Filtrar y Empotrar

Visualización de Información
IIC2026

Profesor: Denis Parra

Planificación semestral

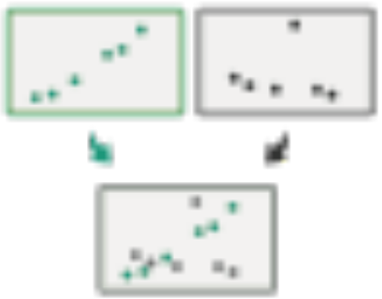
		Pre: python/pandas	
Semana	**Martes**	**Ayudantía**	**Jueves**
1	**Intro + ¿Qué es visualización?**	**Tunear HTML/SVG/CSS (framewor**	**Javascript I (ayudantia)**
2	**Data abstraction**	feriado virgencita	**Task abstraction**
3	**Análisis y validación**	**Javascript II**	**Marcas y canales**
4	**Percepción**	**d3 introducción**	***Rules of thumb***
5	***Tablas***	**d3 plot estáticos**	***Redes (1)***
6	***Redes (2)***	D3: networks	***Datos Espaciales***
7	feriado fiestas patrias	feriado fiestas patrias	**Color**
8	**Manipulación**	D3: manipulacion	***Manipulación 2***
9	***Presentación Hernán***	D3: interactividad	***Presentación Cristobal***
10	**IR / Mineria Texto**		Visualización de Texto
11	PRESENTACIONES	PRESENTACIONES	PRESENTACIONES
12	Series de Tiempo (Nebil)		*Charla Invitada*
13	**Casos de Estudio I**		feriado dia de los morts
14	**Casos de Estudio II**		VIsualizacion de Algoritmos
15	Invitado de Socvis E. Graells		
16			
	Presentaciones finales		

Facet

Juxtapose

Partition

Superimpose



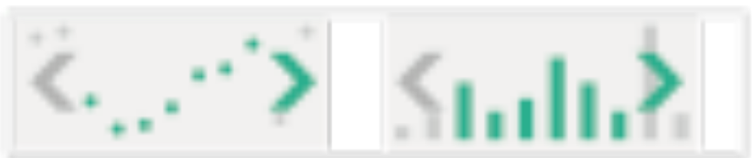
Yuxtponer: poner lado a lado

Juxtapose and coordinate views

- Share Encoding: Same/Different
  - *Linked Highlighting*

- Share Data: All/Subset/None

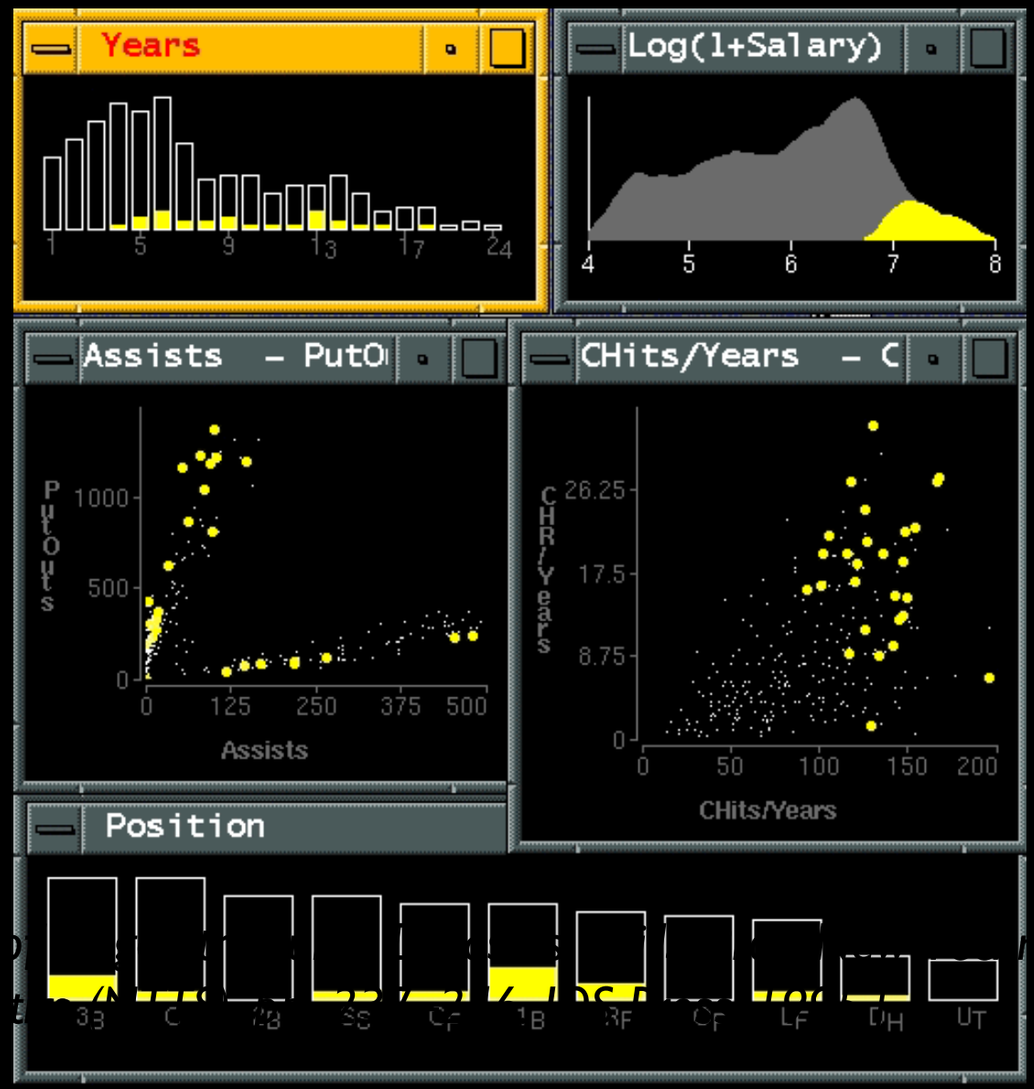
- Share Navigation



Idiom: **Linked highlighting**

System: **EDV**

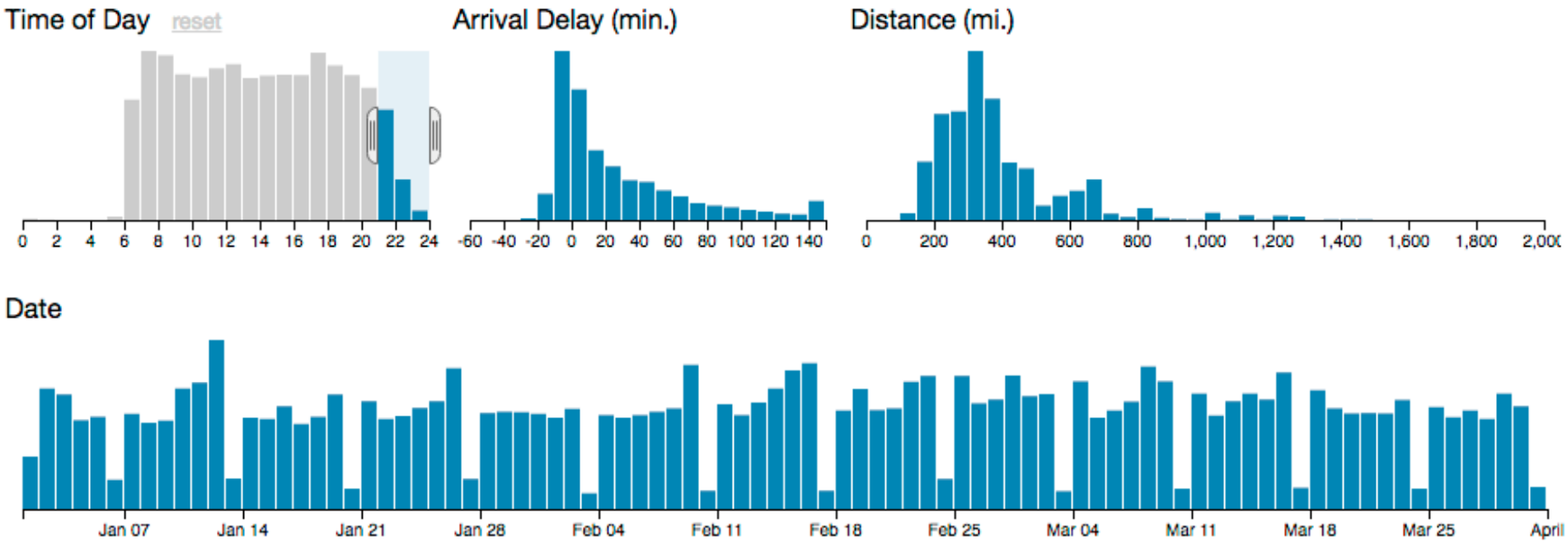
- see how regions contiguous in one view are distributed within another
  - powerful and pervasive interaction idiom
- encoding: different
  - *multiform*
- data: all shared



Idiom: **cross filtering**

System: **Crossfilter**

- item filtering
- coordinated views/controls combined
  - all scented histogram bisliders update when any ranges change



http://square.github.io/crossfilter/

Idiom: **bird's-eye maps**

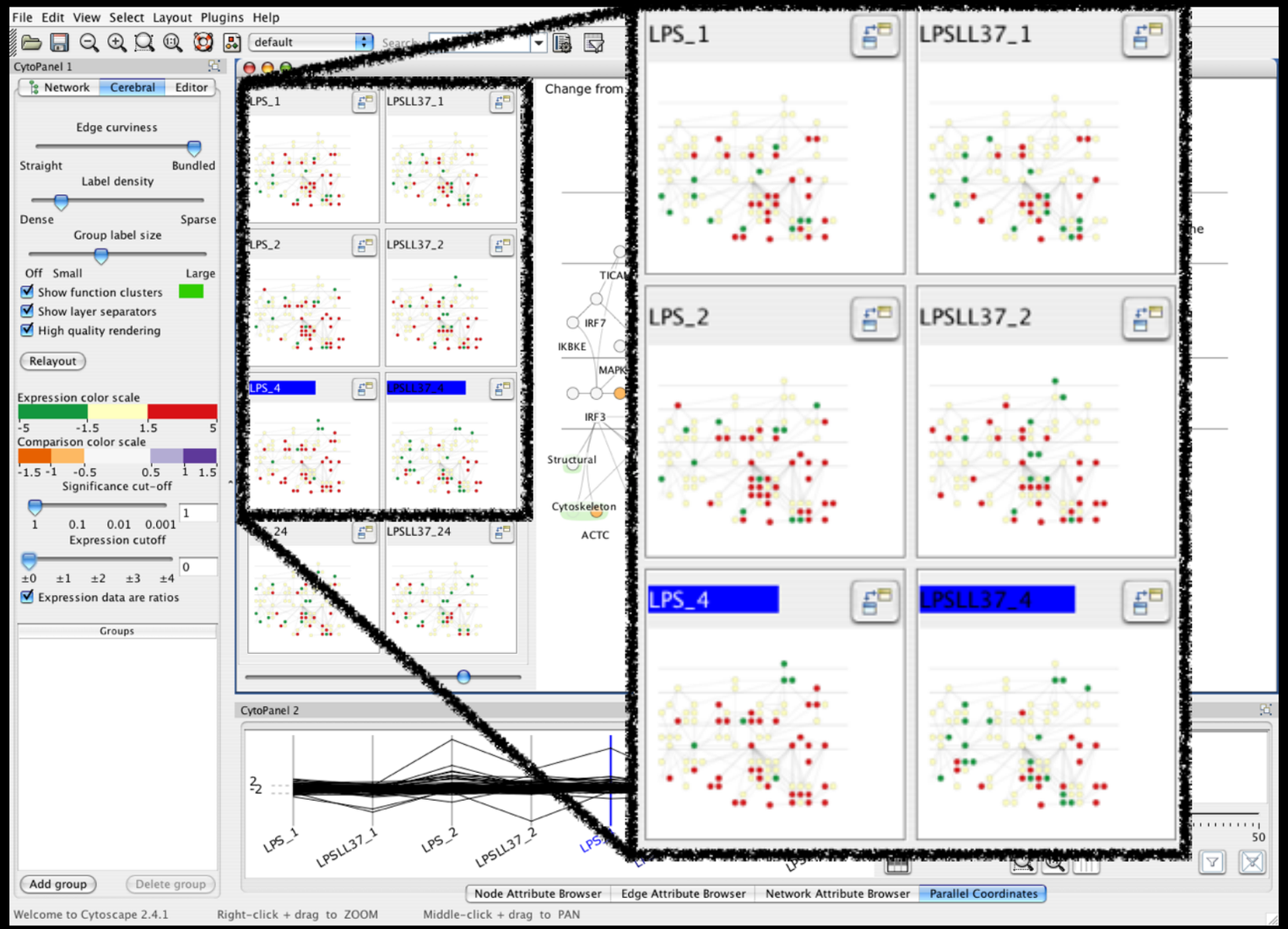
System: **Google Maps**

- encoding: same
- data: subset shared
- navigation: shared
  - bidirectional linking
- differences
  - viewpoint
  - (size)
- *overview-detail*

