledge

**Quadrigram** allows you to engage people by sharing stories that matter.

# Quadrigram

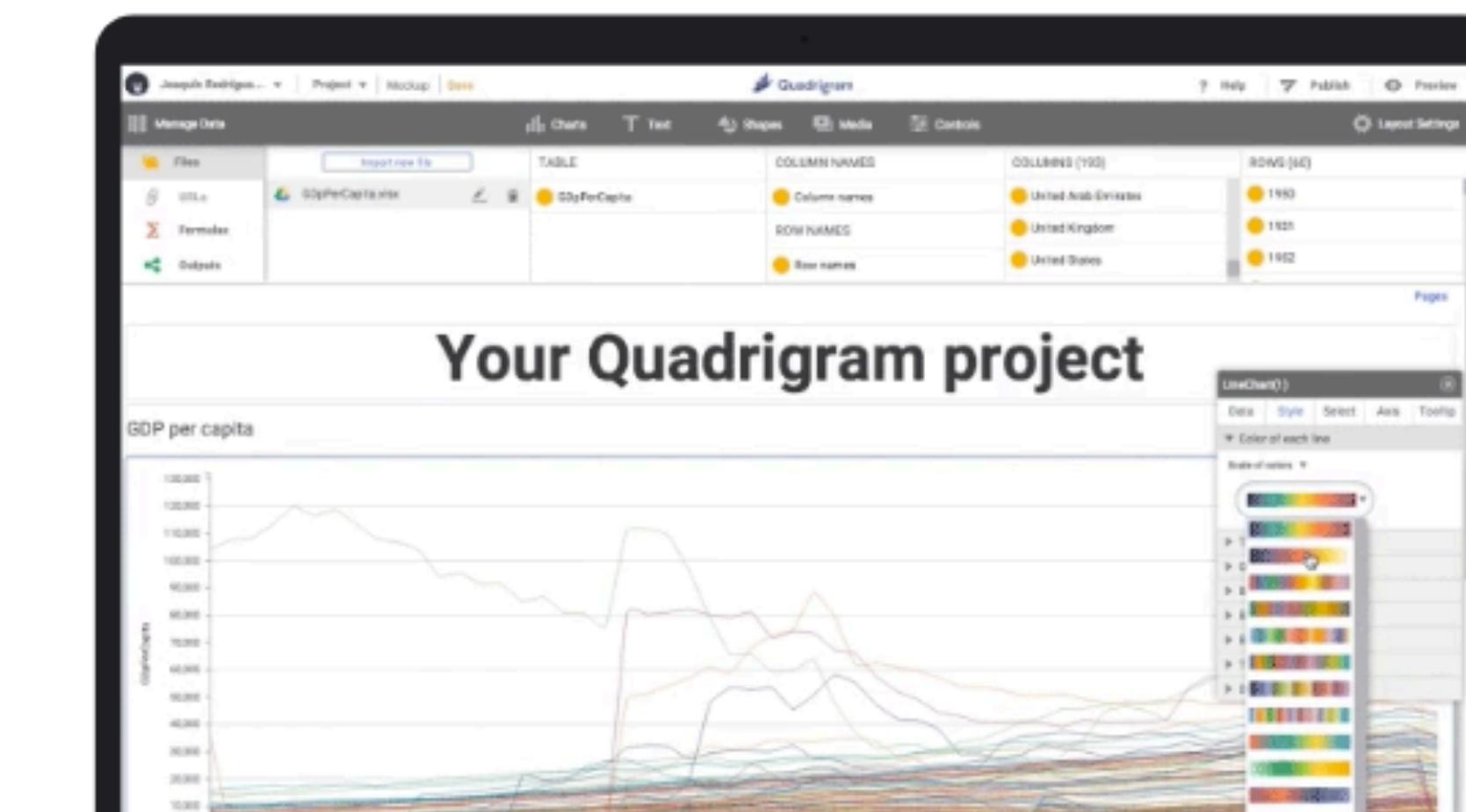
PURCHASE NOW

Or try it for **FREE**

WHAT

## Easy to use

Quadrigram is a visual drag & drop data editor that will transform the stories you bring to the web.

