Lecture starts at 1:10pm
Download slides from Canvas (Week 13) while you wait — you'll need them during lecture

Grab bag: networks, multivariate vis, dashboards

SI 649 W20: Information visualization

Matthew Kay, Assistant Professor, School of Information
& Computer Science and Engineering
University of Michigan

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This week

Lecture

Networks
Multivariate visualization
Dashboards

Lab

Peer round robin (group projects)

Lab reflections

No more lab reflections

If you did one this past week, it’s a bonus

Remaining group project milestones

Initial implementation and demo (Apr 7, Apr 8)

Final presentation (Apr 19, Apr 20)

Final report (Apr 24)

Lecture breakouts

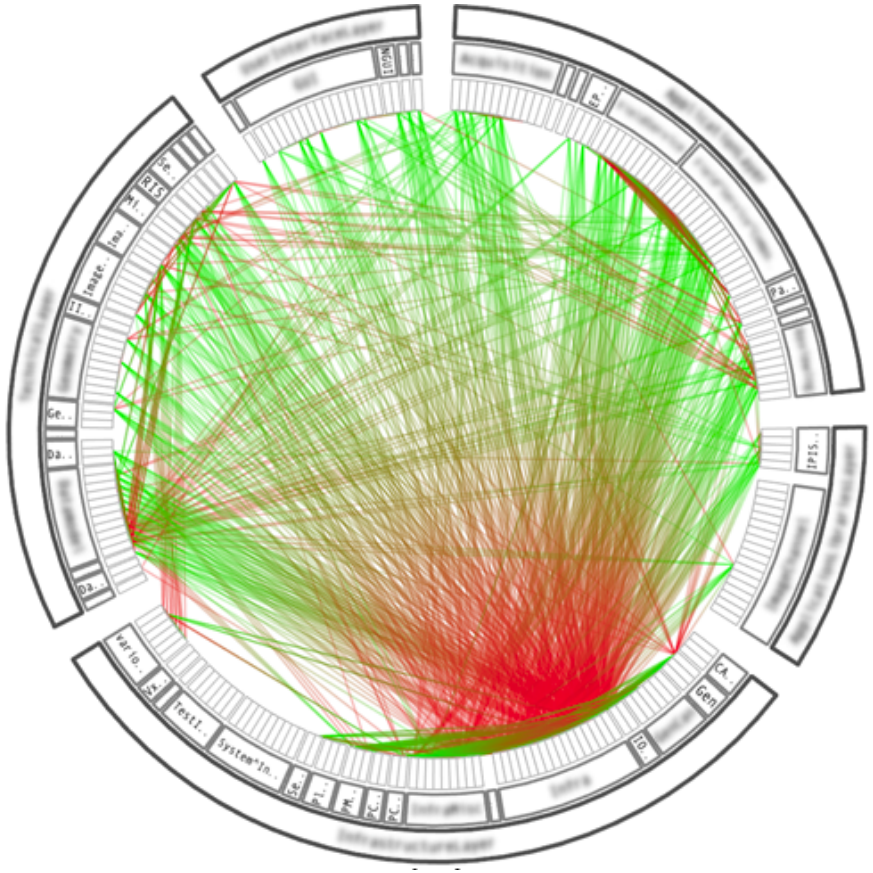
We're going to give Zoom breakouts a try today

In the short term, please make sure you have the slides downloaded from Canvas (Week 13 folder) — you'll need them for reference

Networks

Boosting effectiveness: layout: edge bundling

[Holten, Hierarchical Edge Bundles: Visualization of Adjacency Relations in Hierarchical Data]



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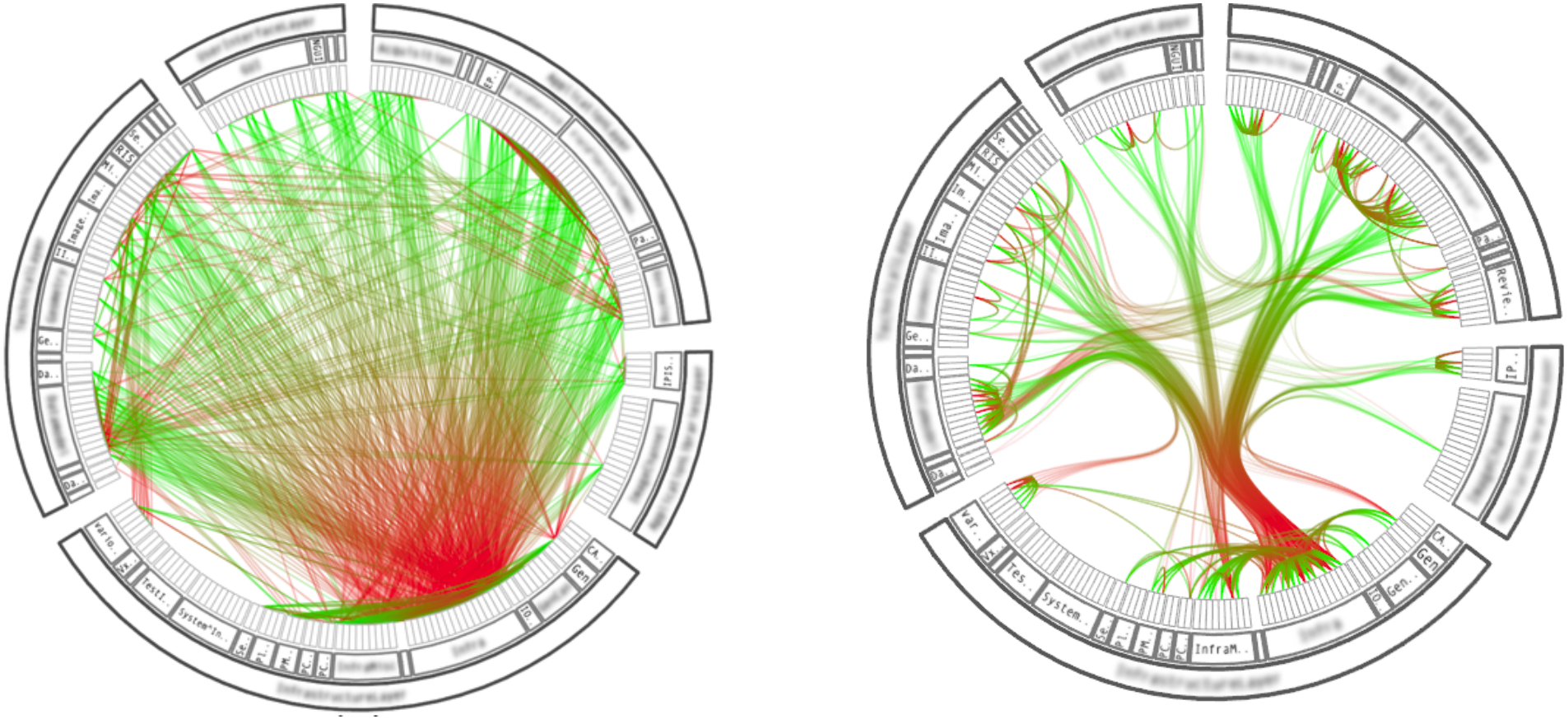
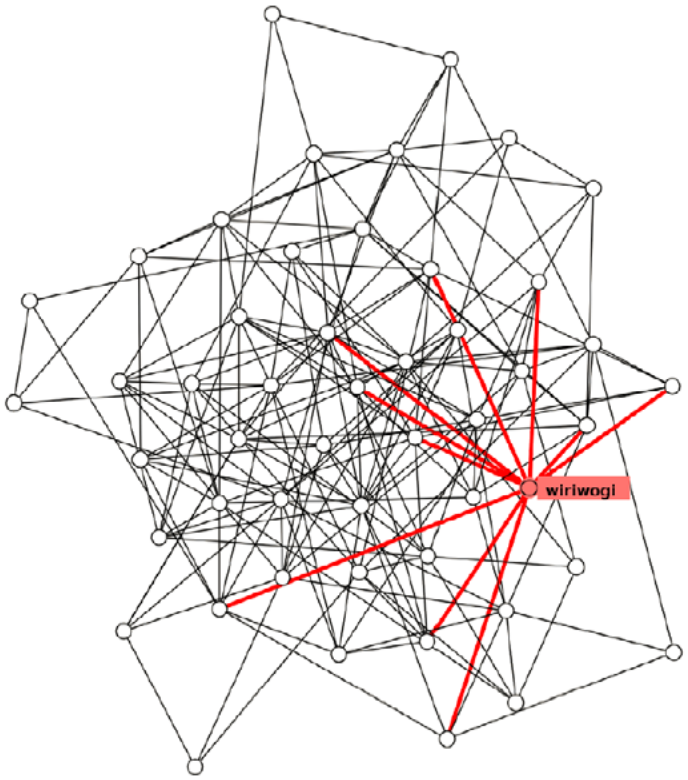


Node linearization

[McGuffin, Simple Algorithms for Network Visualization: A Tutorial, 2012]



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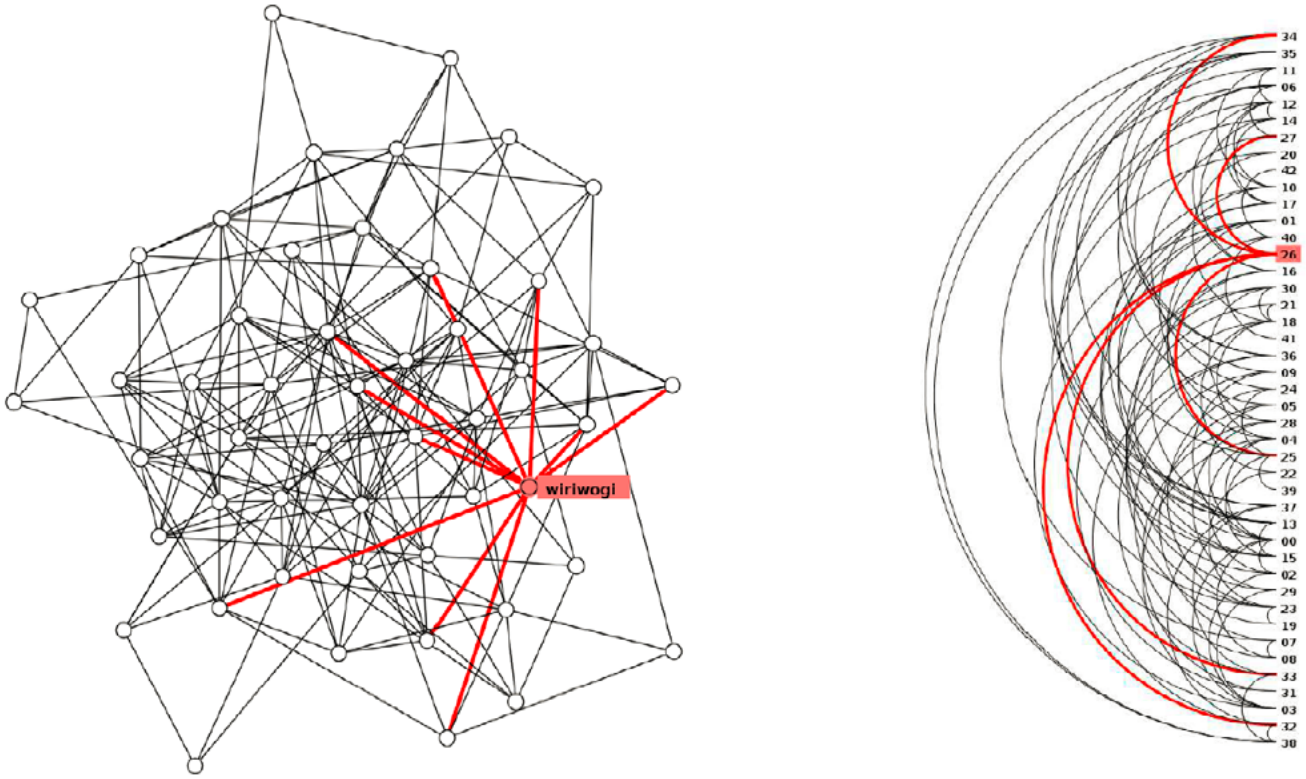

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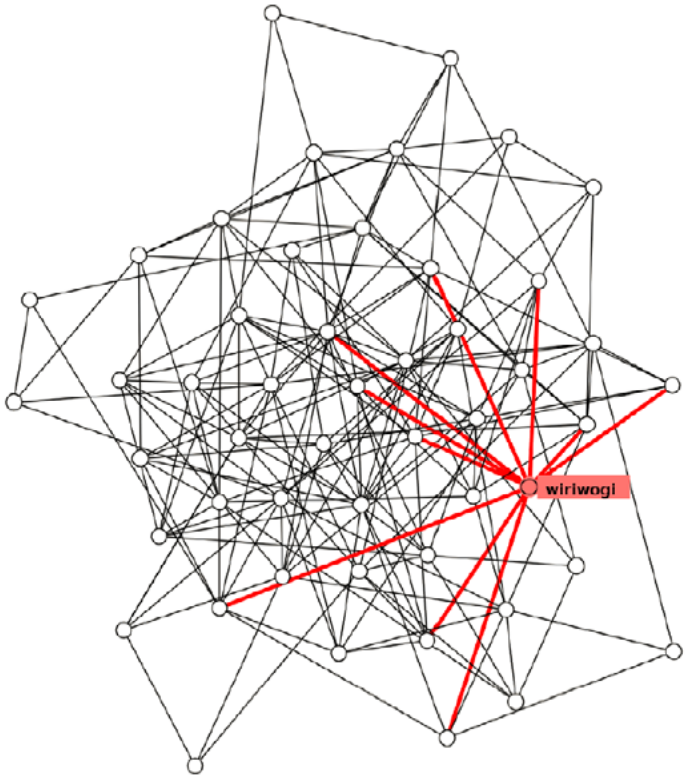

