

INTERACTIONS, VIEWS

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Interactions

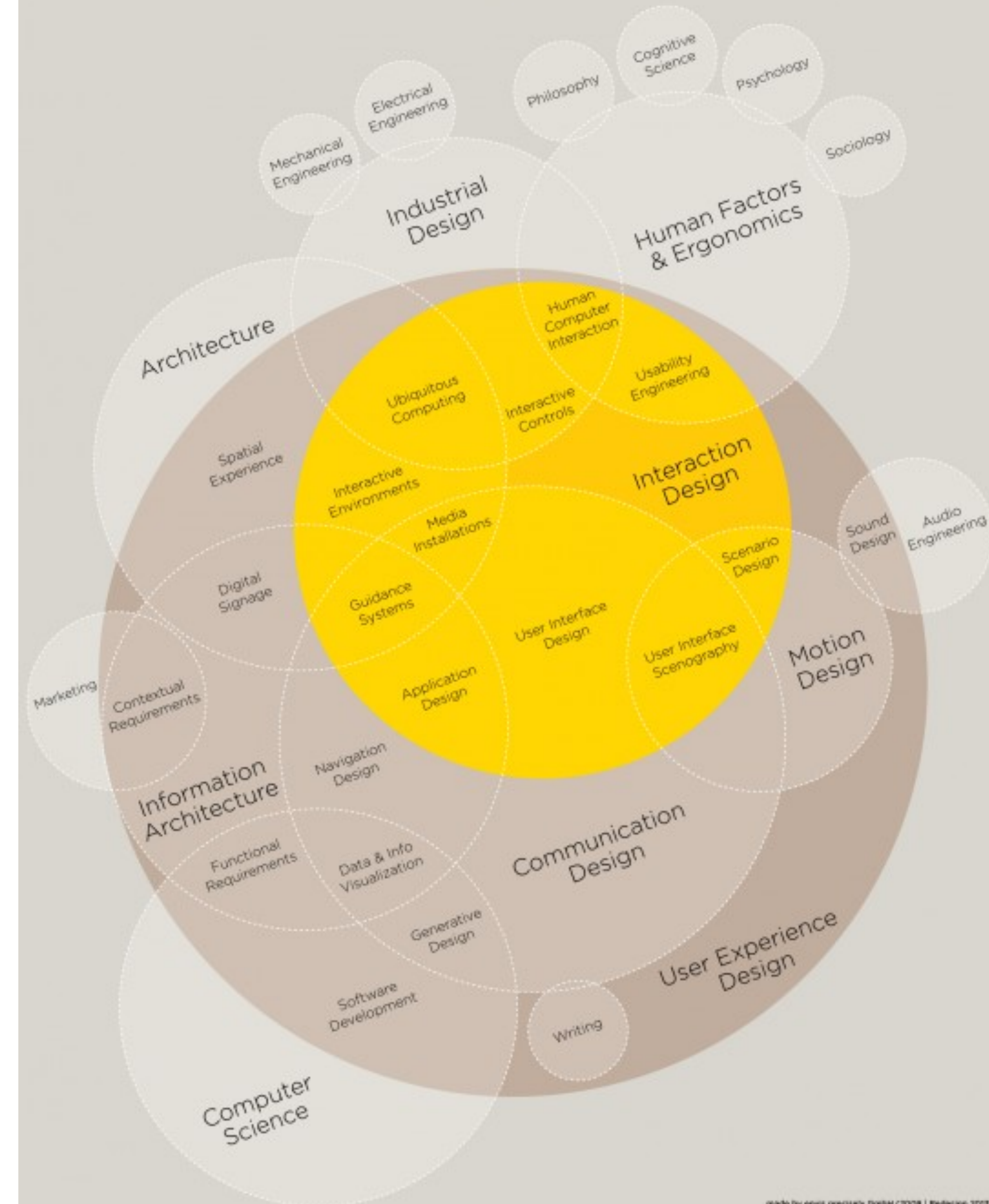
Most datasets are too big to show everything at once

Interacting with your data amplifies cognition

We develop a “feeling” as we touch the data

It is easier to observe causality between data points

The Disciplines of User Experience Design



Interaction Methods

How do you plan on interacting with your viz?

Mouse / keyboard

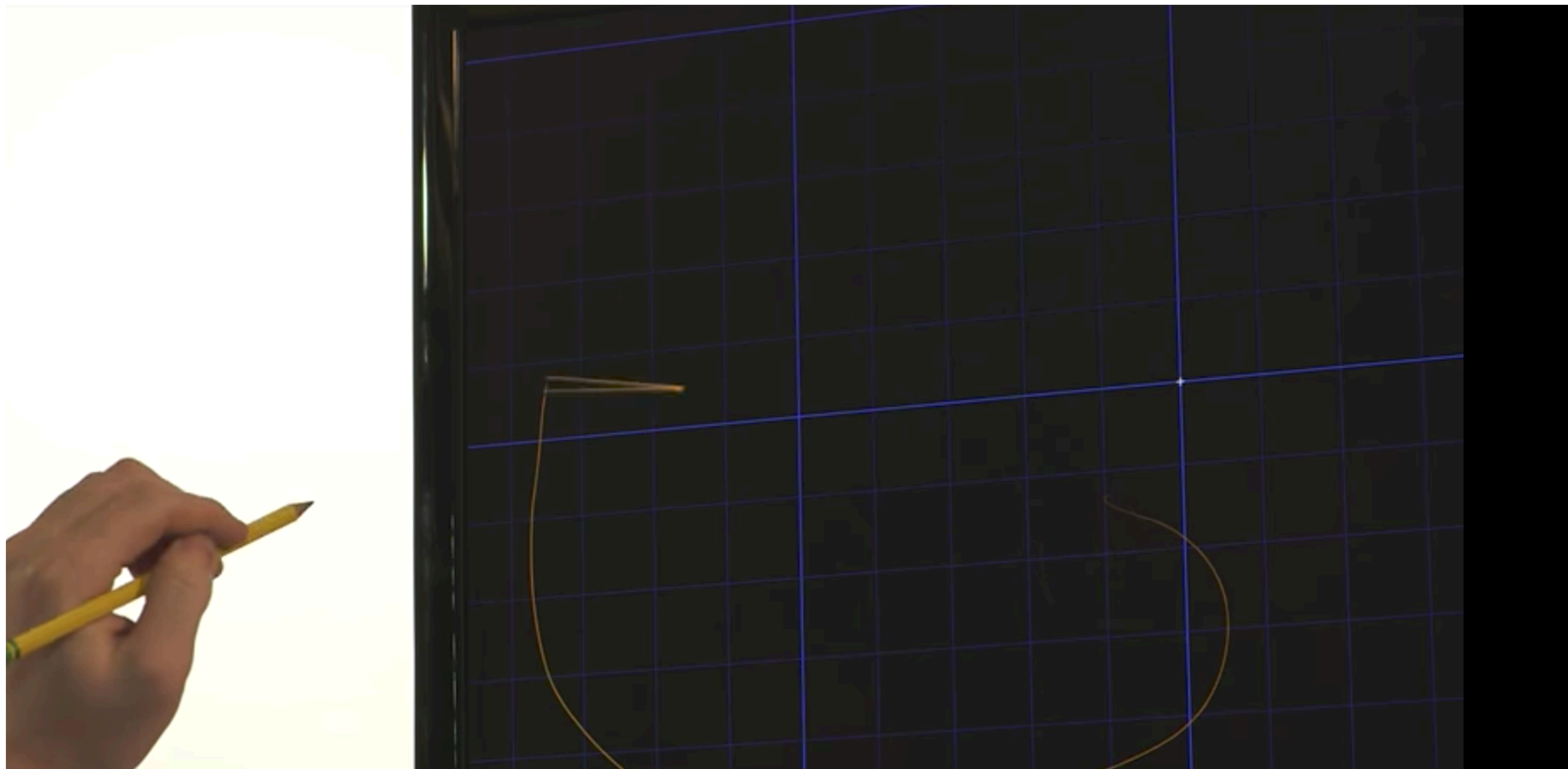
Touch / mobile

Gestures

VR / Kinect / Leap motion







Some definitions

Filtering: showing a part of the dataset via a dynamic query on its properties or attributes

Brushing: selecting a subset of the data items with an input device

Linking: showing how subset of the data items behaves in other views

Aggregation: showing visual representations of subsets of the data



Interaction examples



Faceted (navigational) search

Dynamic queries that use semantic categories organized in a hierarchical structure (taxonomy)

Define criteria for inclusion exclusion (AND, OR, XOR)

Under-the-hood complex database search queries

The screenshot illustrates a faceted search interface for digital cameras. The main heading is "Digital cameras". Below it is a "Refine your results" section with several facets:

- Manufacturer**: Canon USA (5), Sony (2), Nikon (2), Olympus (6), Pentax (2)
- Resolution**: 6 megapixels (3), 8 megapixels and up (14)
- Zoom range**: 3X to 4X (11), 8X to 12X (1)
- More**: LCD size, Image stabilizer, Flash memory, Still image format, Maximum ISO, See all >


Callouts explain the facets:

- "Manufacturer is a **facet**, a way of categorizing the results" points to the Manufacturer facet.
- "Canon, Sony, and Nikon are **constraints**, or facet values" points to the selected values in the Manufacturer facet.
- "The **facet count** or constraint count shows how many results match each value" points to the counts in parentheses next to the facet values.
- "The **breadcrumb** trail shows what constraints have already been applied and allows for their removal" points to the "you selected:" section showing "\$400 - \$500", "SLR", and "remove all".