Idiom: **Small multiples**

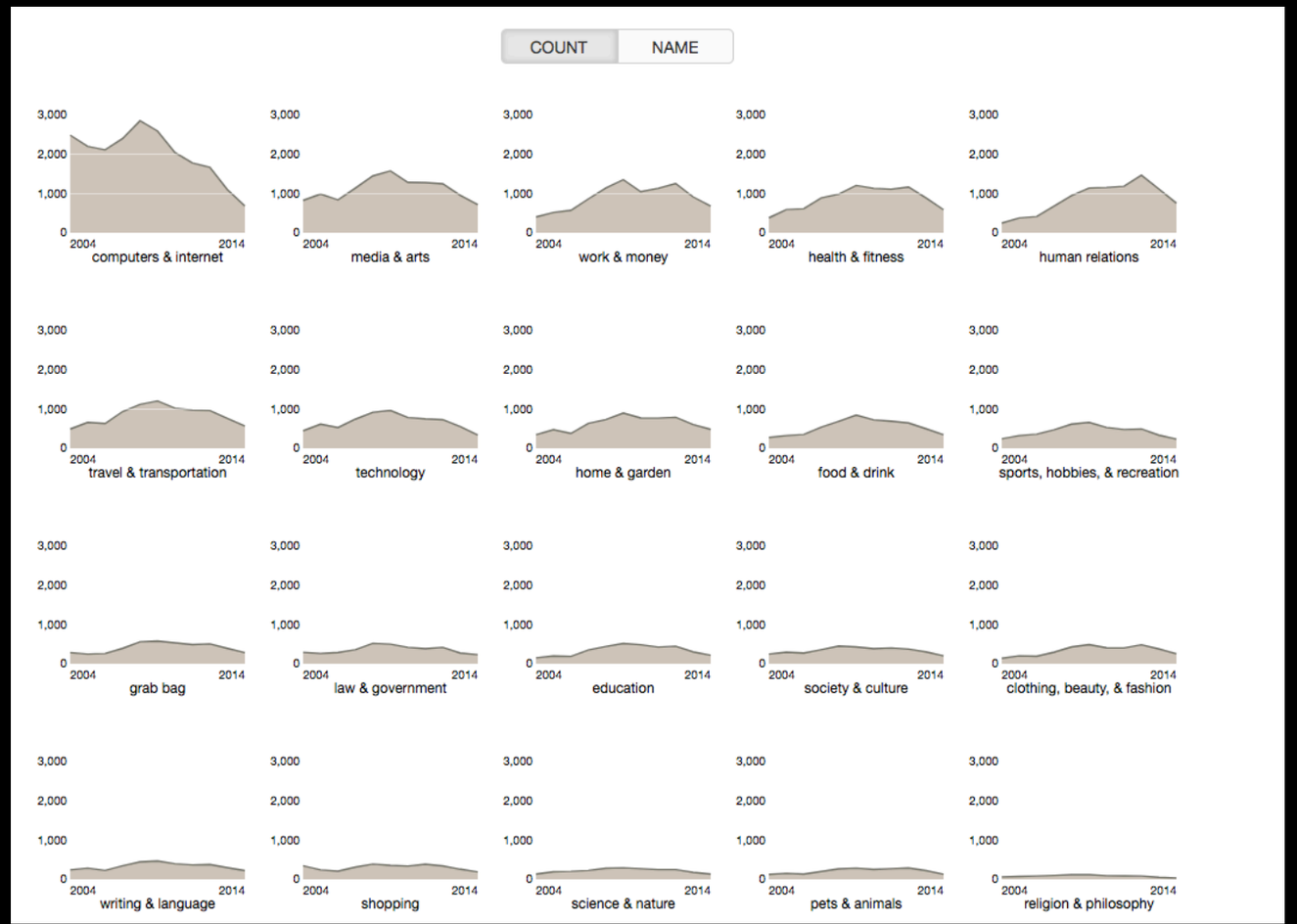
- encoding: same
- data: none shared
  - different attributes for node colors
  - (same network layout)
- navigation: shared

System:

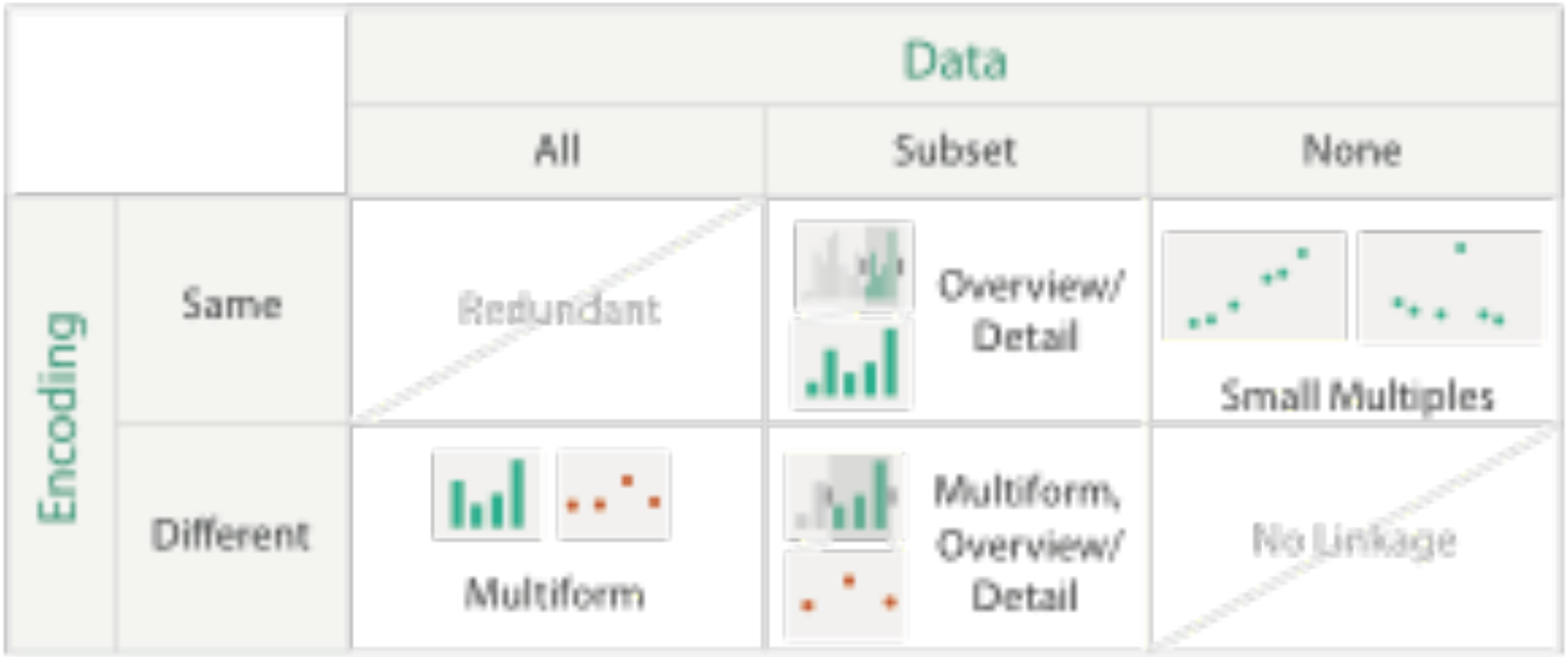


Small multiples

- http://projects.flowingdata.com/tut/linked_small_multiples_demo/



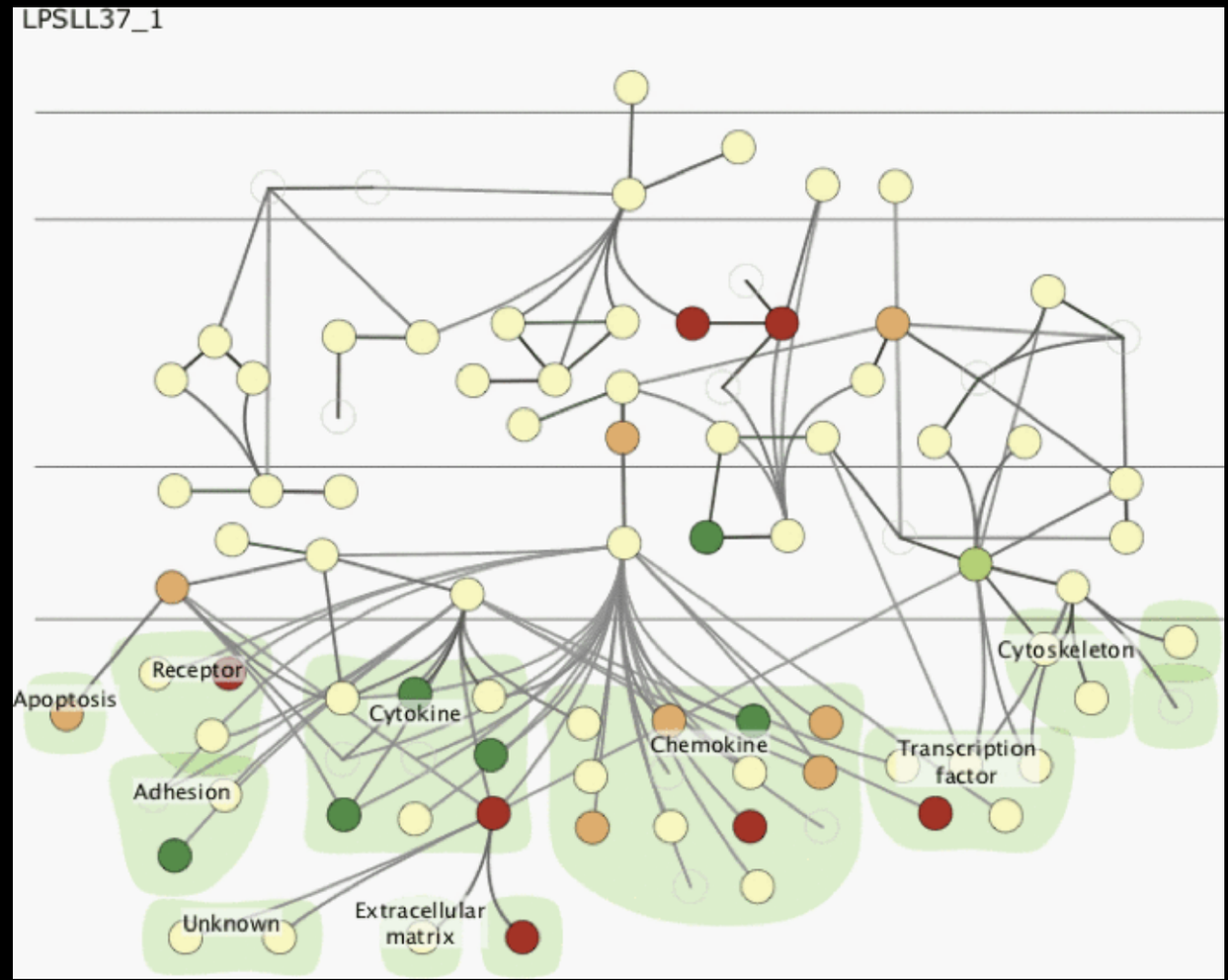
Coordinate views: Design choice interaction