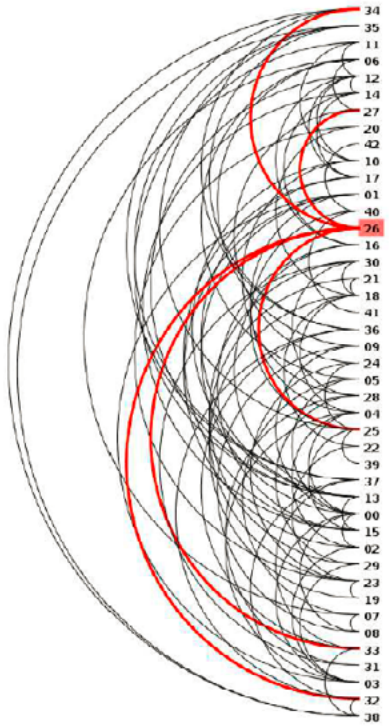

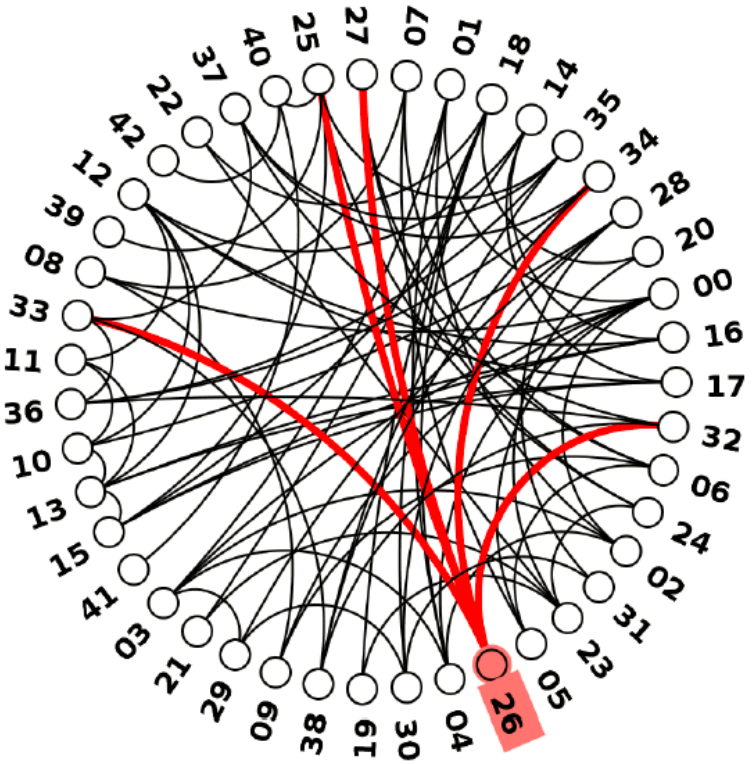

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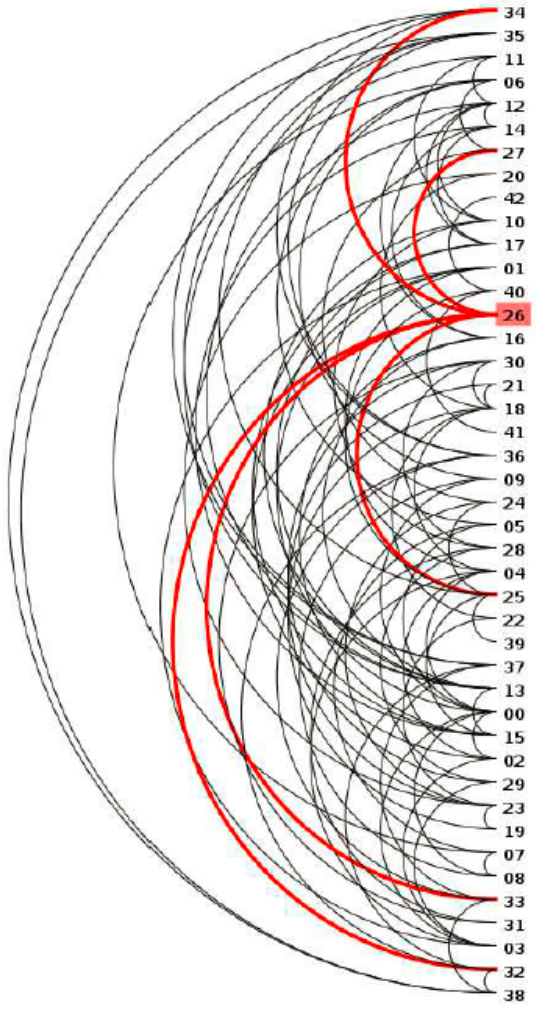
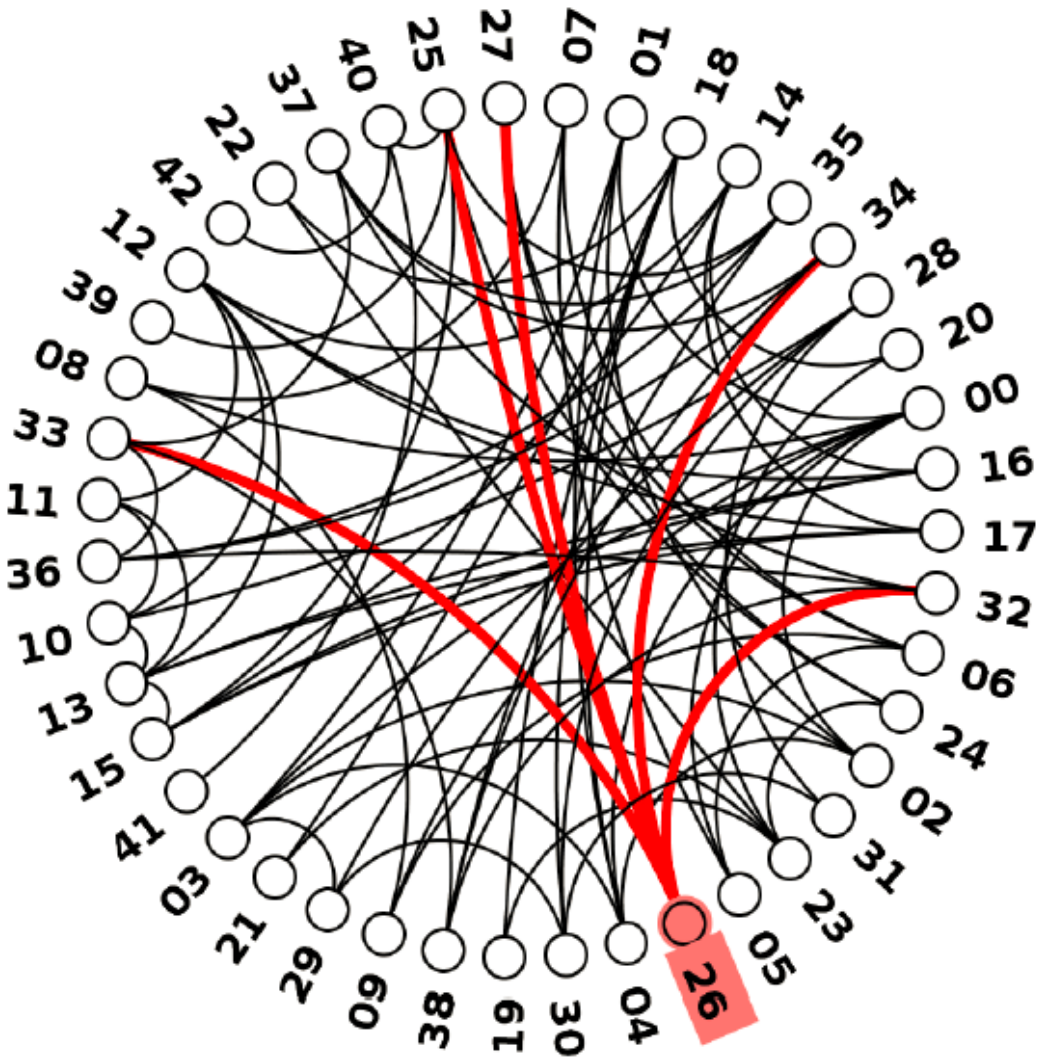
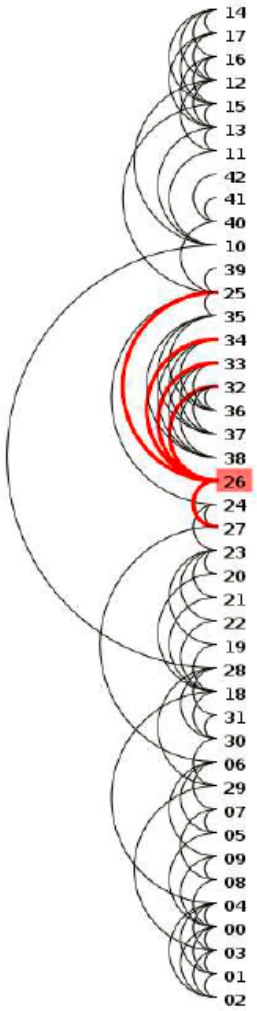
[McGuffin]

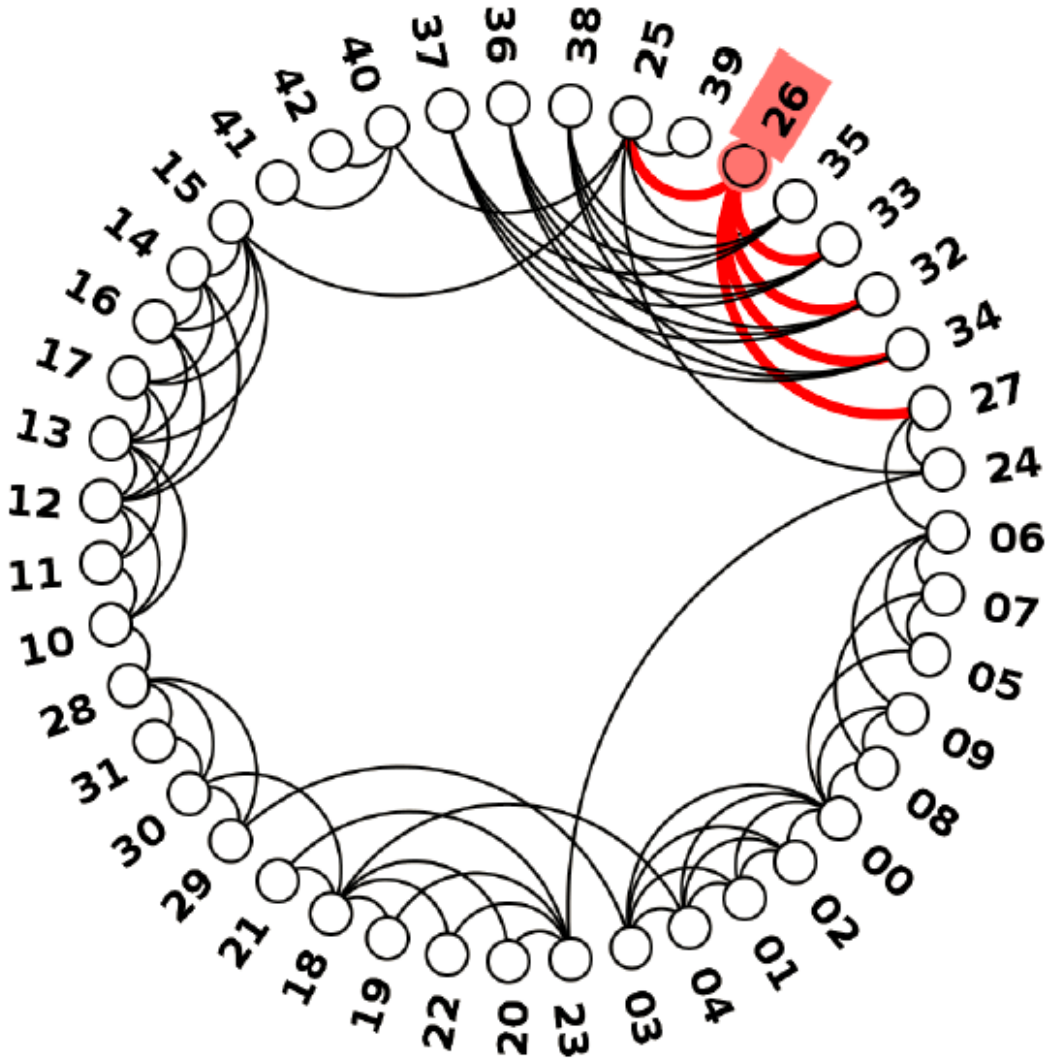




Node linearization: Barycentric order

[McGuffin]





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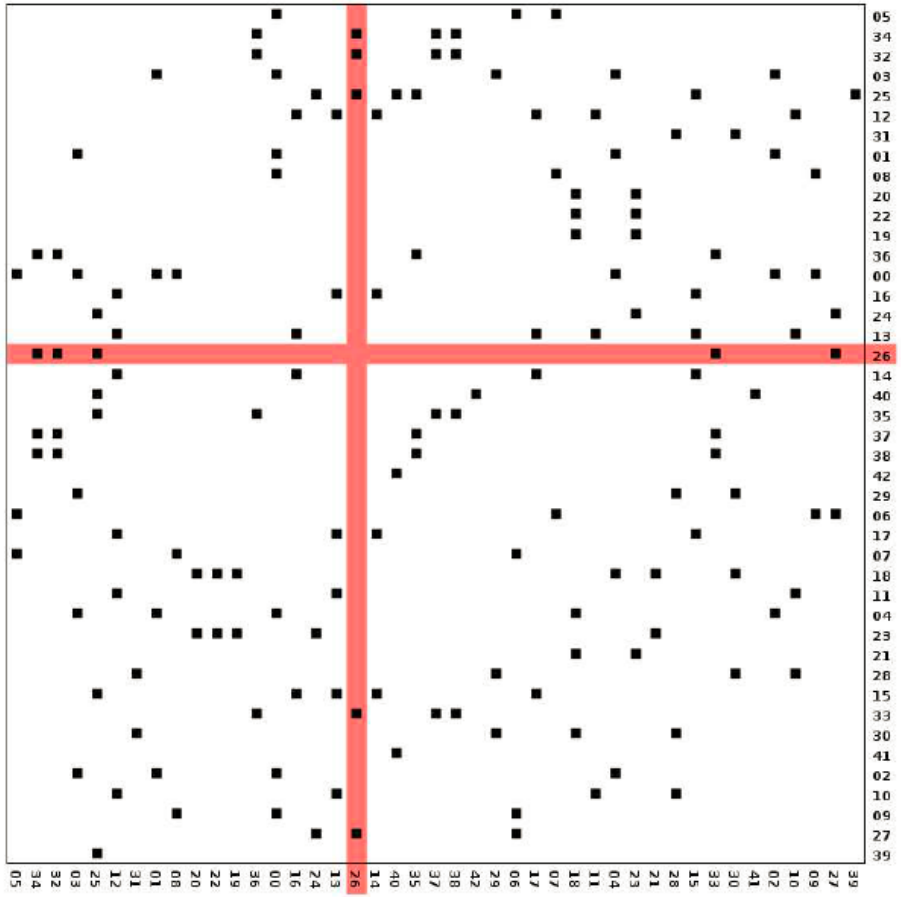