Below the facets, it shows "17 results". A "Regular search results list" section includes pagination (1, 2, next) and a "COMPARE SELECTED" button. The first result is:

Image	Product Name	Price
	Canon EOS Rebel XS (silver, with 18-55mm lens)	\$459 to \$699 at 15 stores

Faceted (navigational) search

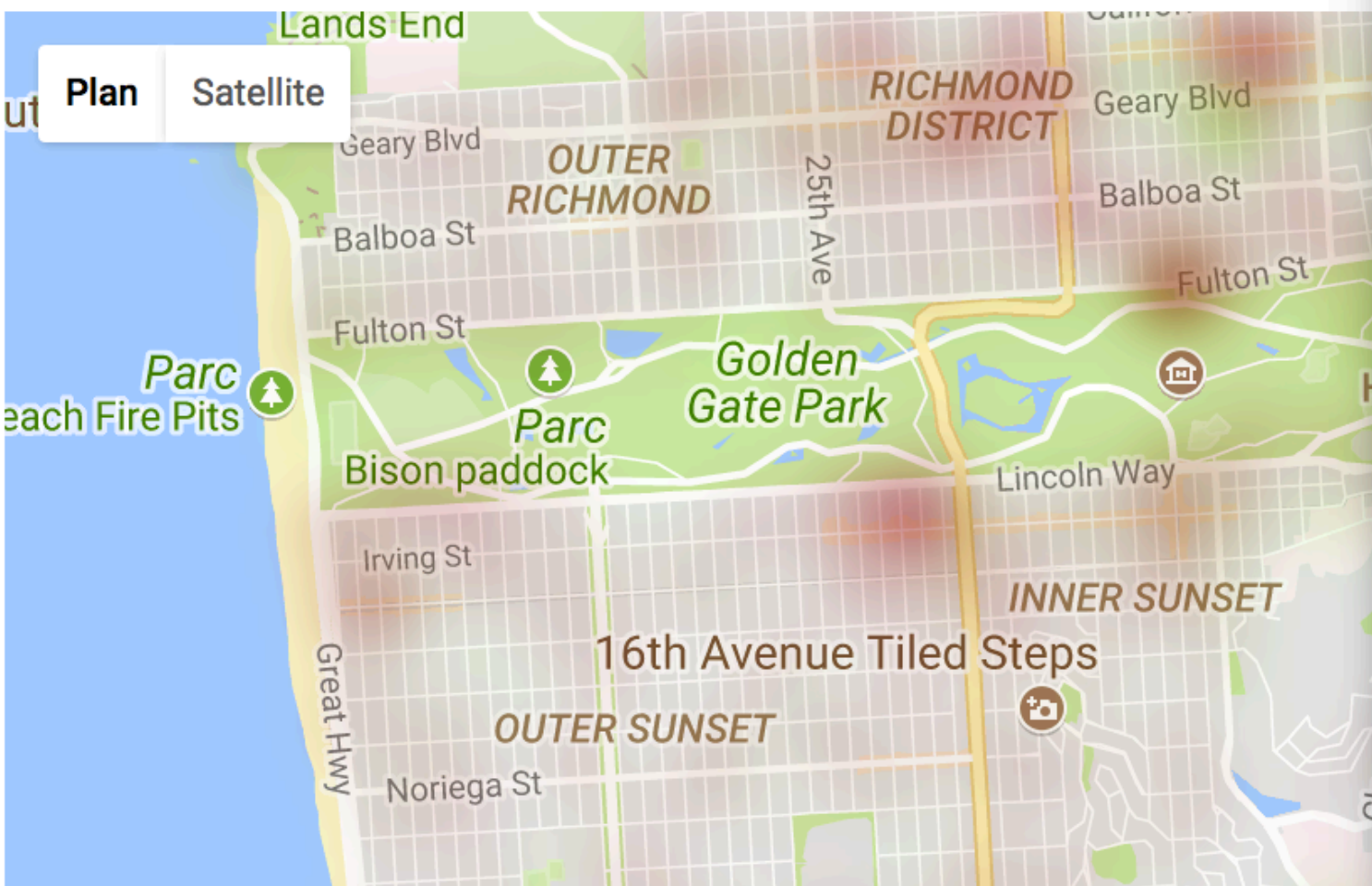
 **Elasticsearch demo: SF Crime Heatmap**

Play along with our **Elasticsearch Significant Terms** demo using **Reporting**. Add layers and try activating and deactivating Significant Terms. Check out **our blogpost** for more details.

Year: 2015

Plan

Satellite



-

Category

Larceny/Theft

Other Offenses

Non-Criminal

Assault

Drug/Narcotic

Vehicle Theft

✓ Vandalism

Warrants

Burglary

Suspicious Occ

Missing Person

Robbery

Fraud

Forgery/Counterfeiting

Secondary Codes

Weapon Laws

Prostitution

Trespass

Stolen Property

Sex Offenses, Forcible

Drunkenness

Disorderly Conduct

PD Crime Incident

Significant Terms: ☐

Add layer

Basic layer

Toggle

Terms agg for [category Vandalism]

Toggle

Incremental text-search

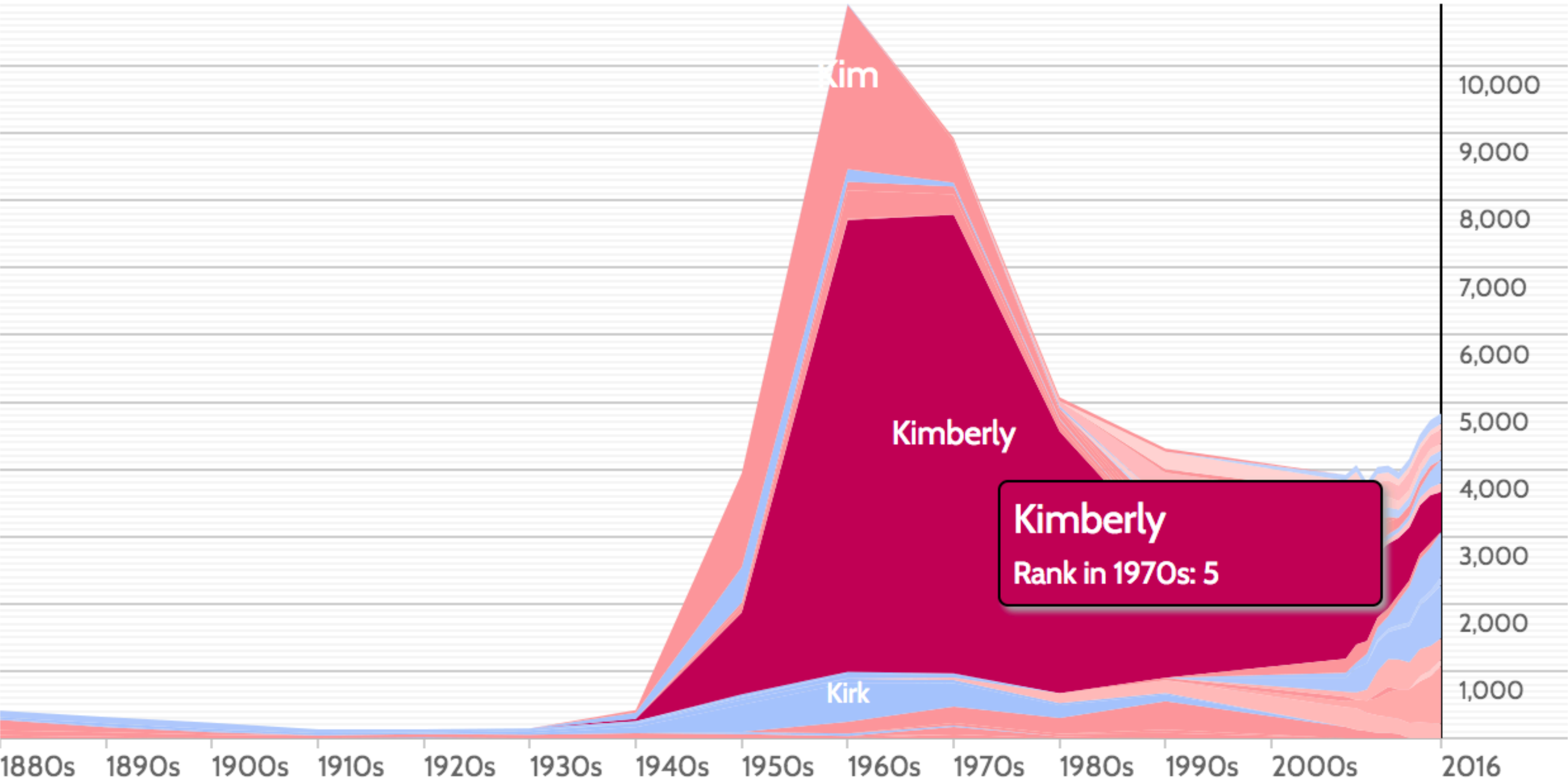
Baby Name > ☒ Both ☐ Boys ☐ Girls

boys	1000	500	100	25	1
girls	1000	500	100	25	1

Current rank:

Names starting with 'KI' per million babies

per million births



Baby Name > ☒ Both ☐ Boys ☐ Girls

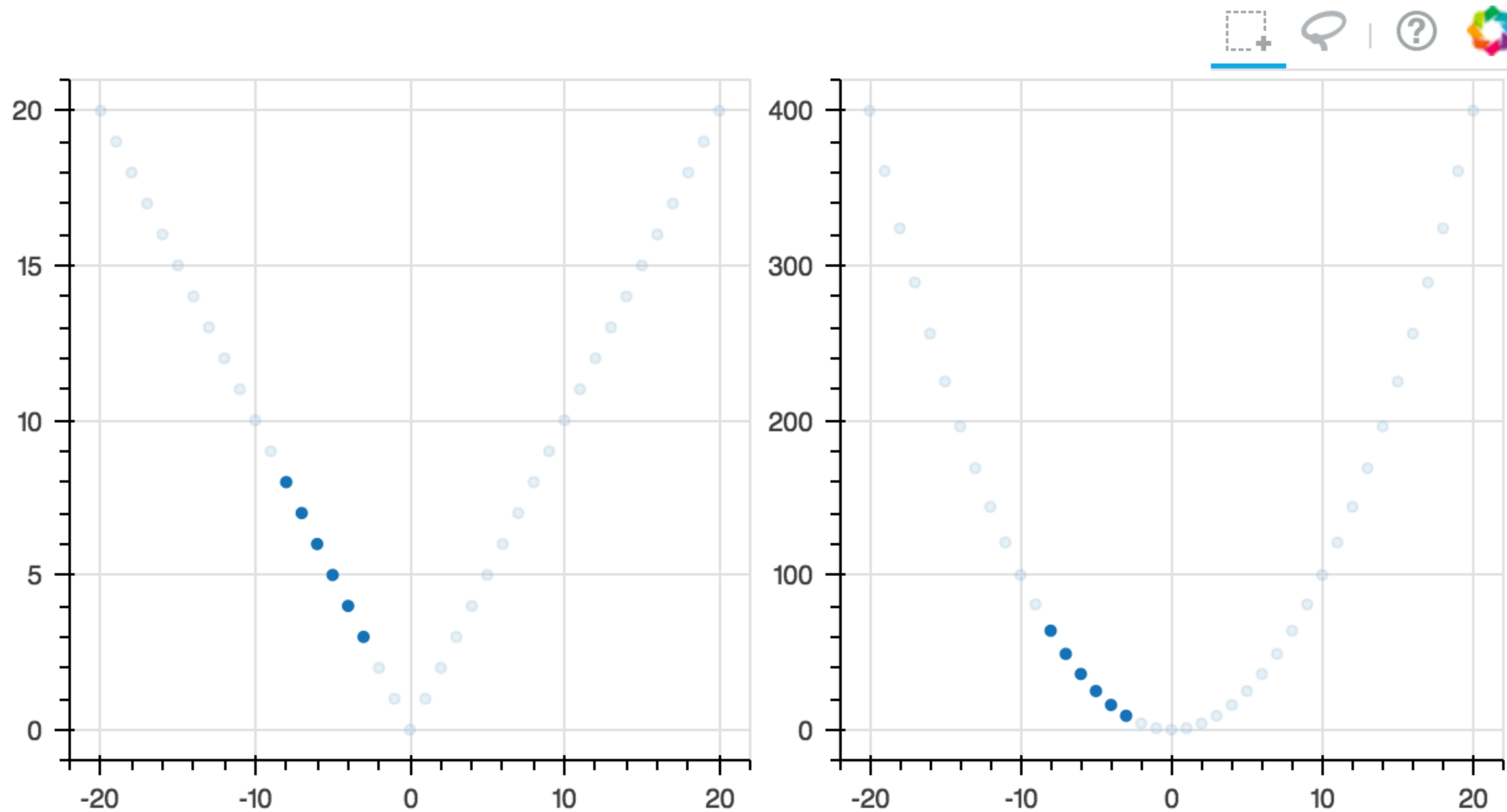
Current rank:

No names 'KIRELL' ranked in the top 1,000 in any time period.
Please type backspace and try a new search!

No names 'KIRELL' ranked in the top 1,000 in any time period.
Please type backspace and try a new search!

1880s 1890s 1900s 1910s 1920s 1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s 2010s