- why juxtapose views?
  - benefits: eyes vs memory
    - lower cognitive load to move eyes between 2 views than remembering previous state with single changing view
  - costs: display area, 2 views side by side each have only half the area of one view

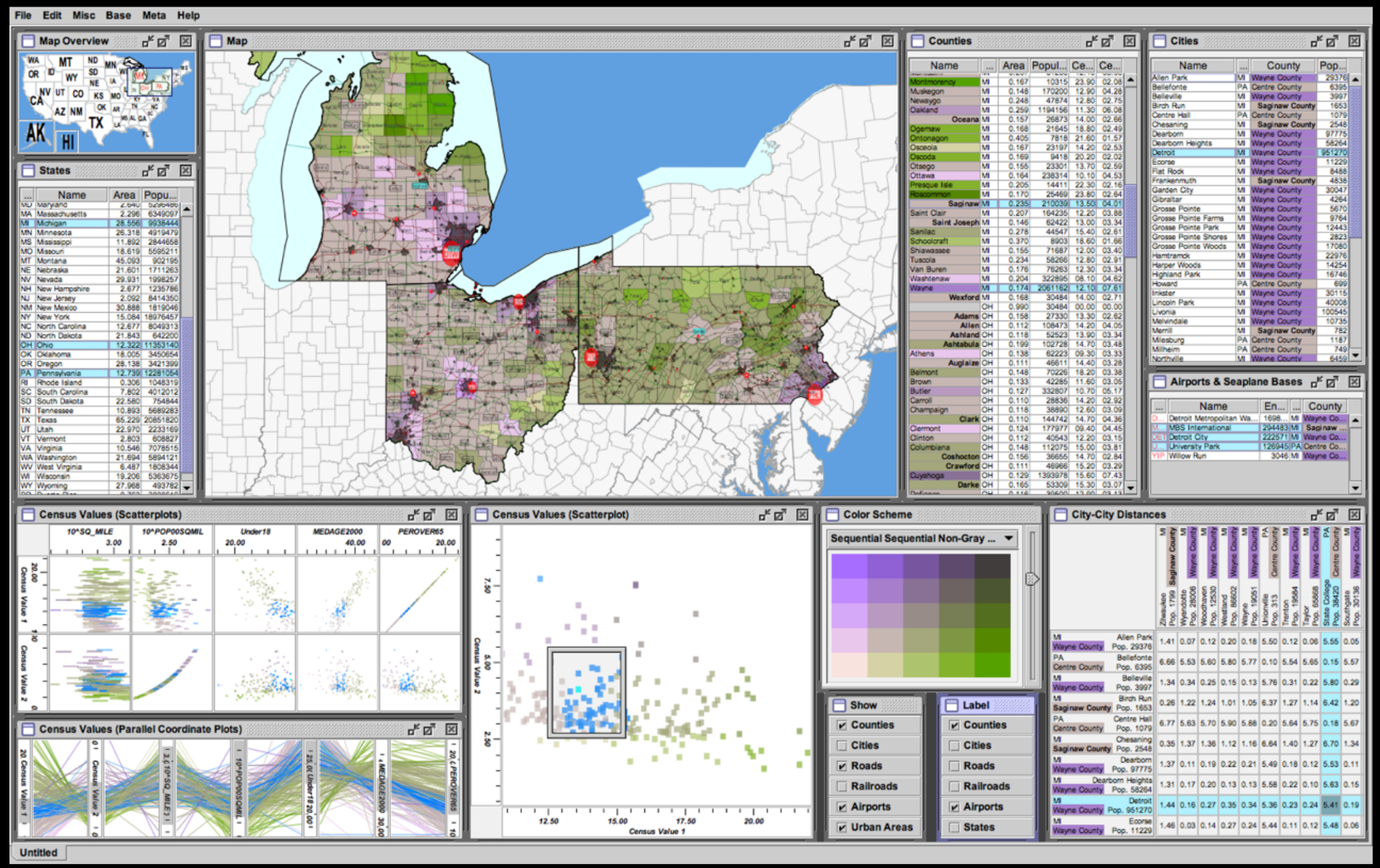
Why not animation?

- disparate frames and regions: comparison difficult
  - vs contiguous frames
  - vs small region
  - vs coherent motion of group
- safe special case
  - animated transitions



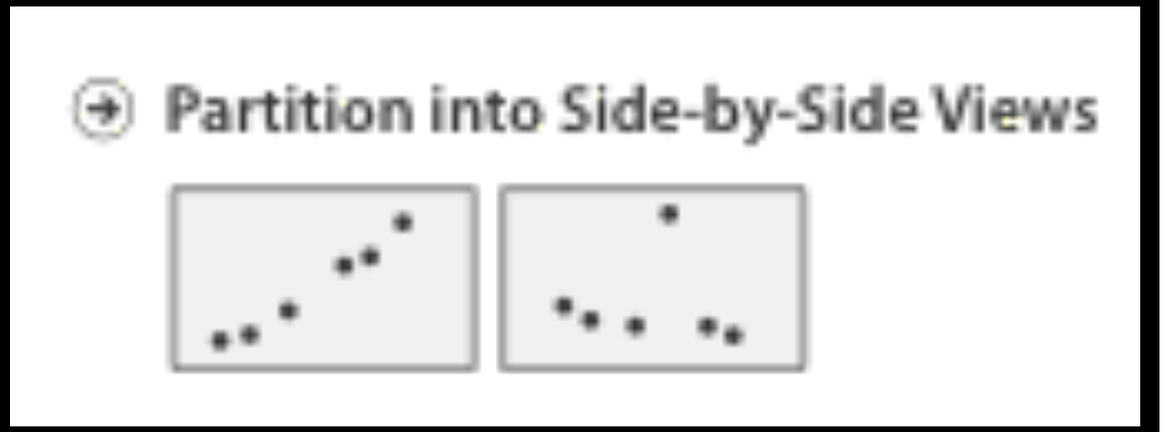
System: **Improvise**

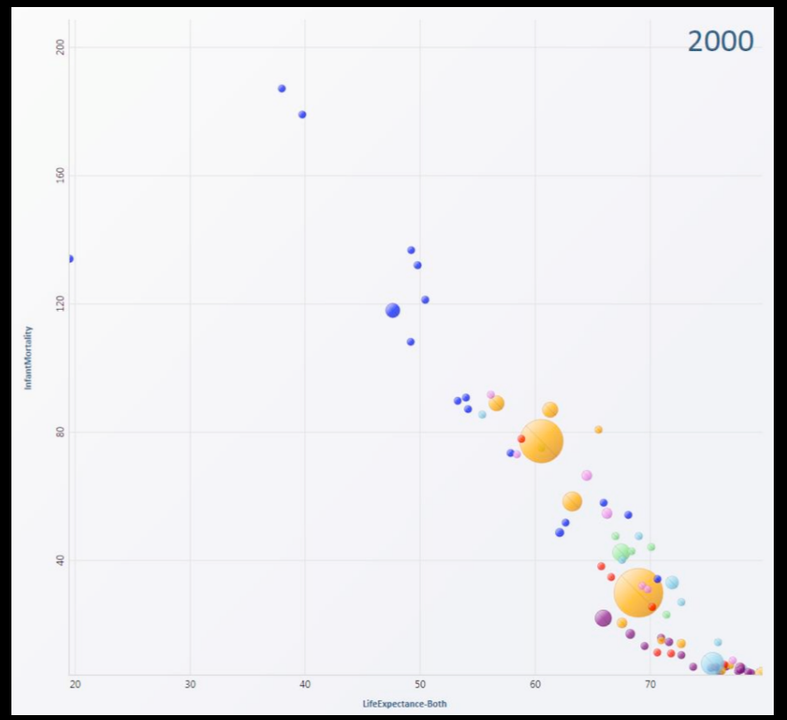
- investigate power of multiple views
  - pushing limits on view count, interaction complexity
  - how many is ok?
    - open research question
  - reorderable lists
    - easy lookup
    - useful when linked to other encodings

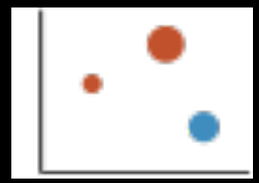


Partition into views

- how to divide data between views
  - split into regions by attributes
  - encodes association between items using spatial proximity
  - order of splits has major implications for what patterns are visible
- no strict dividing line
  - *view: big/detailed*
    - contiguous region in which visually encoded data is shown on the display
  - *glyph: small/iconic*
    - object with internal structure that arises from multiple marks

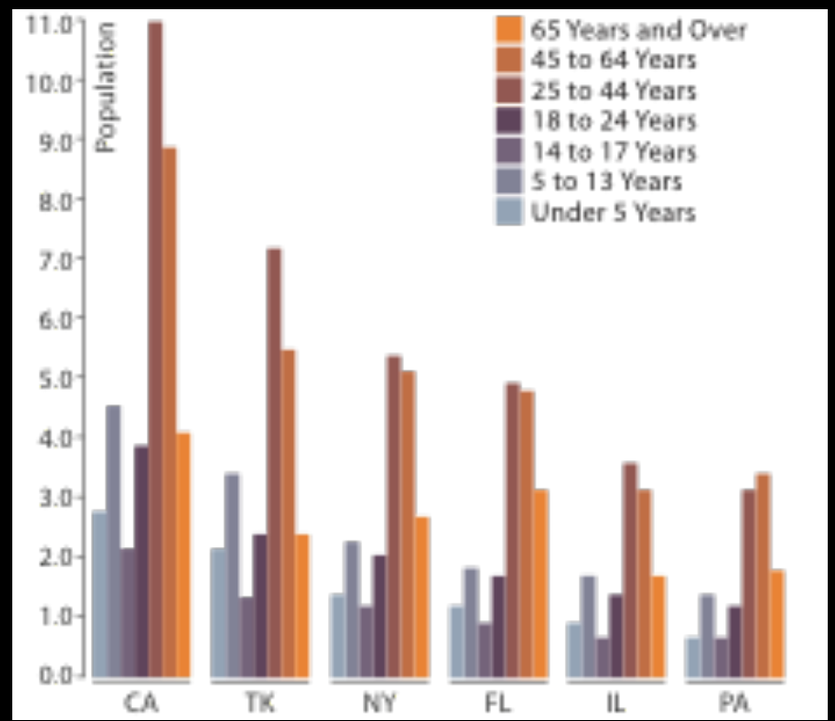




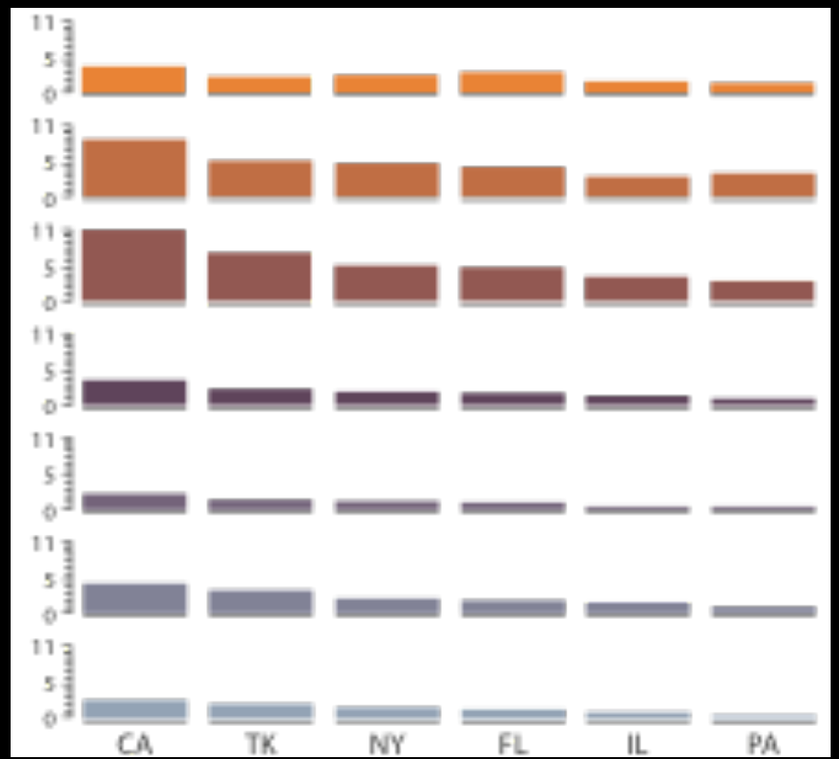


Partitioning: List alignment

- single bar chart with grouped bars
  - –split by state into regions
    - complex glyph within each region showing all ages
  - –compare: easy within state, hard across ages