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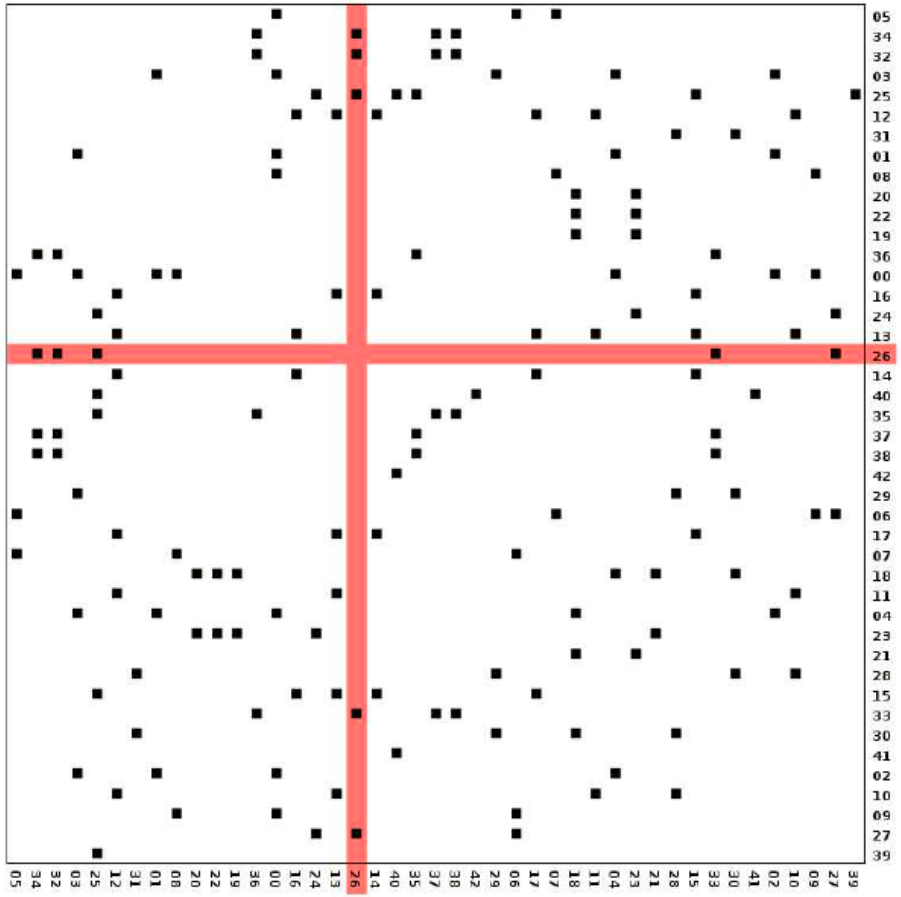
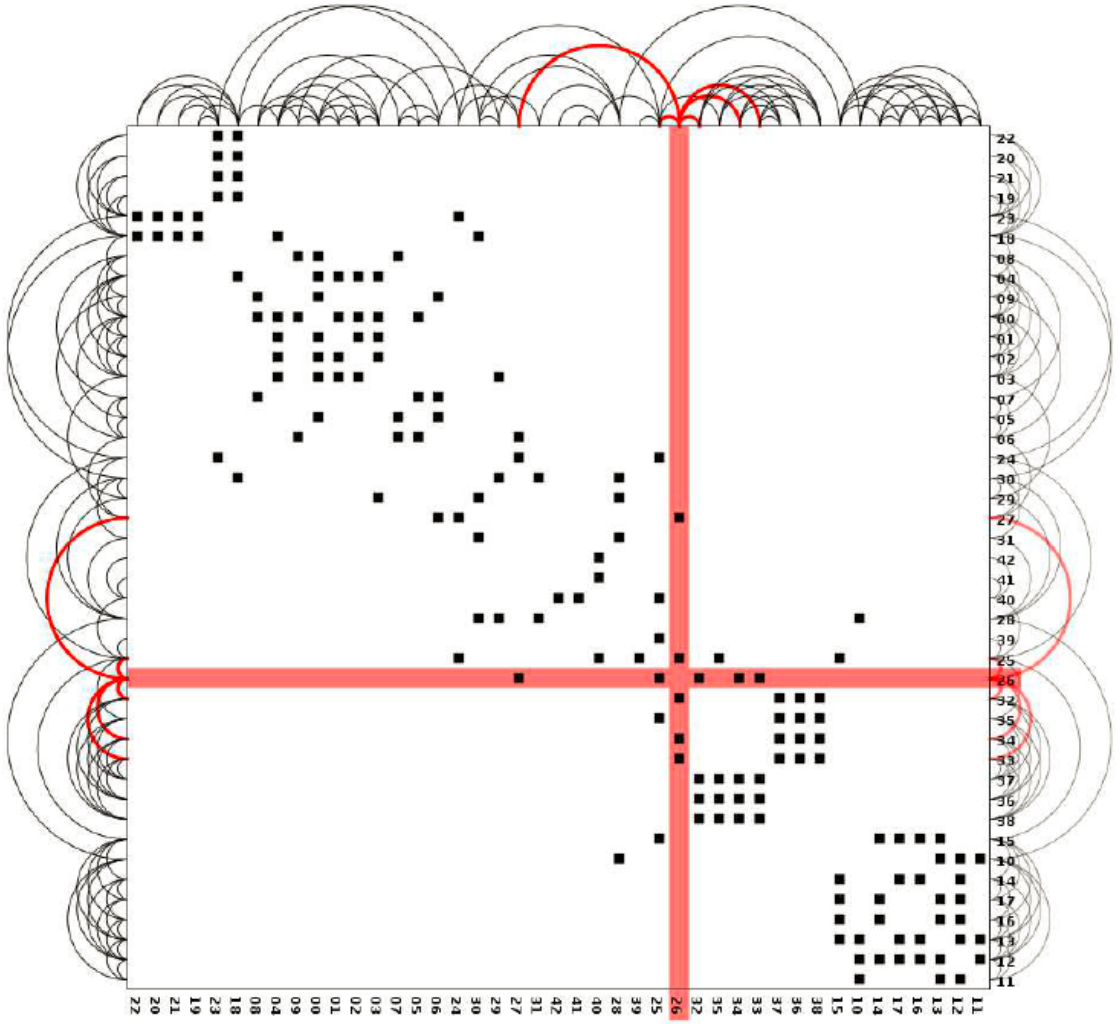
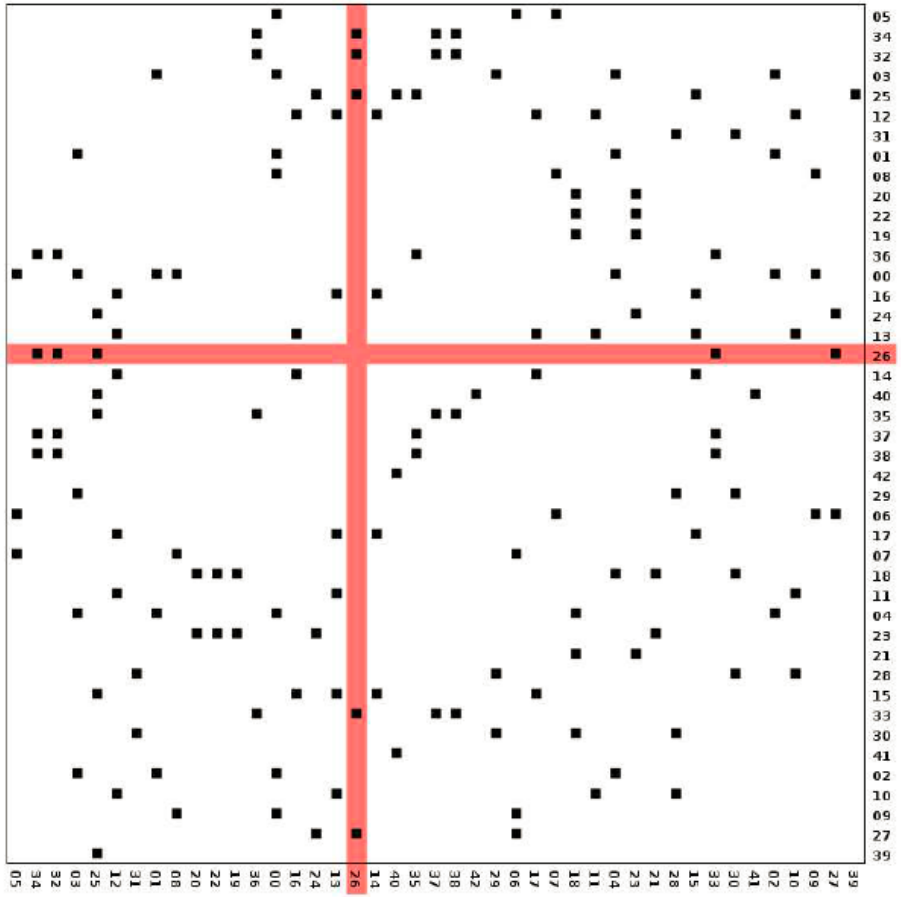
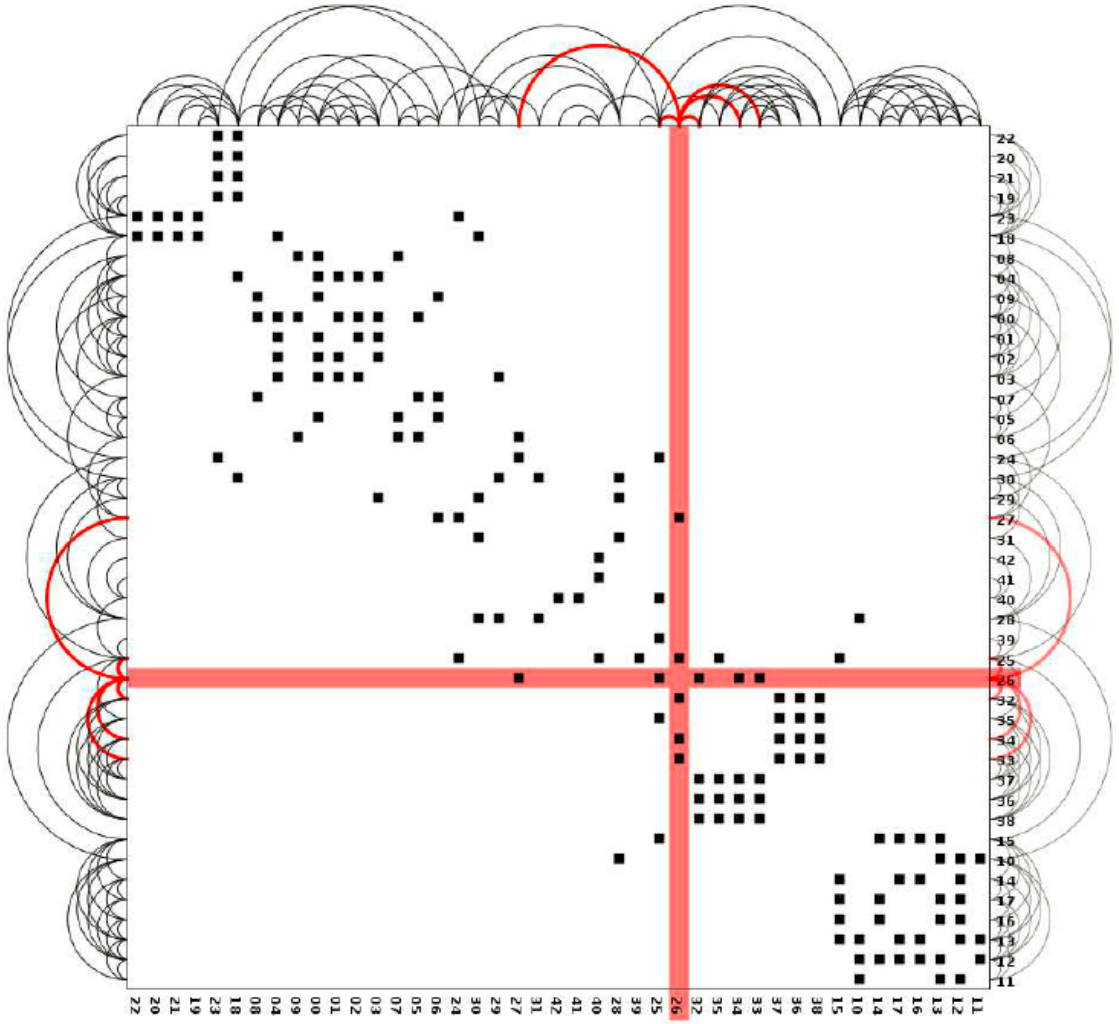




(also node-link + matrix example: MatLink)

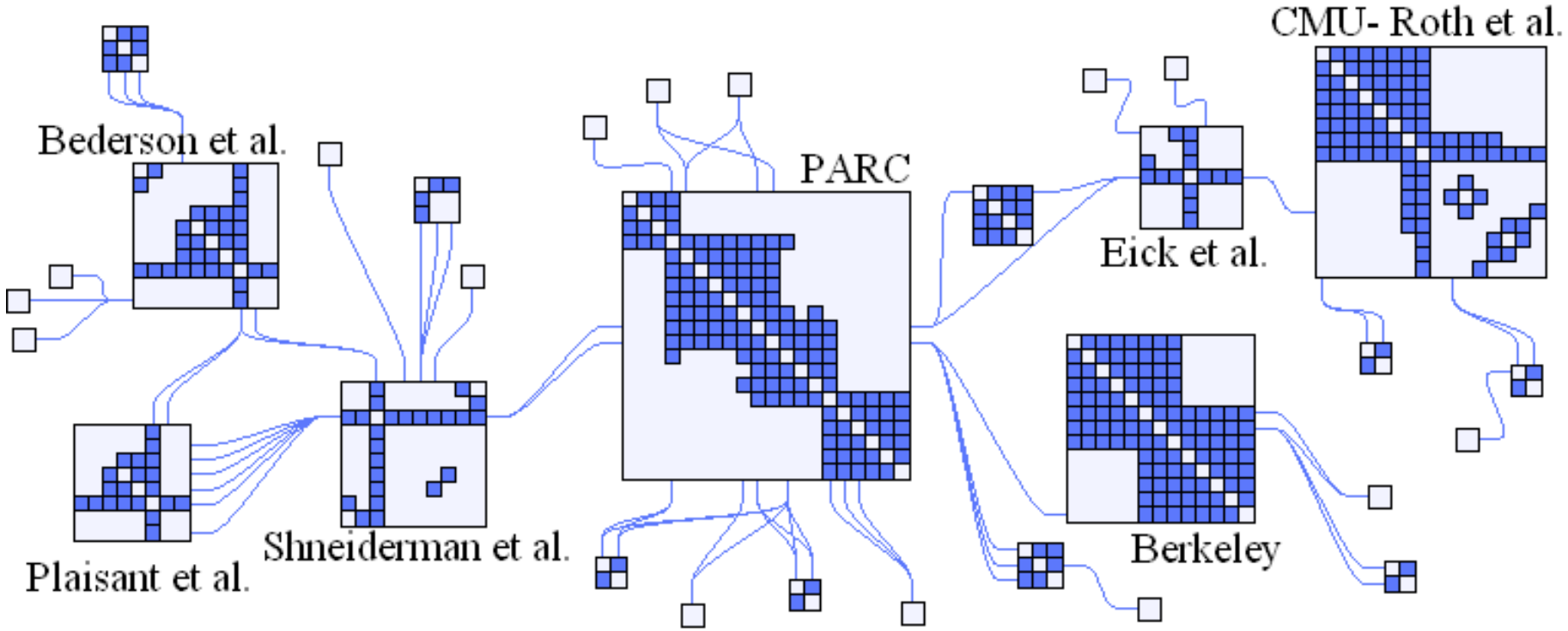
[McGuffin]





