

Lecture

Interaction Techniques – II

Facet into Multiple Views

DATA ANALYSIS & VISUALIZATION

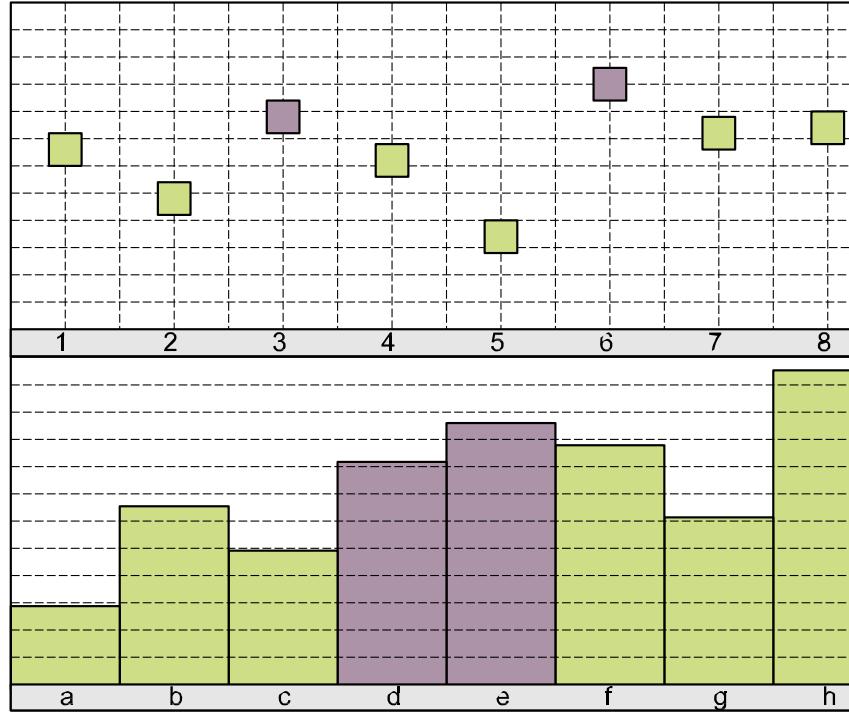
FALL 2021

Dr. Muhammad Faisal Cheema
FASTNU

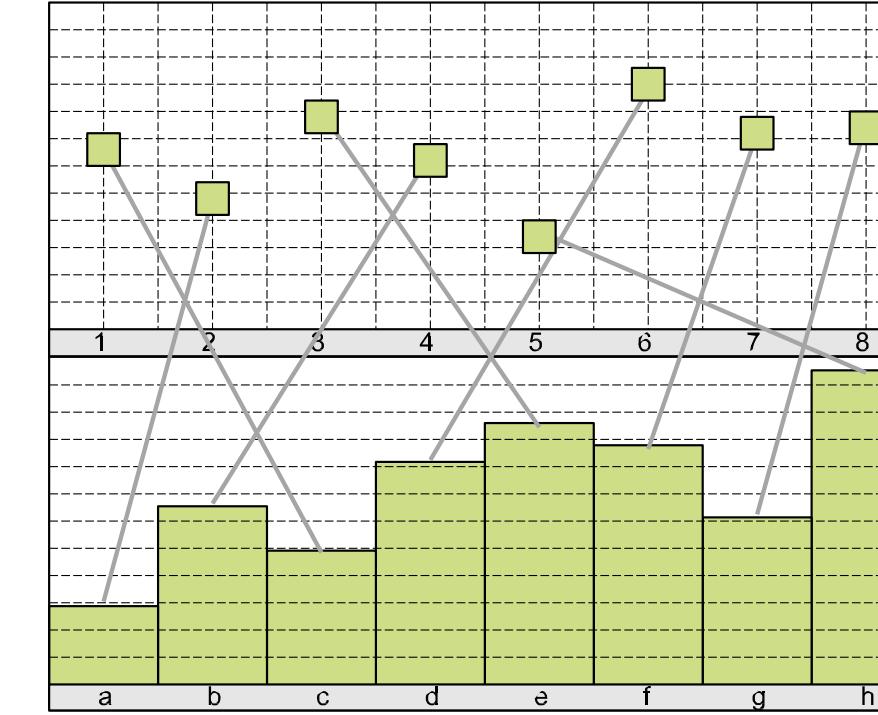
Multiple Views

- Facet (noun and verb)
 - particular aspect or feature of something
 - to split
- Partition visualization into views/layers
 - Either juxtapose or superimpose
 - Depends on data and encoding

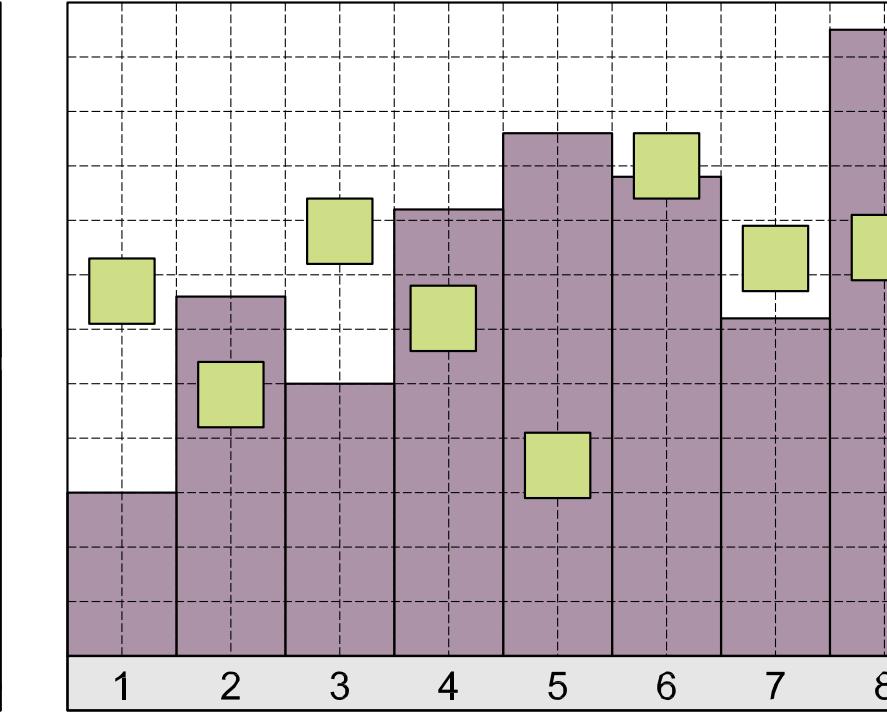
Composite Visualization Techniques



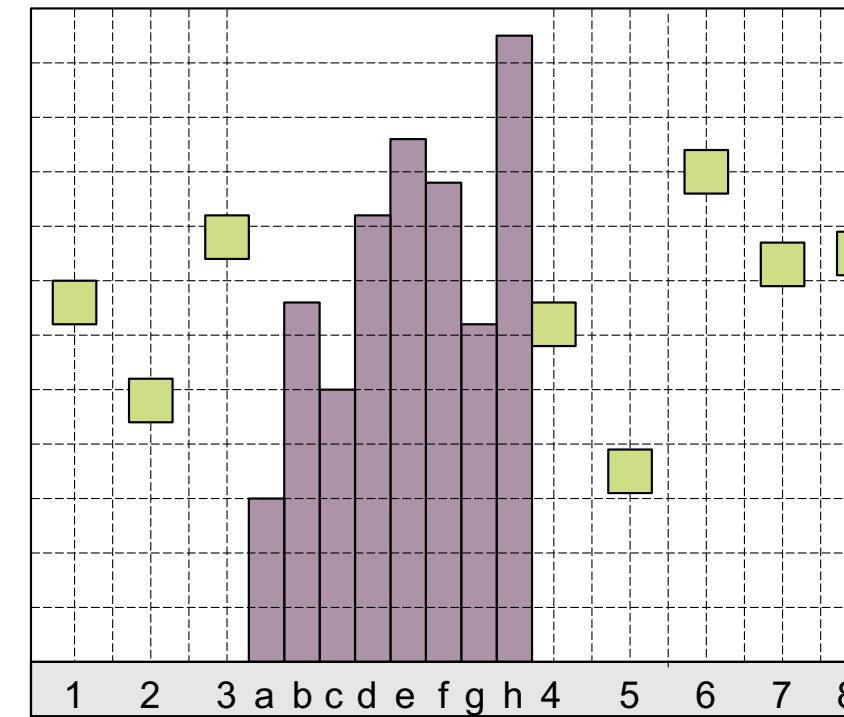
(a) Juxtaposed views.



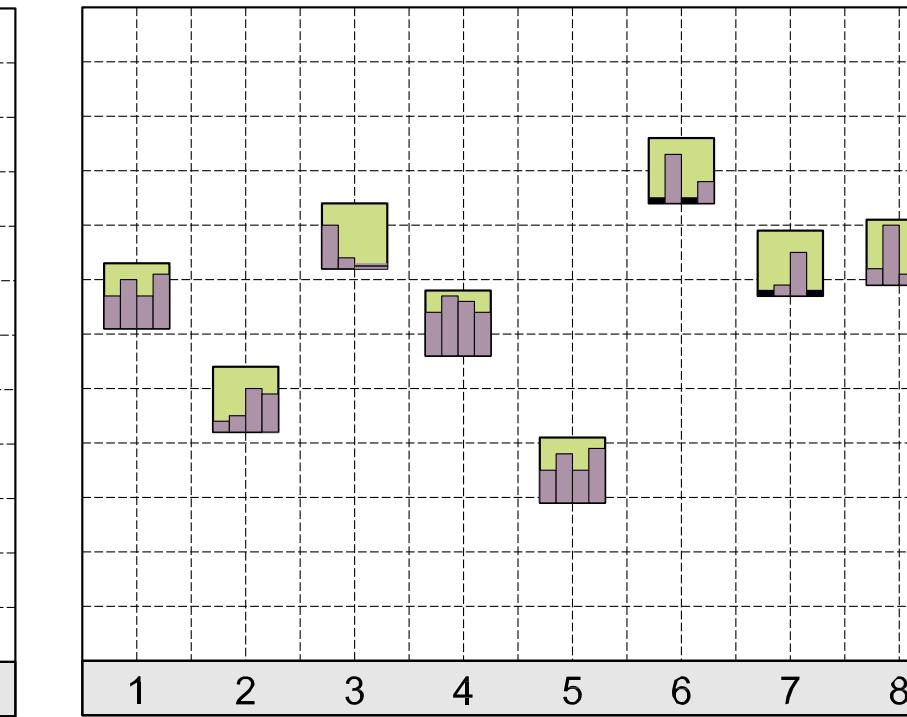
(b) Integrated views.



(c) Superimposed views.



(d) Overloaded views.



(e) Nested views.

[W. Javed and N. Elmquist, 2012]