- small-multiple bar charts
  - –split by age into regions
    - one chart per region
  - –compare: easy within age, harder across states

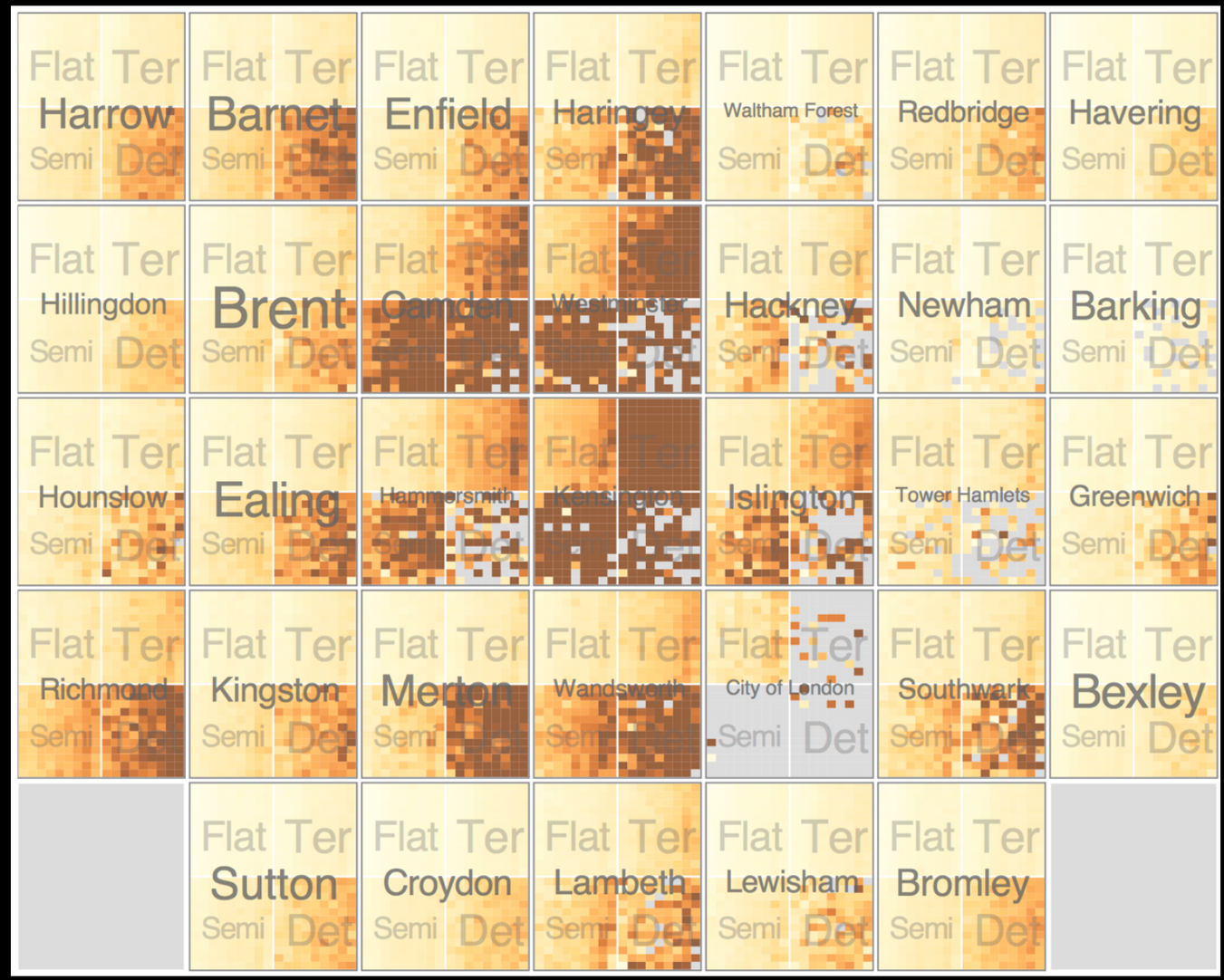


Partitioning: Recursive subdivision

System: **HIVE**

- split by neighborhood
- then by type
- then time
  - years as rows
  - months as columns
- color by price

- neighborhood patterns
  - where it's expensive
  - where you pay much more for detached type



Partitioning: Recursive subdivision

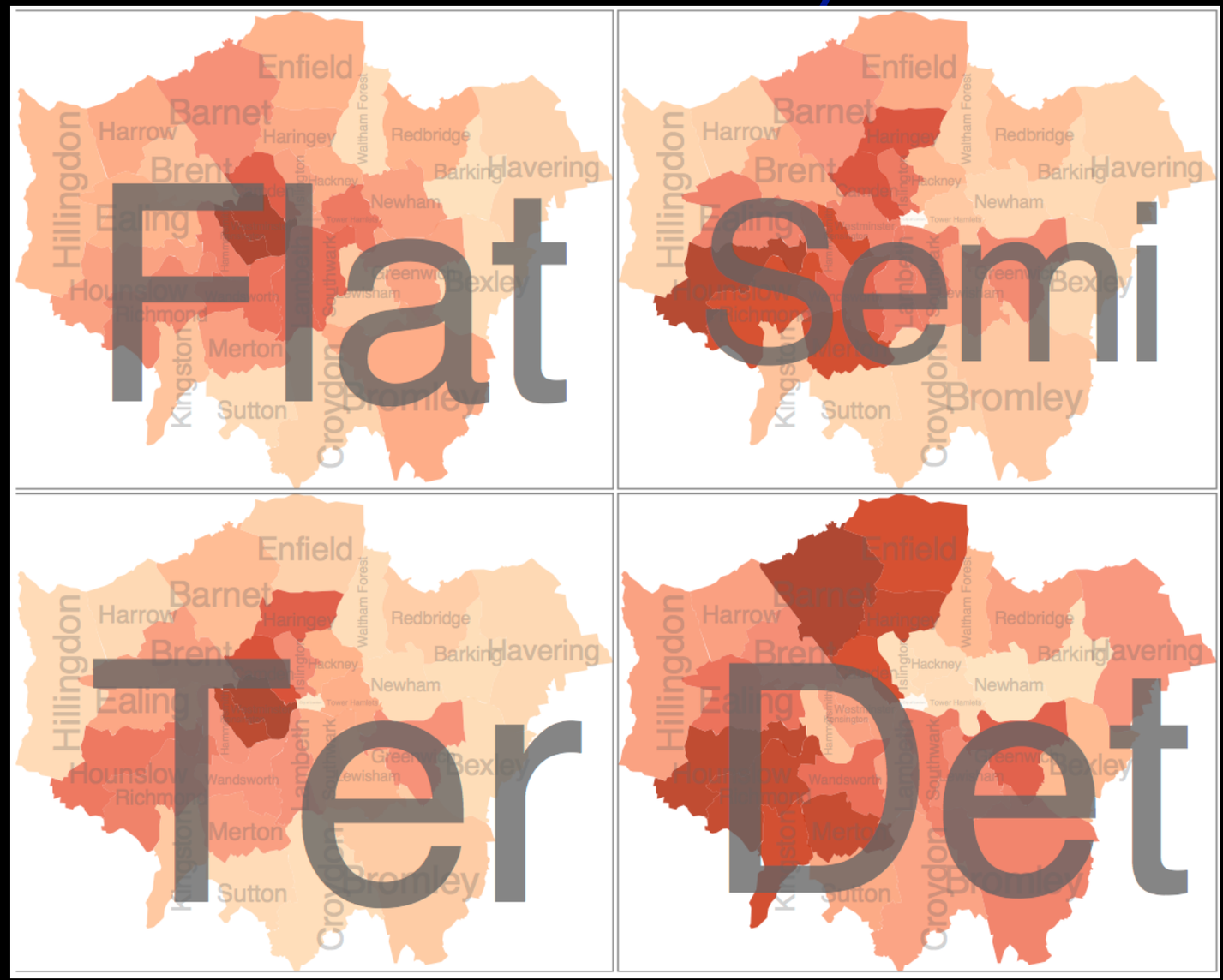
System: **HIVE**

- switch order of splits
  - type then neighborhood
- switch color
  - by price variation
- type patterns
  - within specific type, which neighborhoods inconsistent

Partitioning: Recursive subdivision

System: **HIVE**

- different encoding for second-level regions
  - choropleth maps



Partitioning: Recursive subdivision

System: **HIVE**

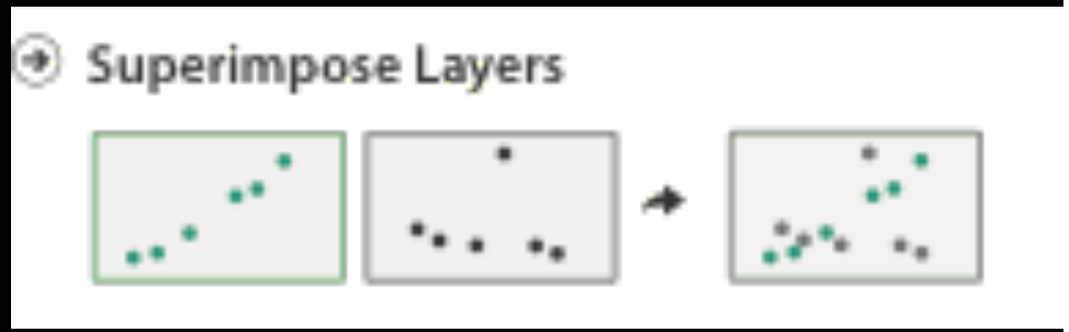
- size regions by sale counts
  - not uniformly
- result: treemap

Demos

- **Small Multiples with Gaps**
  - http://www.gicentre.org/smwg/
- **Morphing geojson polygons into rectangles**
  - https://github.com/sebastian-meier/d3.geo2rect
- Mapas Origen Destino
  - https://github.com/sebastian-meier/d3.layout.odmap

Superimpose layers

- *layer*: set of objects spread out over region
  - each set is visually distinguishable group
  - extent: whole view
- design choices
  - how many layers, how to distinguish?
    - encode with different, nonoverlapping channels
    - two layers achieveable, three with careful design
  - small static set, or dynamic from many possible?