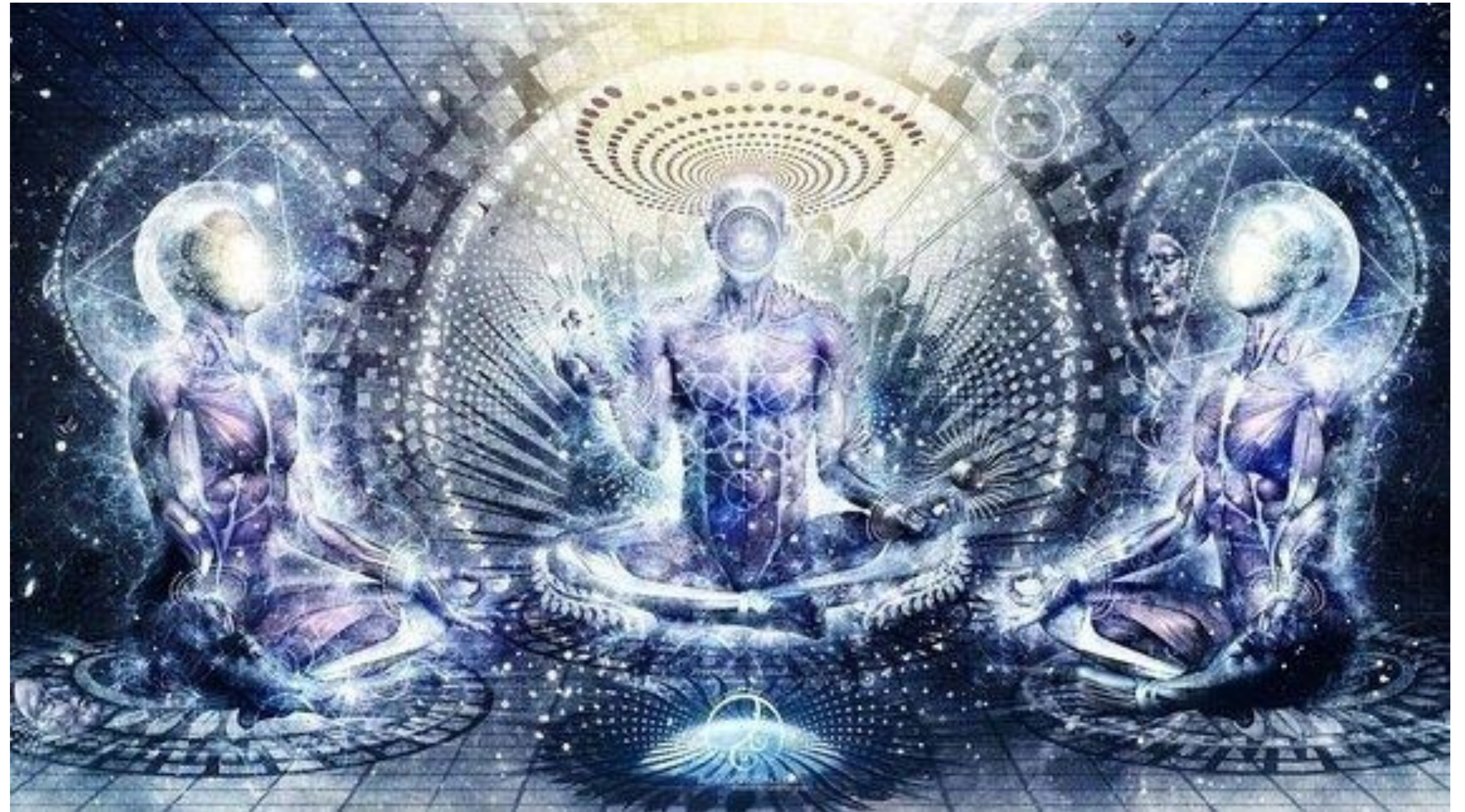
Linked plots, brushing



Live example

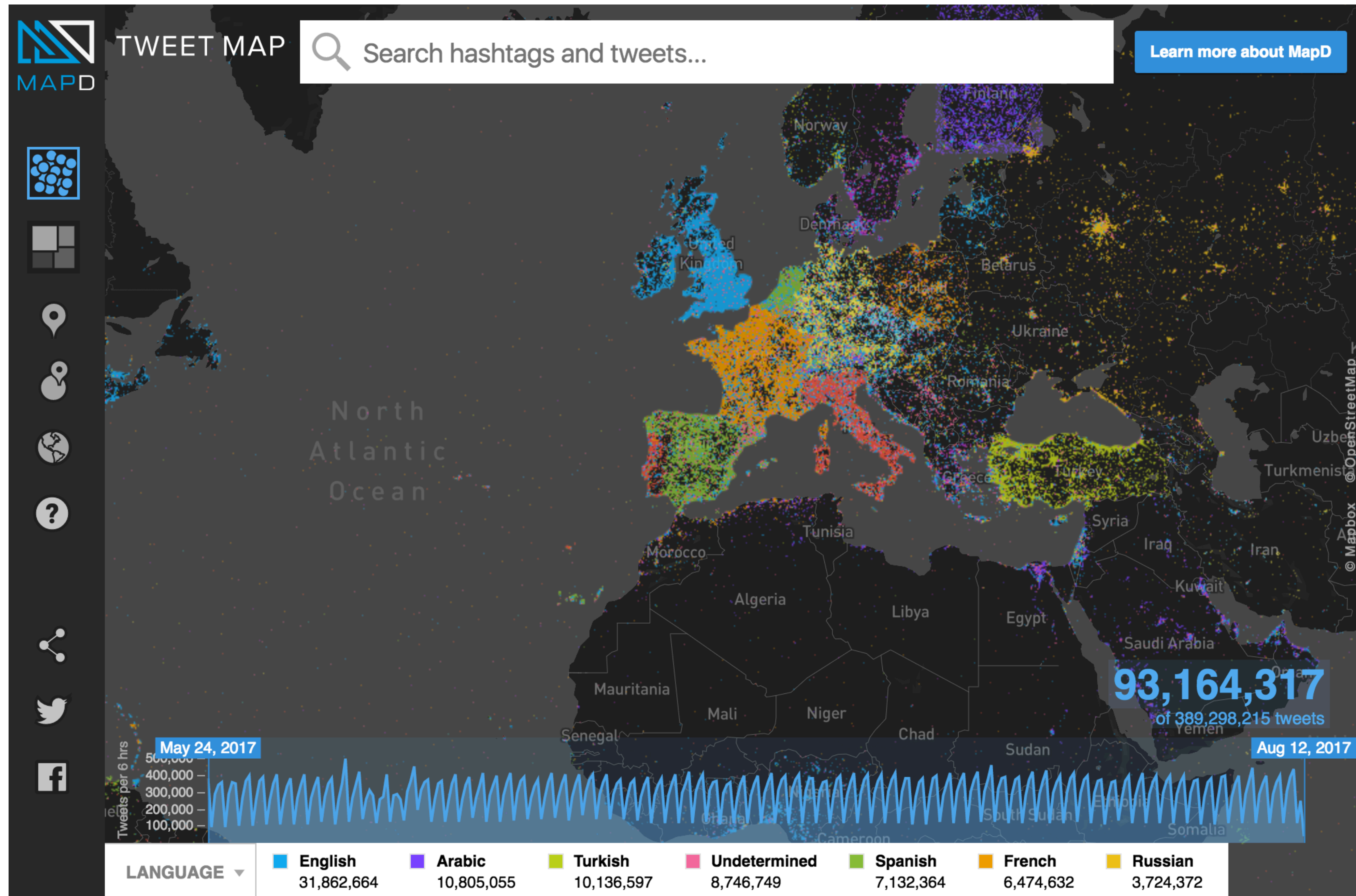
Visual Information Seeking Mantra

1. Overview first
 2. Zoom and filter
 3. Details on demand
- relate, history, extract



The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations

MapD Tweet map



Faceting the display

→ Change over Time



→ Select



→ Navigate

→ Item Reduction

→ Zoom

Geometric or *Semantic*



→ Pan/Translate



→ Constrained



Single views

→ Attribute Reduction

→ Slice



→ Cut



→ Project



→ Juxtapose and Coordinate Multiple Side-by-Side Views

→ Share Encoding: Same/Different

→ Linked Highlighting



→ Share Data: All/Subset/None



→ Share Navigation



		Data		
		All	Subset	None
Encoding	Same	Redundant	Overview/ Detail	Small Multiples
	Different	Multiform	Multiform, Overview/ Detail	No Linkage

→ Partition into Side-by-Side Views

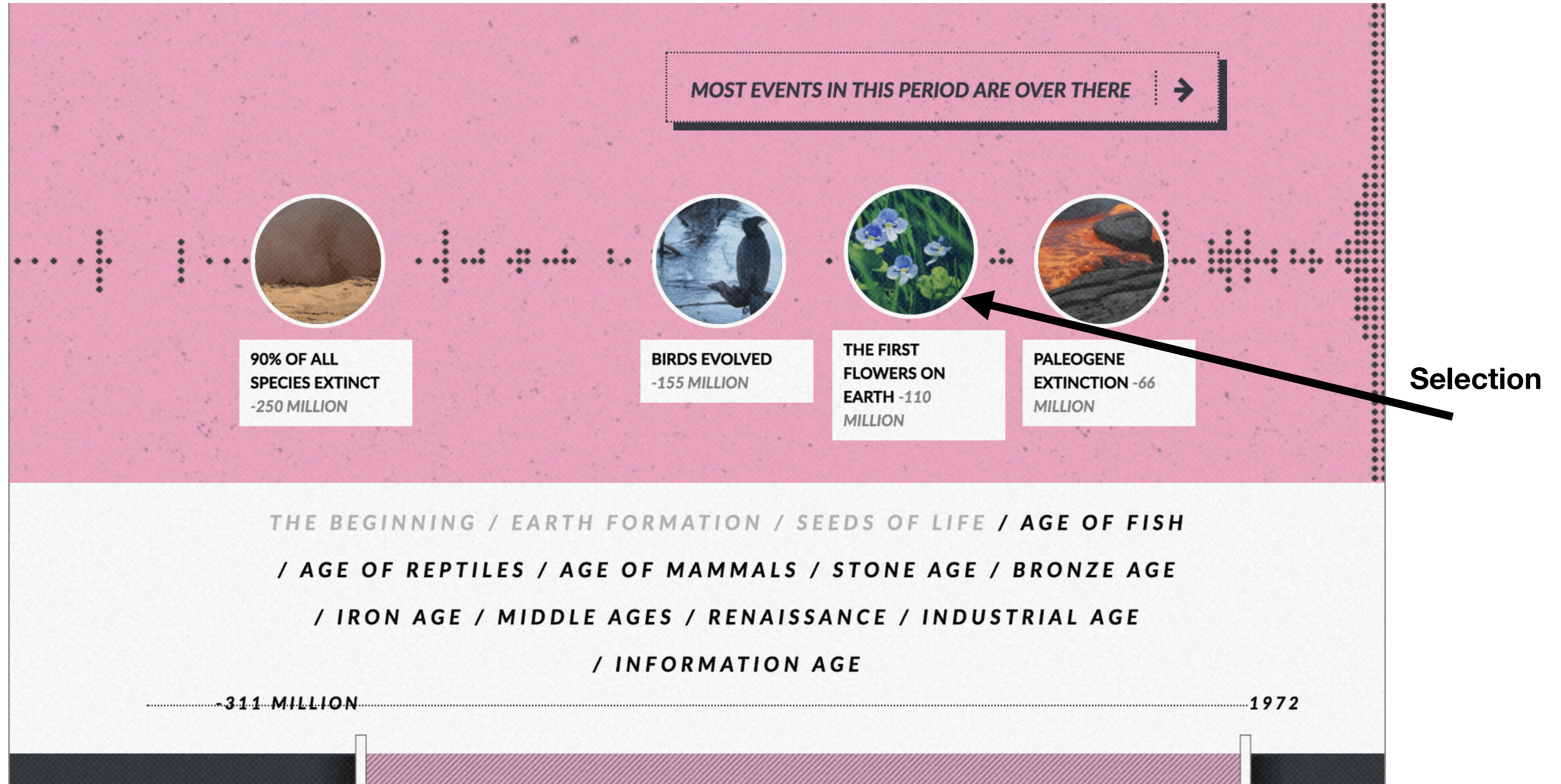


→ Superimpose Layers



Multiple views

Single view example



Slider + transitions / animations

Mouse wheel interaction: semantic zooming

Why use transitions?