Multiple Views

→ Juxtapose and Coordinate Multiple Side-by-Side Views

→ Share Encoding: Same/Different

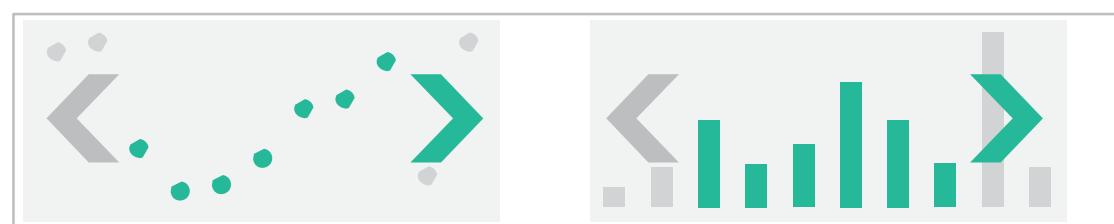
→ *Linked Highlighting*



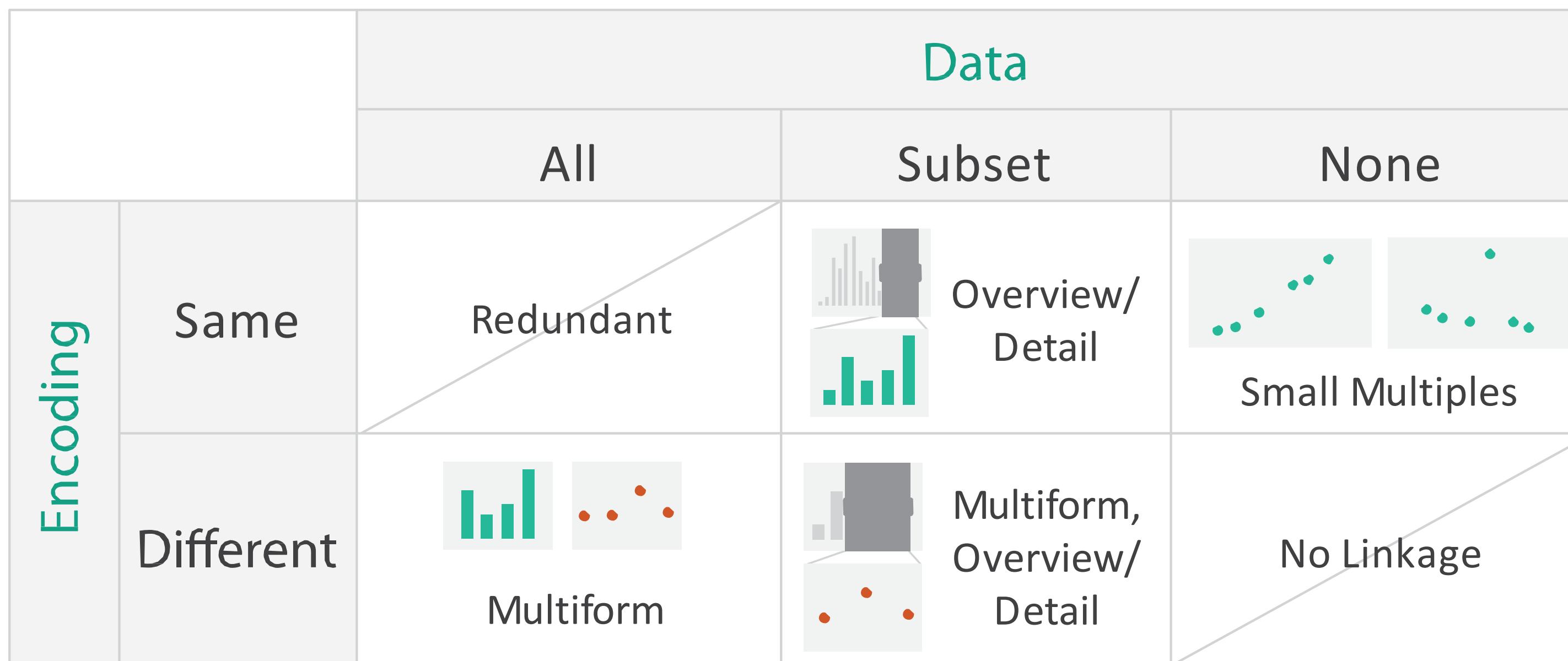
→ Share Data: All/Subset/None



→ Share Navigation

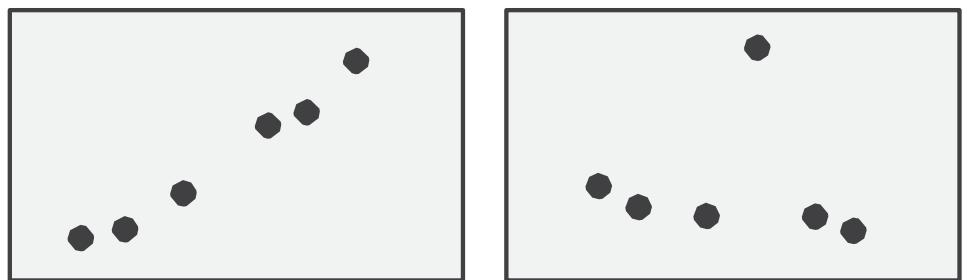


Multiple Views

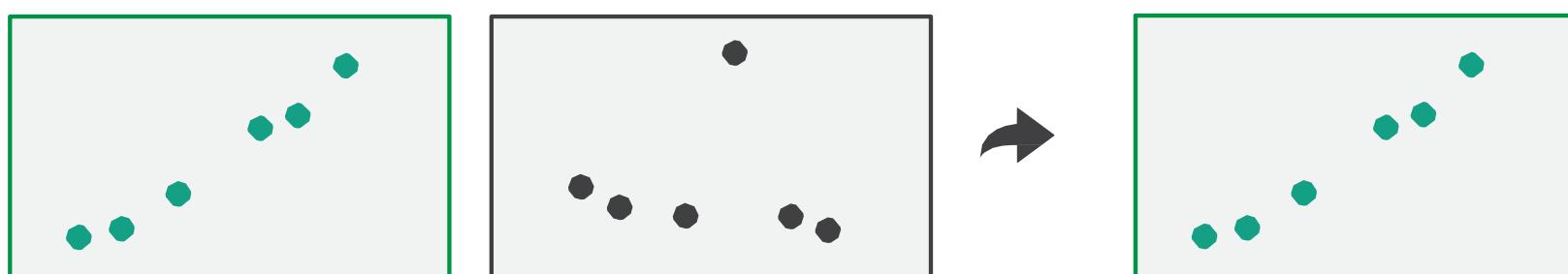


Multiple Views

→ Partition into Side-by-Side Views



→ Superimpose Layers



Multiform Views

- The same data visualized in different ways
- Does not need to be a totally different encoding (all choices need not be disjoint), e.g. horizontal positions could be the same
- One view becomes cluttered with too many attributes
- Consumes more screen space
- Allows greater separability between channels

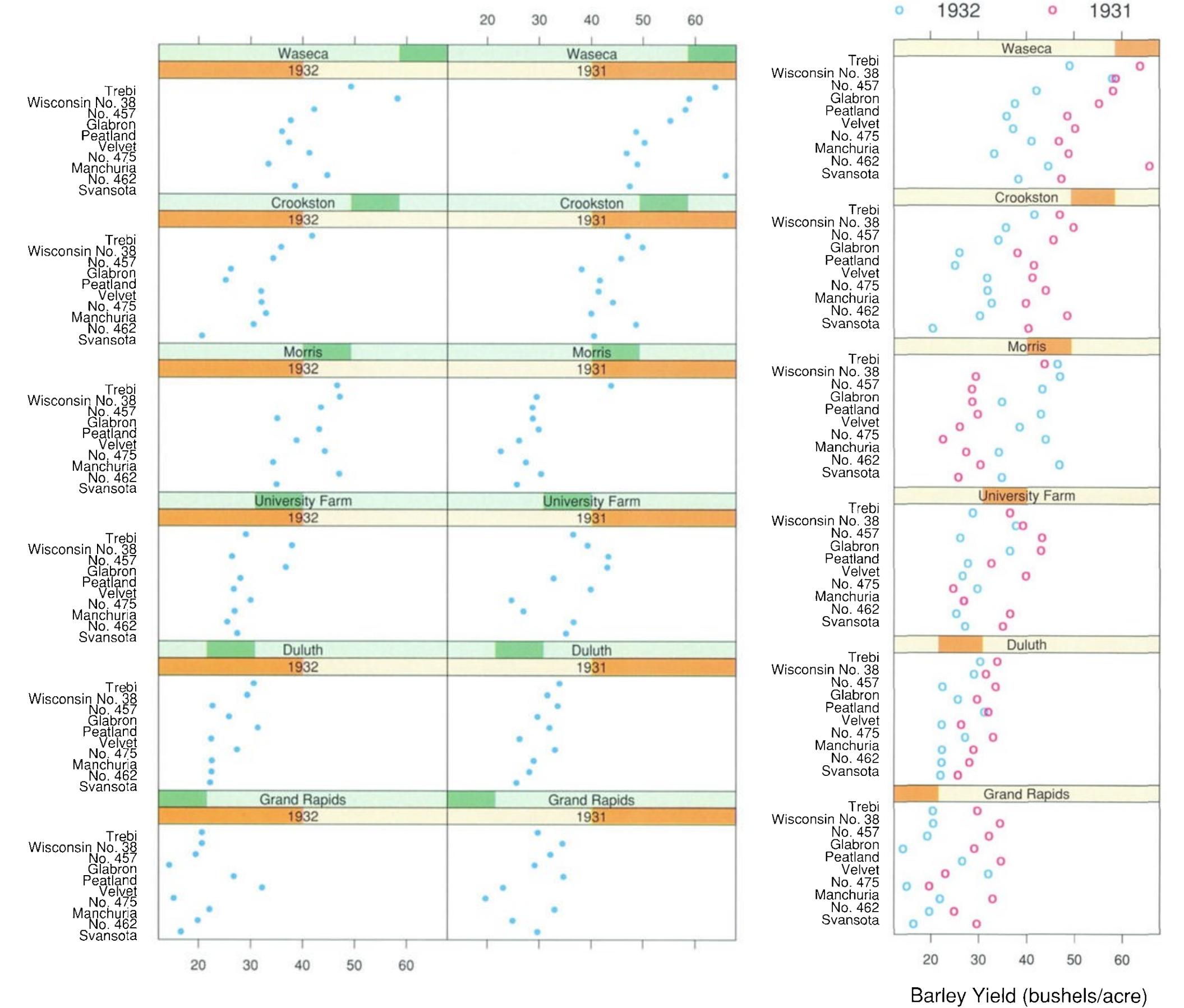
Multiple Views

Example of Partitioned Views

Partitioned Views

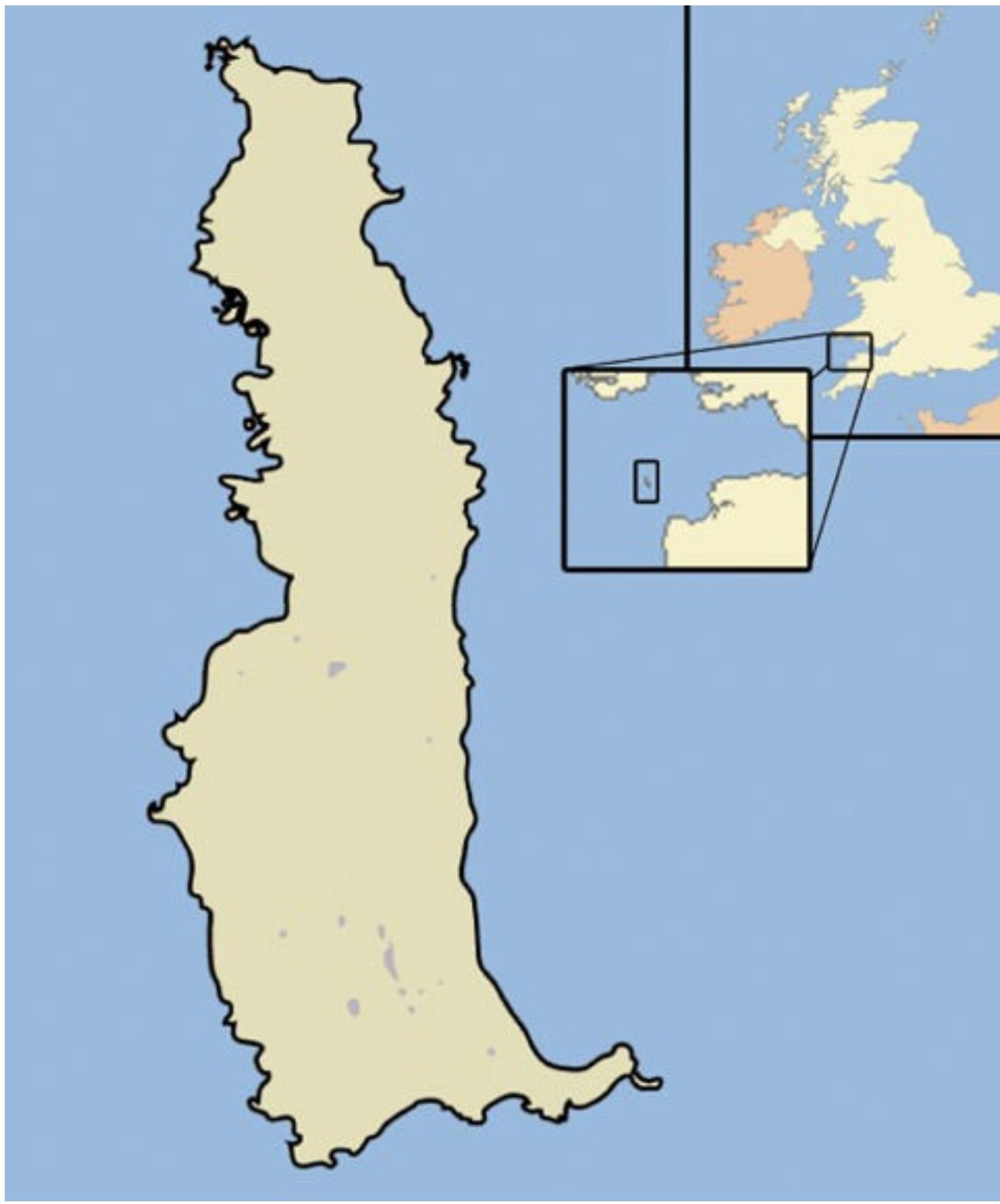
- Split dataset into groups and visualize each group
- Extremes: one item per group, one group for all items
- Can be a hierarchy
 - Order: which splits are more "related"?
 - Which attributes are used to split? usually categorical

Partitioned Views: Trellis Matrix Alignment



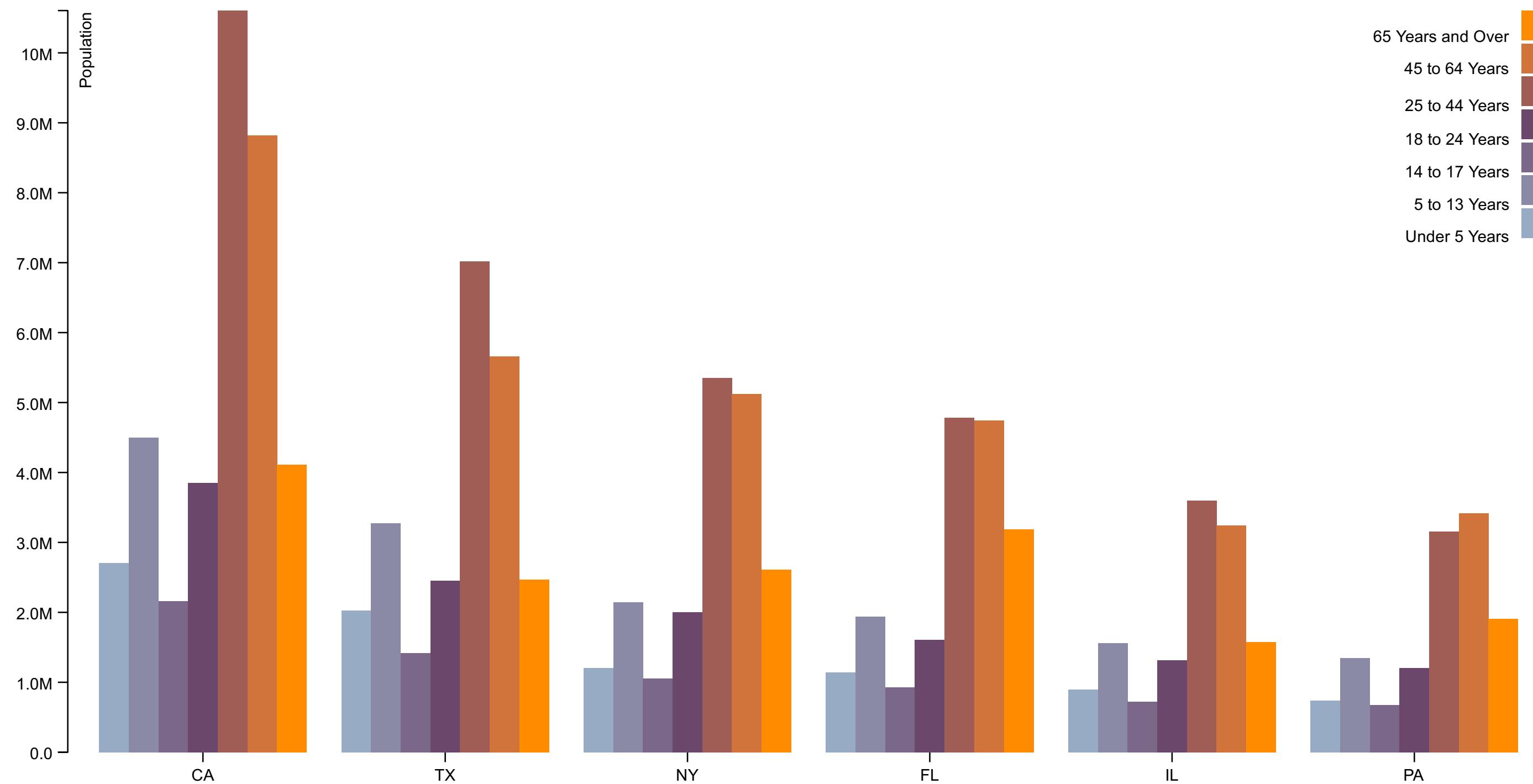
[Becker et al., 1996]