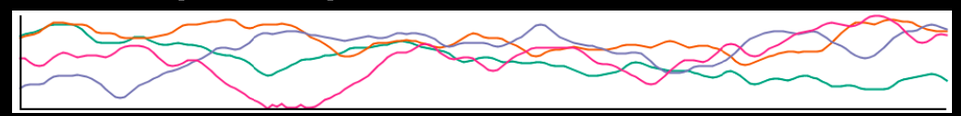
Static visual layering

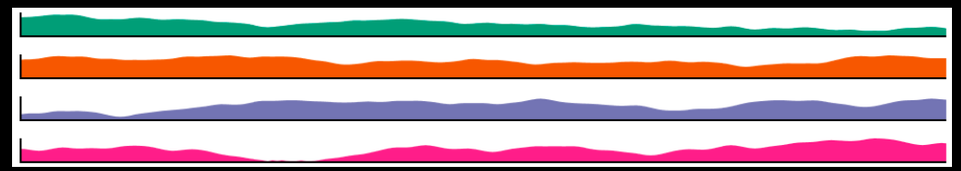
- foreground layer: roads
  - hue, size distinguishing main from minor
  - high luminance contrast from background
- background layer: regions
  - desaturated colors for water, parks, land areas
- user can selectively focus attention
- "get it right in black and white"
  - check luminance contrast with greyscale view

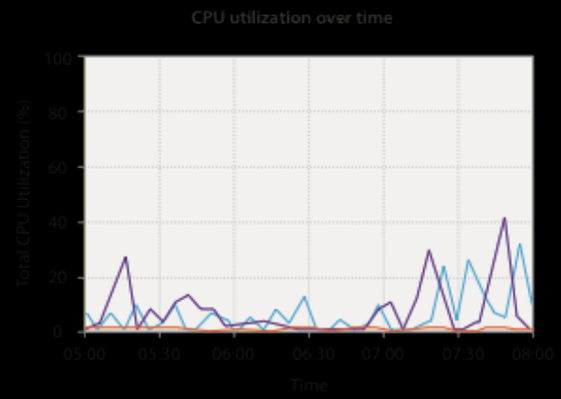
http://www.stonesc.com/wordpress/2010/03/get-it-right-in-black-and-white

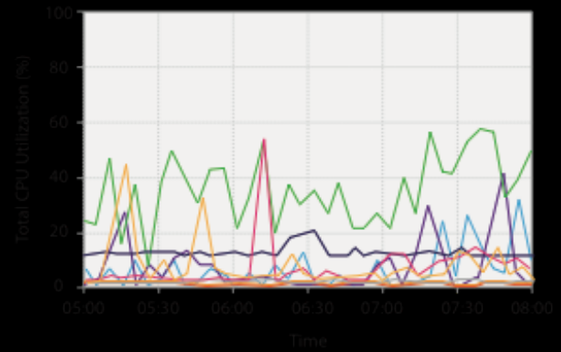
Superimposing limits

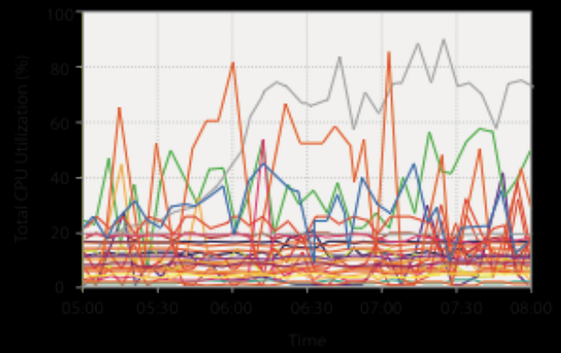
- few layers, but many lines
  - up to a few dozen
  - but not hundreds
- superimpose vs juxtapose: empirical study
  - superimposed for local, multiple for global
  - tasks
    - local: maximum, global: slope, discrimination
  - same screen space for all multiples vs single superimposed







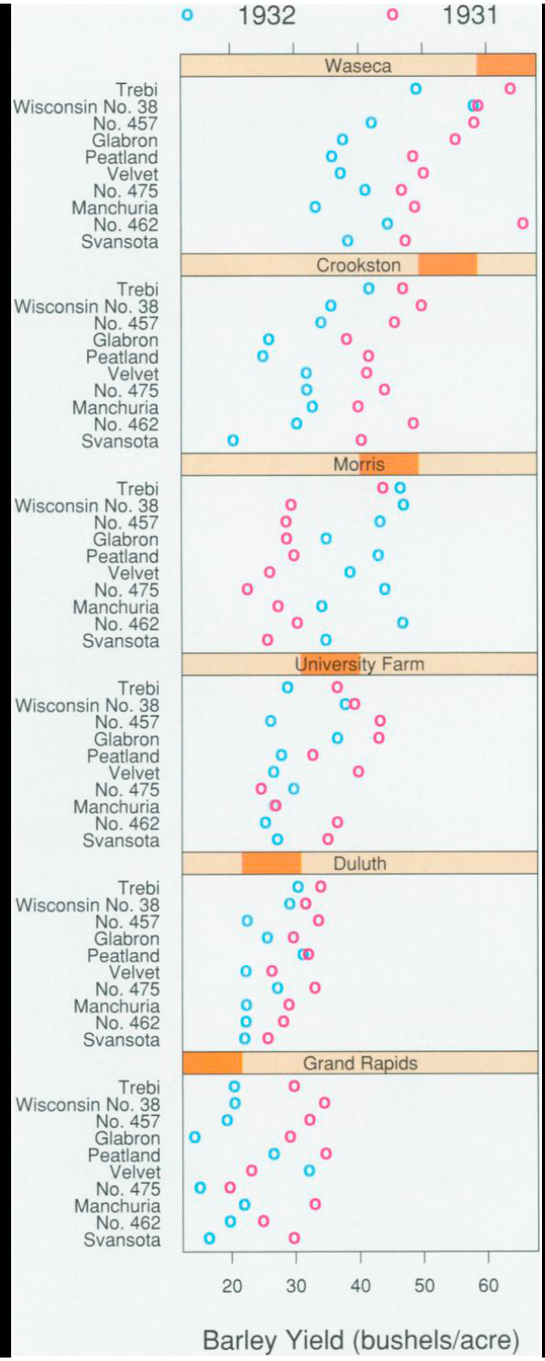




Idiom: **Trellis plots**

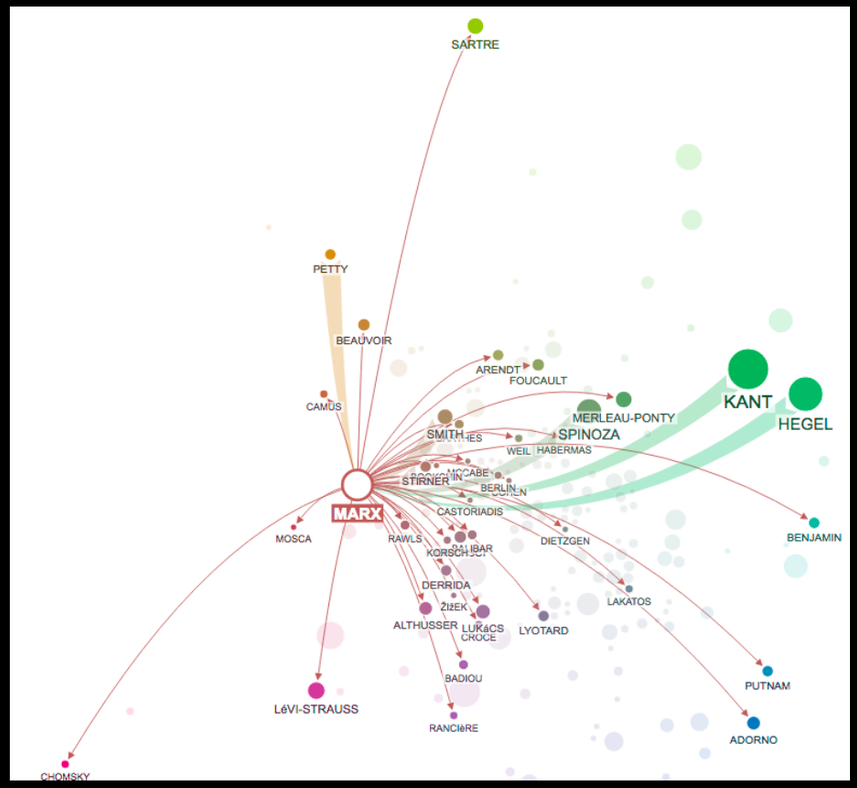
- superimpose within same frame
  - color code by year

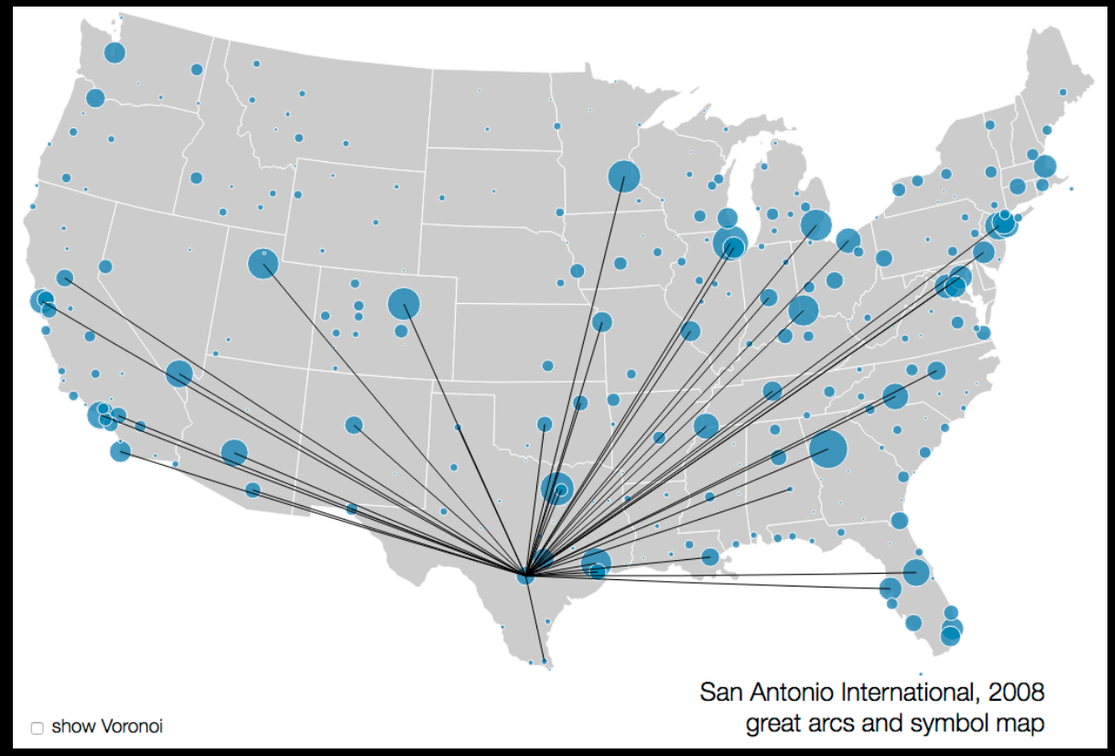
- partitioning
  - split by site, rows are wheat varieties
- main-effects ordering
  - derive value of median for group, use to order
  - order rows within view by variety median
  - order views themselves by site median