NodeTrix: the other way around

[Riche et al, http://www.aviz.fr/Research/Nodetrix, https://www.youtube.com/watch?v=7G3MxyOcHKQ]



Multivariate visualization

Multivariate data

Examples of useful techniques for multivariate data:

1. Small multiples
2. Scatterplot matrices
3. Parallel coordinates

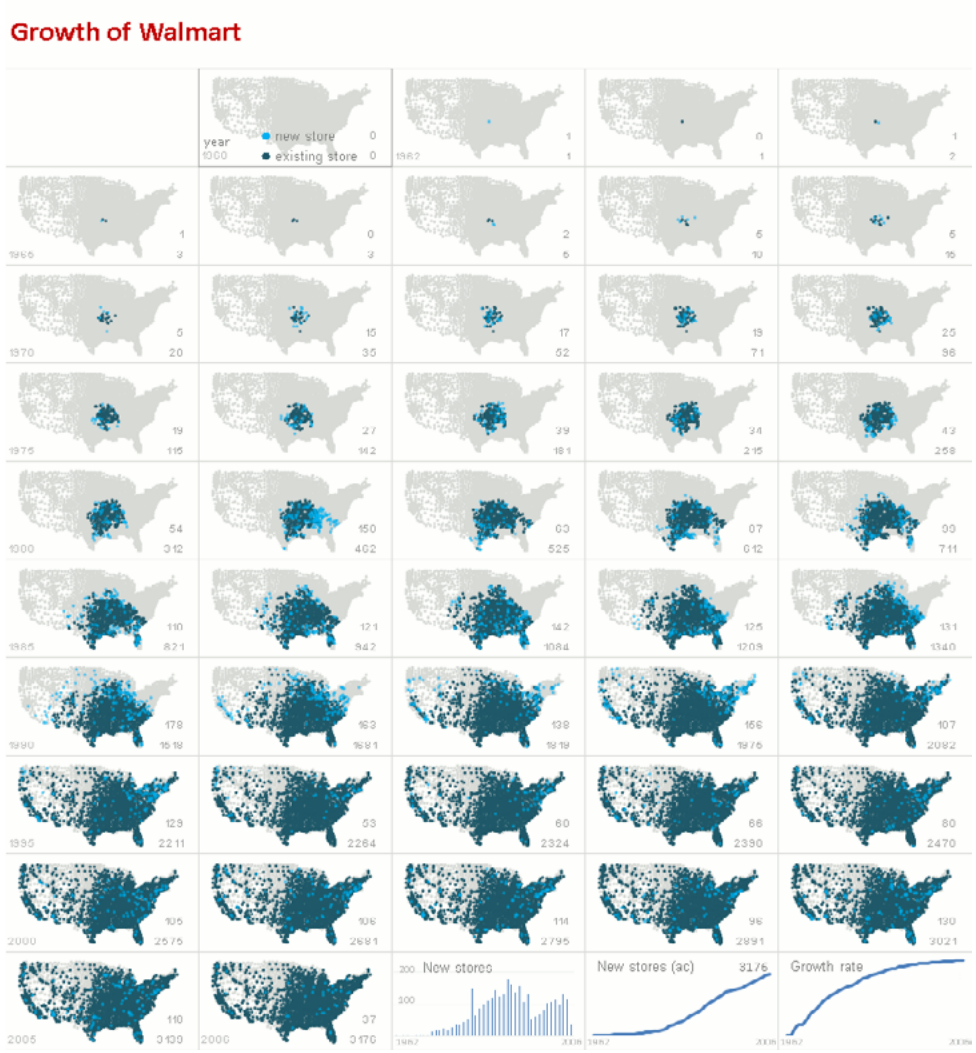
Walmart example (we've already seen)

Reader-driven comparison

Micro-macro readings, layering

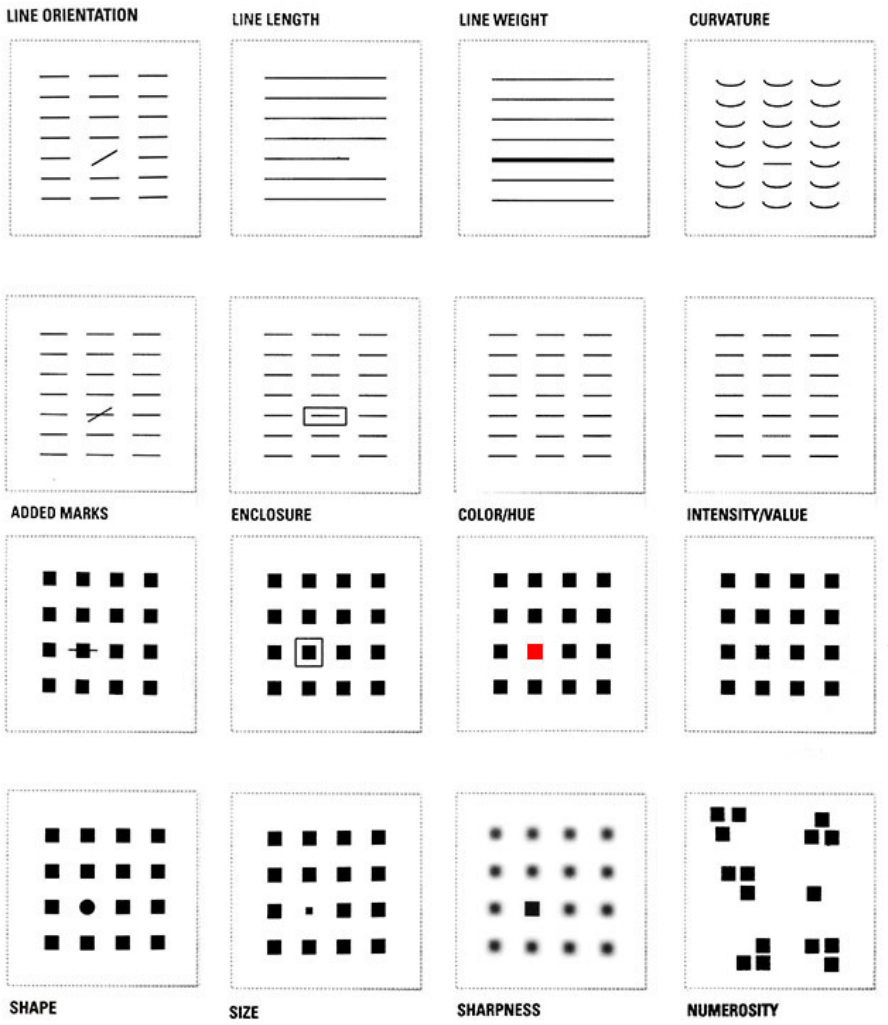
High-level properties through ensemble coding