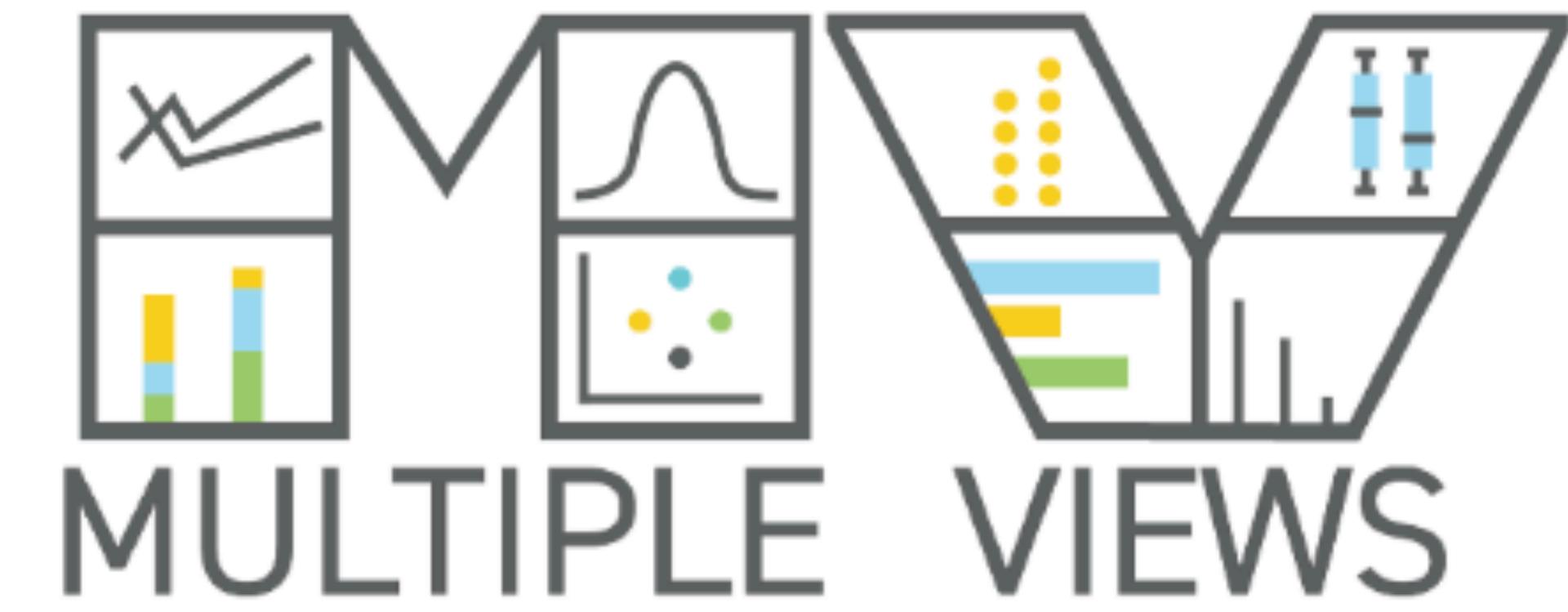


# RAWGraphs

The missing link between spreadsheets and data visualization.

[USE IT NOW!](#)[FORK IT ON GITHUB](#)

# Blogs



Visualization  
Research  
Explained



# Visualization and Visual Communication

What's happening in information visualization? [Robert Kosara](#) digests new and emerging developments and explores what we know and don't know – so we can be less wrong about visualization.

*Recent* [SEE ALL →](#)**Spotting rip currents**

Rip currents are like hidden rivers near the shore that ...