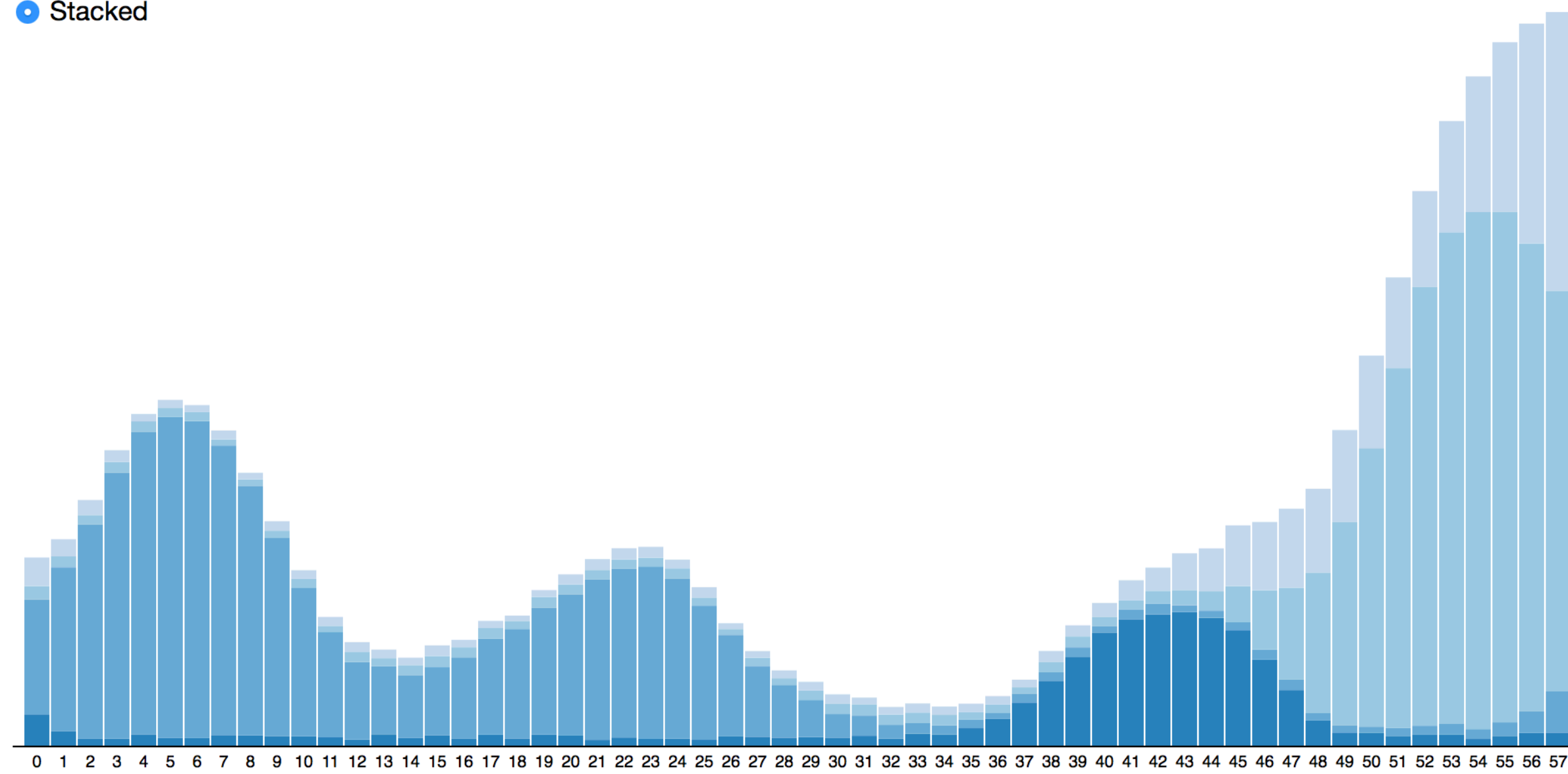
Animated transition: smooth interpolation between visualization states or techniques

Makes it possible to track what is happening!

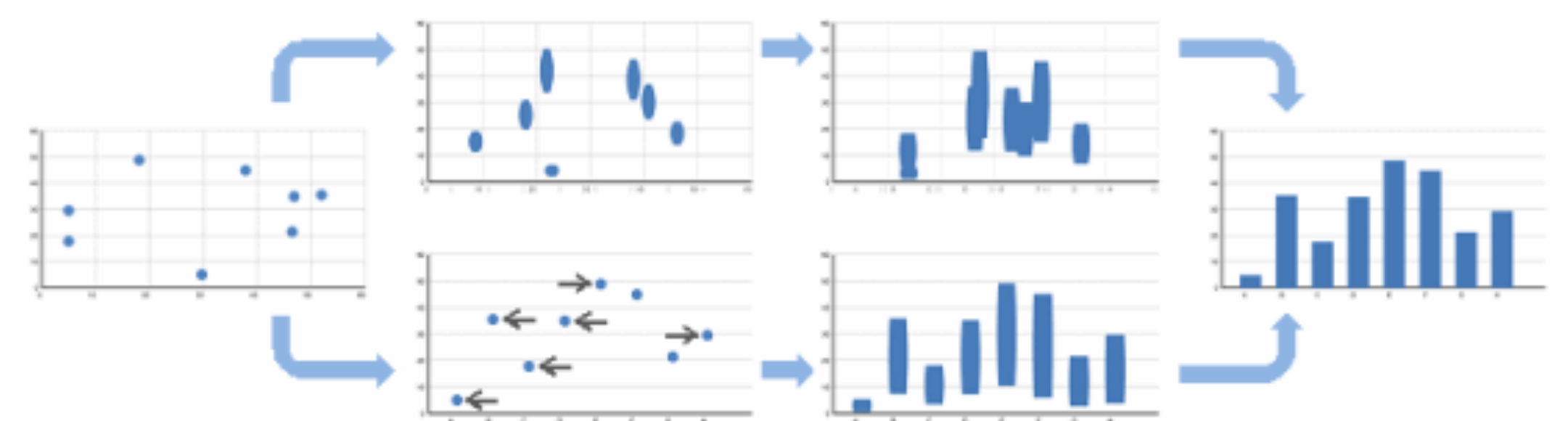
Caveats: changes can be hard to track

Better to rely on the eyes with multiple views than with a memory of the previous state

○ Grouped
● Stacked



Animated Transitions in Statistical Data Graphics



[Jeffrey Heer, George Robertson]

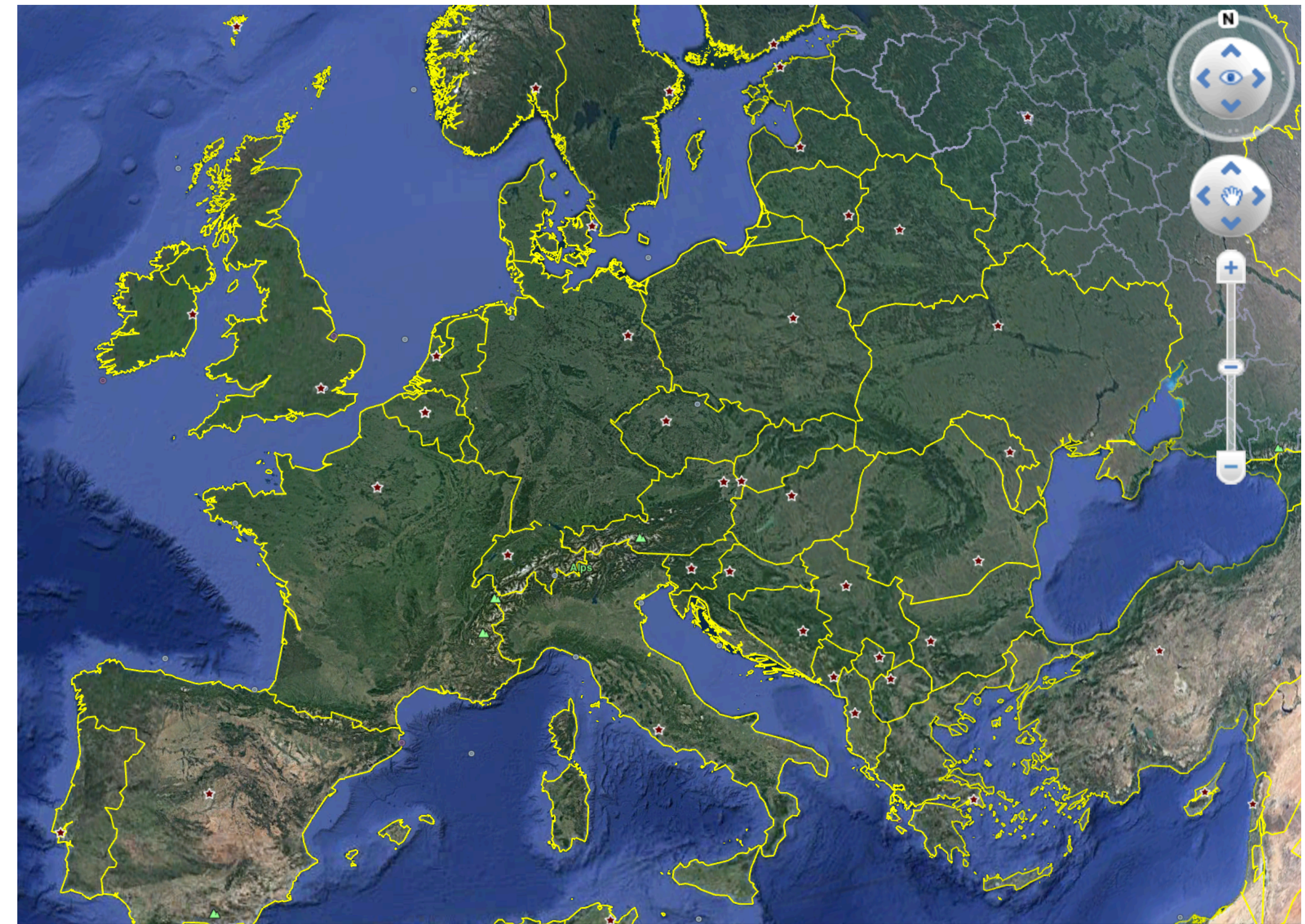
Navigation

Pan: move around in the plane

Geometric zoom: move camera far to close

Rotate

Tilt: Look from another angle (3D)



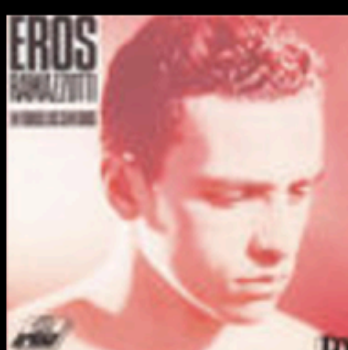
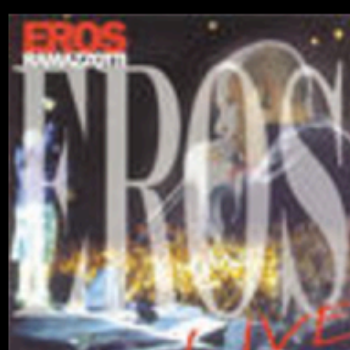
Google Earth

Geometric vs semantic zooming

Geometric (standard) zooming: The view depends on the physical properties of what is being viewed.