Double use of position channel

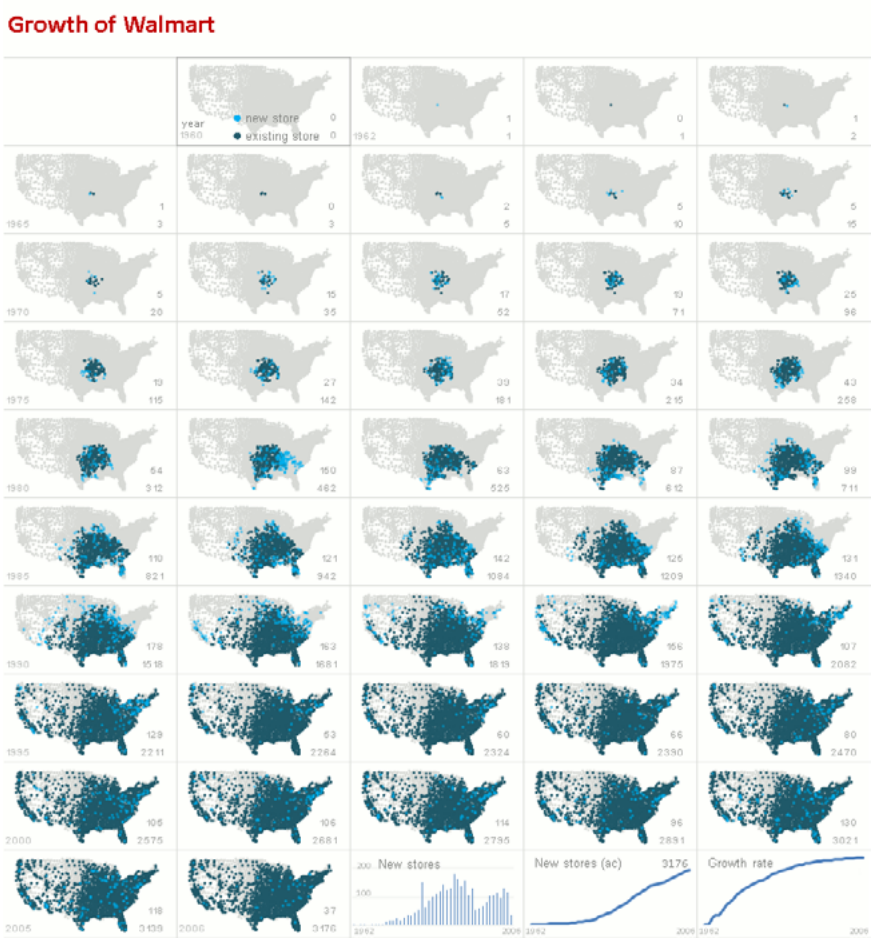


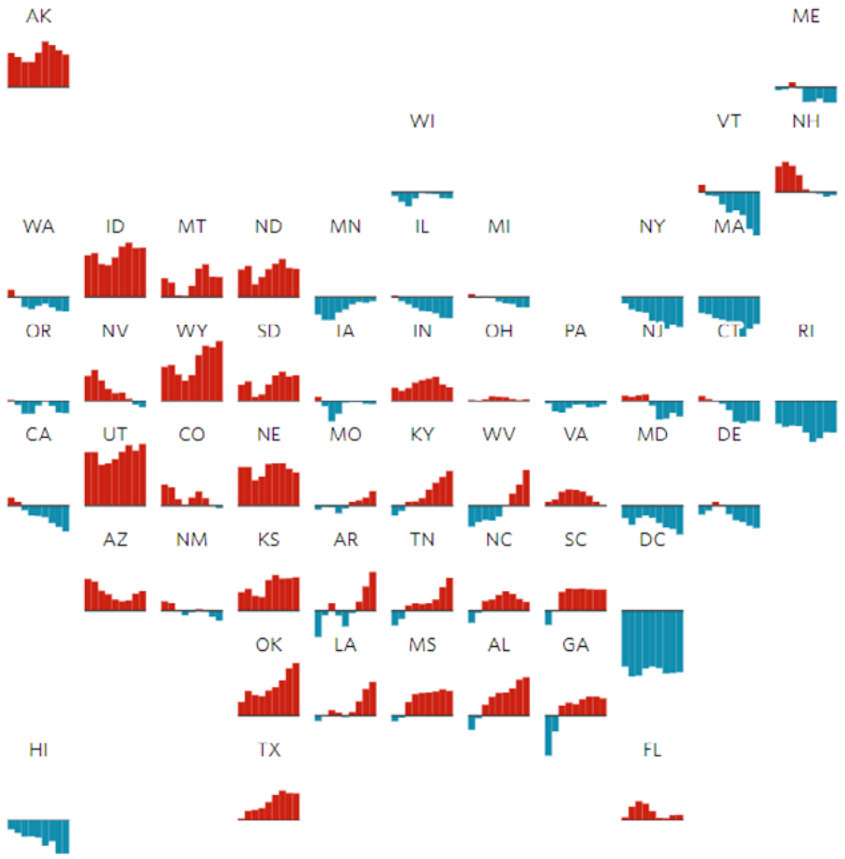
Micro-macro / layering

Can use preattentive attributes for layering in small multiples



Position channel mappings for small multiples





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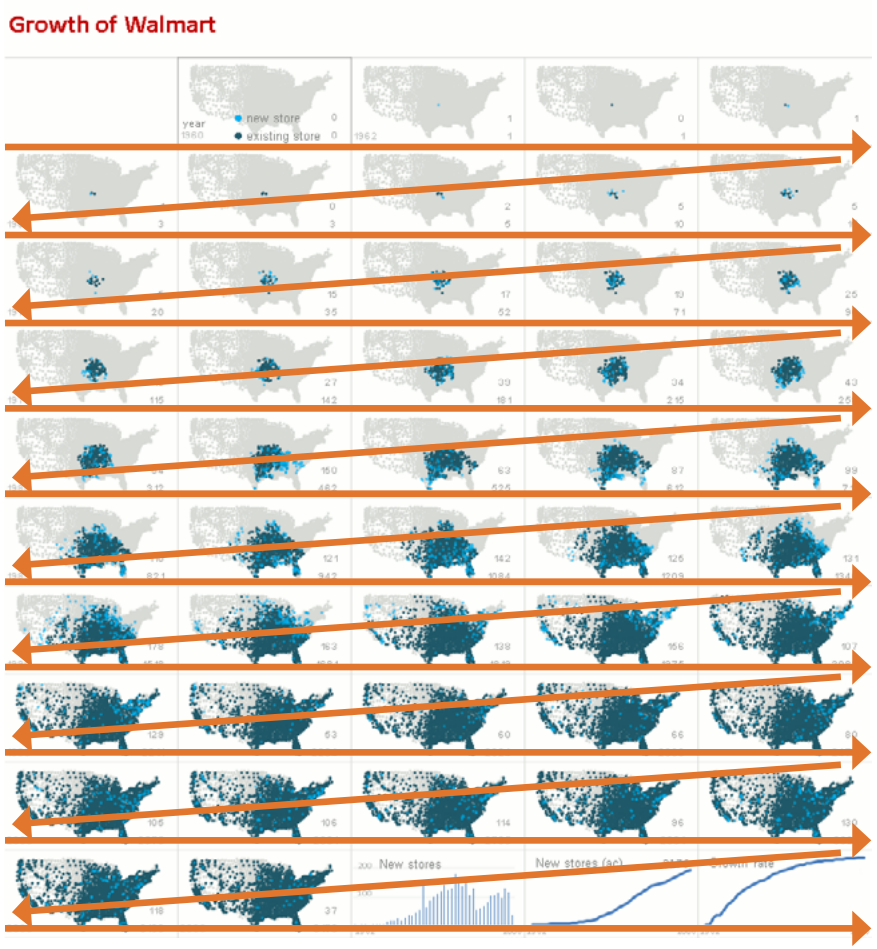
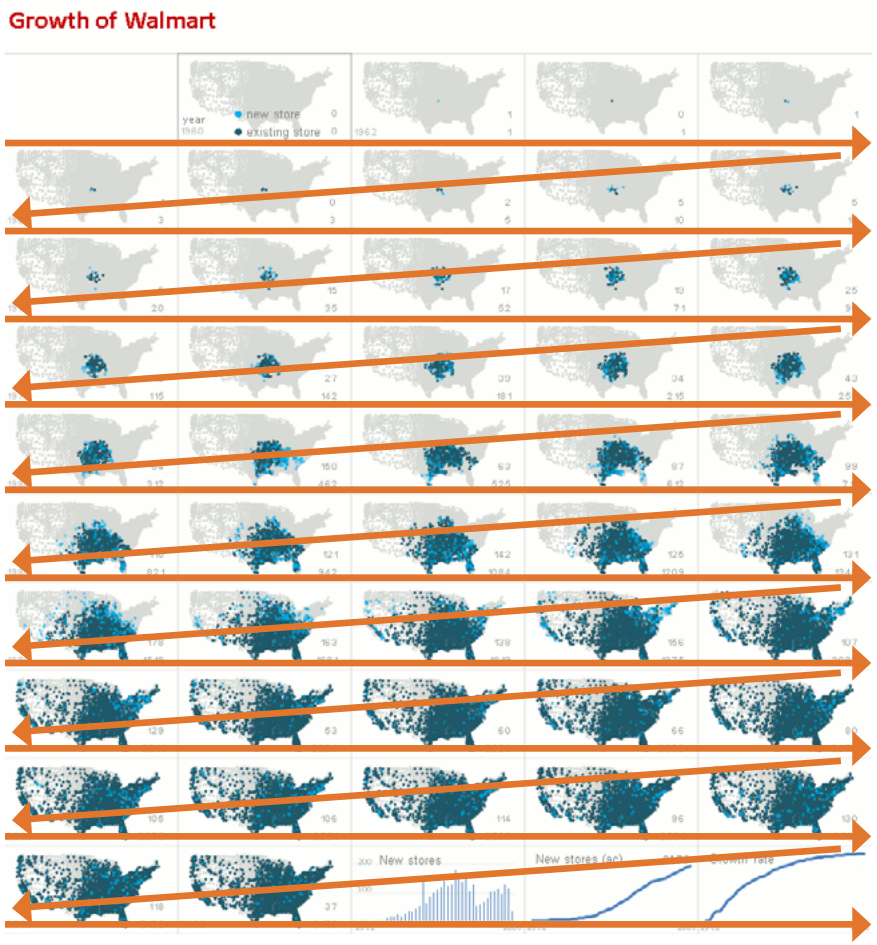


year -> wrapped column (x position)

Position channel mappings for small multiples



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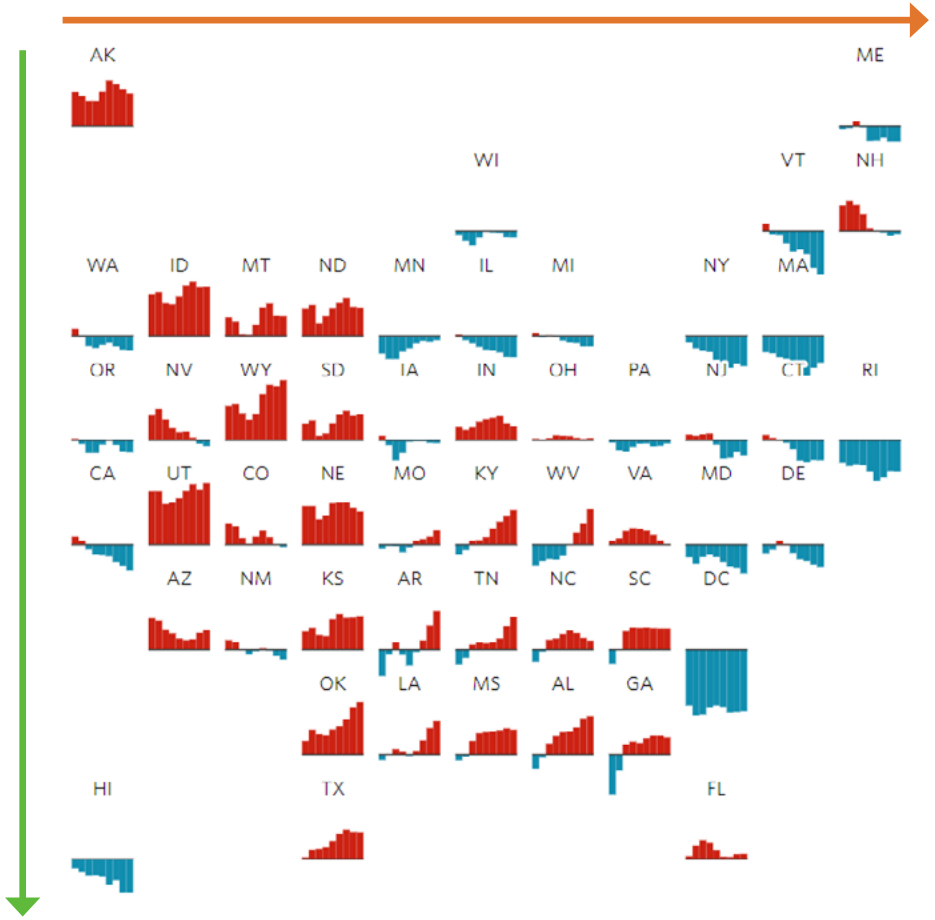


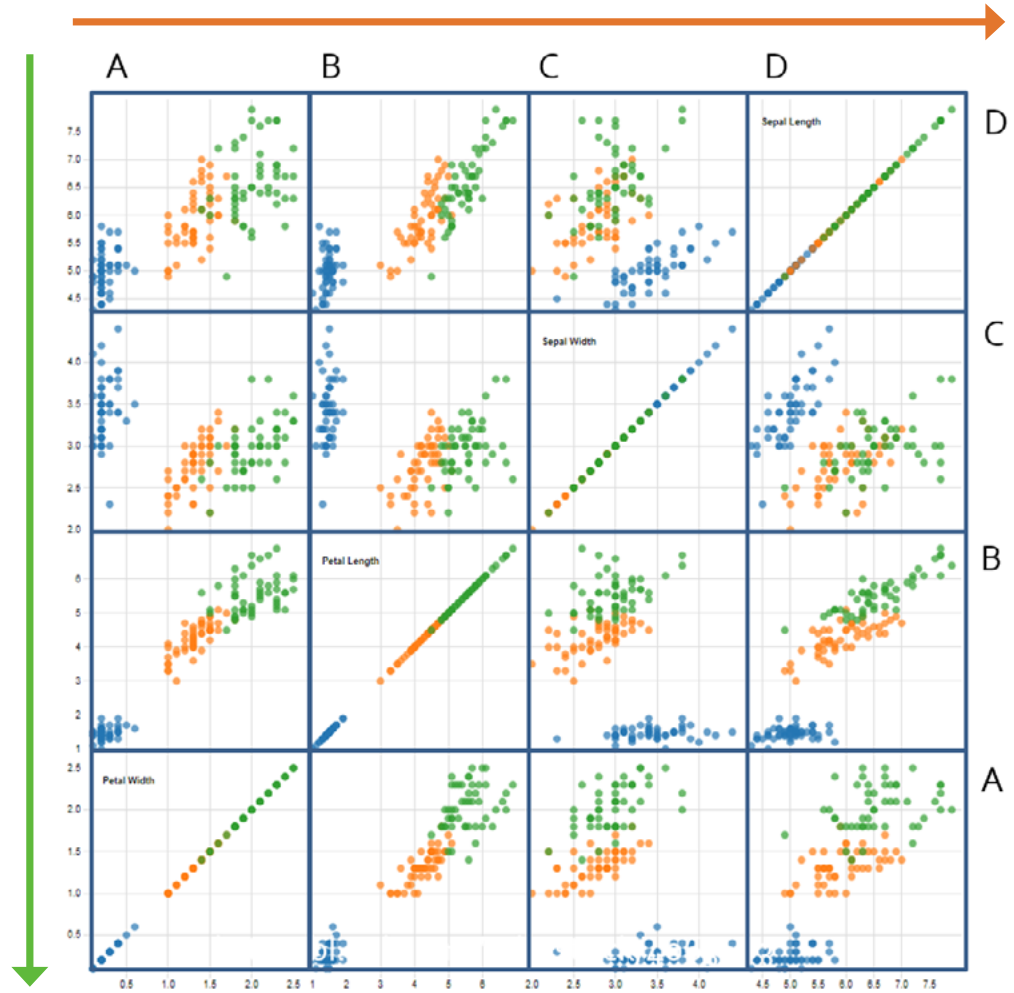
~longitude -> column (x position)
~latitude -> row (y position)

SPLOM: Scatterplot matrix

[https://bl.ocks.org/mbostock/4063663]

Special case of small multiples
variable -> column (x position)
variable -> row (y position)

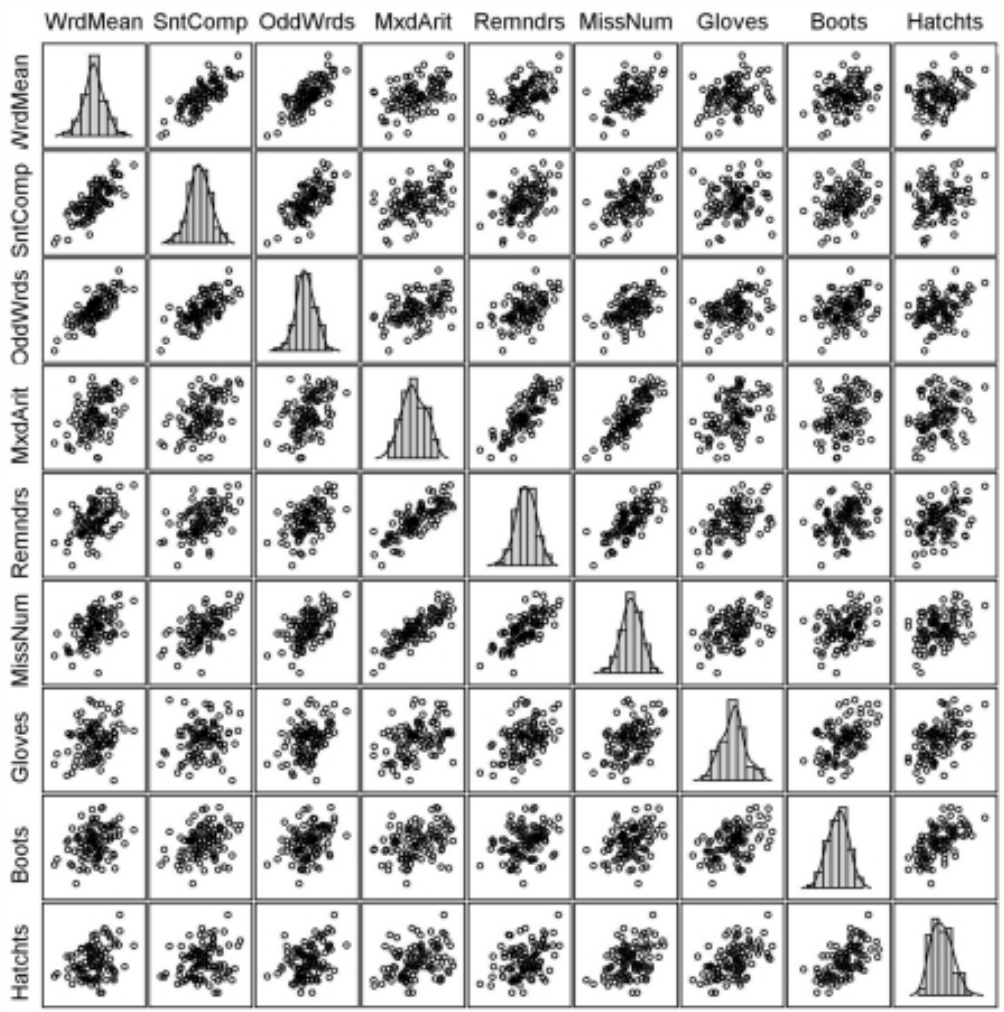
Each panel:
column variable -> x position
row variable -> y position



SPLOMs don't scale well with many variables

Scatterplot is best representation for correlation...

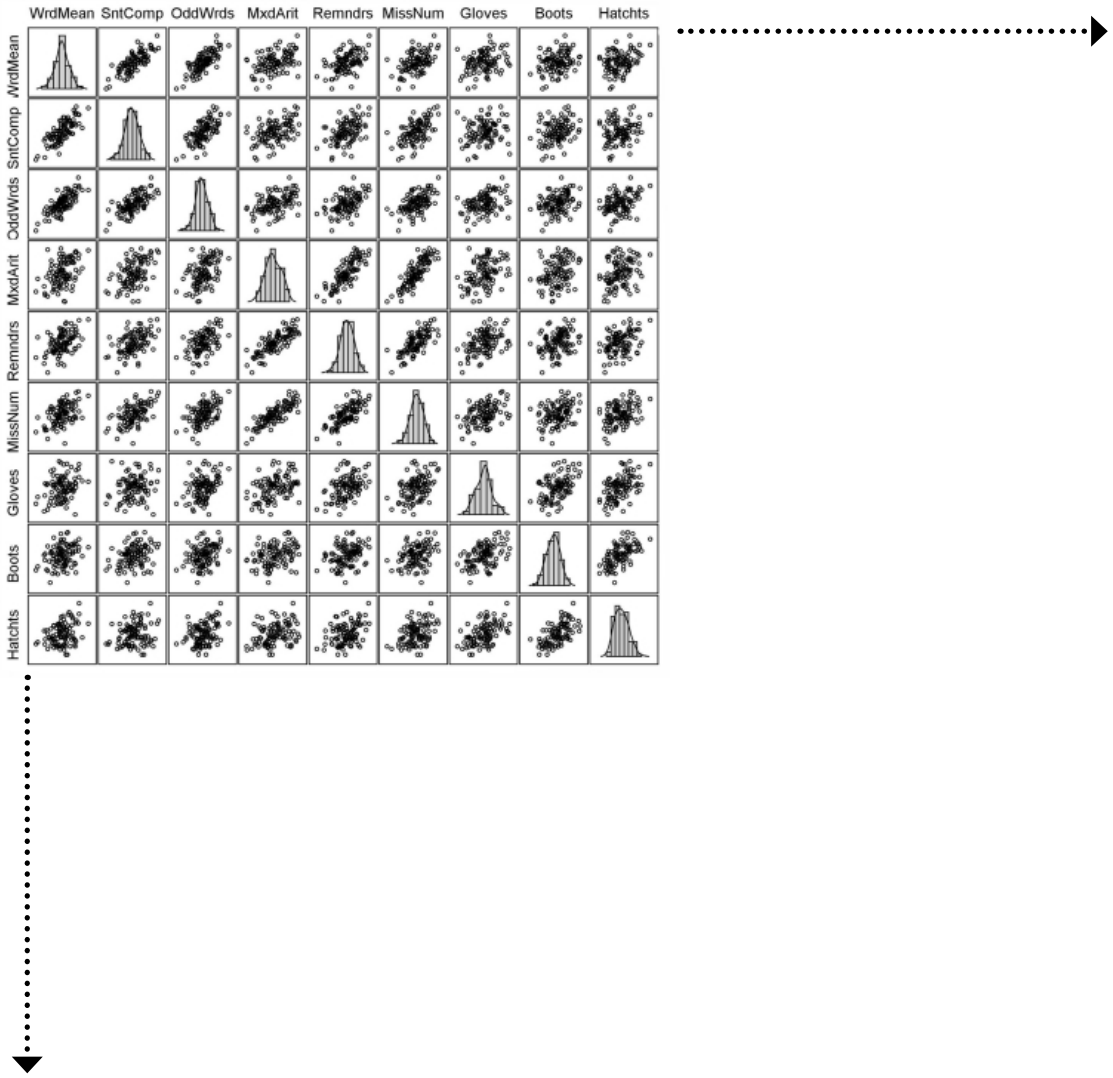
[Harrison et al., Ranking Visualizations of Correlation Using Weber's Law, InfoVis 2014]



SPLOMs don't scale well with many variables

Scatterplot is best representation for correlation...