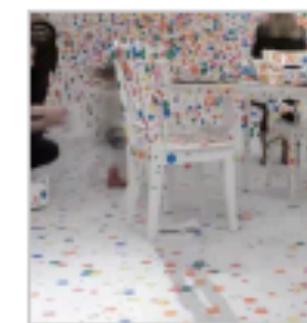
FEED SPONSOR

**Be the data whisperer →**

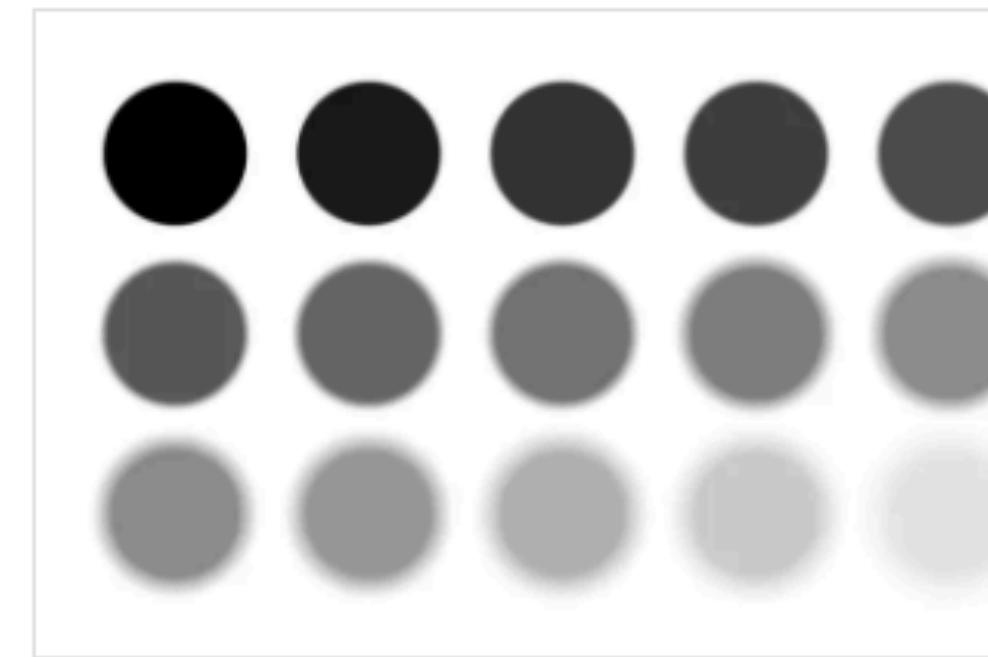
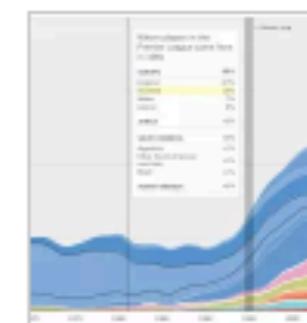
Notre Dame's Mendoza College of Business in Chicago offers a one-year, part-time MS in Business Analytics for ambitious working professionals

**Obliteration Room invited people to put dotted stickers everywhere**

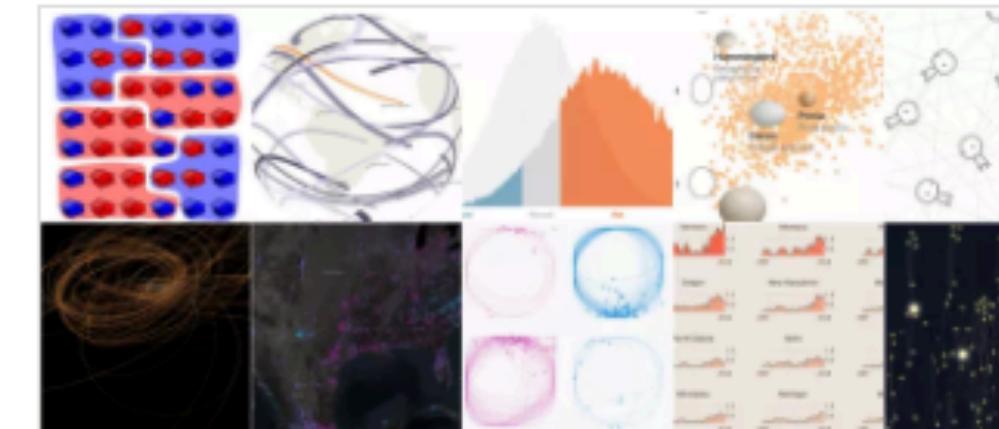
The Obliteration Room (2012) by artist Yayoi Kusama started as ...

**Where athletes in professional sports come from**

Sports are growing more

**Visualizing the Uncertainty in Data**

Data is an abstraction, and it's impossible to encapsulate everything it represents in real life. So there is uncertainty. Here are ways to visualize the uncertainty.

**10 Best Data Visualization Projects of 2017**

It was a rough year, which brought about a lot of good work. Here are my favorite data visualization projects of the year.

**Become a member.**

*Learn to visualize your data.  
From beginner to advanced.*

[WHAT YOU GET](#)**Categories****Visualization***Seeing data***Statistics***Analyzing data***Maps***Seeing geographic data***Software***Working with data***Infographics***Explaining data***Sources***Getting data***Networks***Connecting data***Design***Making data readable***Favorites**

Most popular porn searches, by state



visualising  
data



HOME BLOG RESOURCES TRAINING BOOK ABOUT

14 JAN | THE LITTLE OF VISUALISATION DESIGN: PART 59 >>

LATEST 50

COLLECTIONS

DESIGN

ARTICLES

EXTERNAL

NEWS

ANNOUNCEMENTS

MONTHS

DATA VISUALISATION & INFOGRAPHIC DESIGN  
TRAINING WORKSHOP SCHEDULE  
[www.visualisingdata.com/training](http://www.visualisingdata.com/training)