Dynamic visual layering

- interactive based on selection
- one-hop neighbour highlighting demos: click vs hover (lightweight)





http://mariandoerk.de/edgemaps/demo/

http://mbostock.github.io/d3/talk/20111116/airports.html

Further reading

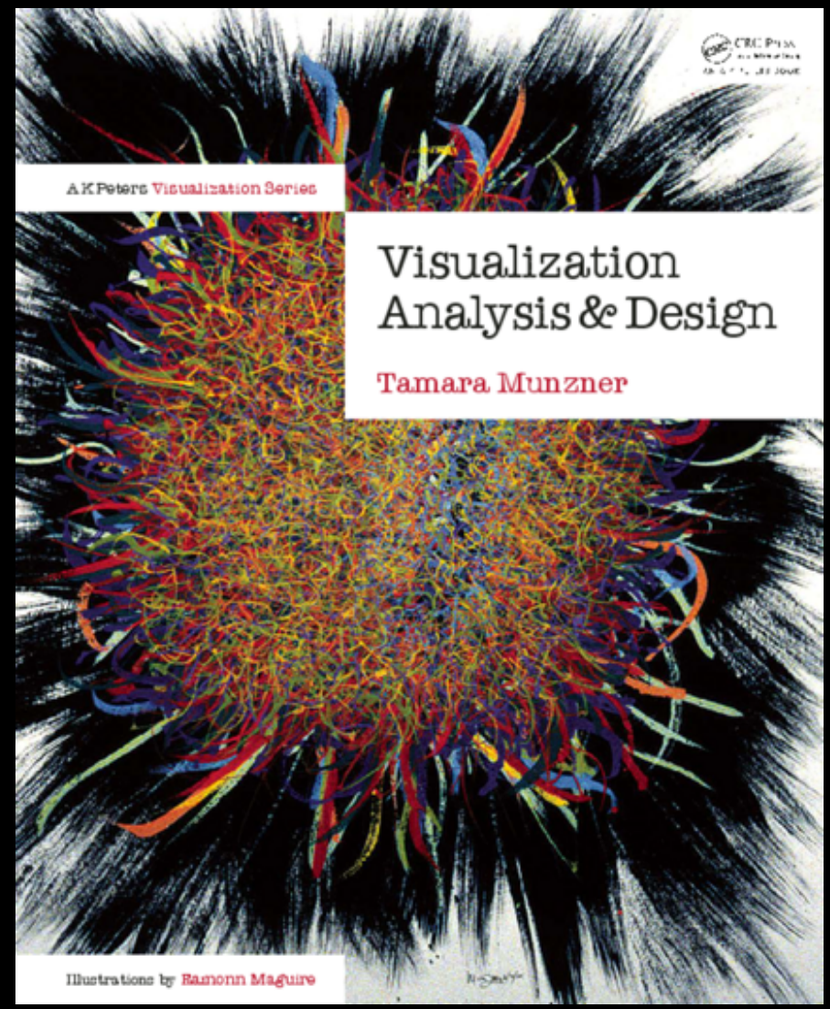
- Visualization Analysis and Design. Munzner. AK Peters Visualization Series, CRC Press, 2014.
  - *Chap 12: Facet Into Multiple Views*
- *A Review of Overview+Detail, Zooming, and Focus+Context Interfaces.* Cockburn, Karlson, and Bederson. ACM Computing Surveys 41:1 (2008), 1–31.
- *A Guide to Visual Multi-Level Interface Design From Synthesis of Empirical Study Evidence.* Lam and Munzner. Synthesis Lectures on Visualization Series, Morgan Claypool, 2010.
- *Zooming versus multiple window interfaces: Cognitive costs of visual comparisons.* Plumlee and Ware. ACM Trans. on Computer-Human Interaction (ToCHI) 13:2 (2006), 179–209.
- *Exploring the Design Space of Composite Visualization.* Javed and Elmqvist. Proc. Pacific Visualization Symp. (PacificVis), pp. 1–9, 2012.
- *Visual Comparison for Information Visualization.* Gleicher, Albers, Walker, Jusufi, Hansen, and Roberts. Information Visualization 10:4 (2011), 289–309.
- *Guidelines for Using Multiple Views in Information Visualizations.* Baldonado, Woodruff, and Kuchinsky. In Proc. ACM Advanced Visual Interfaces (AVI), pp. 110–119, 2000.
- *Cross-Filtered Views for Multidimensional Visual Analysis.* Weaver. IEEE Trans. Visualization and Computer Graphics 16:2 (Proc. InfoVis 2010), 192–204, 2010.
- *Linked Data Views.* Wills. In Handbook of Data Visualization, Computational Statistics, edited by Unwin, Chen, and Härdle, pp. 216–241. Springer-Verlag, 2008.
- *Glyph-based Visualization: Foundations, Design Guidelines, Techniques and Applications.* Borgo, Kehrer, Chung, Maguire, Laramee, Hauser, Ward, and Chen. In Eurographics State of the Art Reports, pp. 39–63, 2013.

More Information

- this talk
  http://www.cs.ubc.ca/~tmm/talks.html#vad17fullday

- book page (including tutorial lecture slides)
  http://www.cs.ubc.ca/~tmm/vadbook
  - 20% promo code for book+ebook combo: HVN17
  - http://www.crcpress.com/product/isbn/9781466508910
  - illustrations: Eamonn Maguire

- papers, videos, software, talks, courses
  http://www.cs.ubc.ca/group/infovis
  http://www.cs.ubc.ca/~tmm



Visualization Analysis and Design.
Munzner. A K Peters Visualization Series, CRC Press, Visualization Series, 2014.

Ch 14: Embed Focus+Context Papers: TreeJuxtaposer

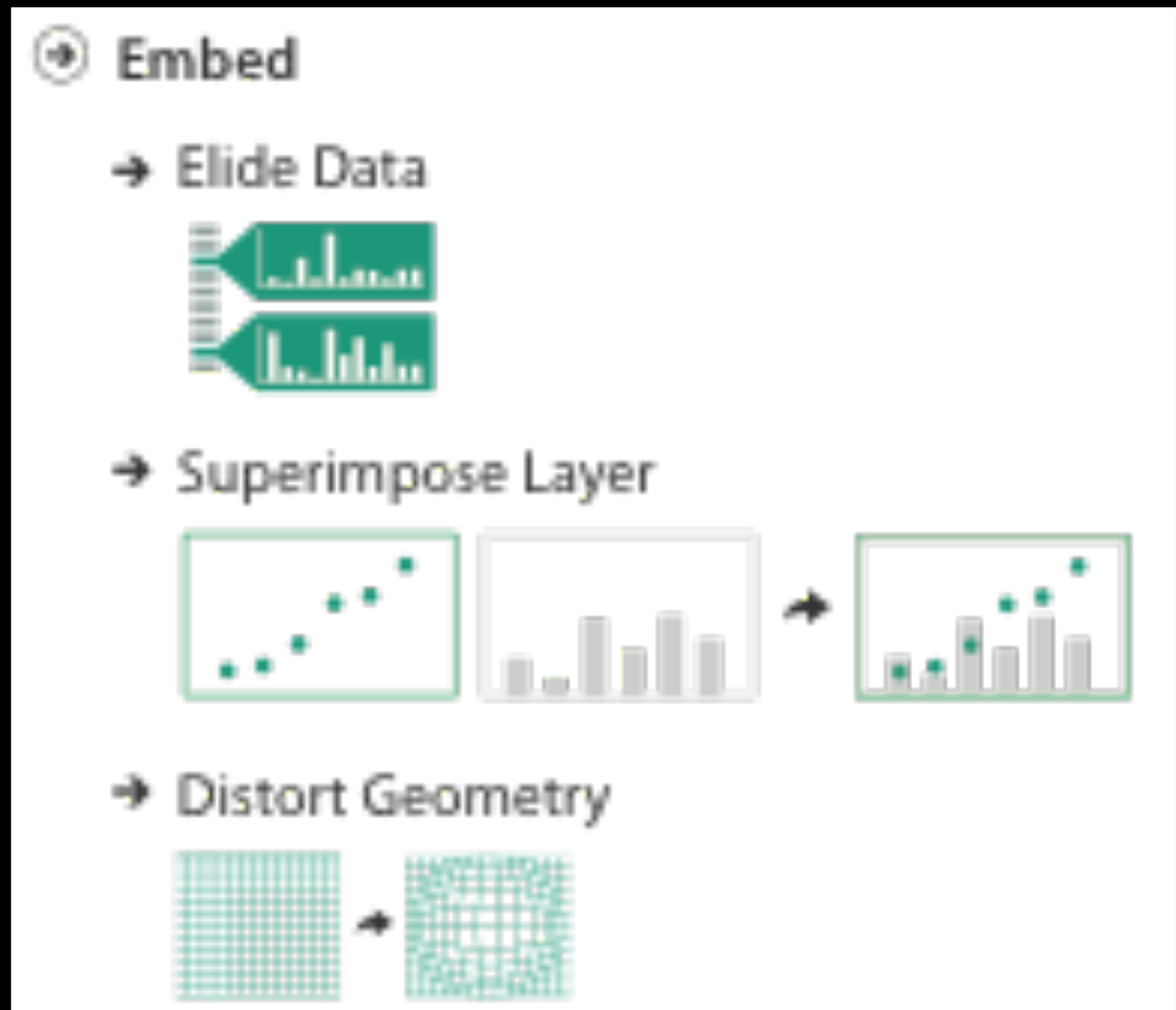
Tamara Munzner
Department of Computer Science
University of British Columbia

CPSC 547, Information Visualization
Day 14: 5 November 2015

- http://www.cs.ubc.ca/~tmm/courses/547-15

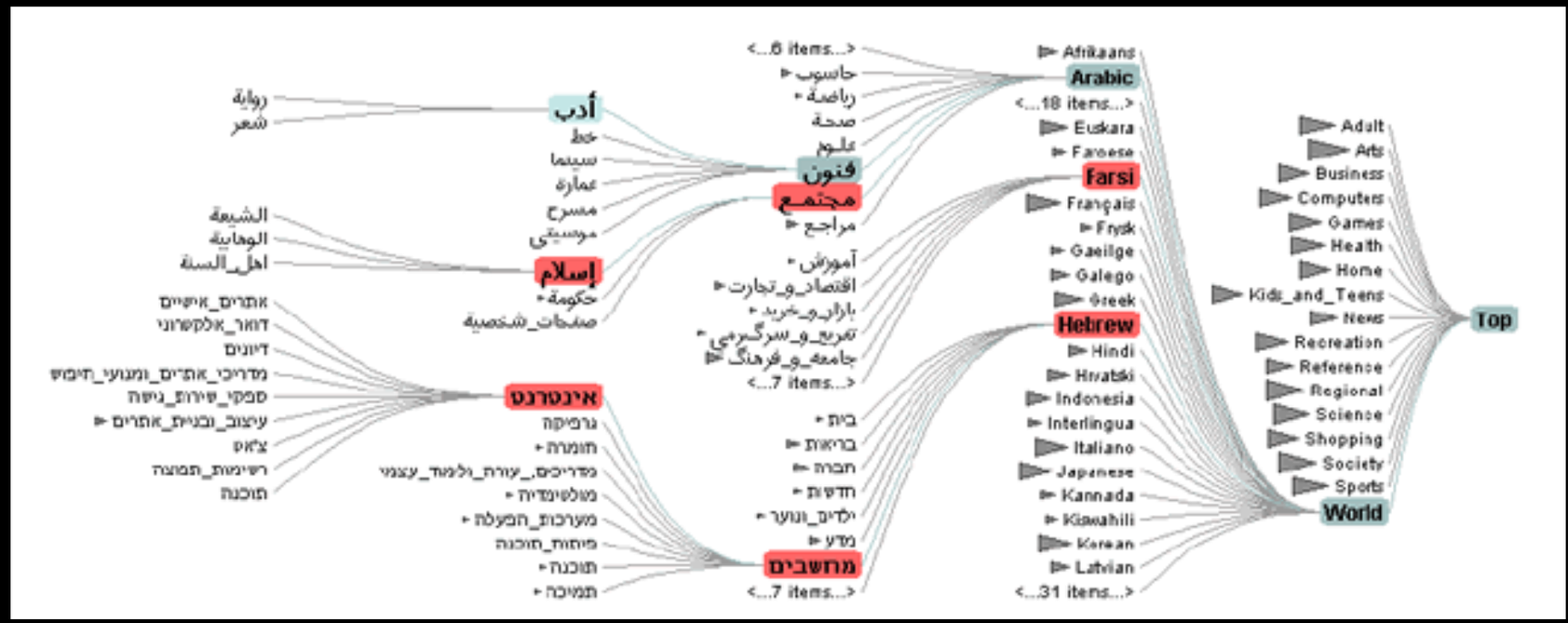
Embed: Focus+Context

- combine information within single view
- Elide (omitir)
  - selectively filter and aggregate
- superimpose layer
  - local lens
- distortion design choices
  - region shape: radial, rectilinear, complex
  - how many regions: one, many
  - region extent: local, global
  - interaction metaphor