Overview-Detail View



[Wikipedia]

Partitioned View

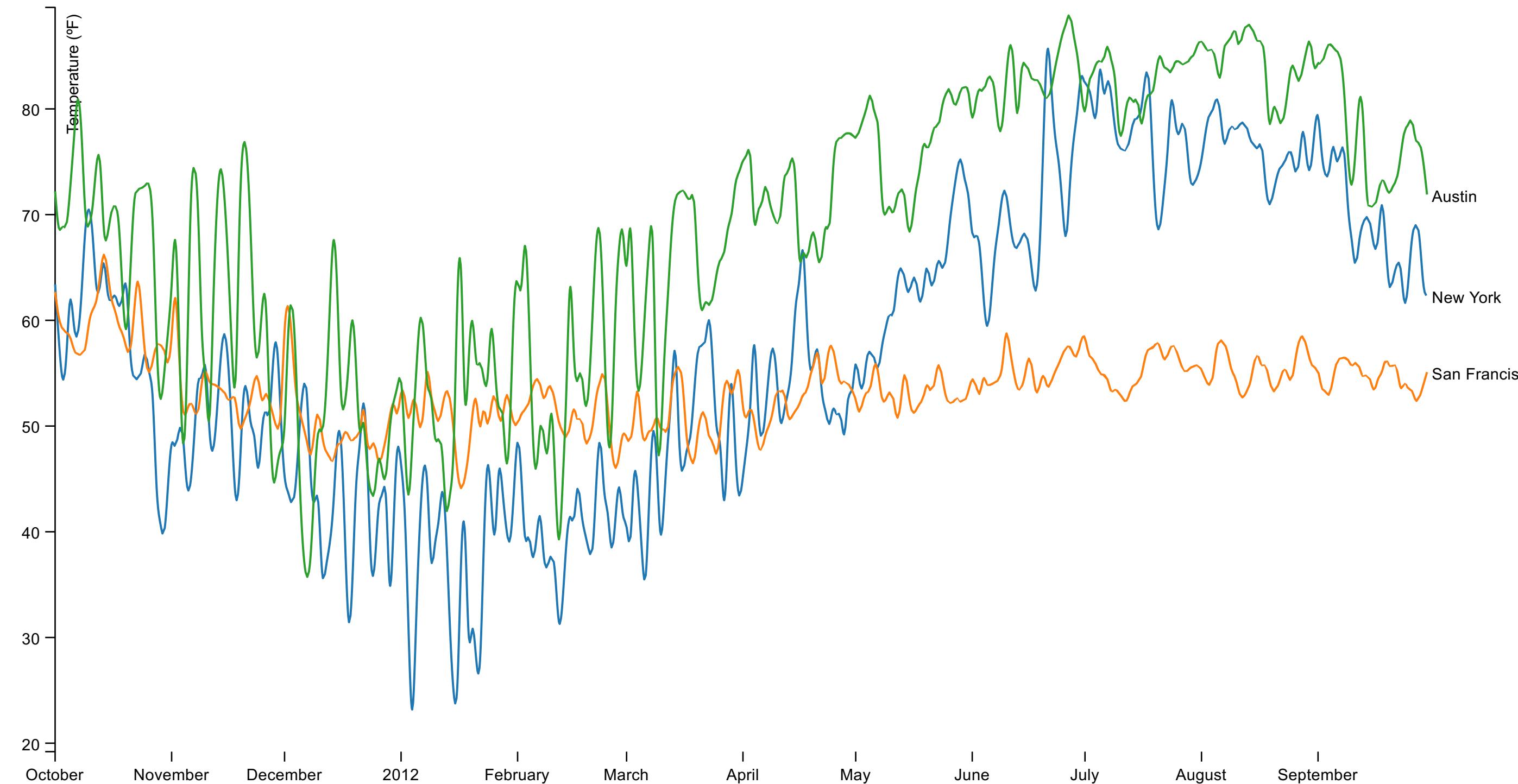


[M. Bostock, <http://bl.ocks.org/mbostock/3887051>]

Multiple Views

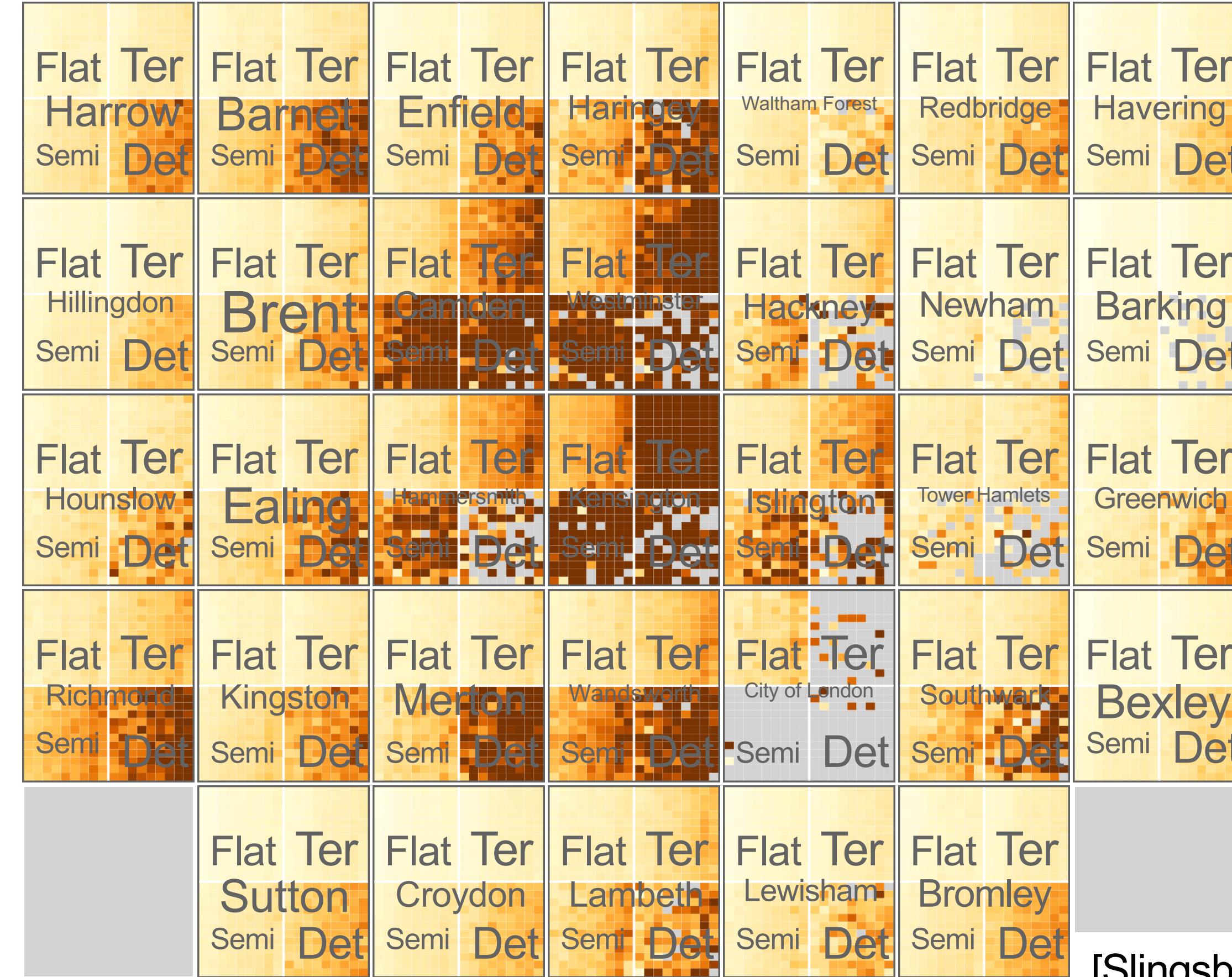
Example of Superimposed layers

Superimposed Line Charts



[M. Bostock, <http://bl.ocks.org/mbostock/3884955>]

Recursive Subdivision (Treemaps uses superimposition)



[Slingsby et al., 2009]

Focus + Context

Focus+Context

- Show everything at once but compress regions that are not the current focus
 - User shouldn't lose sight of the overall picture
 - May involve some aggregation in non-focused regions
 - "Nonliteral navigation" like semantic zooming
- Elision
- Superimposition: more directly tied than with layers
- Distortion

Focus+Content Overview

→ Embed

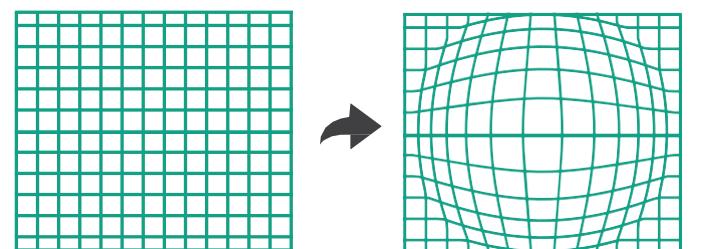
→ Elide Data



→ Superimpose Layer



→ Distort Geometry



Reduce

→ Filter



→ Aggregate



→



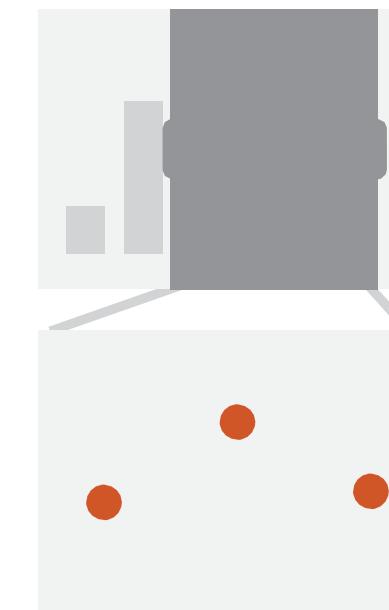
[Munzner (ill. Maguire), 2014]

Focus and Context

Provides detailed view of a **subset** within context of the full dataset



Overview/
Detail



Multiform,
Overview/
Detail

Why? For large or complex data, a single view of the entire dataset cannot capture fine details

Brush & Link

Brushing & Linking multiple views that are simultaneously visible and linked together such that actions in one view affect the others

primary strategy: **highlighting**

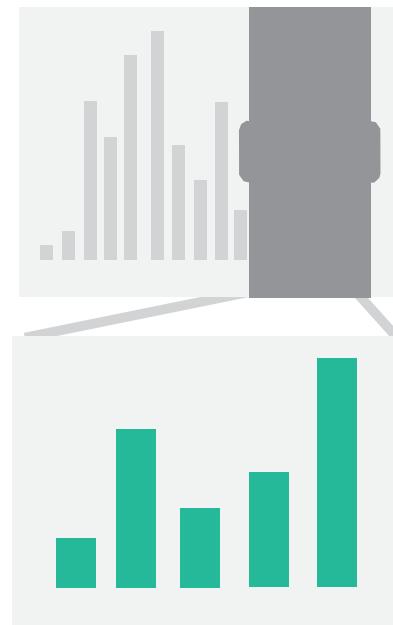
→ Share Encoding: Same/Different

→ *Linked Highlighting*

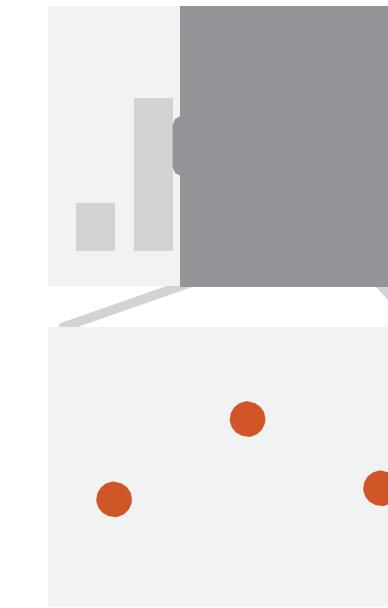


Zoom Techniques

Provides detailed view of a **subset** within context of the full dataset



Overview/
Detail



Multiform,
Overview/
Detail

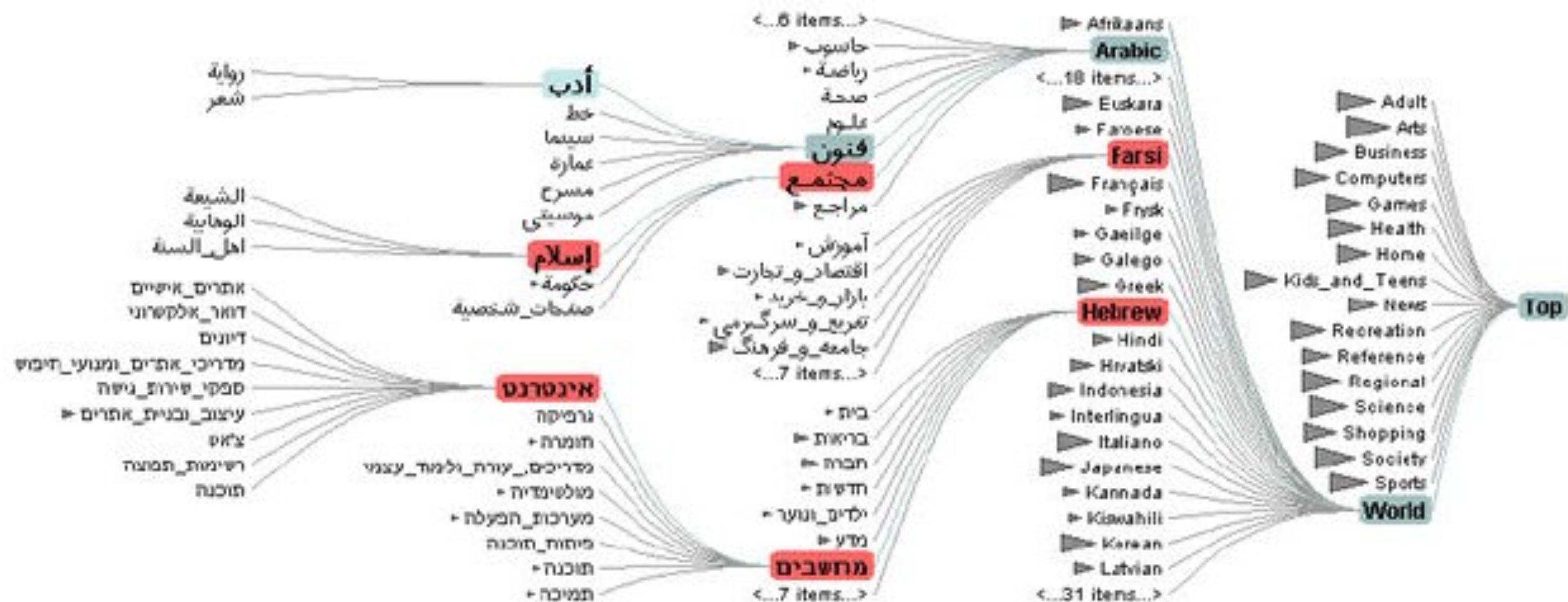
Focus + Context

Elision

Elision

- There are a number of examples of elision including in text , DOI Trees, ...
- Includes both filtering and aggregation but goal is to give overall view of the data
- In visualization, usually correlated with focus regions