But SPLOMs don't always scale



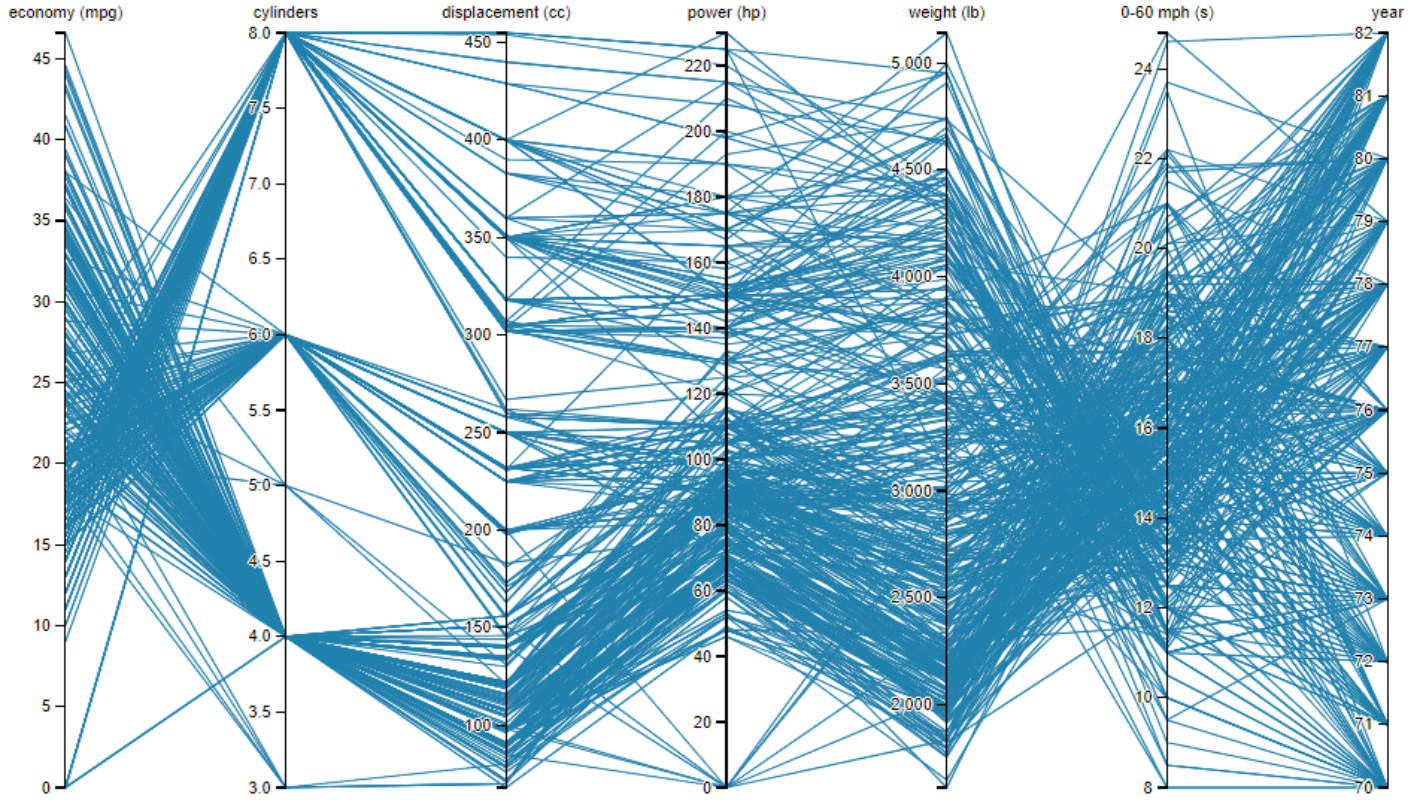
SPLOM alternative: parallel coordinates

[https://bl.ocks.org/jasondavies/1341281]

Scales better

But not best representation

Usually needs interactivity



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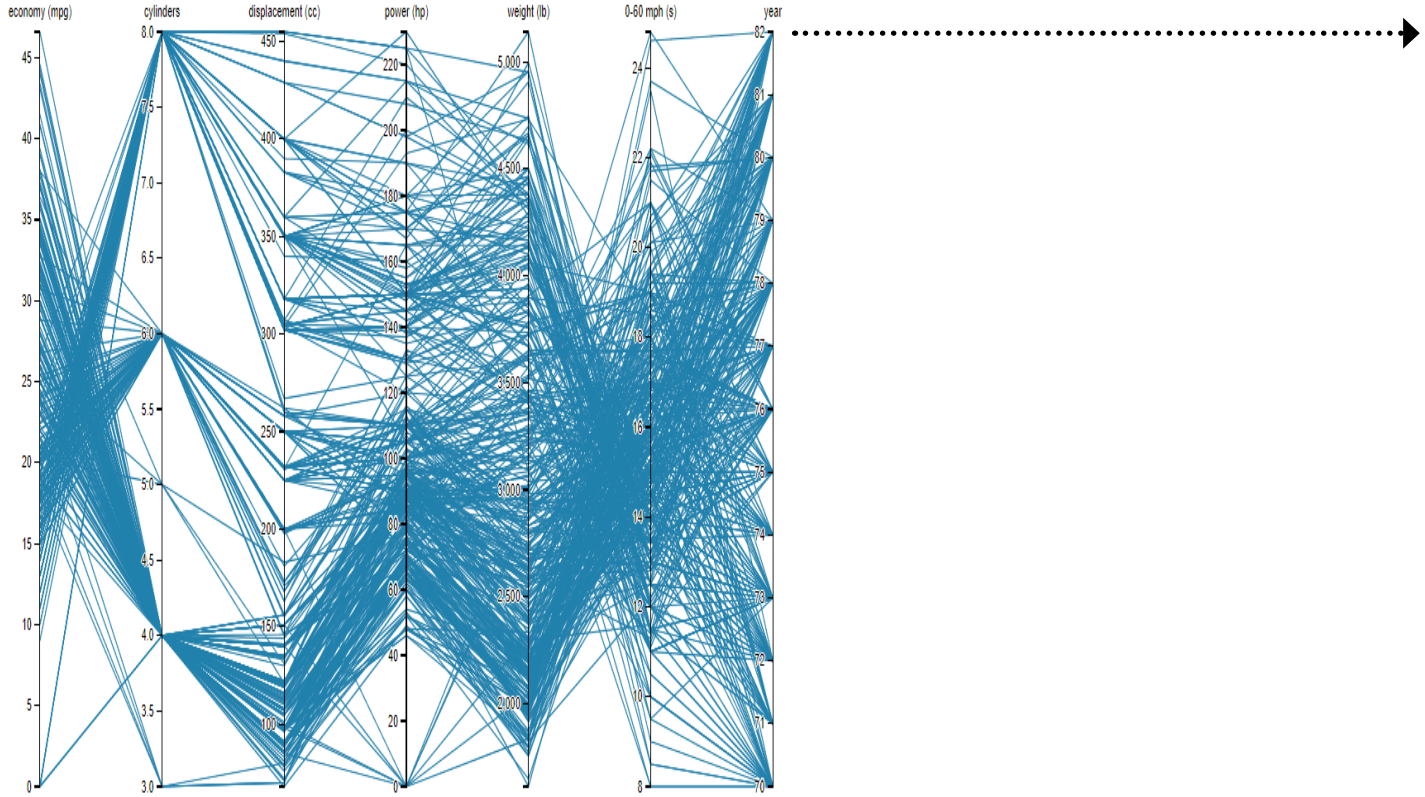


Multivariate visualization

Small multiples help a lot (double position encoding!)

SPLOMs great for correlation

Parallel coordinates: trade effectiveness for scale

Other approaches: dimensionality reduction, then vis

Dashboards!

What Do We Talk About When We Talk About Dashboards?

Alper Sarikaya, Michael Correll, Lyn Bartram, Melanie Tory, and Danyel Fisher. What Do We Talk About When We Talk About Dashboards?. *IEEE Transactions on Visualization and Computer Graphics*, 29(1): 682–692. 2019.

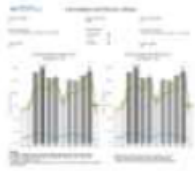
publication: paper DOI

materials: teaser video supplemental material

presentation: slides talk recording

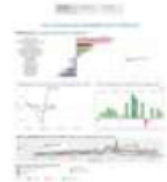
Dashboards have long been the much maligned visualization vehicle of choice for decision-making in commercial and governmental situations. While the visualization research community has concentrated much of its effort on visual analytics, the commercial success and widespread use of dashboards begs more attention. Critically, dashboards are becoming many peoples' direct connection to "big data" sources, enabling data democratization and wider access to data.

https://alper.datav.is/publications/dashboards/





































Dashboards: first, use what we know

Multiple simultaneous views implies:

- Use brushing and linking

- Design for reading at multiple levels

- Know what's important

Based on everything we've learned so far...

What does this dashboard do well?

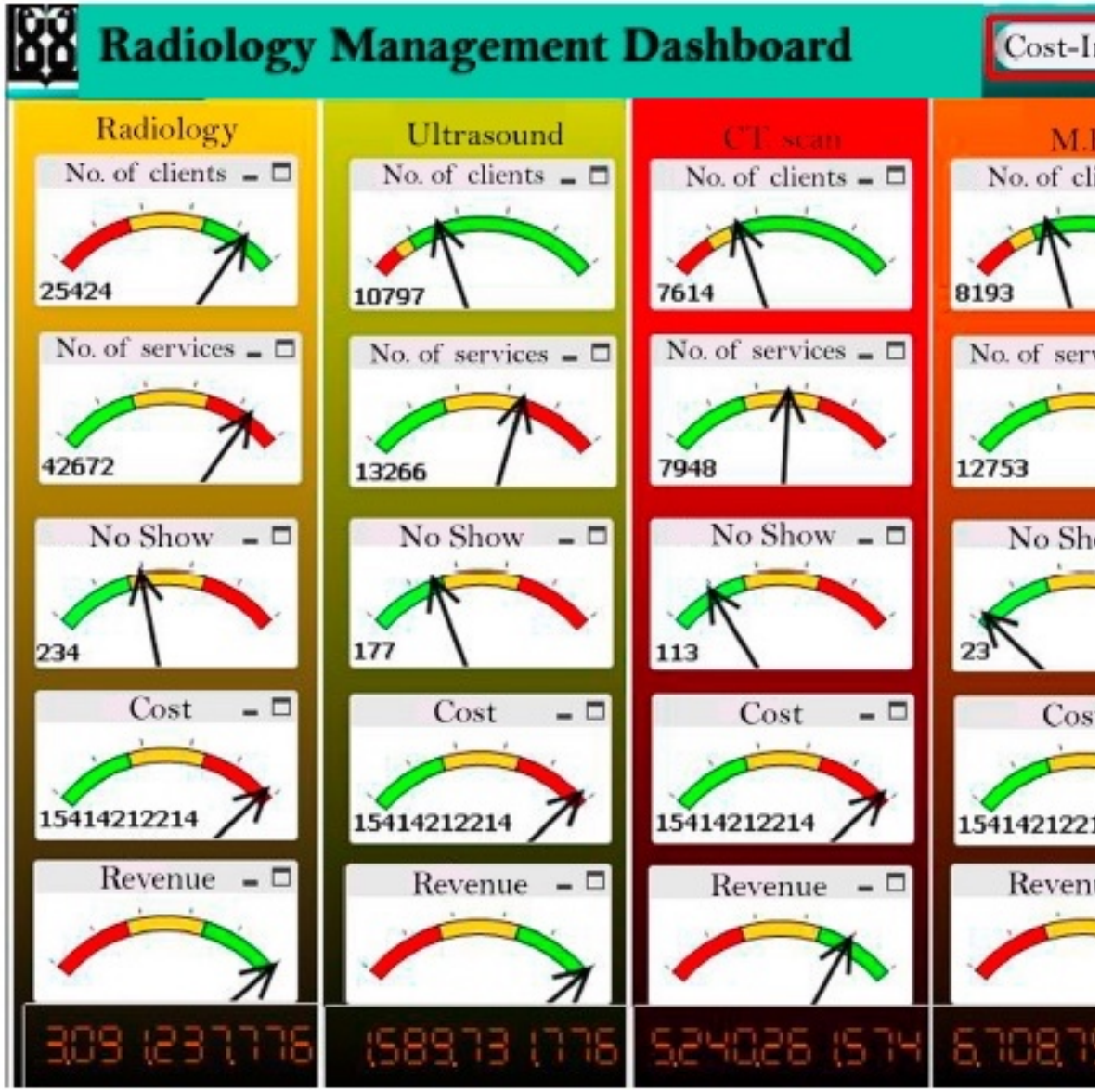
What does this dashboard do poorly?

How would you redesign it?

Good/bad?