Semantic zooming: Different representations for different spatial scales. When zooming away, instead of seeing a scaled down version of an object, see a different representation. The representation shown depends on the meaning to be imparted

[Watson 2004]

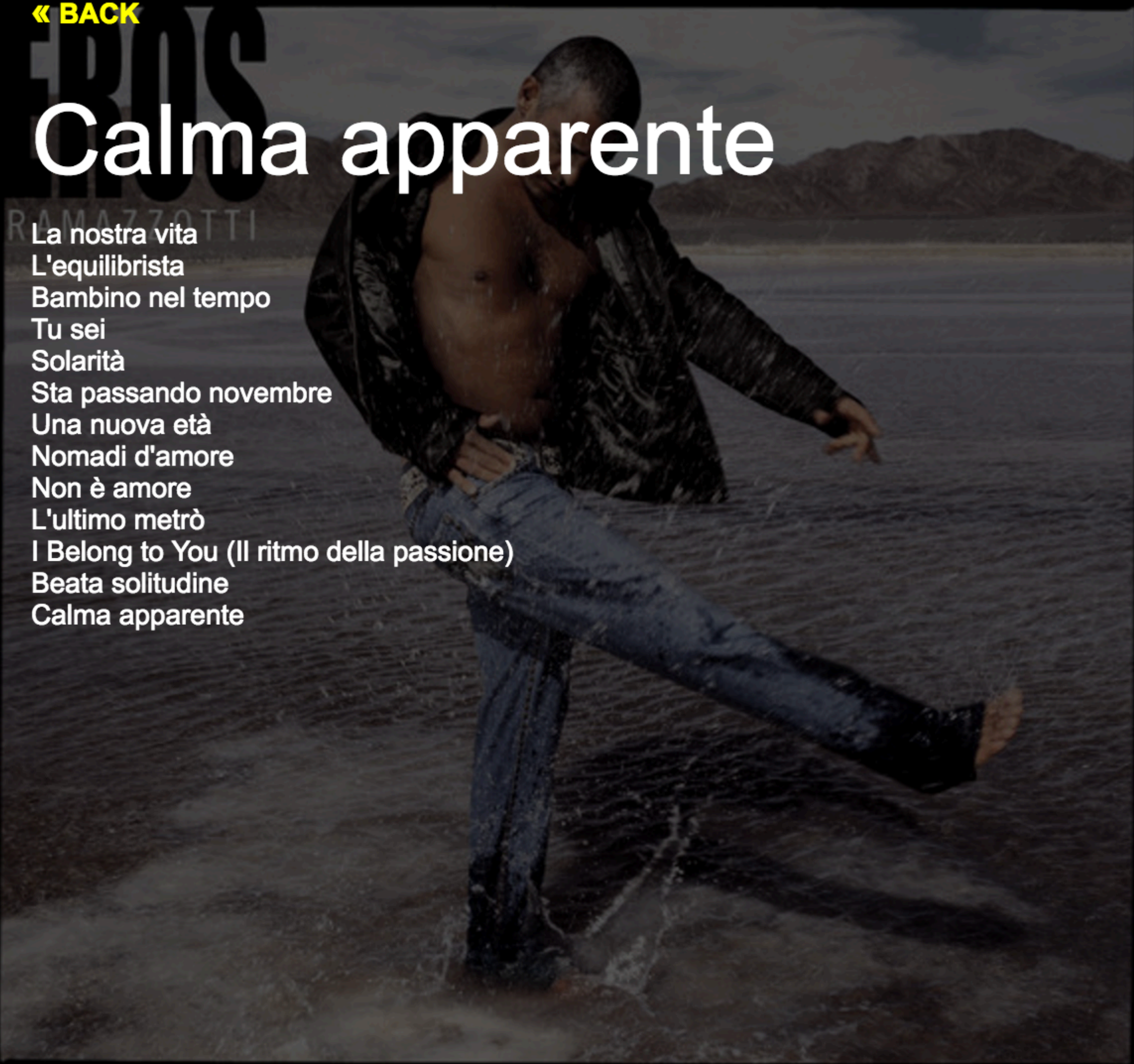


CALMA APPARENTE

« BACK

Calma apparente

- La nostra vita
- L'equilibrista
- Bambino nel tempo
- Tu sei
- Solarità
- Sta passando novembre
- Una nuova età
- Nomadi d'amore
- Non è amore
- L'ultimo metrò
- I Belong to You (Il ritmo della passione)
- Beata solitudine
- Calma apparente



Focus + context

A principle of InfoViz that combines visual encoding and interaction design

“See the trees and the forest at the same time”

Display most important data in details without forgetting about the big picture (the context)

Provide context with: **reduction**, **layering**, **distortion**

➡ Embed

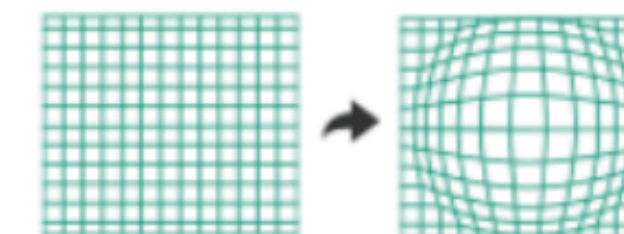
➔ Elide Data



➔ Superimpose Layer

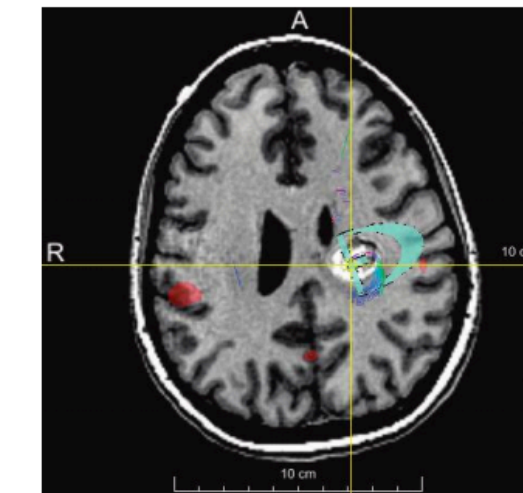
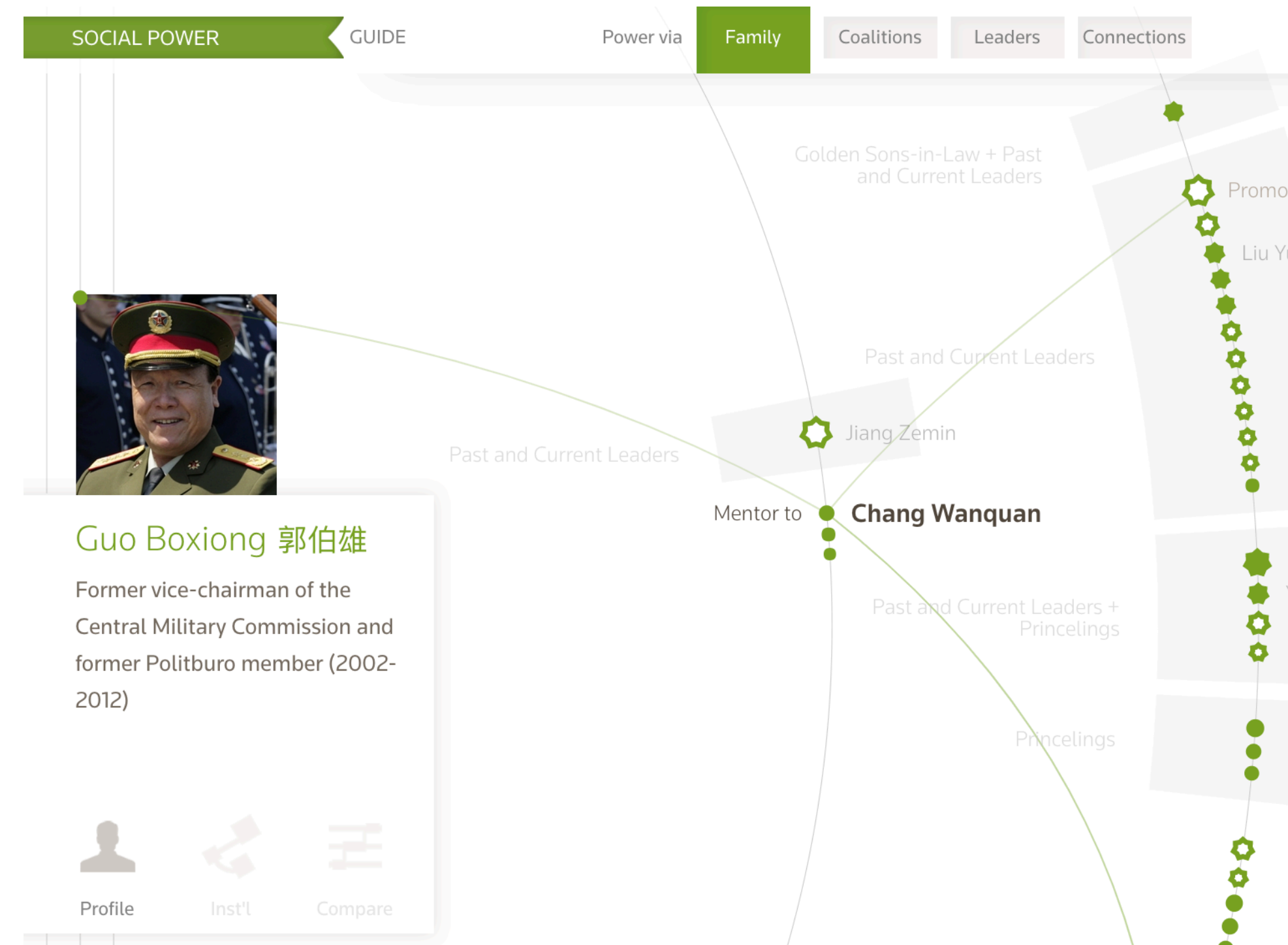