Elision: DOI Trees

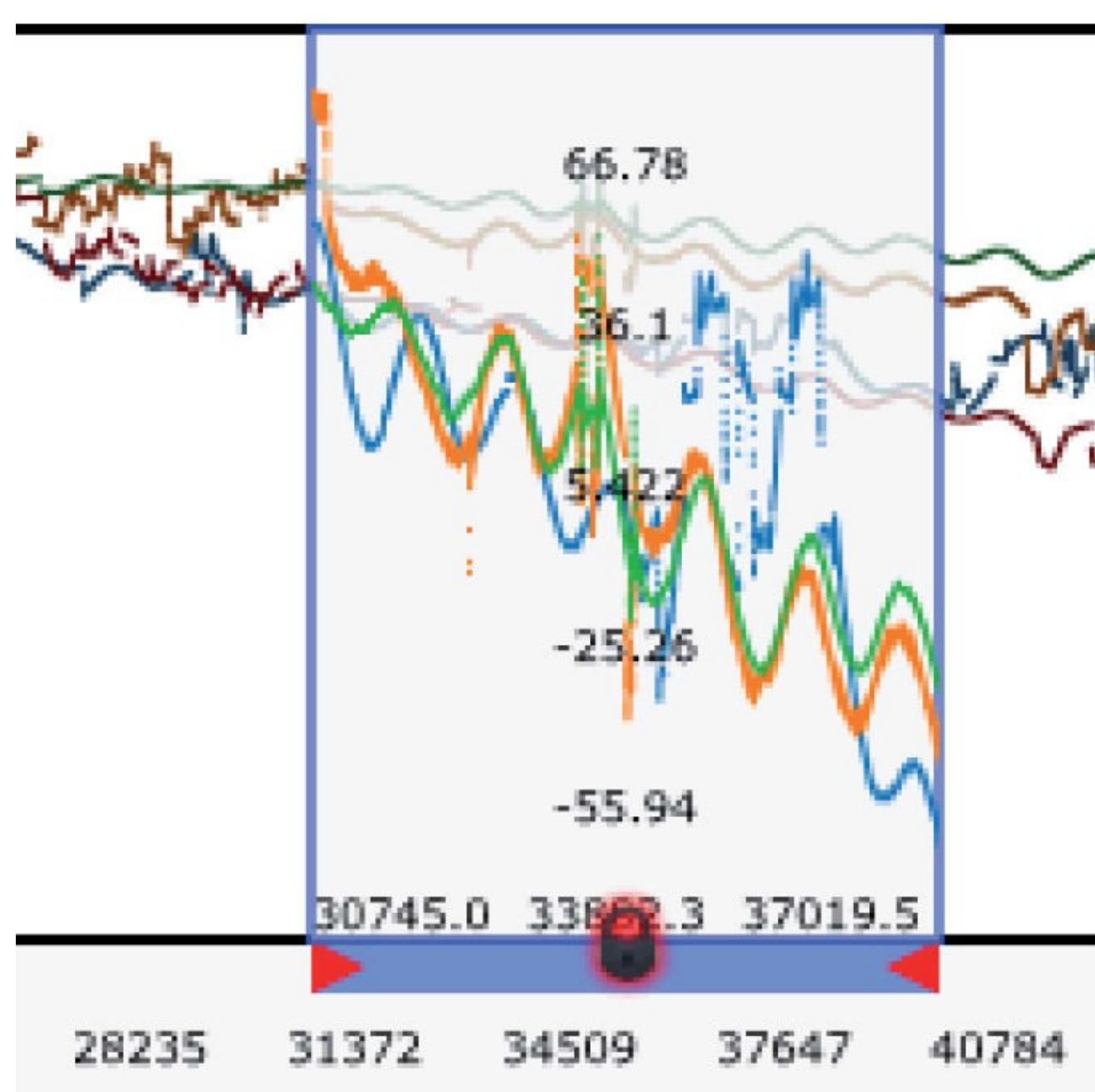


[Heer and Card, 2004]

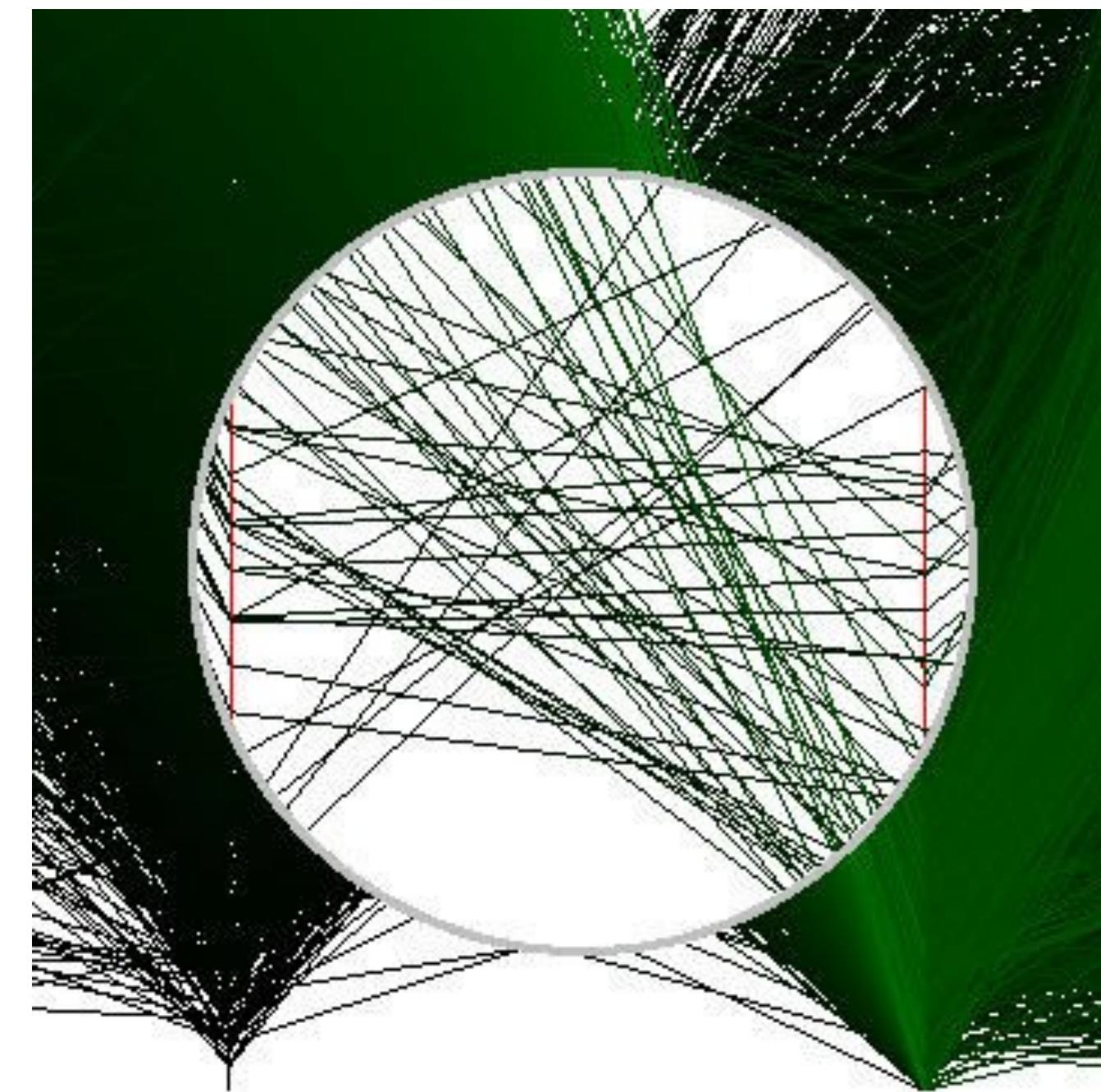
Focus + Context

Superimposed layers

Superimposition with Interactive Lenses



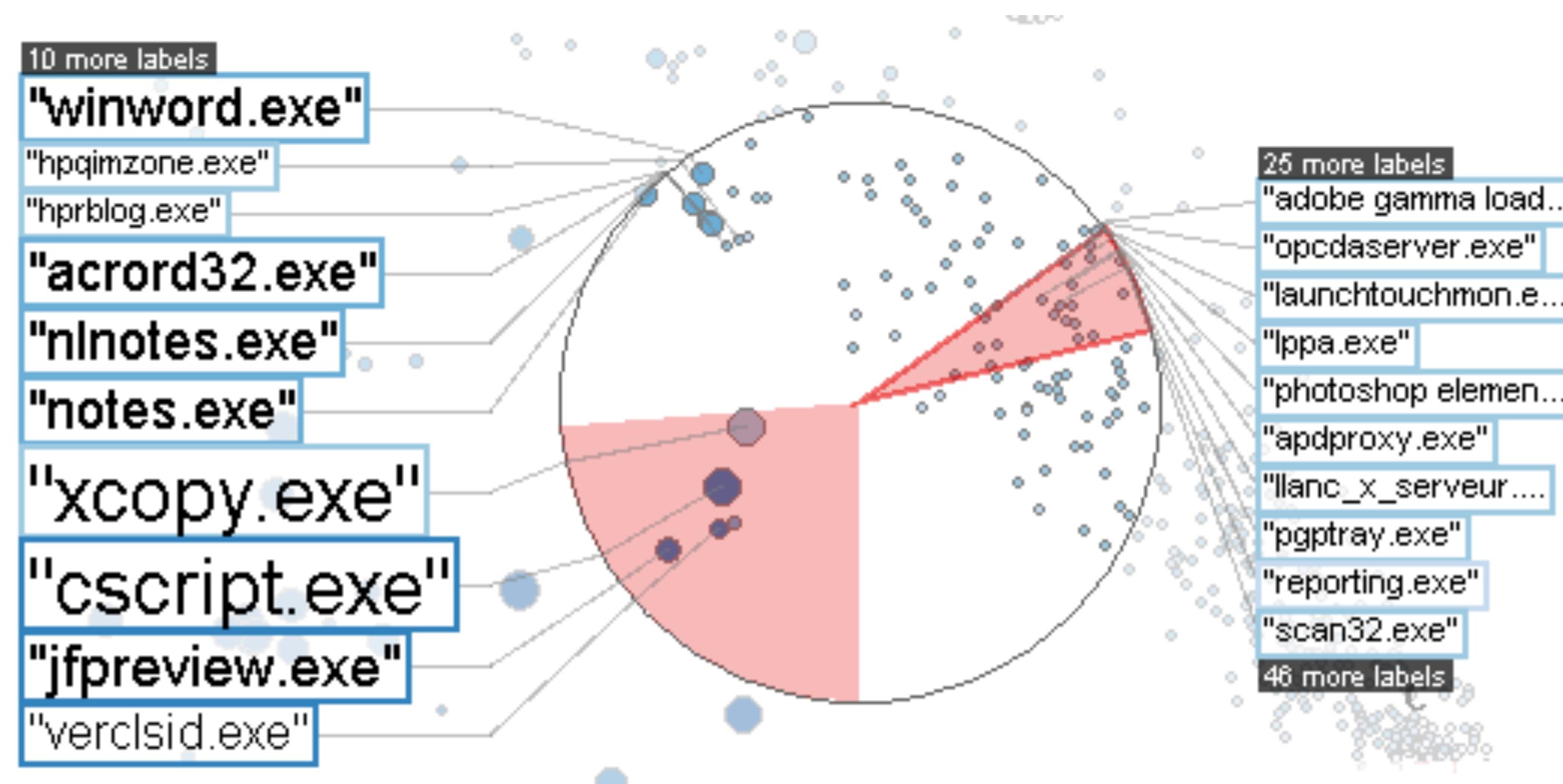
(a) Alteration



(b) Suppression

[ChronoLenses and Sampling Lens in Tominski et al., 2014]

Superimposition with Interactive

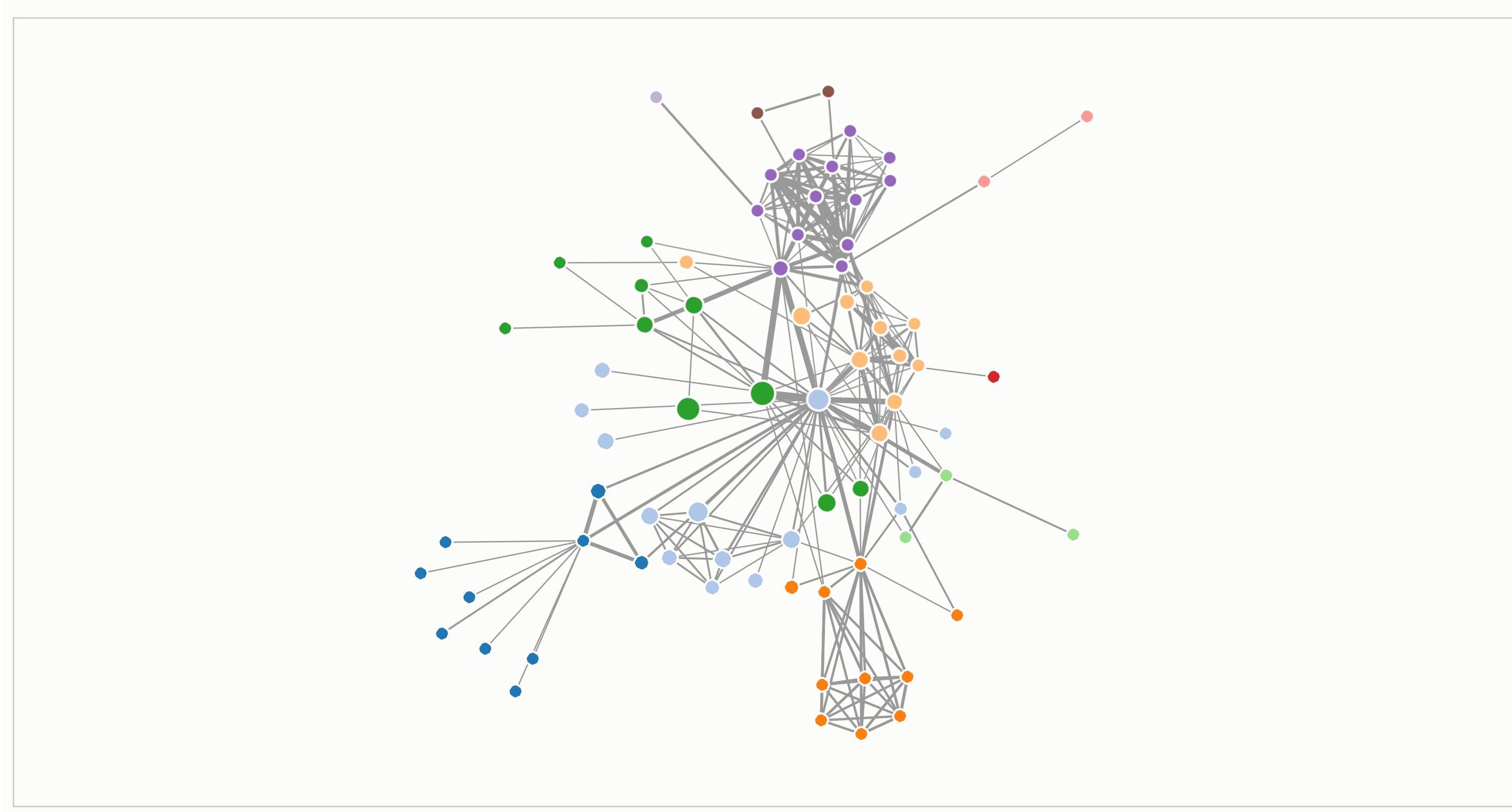


(c) Enrichment

[Extended Lens in Tominski et al., 2014]