Good:

- consistent encodings
- simplicity



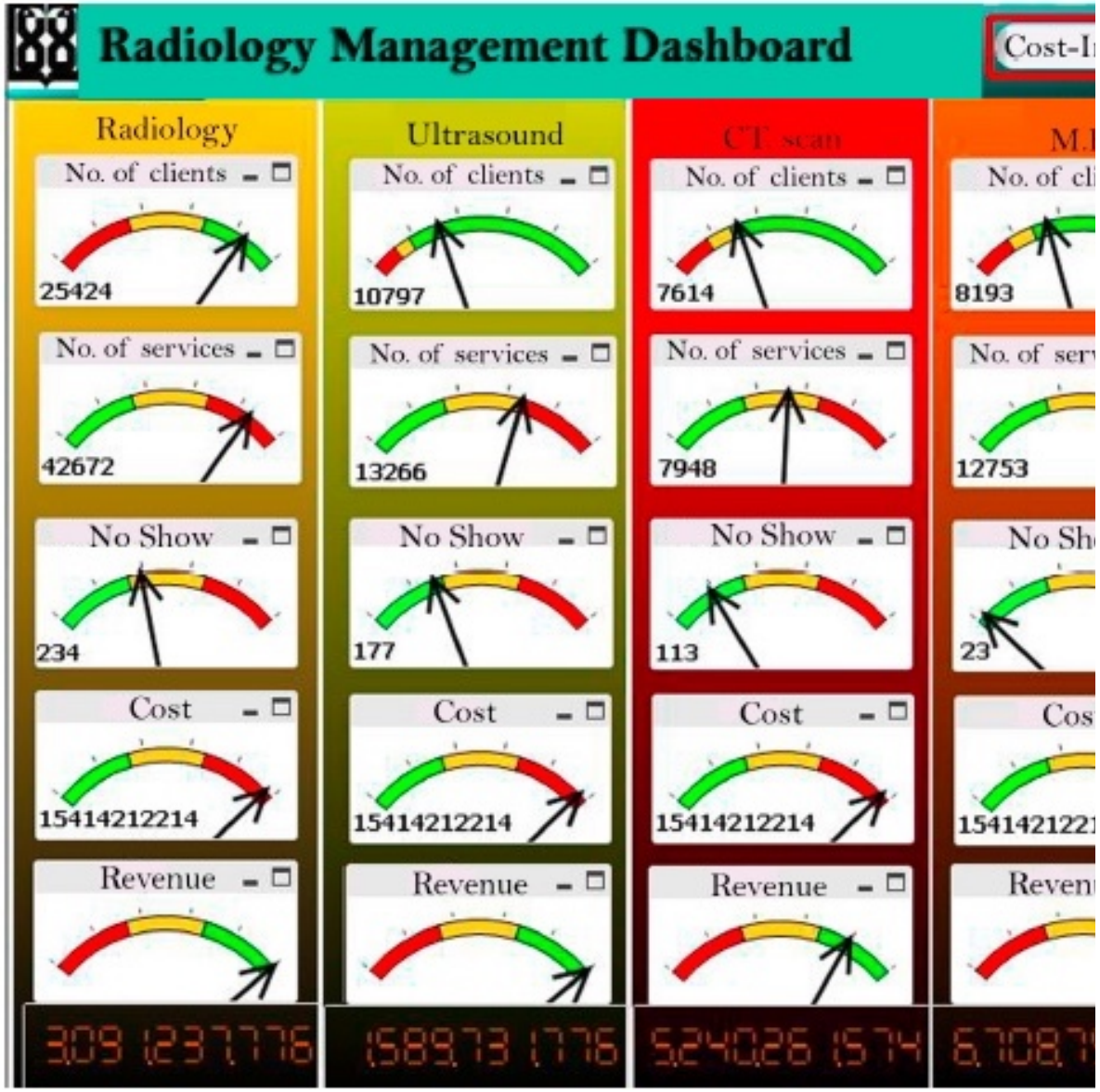
Good/bad?

Good:

- consistent encodings
- simplicity

Bad:

- HIERARCHY
- indexing



Remember hierarchy

State Indicators	All Students Performance
Chronic Absenteeism	N/A
Suspension Rate (K-12)	
English Learner Progress (1-12)	
Graduation Rate (9-12)	
College/Career (9-12) Select for one year of available data	N/A

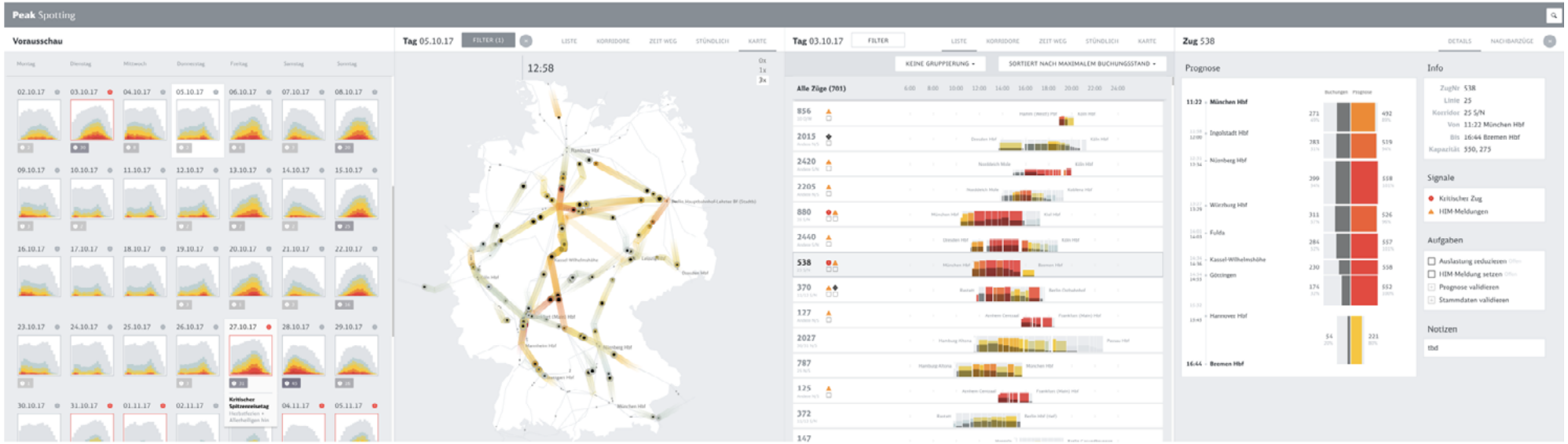
Performance Levels:

Red (Lowest Performance) Orange Yellow Green Blue (Highest Performance)

[J. Tucker. *How is your school doing?*, www.sfgate.com]

Dashboards can (and should) still be coherent

[https://truth-and-beauty.net/projects/peakspotting]



Calendar

"Big Picture" —
What are days of interest, and which patterns can we observe across days?

Day view

Understand a day: spot critical bottlenecks

→ Collect trains which need further inspection or treatment

Train collection

Inspect collected trains further, group, sort, annotate

Train details

Understand exact details for a train, compare to similar trains etc.

→ Actions: assign tasks, annotate, communicate

Peak-spotting

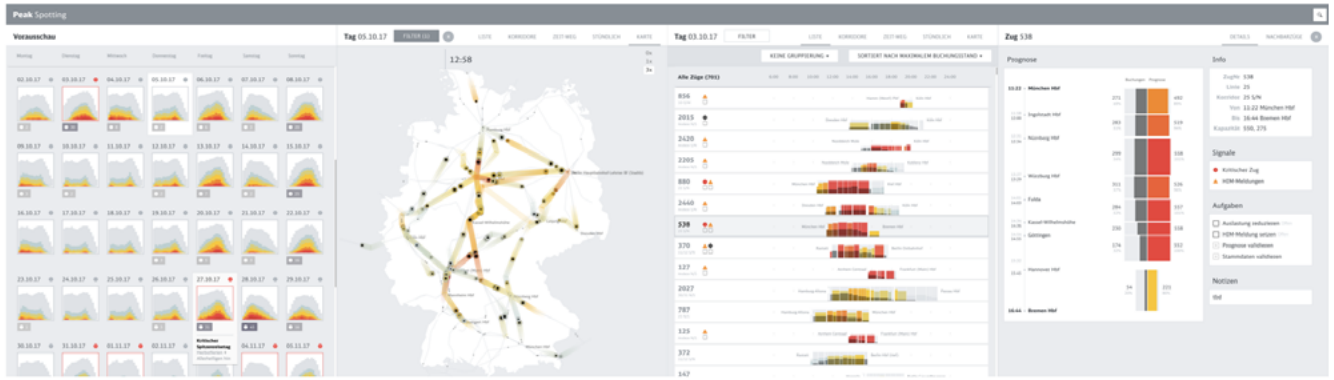
[https://truth-and-beauty.net/projects/peakspotting]

consistent encodings

good hierarchy

attention to workflow

brushing and linking



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Learnability matters

Consistent encodings maximize knowledge transfer across parts of the dashboard

Are users trained or is the dashboard doing the training?

- the former: displays can be more minimalist
- the latter: use communicative techniques to train

Dashboards summary

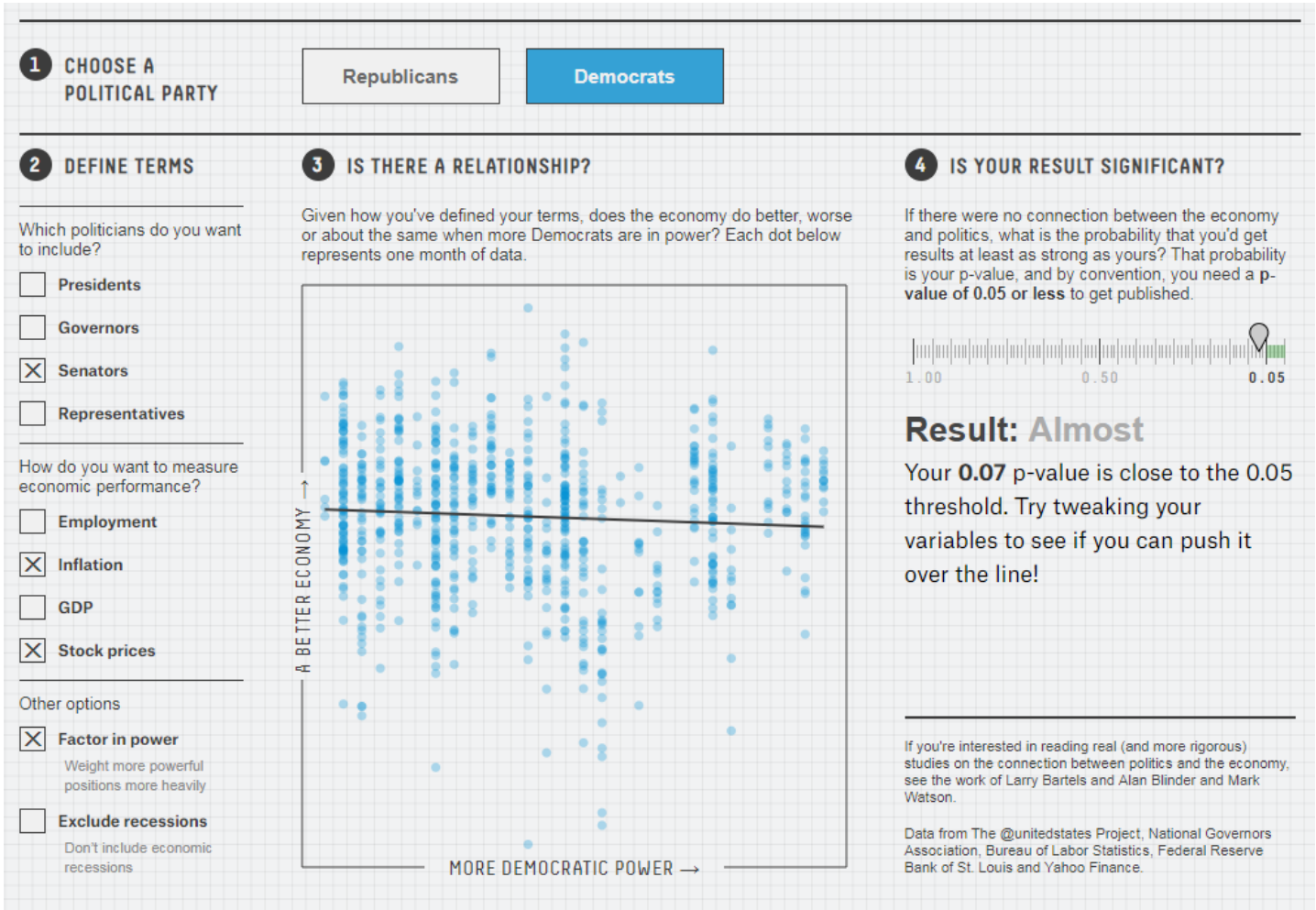
Employ visual hierarchy, consistent encodings

Consider how / when learning happens

Interactivity can help! Brushing / linking, etc.