➔ Distort Geometry

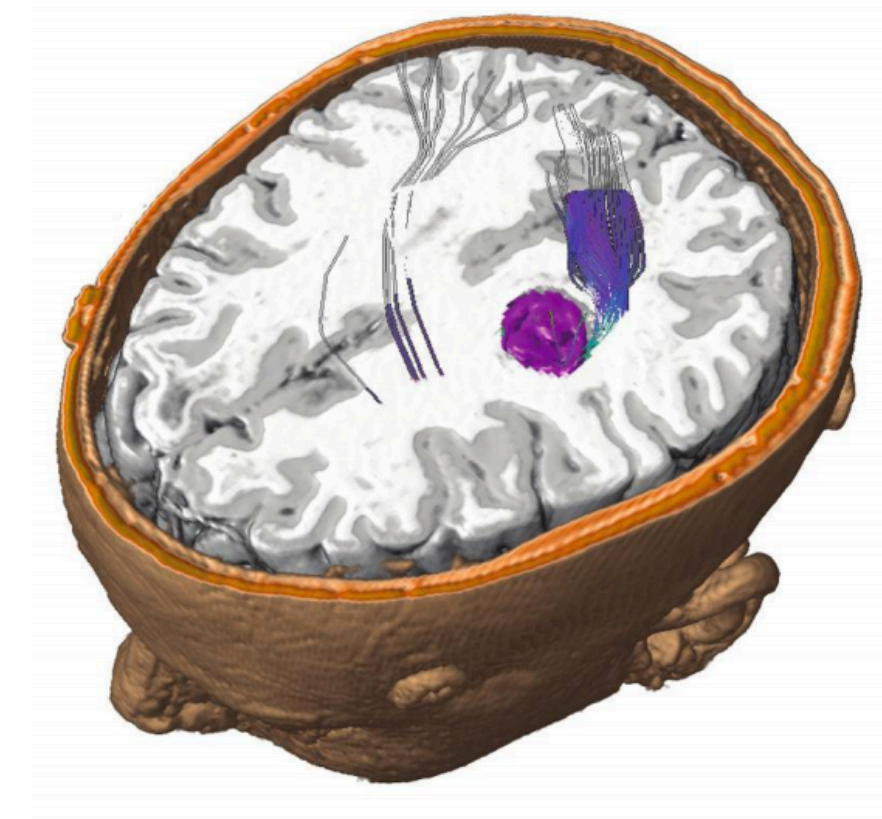


Attribute reduction

Slice: eliminates a dimension/attribute by extracting only the items with a chosen value in that dimension.



(a)



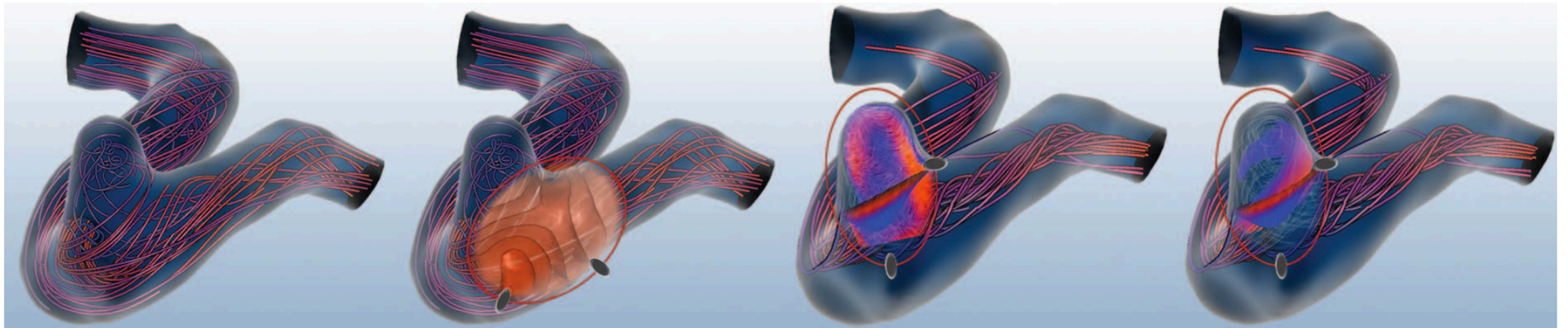
(b)