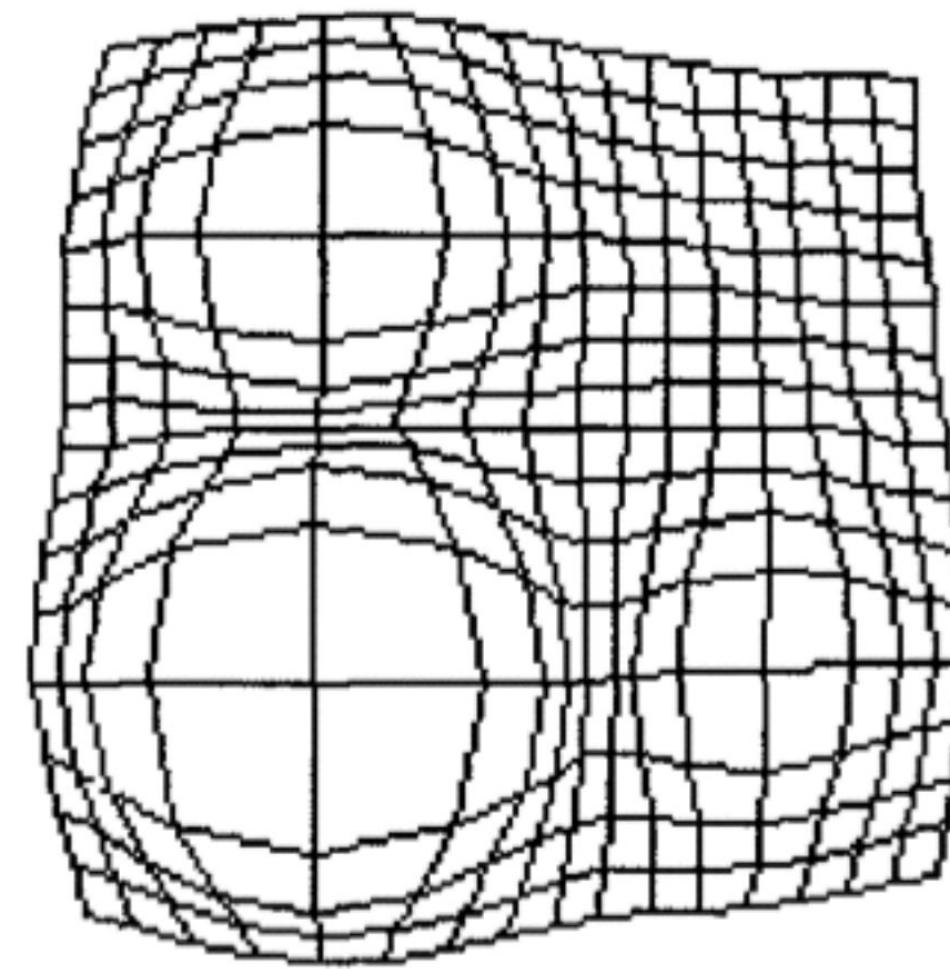
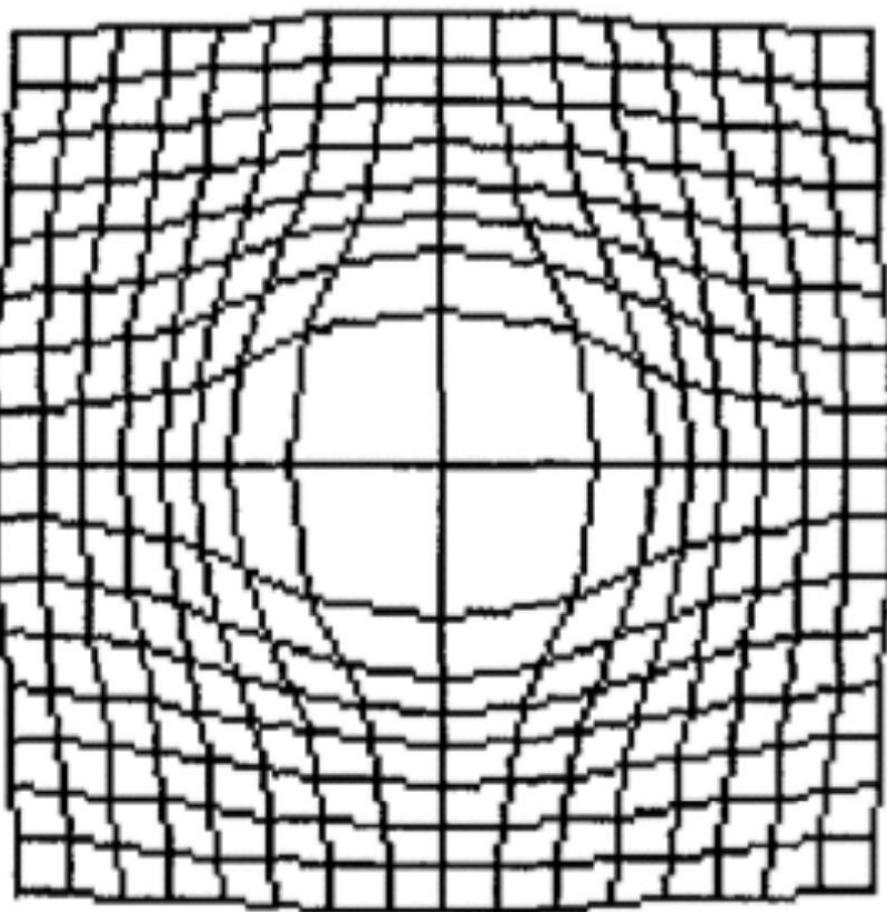
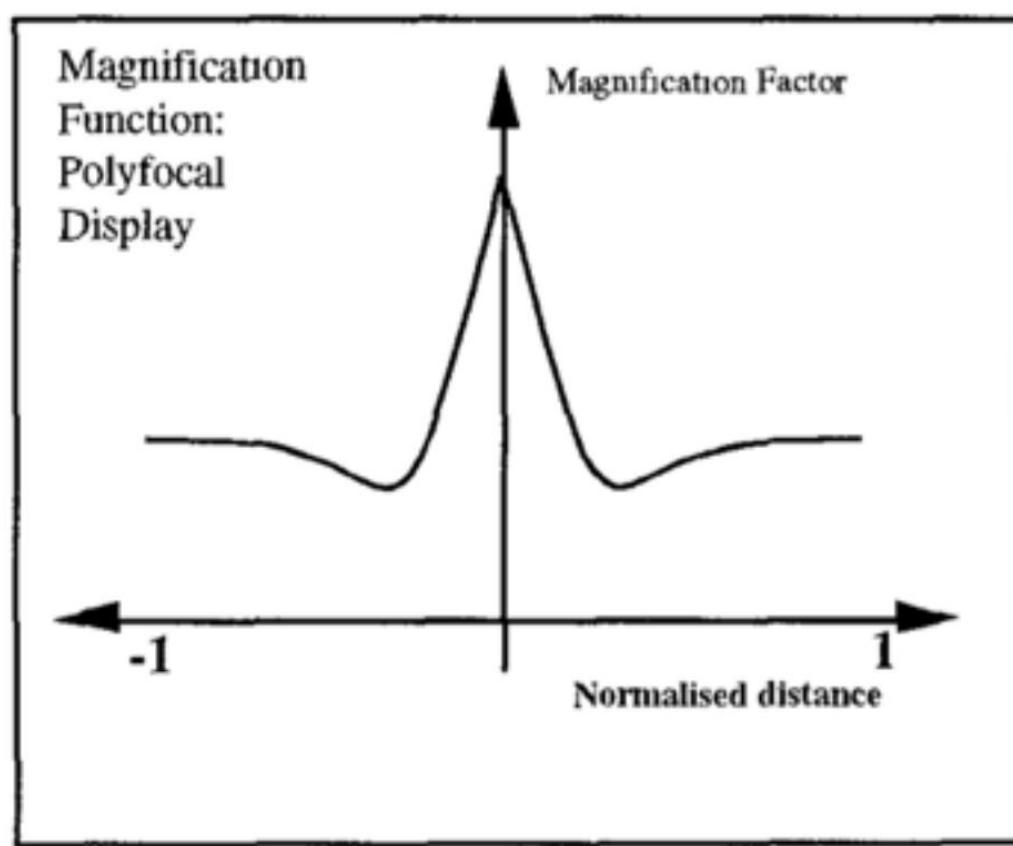
Focus + Context
Distortion

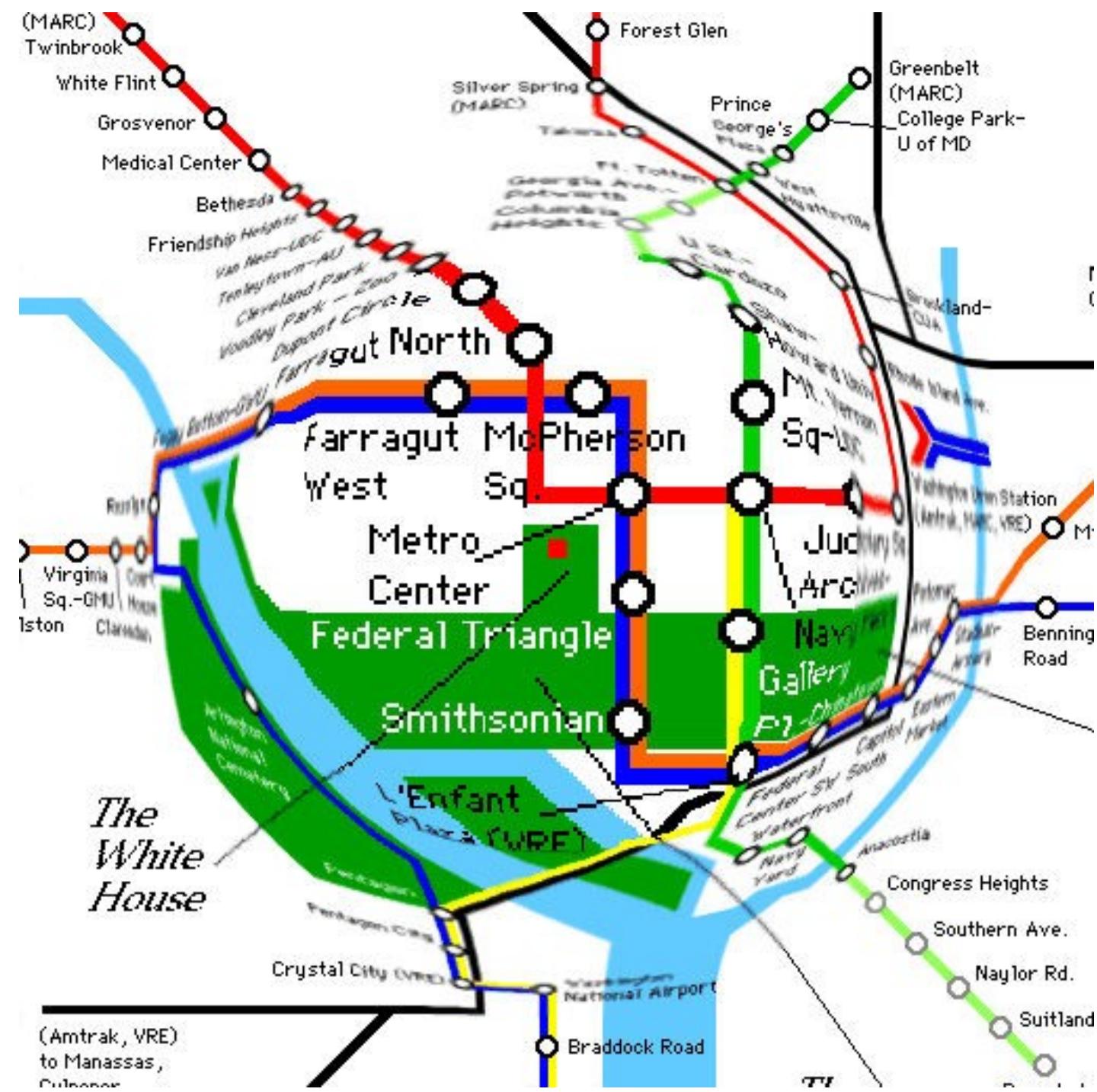
Distortion: Fisheye Lens



[M. Bostock, <http://bostocks.org/mike/fisheye/>]