Idiom: **DOITrees Revisited**

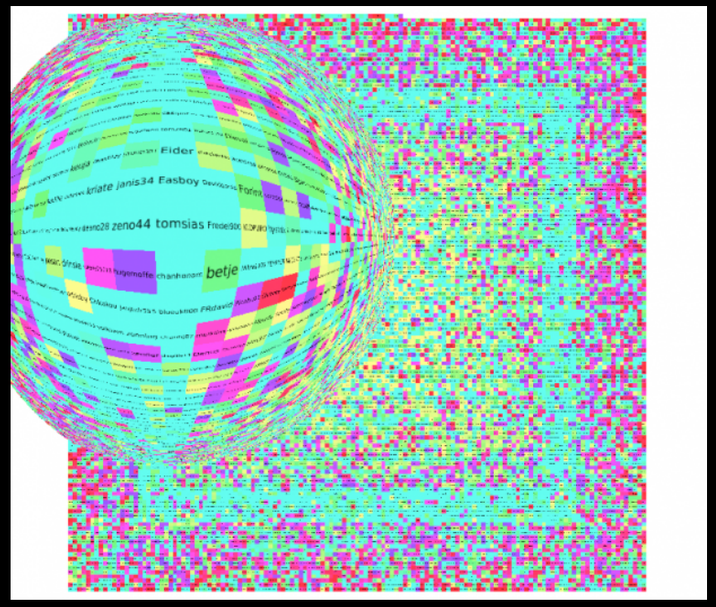
- elide
  - some items dynamically filtered out
  - some items dynamically aggregated together
  - some items shown in detail

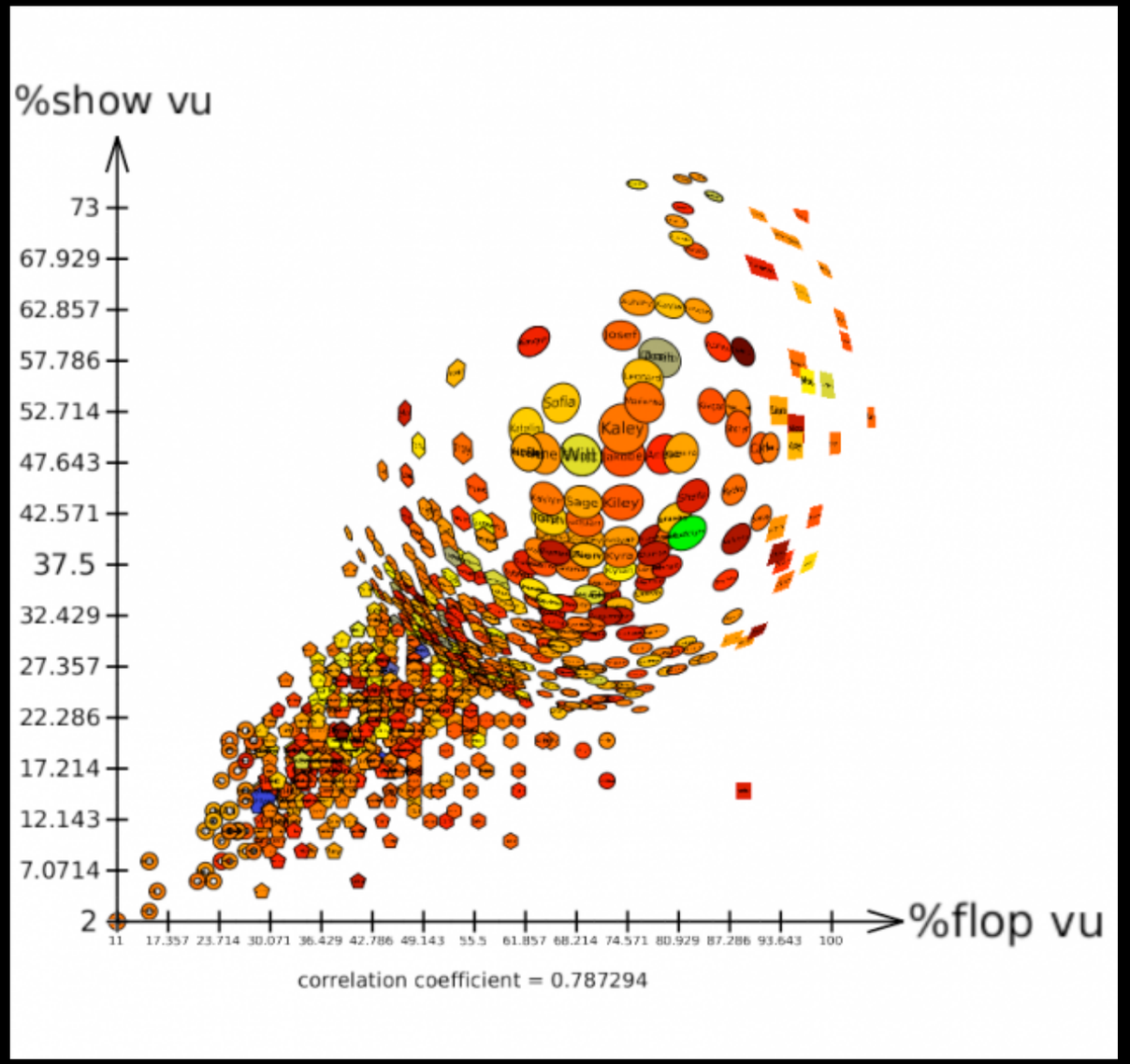


[DOITrees Revisited: Scalable, Space-Constrained Visualization of Hierarchical Data. Heer and Card. Proc. Advanced Visual Interfaces (AVI) 421–424, 2004.]

Idiom: **Fisheye Lens**

- distort geometry
  - shape: radial
  - focus: single extent
  - extent: local
  - metaphor: draggable lens

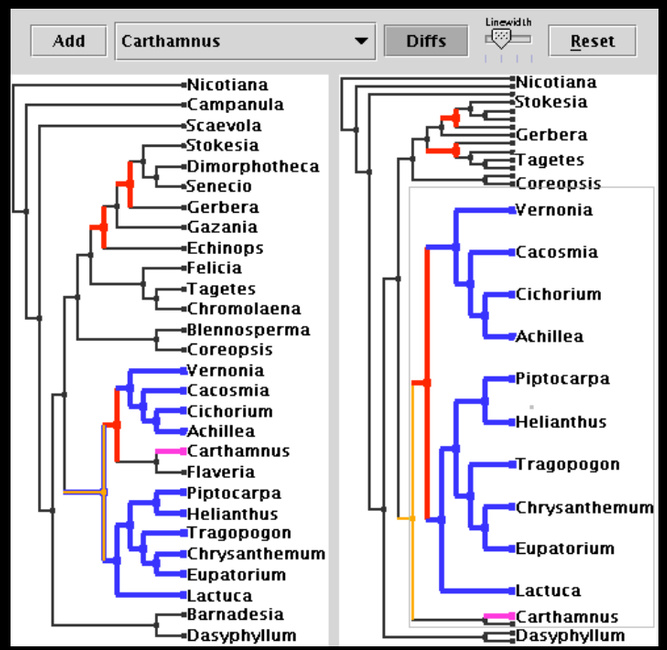




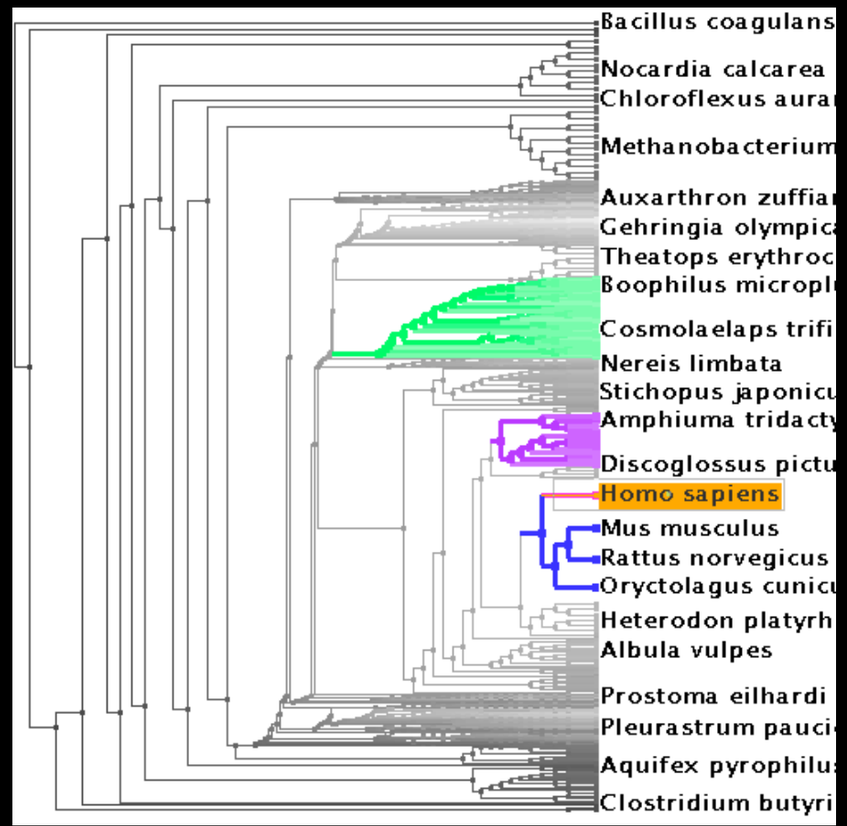
http://tulip.labri.fr/TulipDrupal/?q=node/351
http://tulip.labri.fr/TulipDrupal/?q=node/371

Idiom: **Stretch and Squish Navigation**

- distort geometry
  - shape: rectilinear
  - foci: multiple
  - impact: global
  - metaphor: stretch and squish, borders fixed

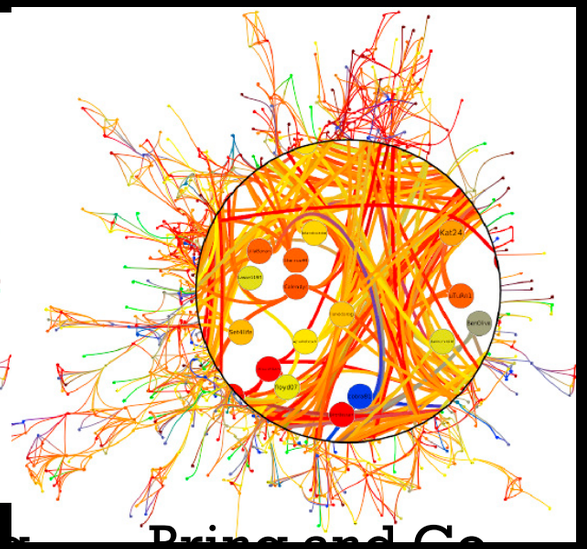


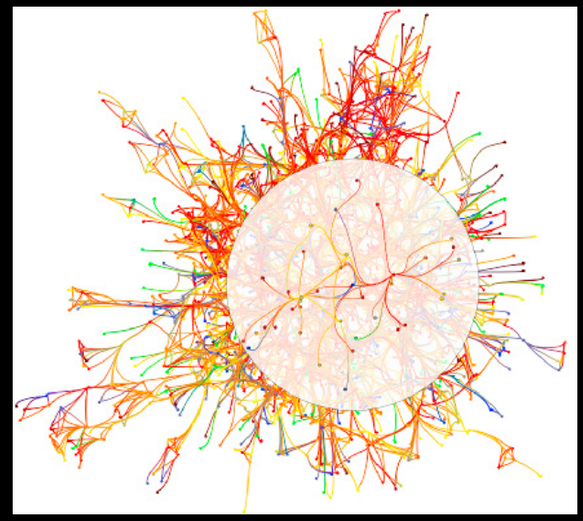
System: **TreeJuxtaposer**

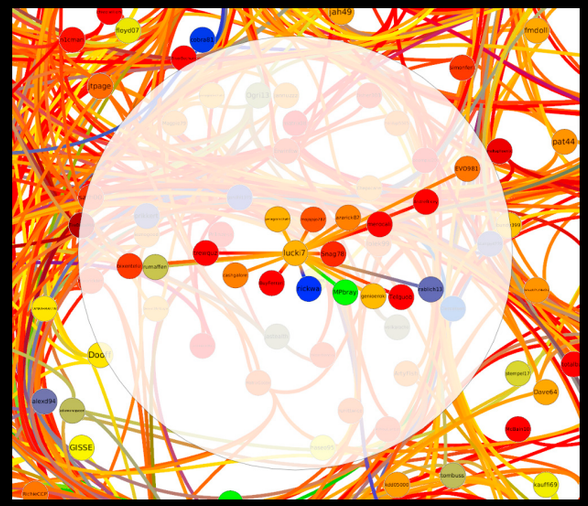


Distortion costs and benefits

- benefits
  - combine focus and context information in single view
- costs
  - length comparisons impaired
    - network/tree topology comparisons unaffected: connection, containment
  - effects of distortion unclear if original structure unfamiliar
  - object constancy/tracking maybe impaired