13 Feb 2019 LONDON 10-day course  
29-30 Feb 2019 AMSTERDAM 10-day course  
13 Mar 2019 HELSINKI 10-day course  
1-2 May 2019 LONDON 10-day course

The **little** of visualisation design

18 DEC UPDATED DATA

Albania	Albanian	Vizualizimi i datave
Austria	English	Data visualization
Canada	English, French	Data-visualisator (EN), Visualisation de données (FR)
China	Mandarin	可视化 (Kuàilì)
Croatia	Croatian	Visualizacija podataka
Denmark	Danish	datavisualering
Finland	Finnish	Tietovizuaali, tieto-visualointi
France	French	Visualisation de données
Germany	German	datavisualisierung
Hungary	Hungarian	Adatvizualizáció
India	Tamil	தகவல் தொகைப்படிப்பு
Indonesia	Indonesian	Visualisasi data
Ireland	Irish	Forasúil a shonraithe
Italy	Italian	Visualizzazione di dati

18 DEC THE LITTLE OF

**DATA STORIES**  
A post about data visualisation with David Berliner and Monica Hartzer

132 | A New Generation of DataViz Tools

07 DEC TRANSLATING 'DATA'

The **little** of visualisation design

With the rise in popularity become old technology

Products that were in decline in :

- DVD player -40
- Trouser press -36
- Small television -34
- Alarm clock -30
- Cold shoulder dress -18
- Desktop computer -15

06 DEC DATA STORIES

A monthly digest of the best of data visualisation

23 OCT THE LITTLE OF

The **little** of visualisation design

18 OCT BEST OF THE

07 AUG THE LITTLE OF

07 AUG SHORT SURVEY ABOUT

31 JUL BEST OF THE

23 JUL FREE DATA

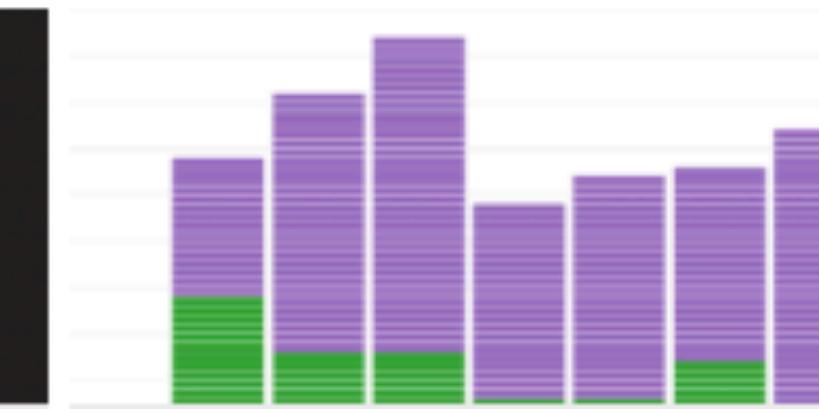
16 JUL THE LITTLE OF

11 JUL FINAL PUSH TO

A monthly digest of the best of data visualisation

17 DEC BEST OF THE

06 DEC VISUALISATION



10 OCT MILESTONE IN DATA

A monthly digest of the best of data visualisation

The **little** of visualisation design

14 DEC THE LITTLE OF

A monthly digest of the best of data visualisation

28 NOV BEST OF THE

A monthly digest of the best of data visualisation

08 SEP BEST OF THE

23 JUL FREE DATA

16 JUL THE LITTLE OF

13 DEC ANNOUNCING THE

Interdisciplinary practices in information design & visualization  
in Potsdam, Germany  
19-21 Oct 18