Fisheye Lens





Distortion Choices

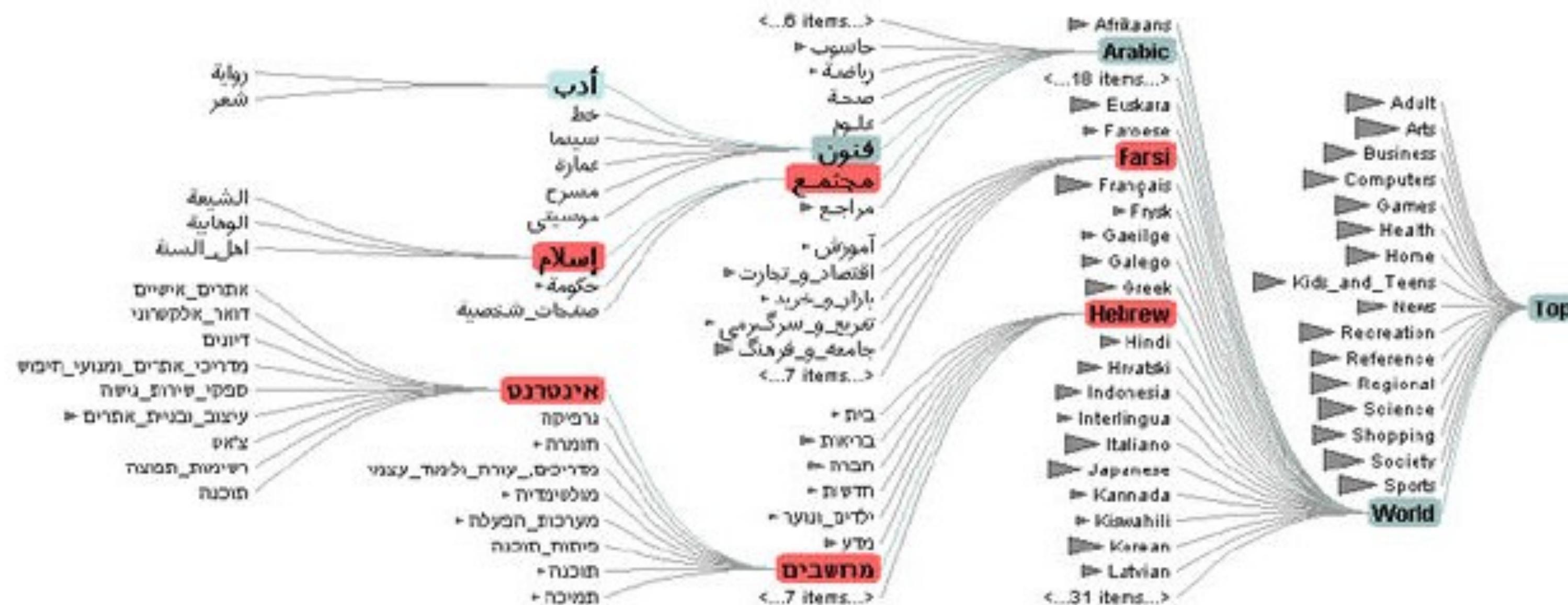
- How many focus regions?
 - One
 - Multiple
- Shape of the focus?
 - Radial
 - Rectangular
 - Other
- Extent of the focus
 - Constrained similar to magic lenses
 - Entire view changes
- Type of interaction:
 - Geometric, moveable lenses, rubber sheet

Degree of Interest Function

- $\text{DOI} = I(x) - D(x,y)$
 - I : interest function
 - D : distance (semantic or spatial)
 - x : location of item
 - y : current focus point (could be more than one)
- Interactive: y changes

Elision: DOLTrees

- Example: 600,000 node tree
 - Multiple foci (from search results or via user selection)
 - Distance computed topologically (levels, not geometric)

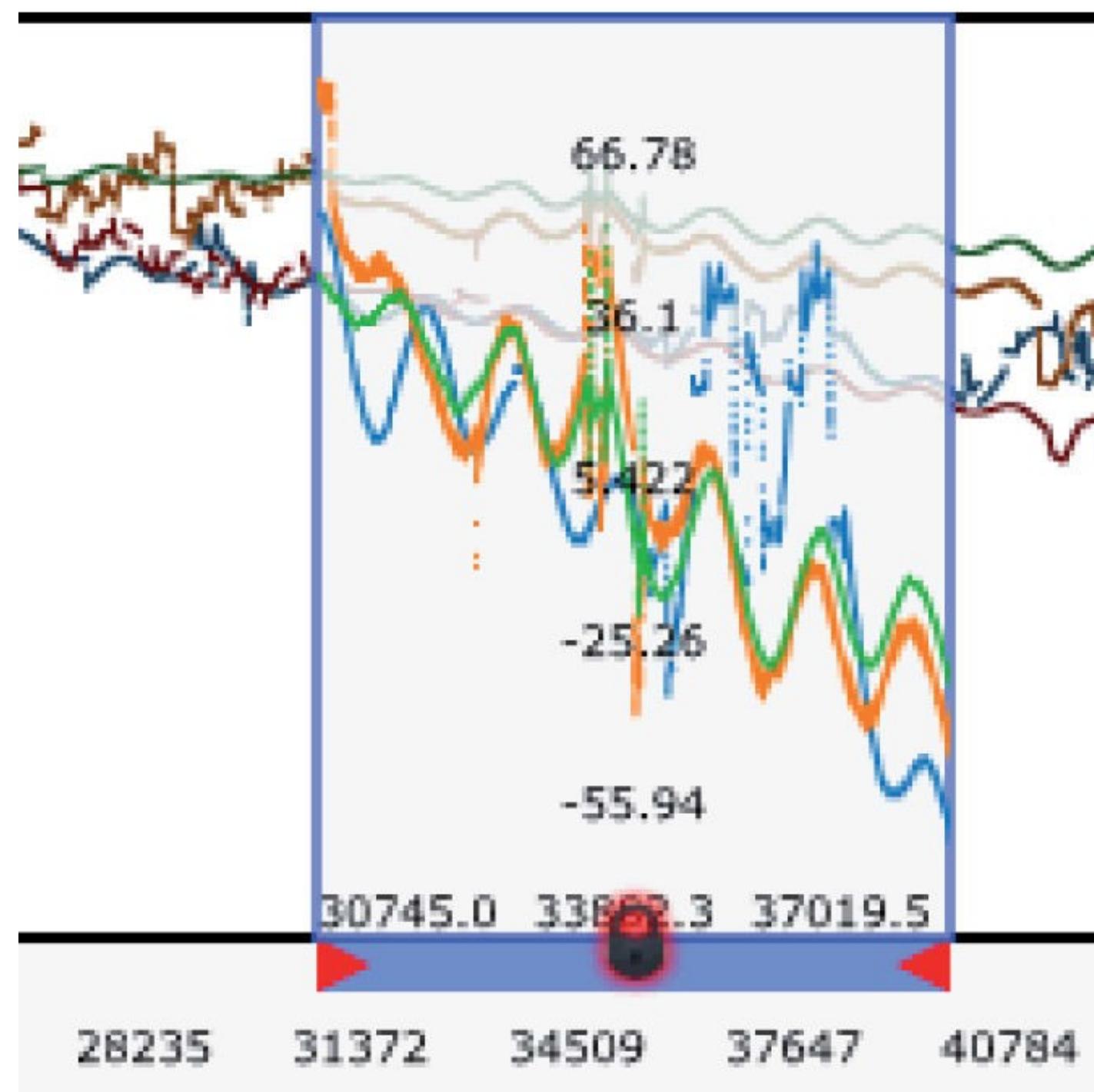


[Heer and Card, 2004]

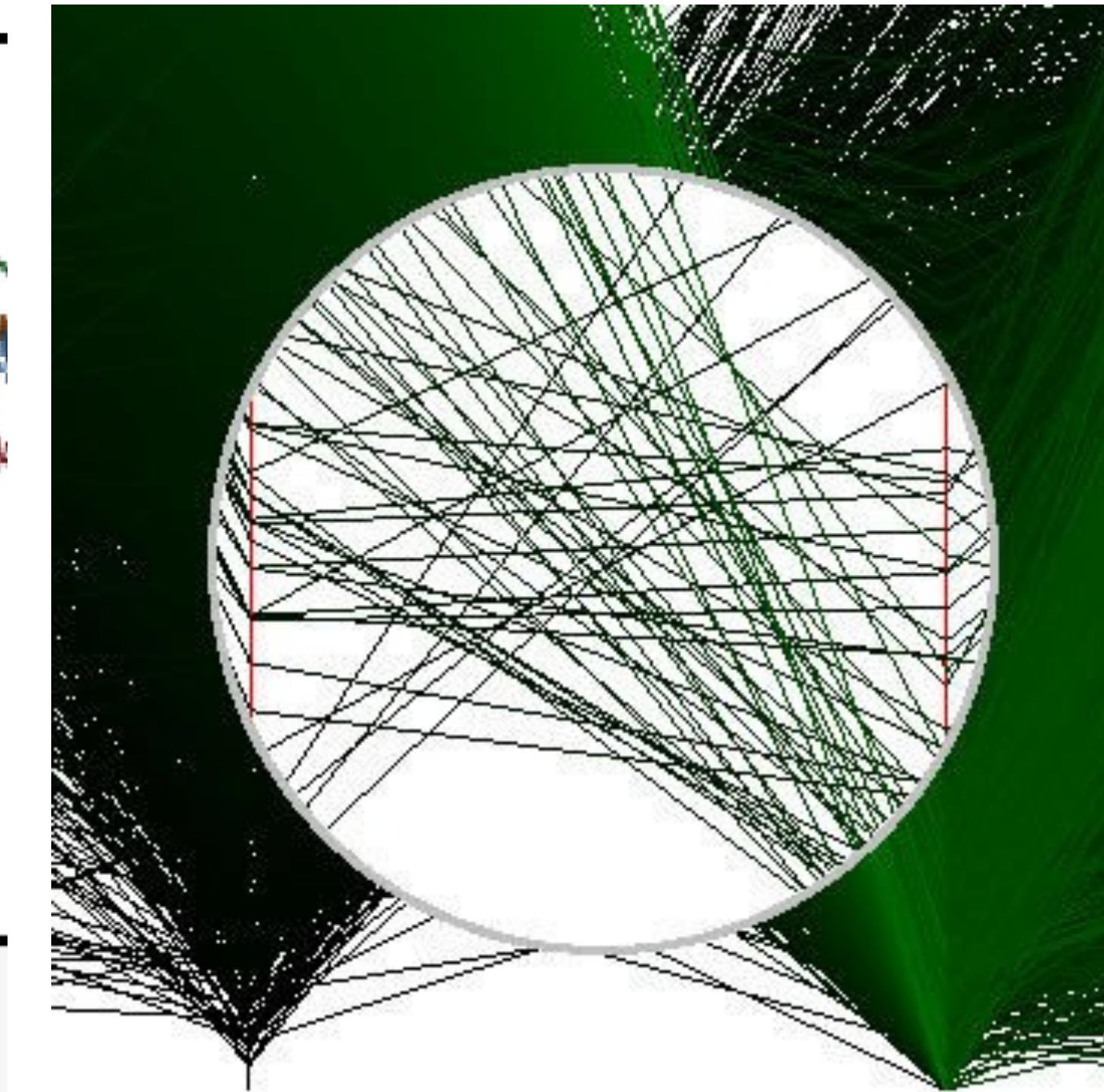
Superimposition

- Different from layers because this is restricted to a particular region
 - For Focus+Context, superimposition is not global
 - More like overloading
- Lens may occlude the layer below

Superimposition with Interactive Lenses



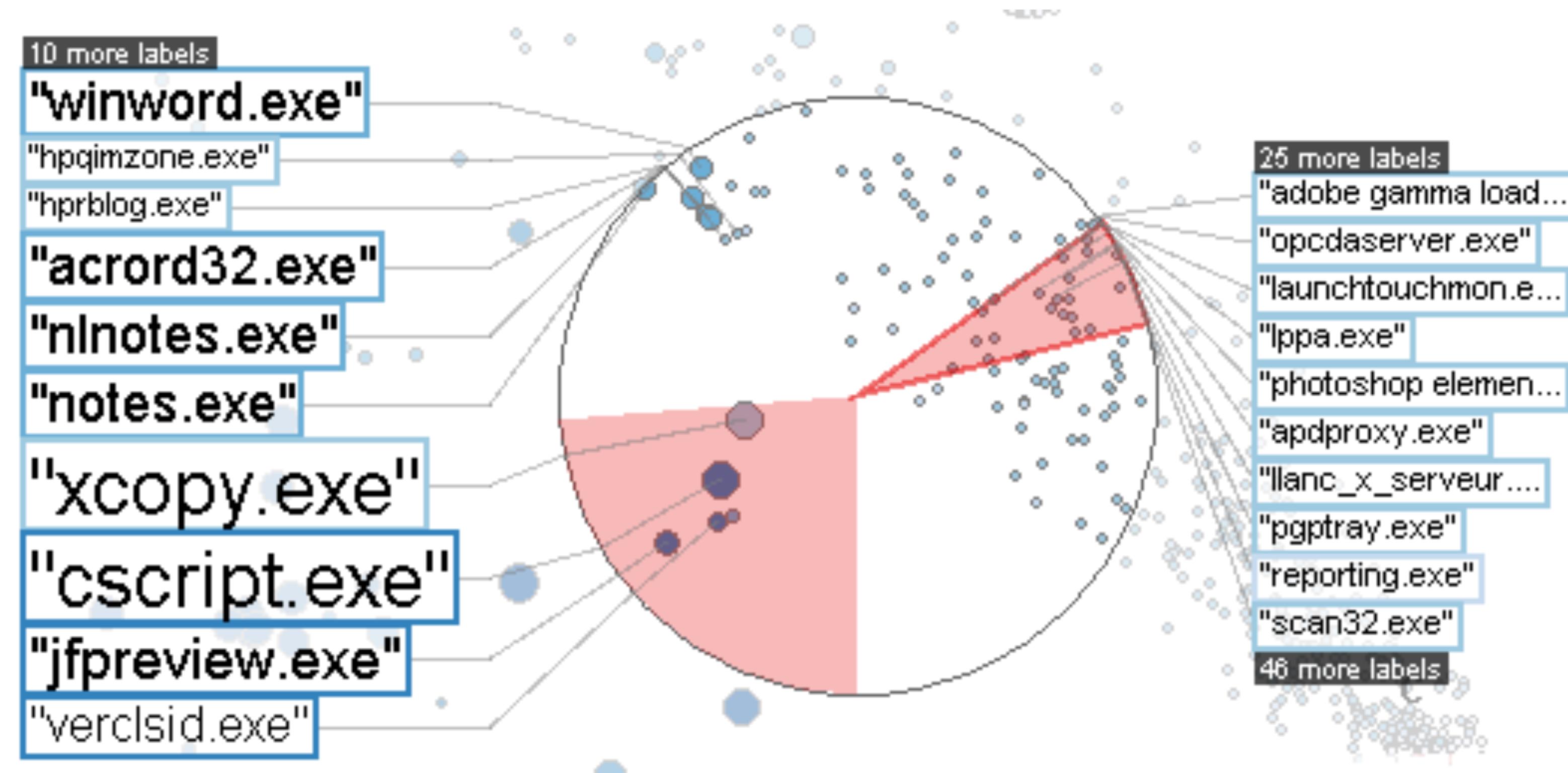
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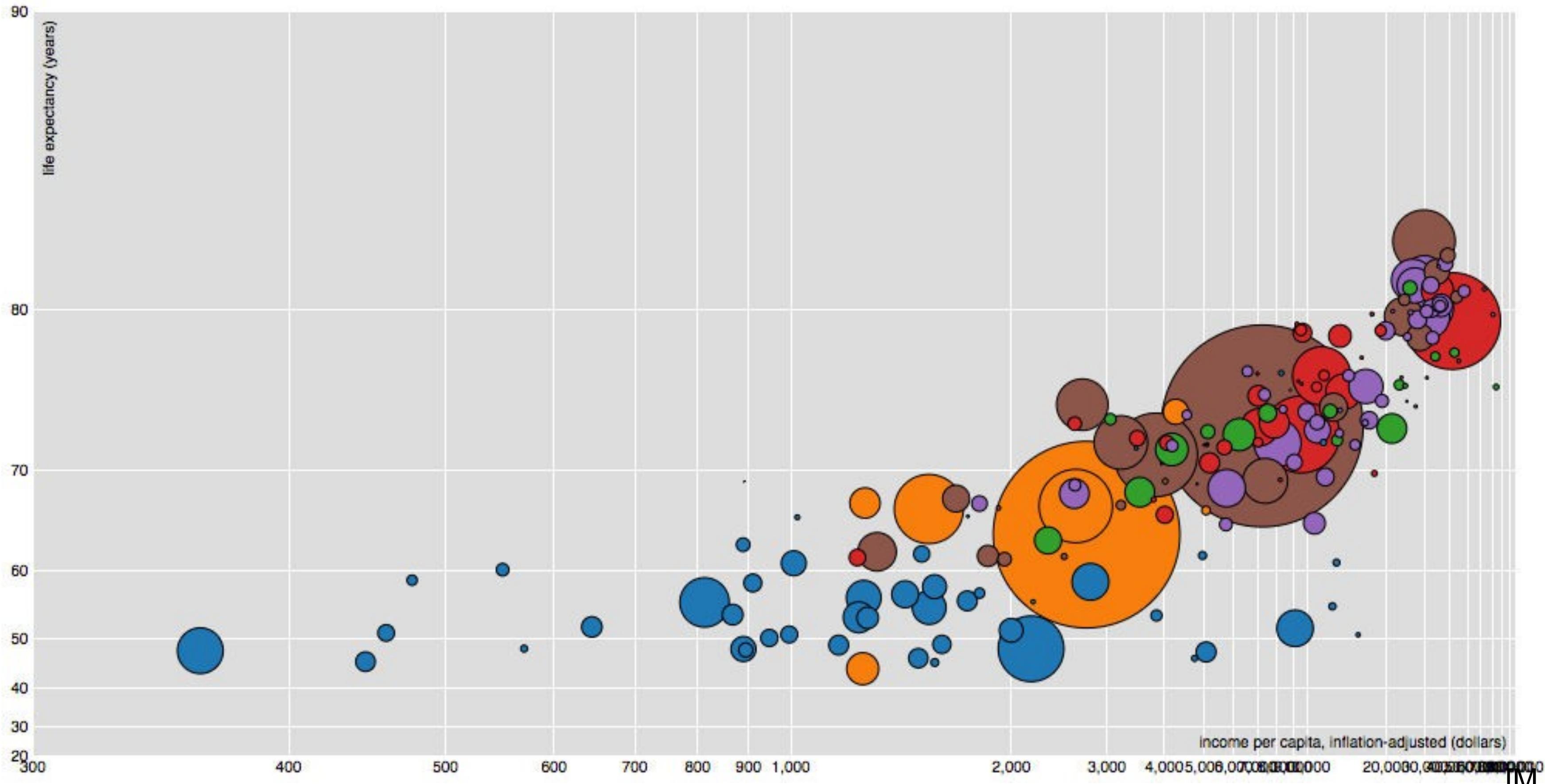
Superimposition with Interactive