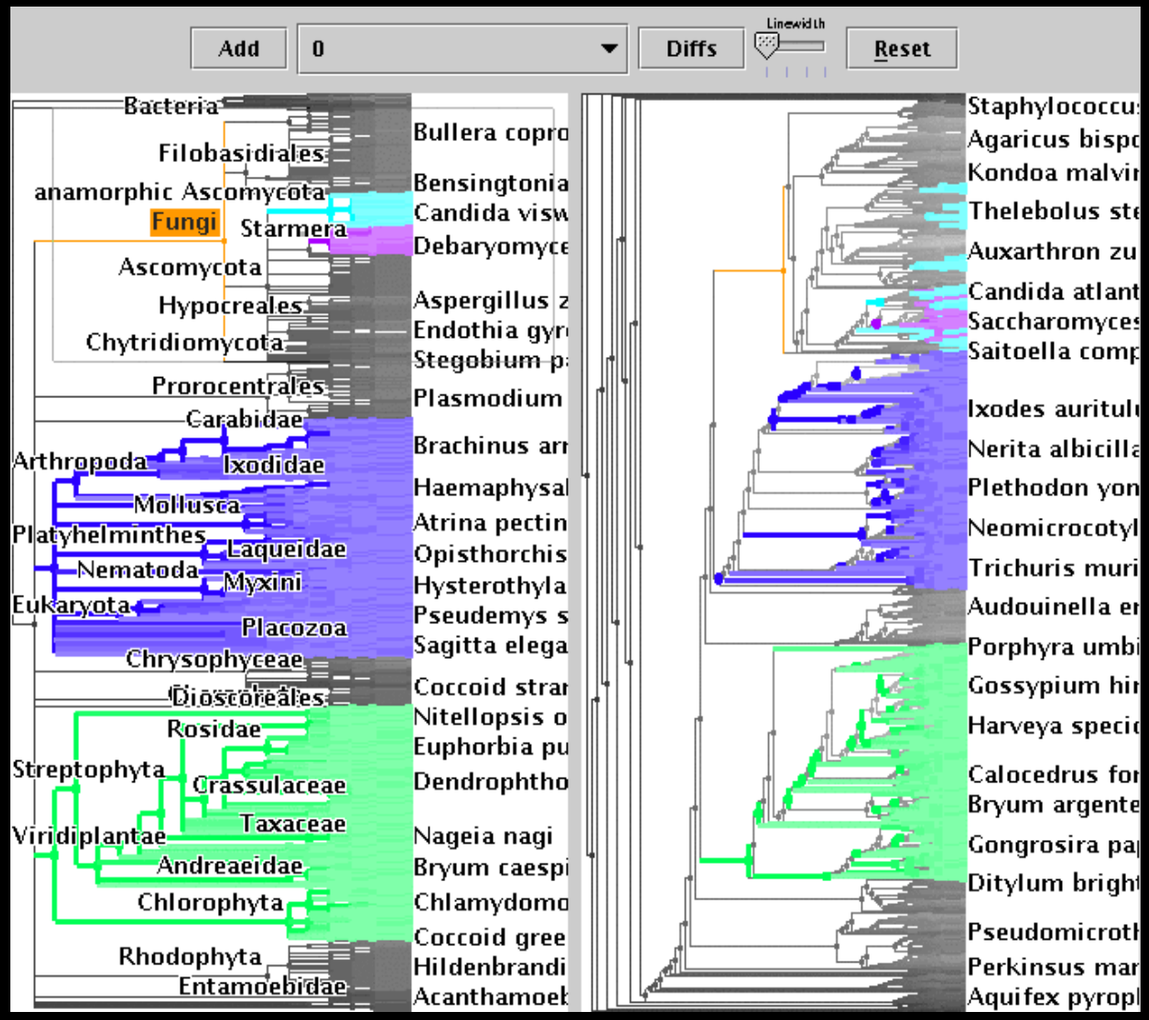


[Living Flows: Enhanced Exploration of Edge-Bundled Graphs Based on GPU-Intensive Edge Rendering. Lambert, Auber, and Melançon. Proc. Intl. Conf. Information Visualisation (IV), pp. 523–530, 2010.]

Further reading

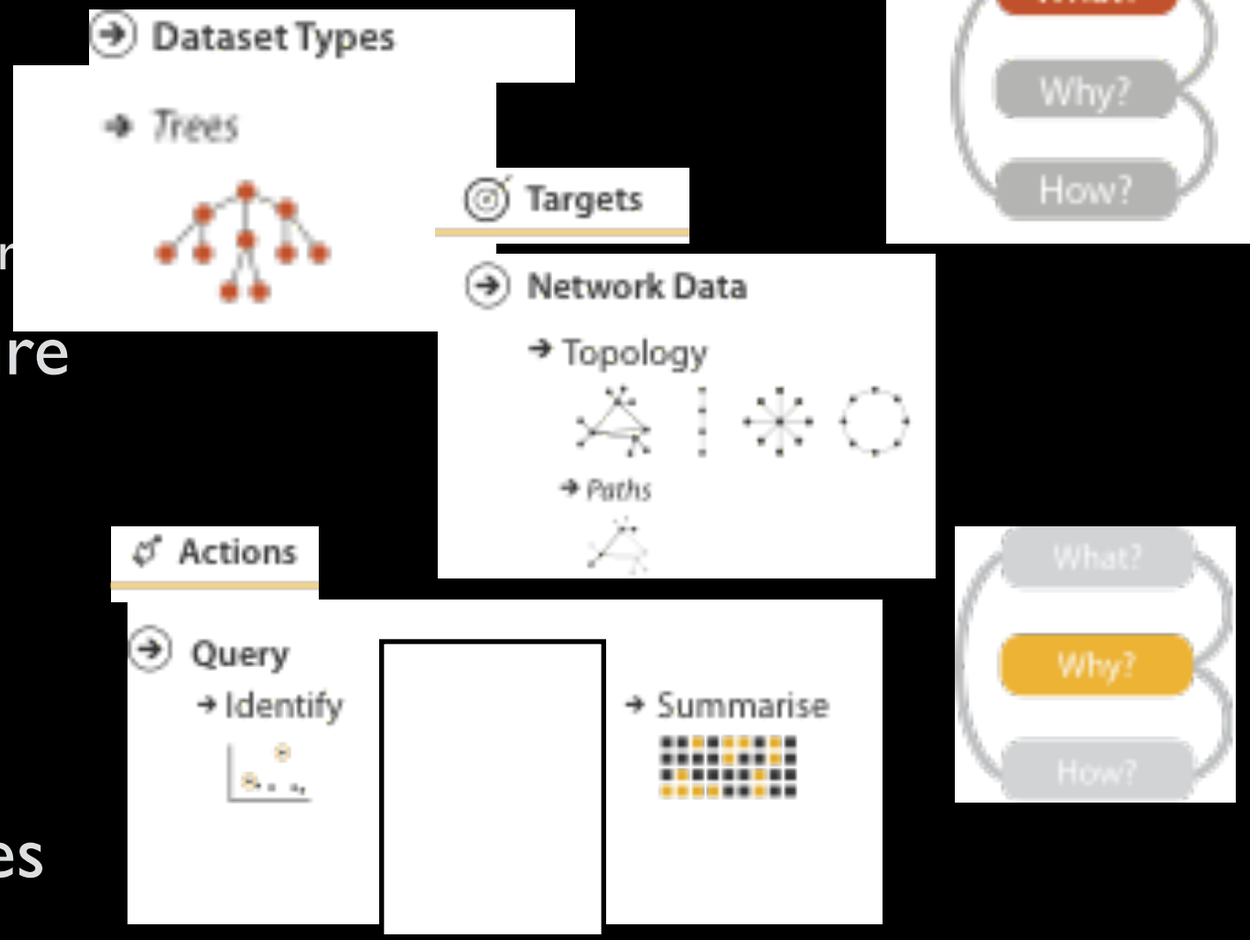
- Visualization Analysis and Design. Munzner. AK Peters / CRC Press, Oct 2014.
  - *Chap 14: Embed: Focus+Context*
- *A Review of Overview+Detail, Zooming, and Focus+Context Interfaces.* Cockburn, Karlson, and Bederson. ACM Computing Surveys 41:1 (2008), 1–31.
- *A Guide to Visual Multi-Level Interface Design From Synthesis of Empirical Study Evidence.* Lam and Munzner. Synthesis Lectures on Visualization Series, Morgan Claypool, 2010.
- *Hierarchical Aggregation for Information Visualization: Overview, Techniques and Design Guidelines.* Elmqvist and Fekete. IEEE Transactions on Visualization and Computer Graphics 16:3 (2010), 439–454.
- *A Fisheye Follow-up: Further Reflection on Focus + Context.* Furnas. Proc. ACM Conf. Human Factors in Computing Systems (CHI), pp. 999–1008, 2006.

TreeJuxtaposer video



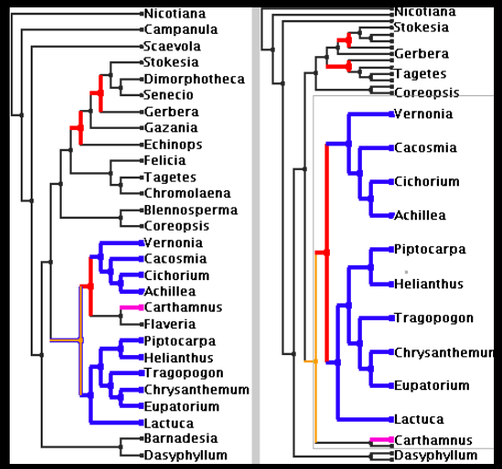
What and why: Data and task abstraction

- data: trees
  - phylogenetic tree reconstruction
    - siblings unordered, interior nodes inferr
- task: compare topological structure
  - larger query scopes require more explicit tool support
    - compare several is more difficult than identify/inspect one
      - even trickier: summarize all
- derived data: structural differences
  - best corresponding node in other tree



How: Idiom design decisions

- juxtapose linked views
  - show two tree layouts side by side
  - linked navigation
- encode with color: linked highlighting
  - structural differences
  - corresponding subtree (click select)
  - best corresponding node (hover select)



How: Idiom design decisions

- embed focus+context in single view
  - reduce with complex combination of filtering and aggregation
- distort geometry
  - metaphor: stretch and squish navigation
  - shape: rectilinear
  - foci: multiple
  - impact: global