12 NOV POLICYVIZ PODCAST:

03 SEP THE LITTLE OF

A monthly digest of the best of data visualisation

07 DEC BEST OF THE

24 OCT LAUNCHING THE

A 6-monthly review of the best of data visualisation

09 AUG 10 SIGNIFICANT



# KANTAR

## Information is Beautiful Awards 2018

About News Awards Entry Showcase Sponsor Attend the Awards ceremony

Awards Challenges

All 2018 2017 2016 2015 2014 2013 2012

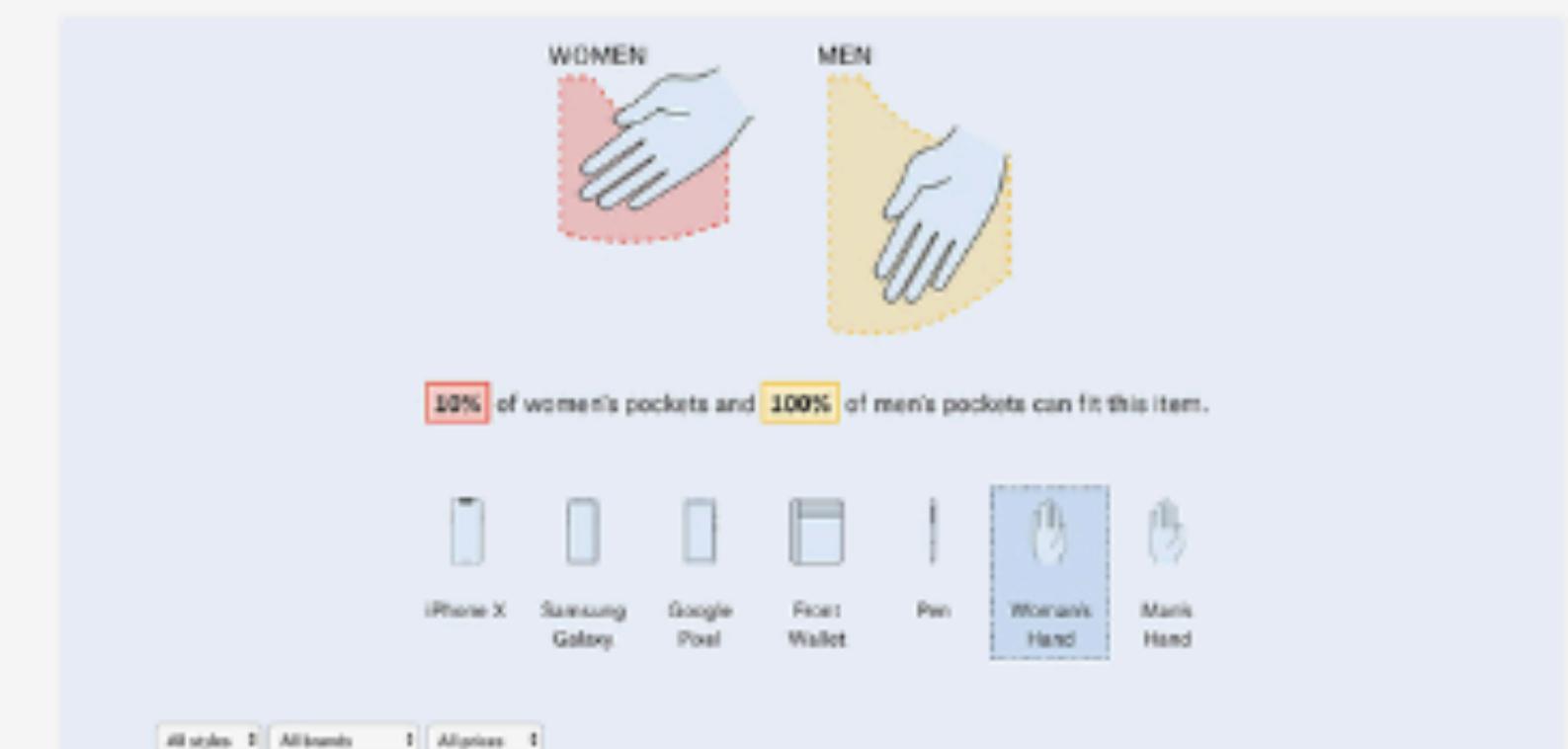
All Shortlist Longlist ★ Winners Gold Silver Bronze Rising Star Outstanding Individual Best-Non-English-Language Outstanding Outfit

Commercial Project Student Community Outstanding Team Most Beautiful

All Arts, Entertainment & Culture Breaking News Humanitarian Leisure, Games & Sport Maps, Places & Spaces People, Language & Identity

Politics & Global Visualization & Information Design Science & Technology Unusual Internal Business Project Paid tool Dataviz Website

Dataviz Project Mini Visualization Dataviz Tool



# Yesterday

## *Fundamental*

---

1. Value of visualization
2. Design principles
3. Graphical perception

# Today

*Practical*

---

1. Data model and visual encoding
2. Exploratory data analysis
3. Storytelling with data
4. Advanced visualizations

Good luck on your visualizations  
and share your knowledge with others!

Thank you!