(c) Enrichment

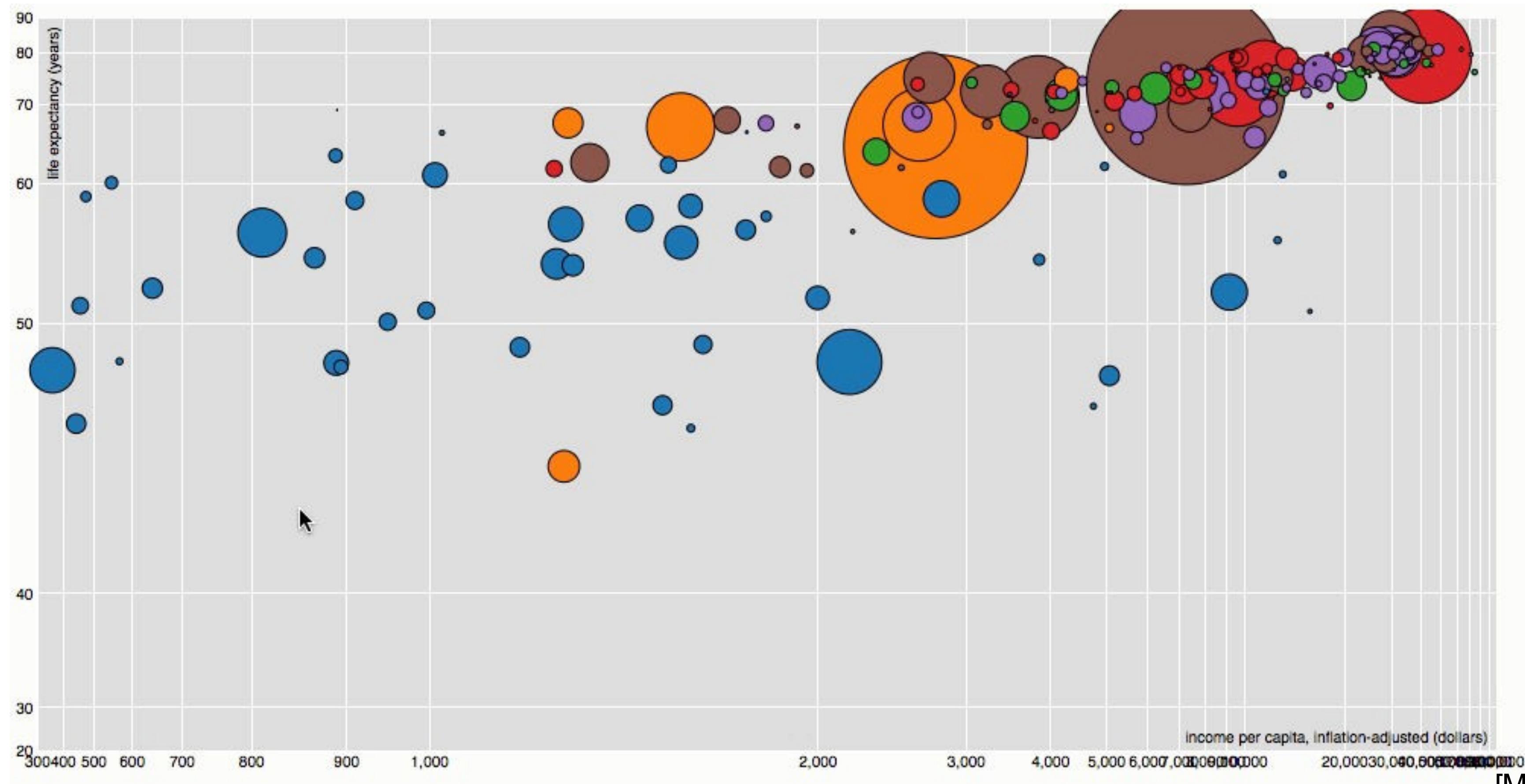
[Extended Lens in Tominski et al., 2014]

Overplotting



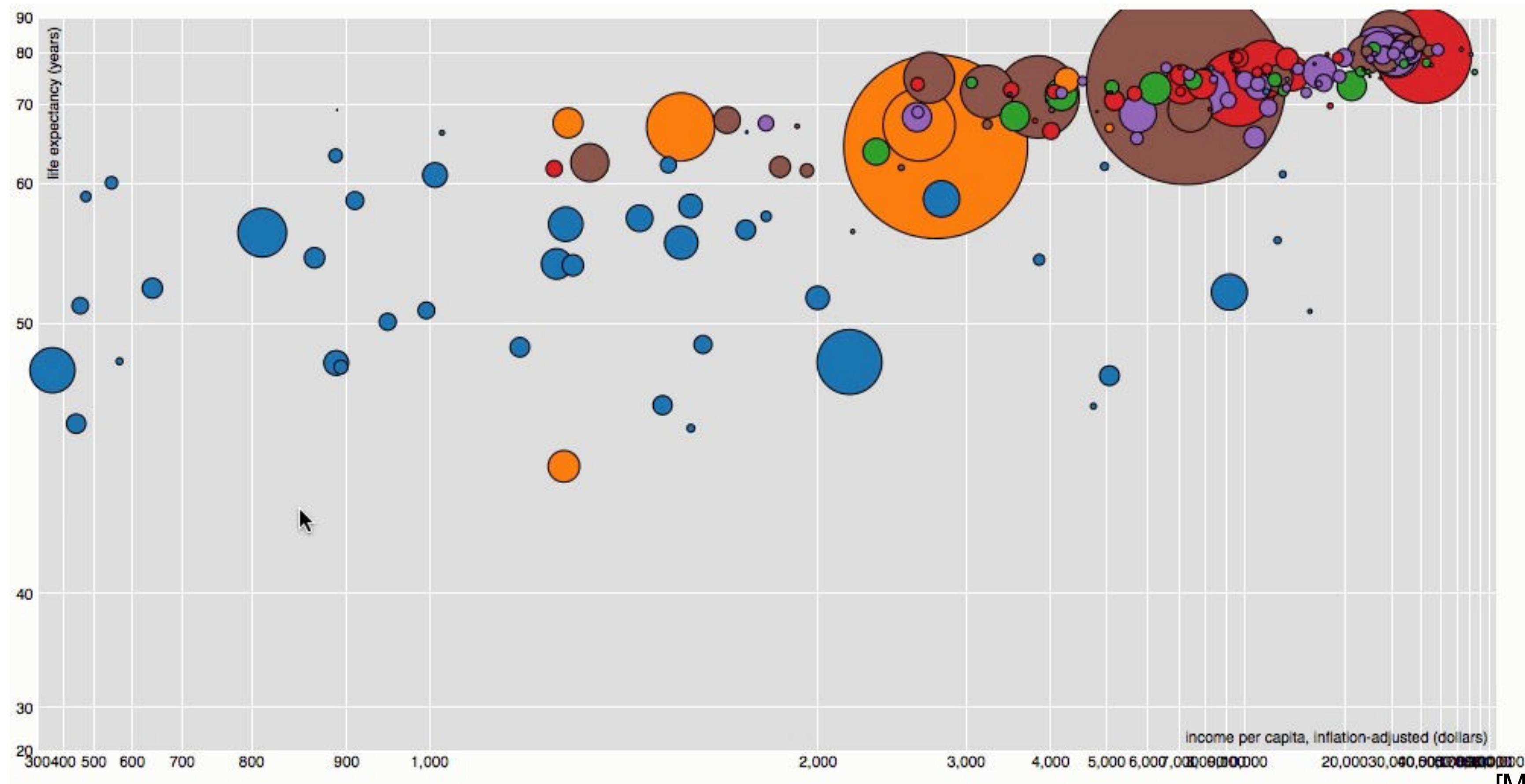
[M_Bostock]

Cartesian Distortion



[M. Bostock]

Cartesian Distortion

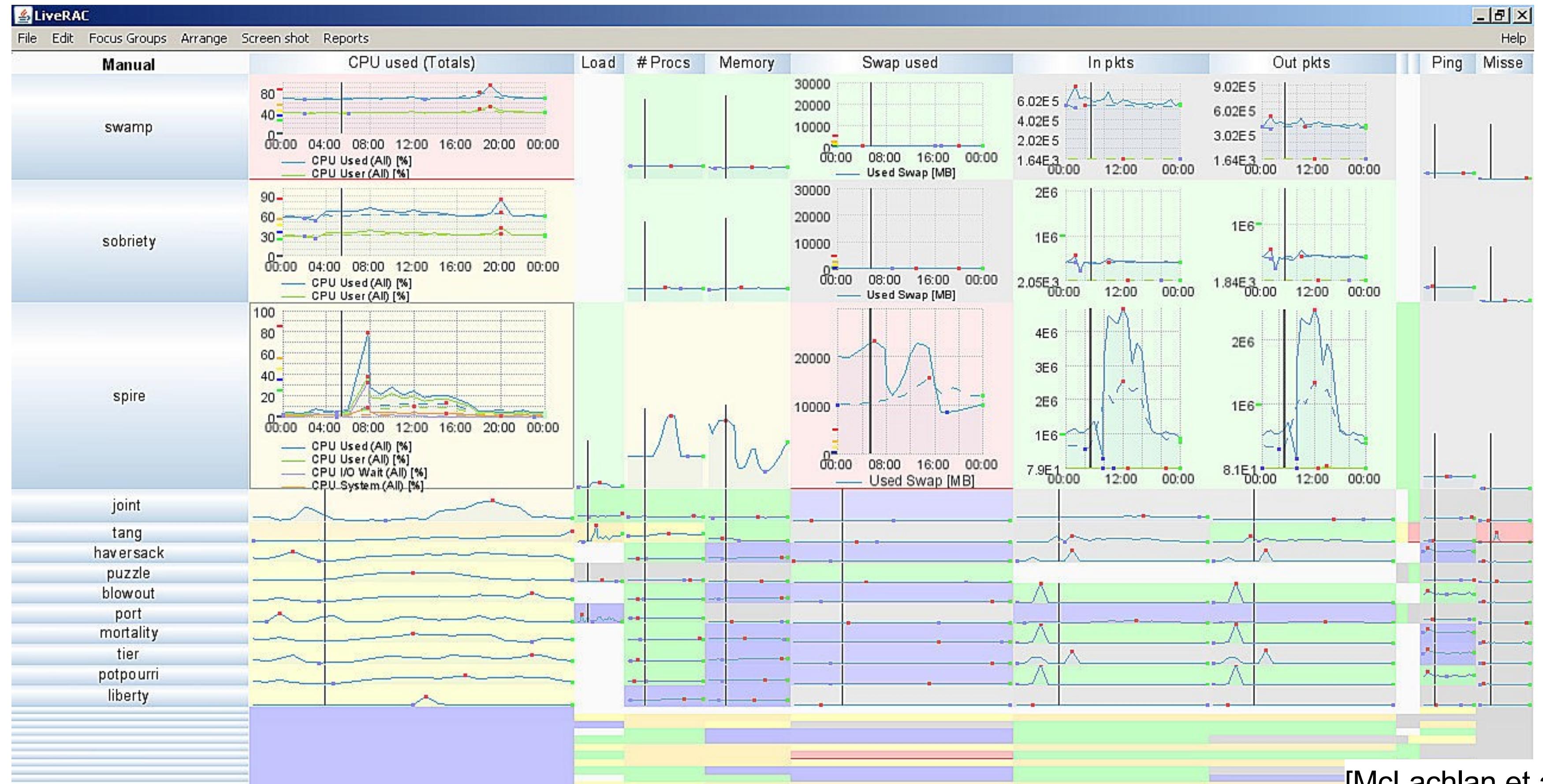


[M. Bostock]