Hack your way to scientific glory

[https://projects.fivethirtyeight.com/p-hacking/]

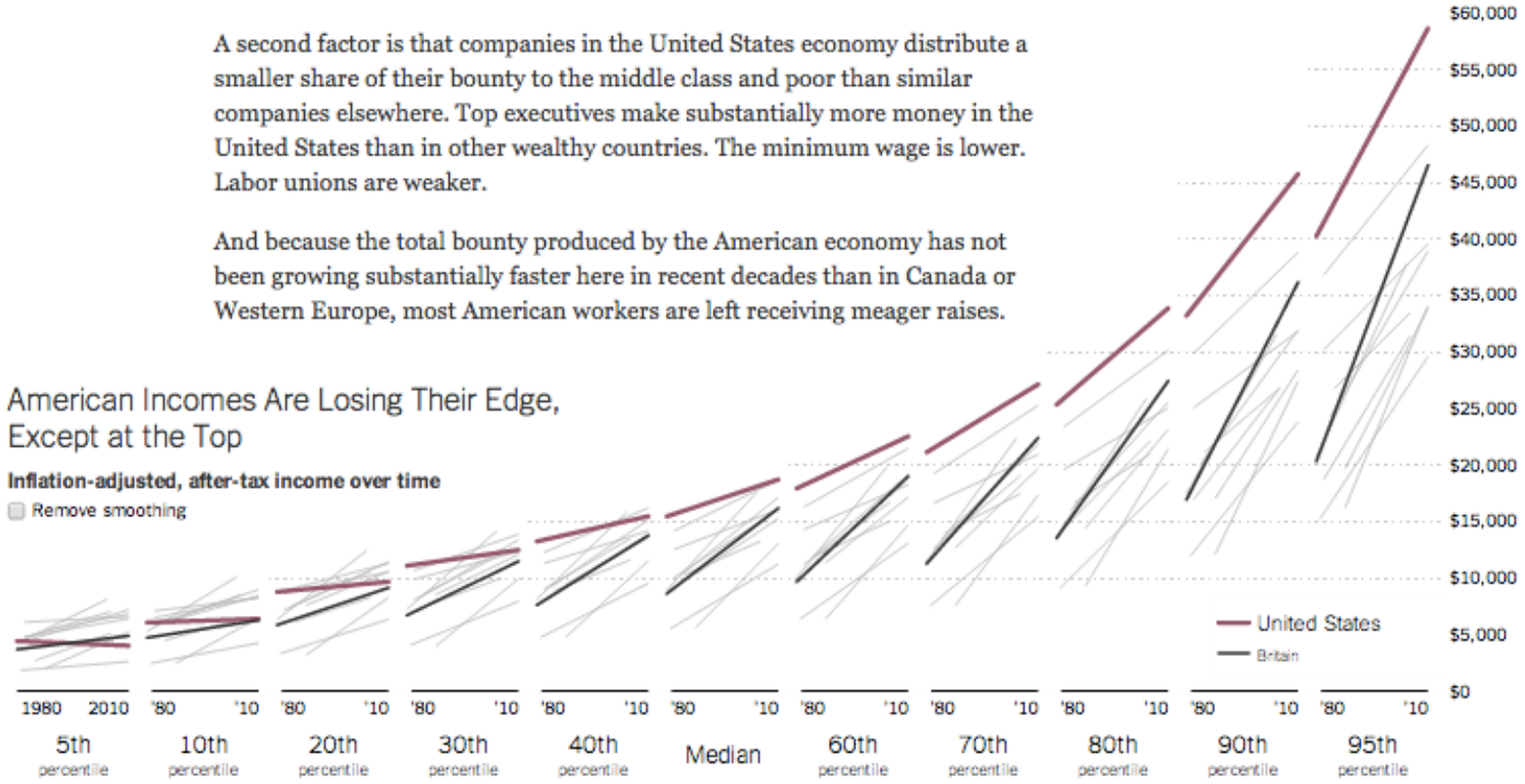


American middle class

[https://nyti.ms/2jRklJs]

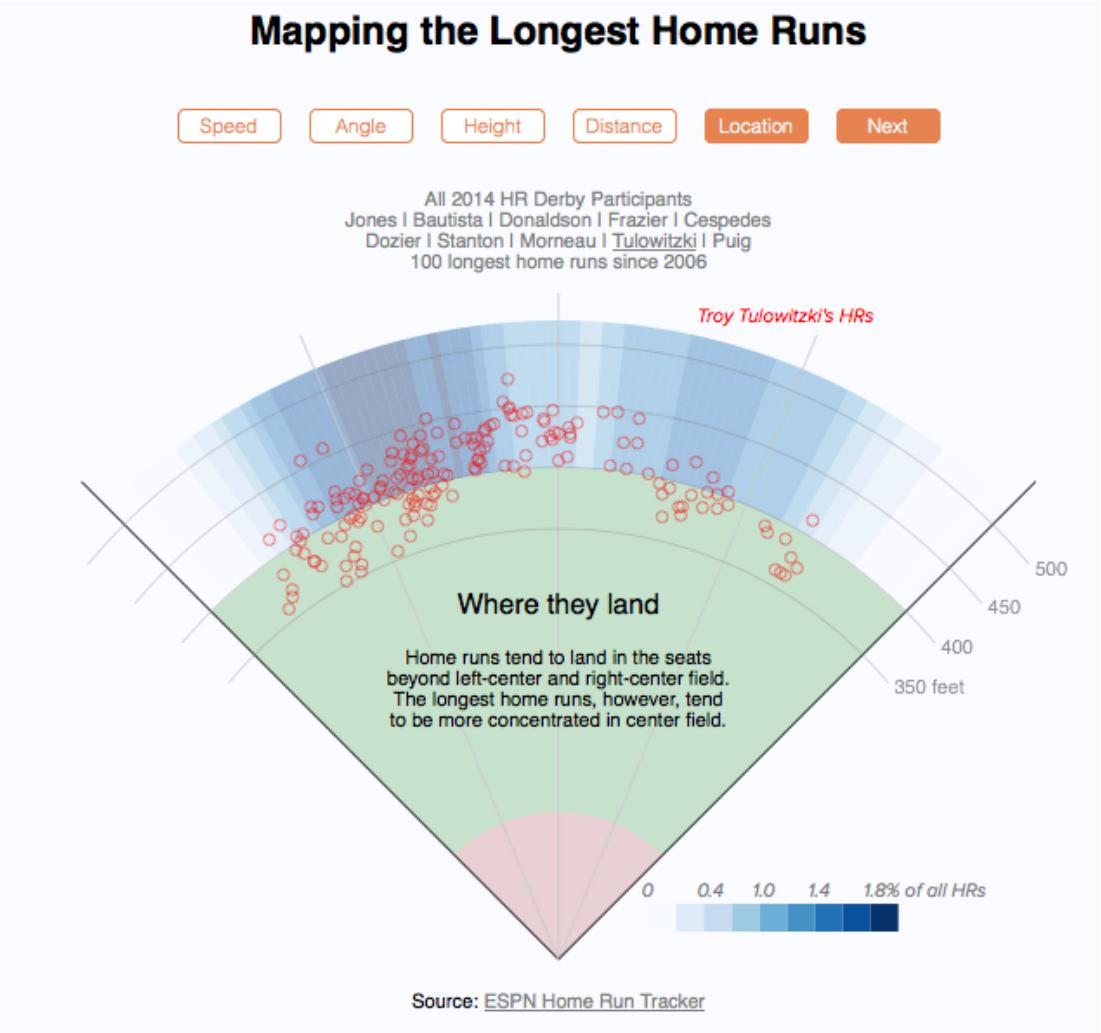
A second factor is that companies in the United States economy distribute a smaller share of their bounty to the middle class and poor than similar companies elsewhere. Top executives make substantially more money in the United States than in other wealthy countries. The minimum wage is lower. Labor unions are weaker.

And because the total bounty produced by the American economy has not been growing substantially faster here in recent decades than in Canada or Western Europe, most American workers are left receiving meager raises.



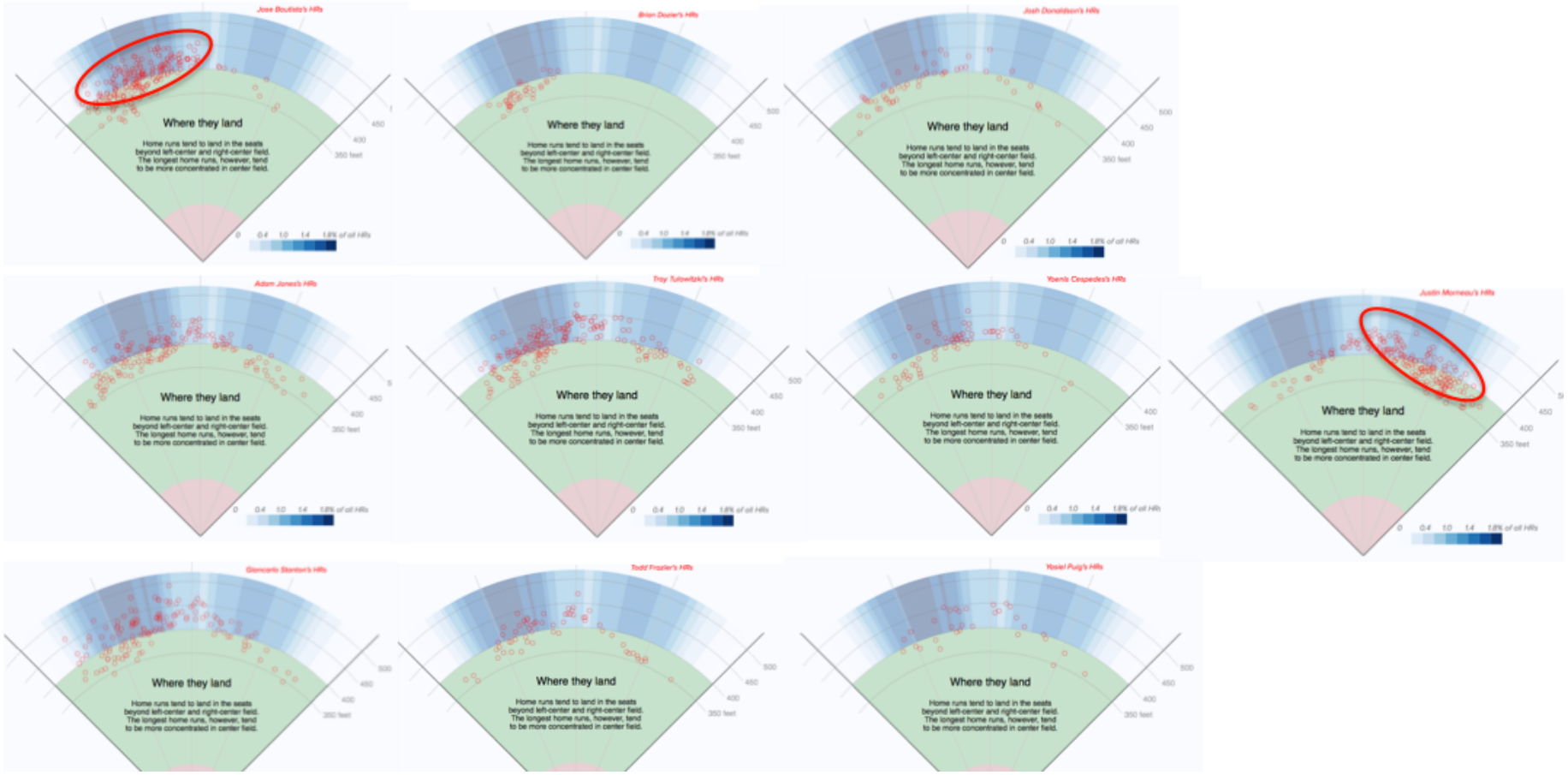
Home runs

https://modeanalytics.com/benn/reports/eb6bbba52fa3



Home runs — critique

http://junkcharts.typepad.com/junk_charts/2014/07/interactivity-as-overhead.html



National

Sam's Club

Target

Walmart

Mostly West

Albertsons

Fresh & Easy

Safeway

West & East

Costco

Trader Joe's

Whole Foods

Midwest & East

Aldi

H-E-B

Hy-Vee

Kroger

Save-A-Lot

South & East

BI-LO

Food Lion

Harris Teeter

Publix

Piggly Wiggly

Winn-Dixie

Northeast

Giant Eagle

Giant Food

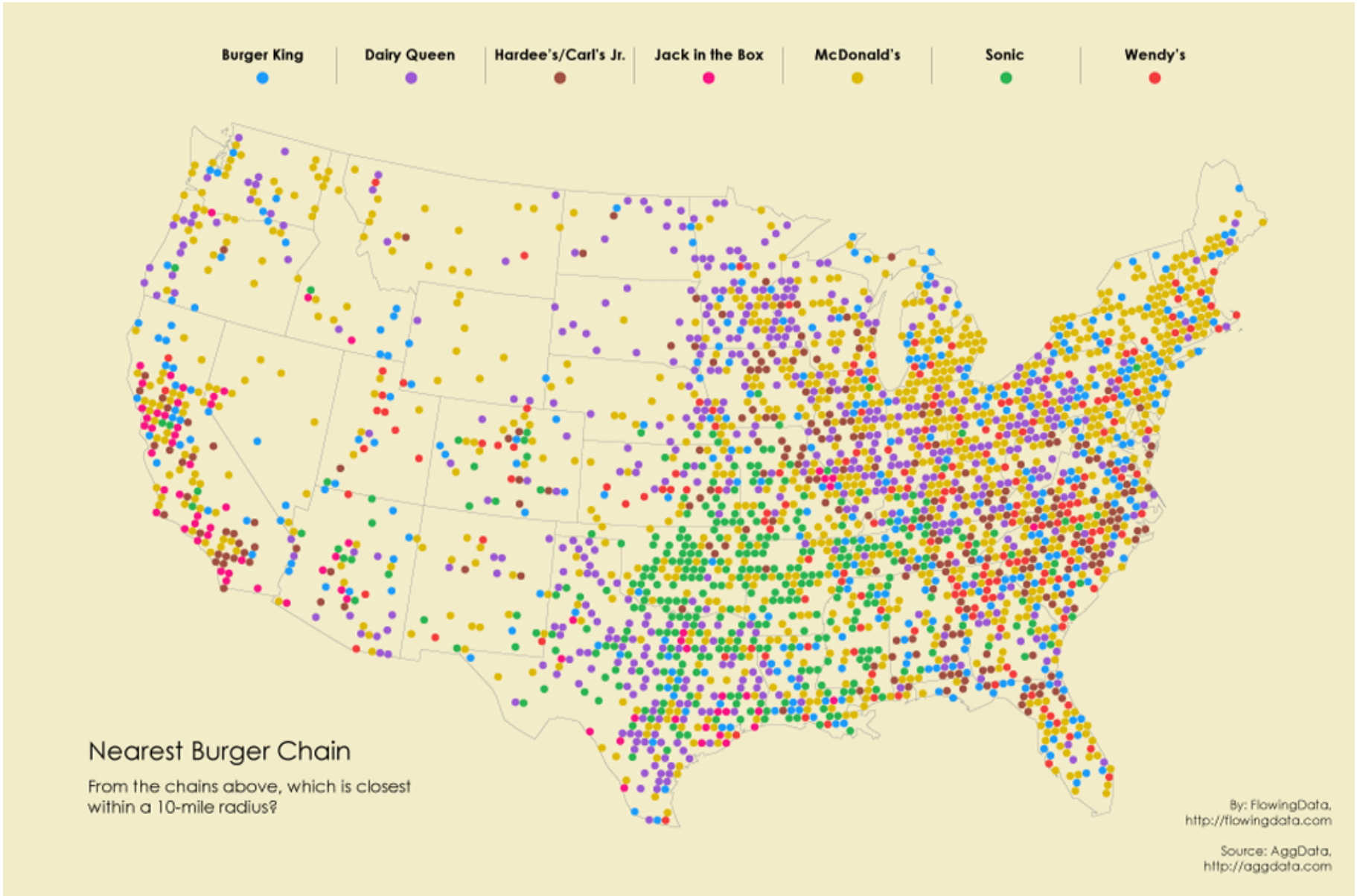
ShopRite

Stop & Shop

Weis Markets

SOURCE
AggData
http://aggdata.com

BY
FlowingData
http://flowingdata.com


Burger King
Dairy Queen
Hardee's/Carl's Jr.
Jack in the Box
McDonald's
Sonic
Wendy's
Nearest Burger Chain
From the chains above, which is closest within a 10-mile radius?
By: FlowingData, http://flowingdata.com
Source: AggData, http://aggdata.com