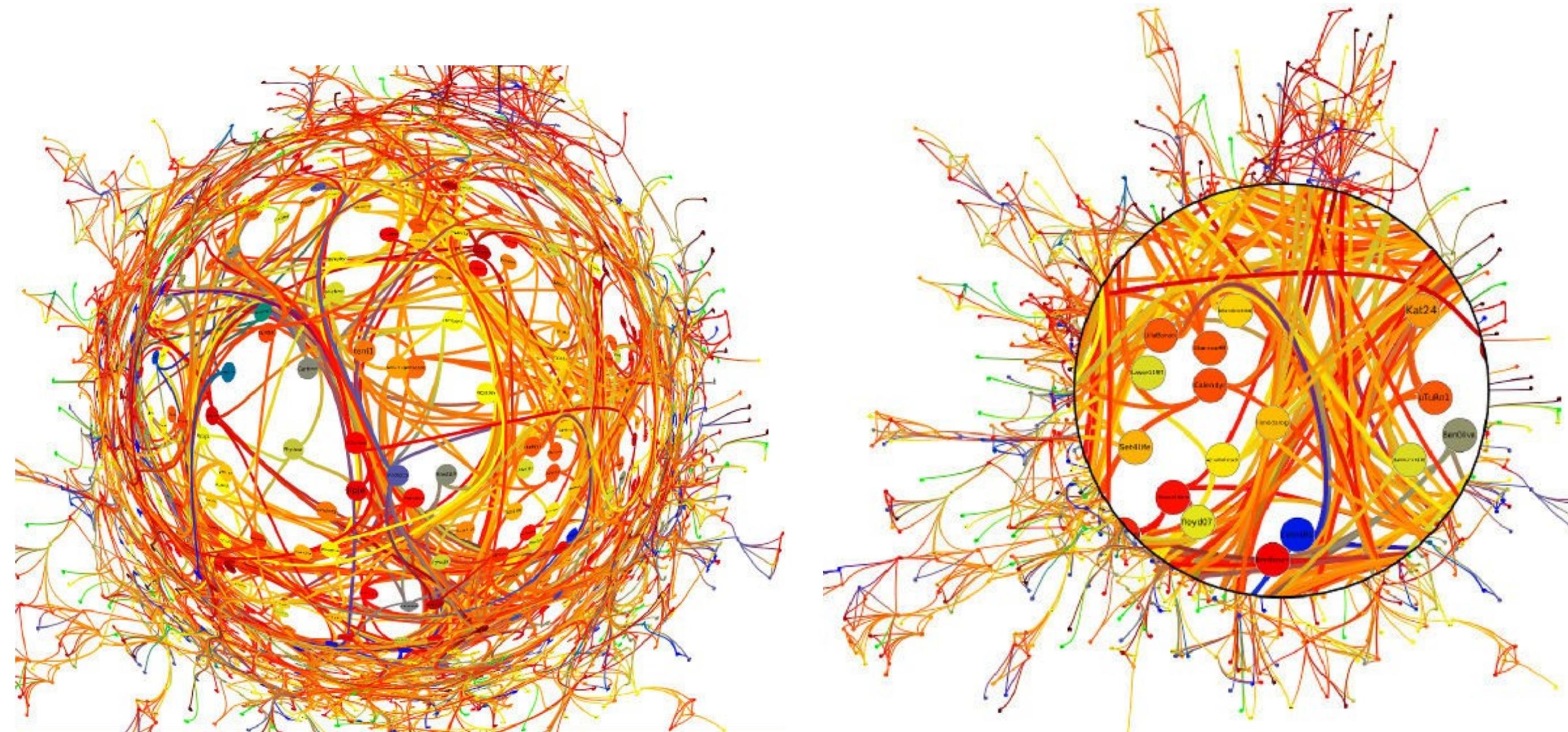
Fisheye Distortion in Programming

[Jakobsen and Hornbaek, 2011]

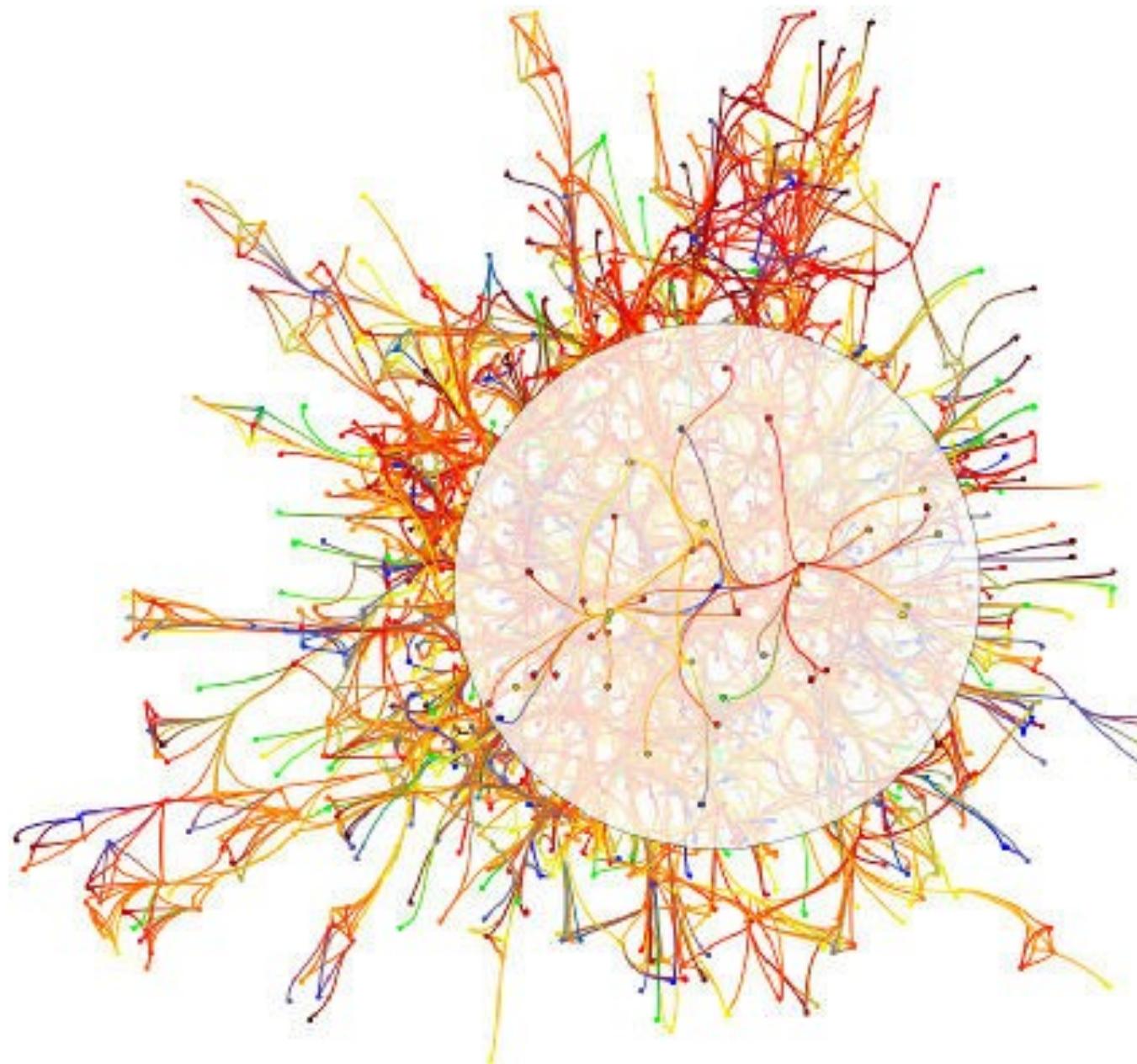
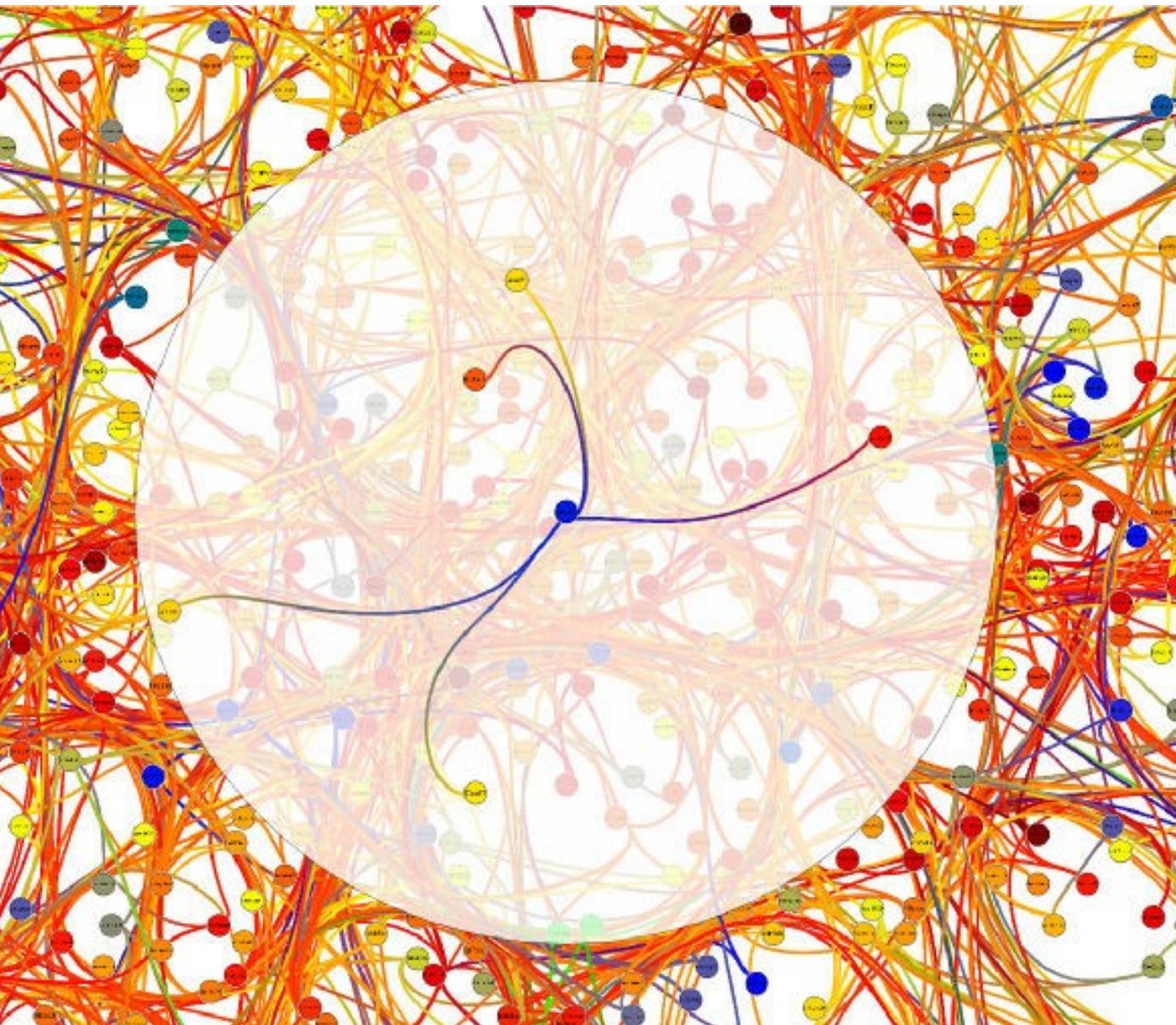
Stretch and Squish Navigation



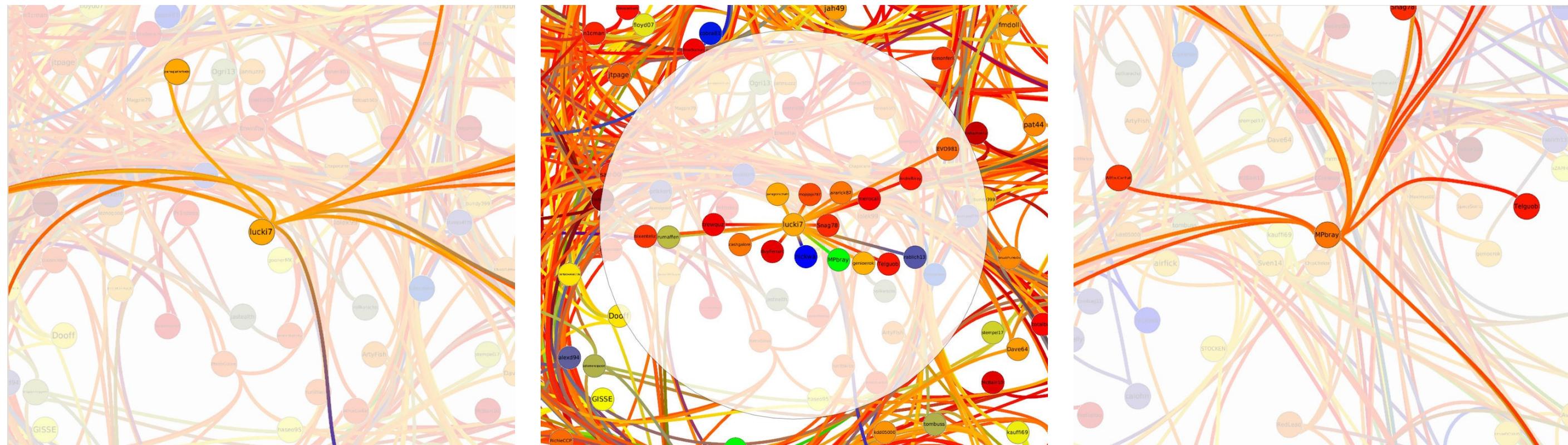
Focus+Context in Graph Exploration



Focus+Context in Graph Exploration



Focus+Context in Graph Exploration



(a) Bring (step 1) – Selecting a node fades out all graph elements but the node neighborhood.

(b) Bring (step 2) – Neighbor nodes are pulled close to the selected node.

(c) Go – After selecting a neighbor (the green node in Fig. 4(b)), a short animation brings the focus towards a new neighborhood.