Elision: focus item is detailed, the rest is summarized for context

Superimpose

Focus layer on a local region

Context is given by the less detailed object

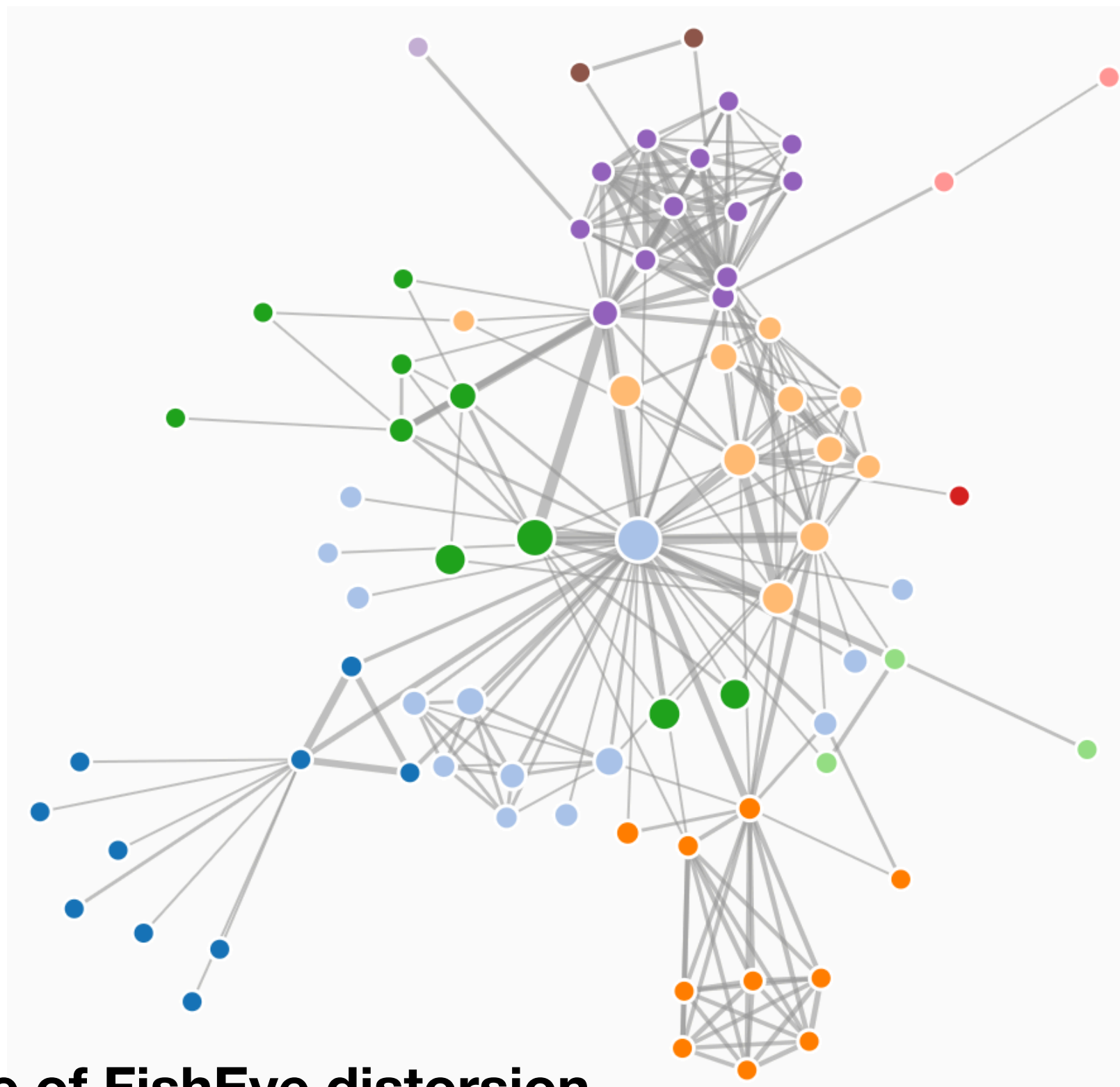
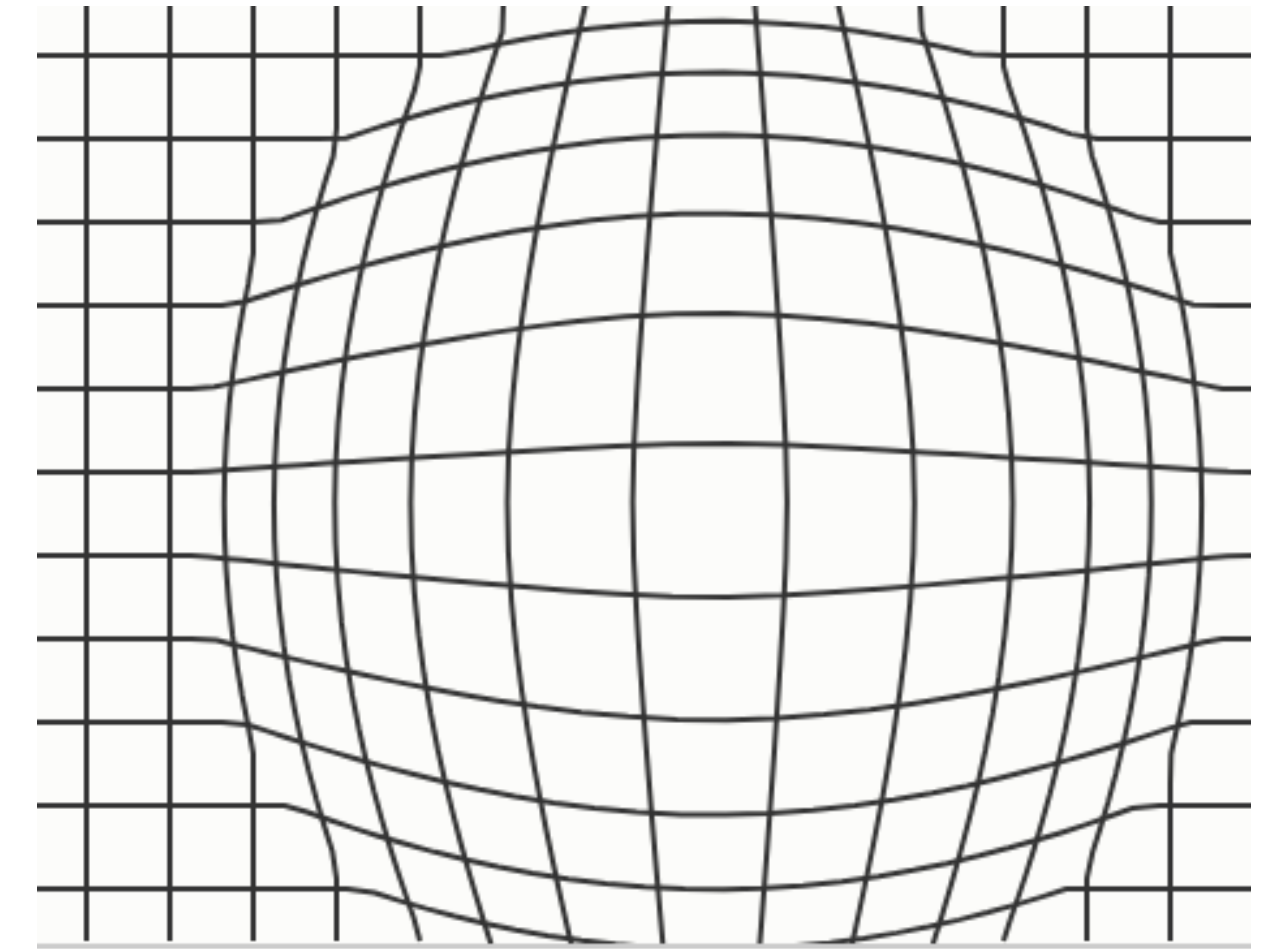


FlowLens

Geometry distortion

Allows details to appear in the region of interest

Caveat: Cannot perform relative spatial comparison



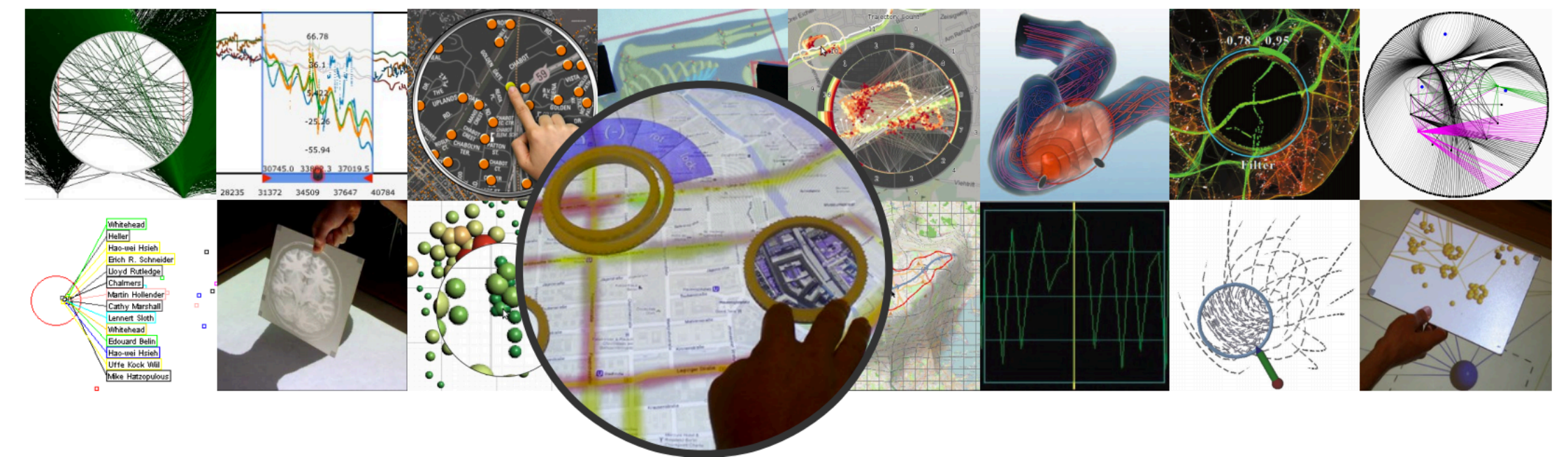
Live example of FishEye distortion

A Survey on Interactive Lenses in Visualization

C. Tominski¹, S. Gladisch¹, U. Kister², R. Dachzelt² & H. Schumann¹

¹Institute for Computer Science, University of Rostock

²Interactive Media Lab, Technische Universität Dresden



Linked views

Linked views: action on one view affects the other(s)

Better to rely on your eyes with multiple views than with a memory of the previous state

We can still animate linked views

➞ Juxtapose and Coordinate Multiple Side-by-Side Views

→ Share Encoding: Same/Different

→ *Linked Highlighting*







→ Share Data: All/Subset/None



→ Share Navigation



		Data		
		All	Subset	None
Encoding	Same	Redundant	 Overview/ Detail	 Small Multiples
	Different	 Multiform	 Multiform, Overview/ Detail	No Linkage

➞ Partition into Side-by-Side Views



➞ Superimpose Layers



Linked views options

Visual encoding: same or multiform (scatter plot linked to scatter plot, or to bar chart)

Share: all, share a subset or don't share any data between the views

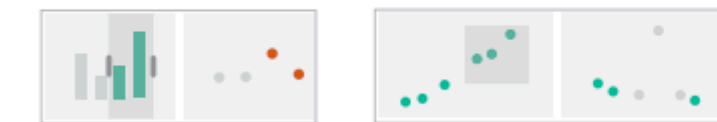
Highlighting: choose to highlight in all views, or not

Navigation: shared or not

➞ Juxtapose and Coordinate Multiple Side-by-Side Views

→ Share Encoding: Same/Different

→ *Linked Highlighting*







→ Share Data: All/Subset/None



→ Share Navigation



		Data		
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➞ Partition into Side-by-Side Views



➞ Superimpose Layers



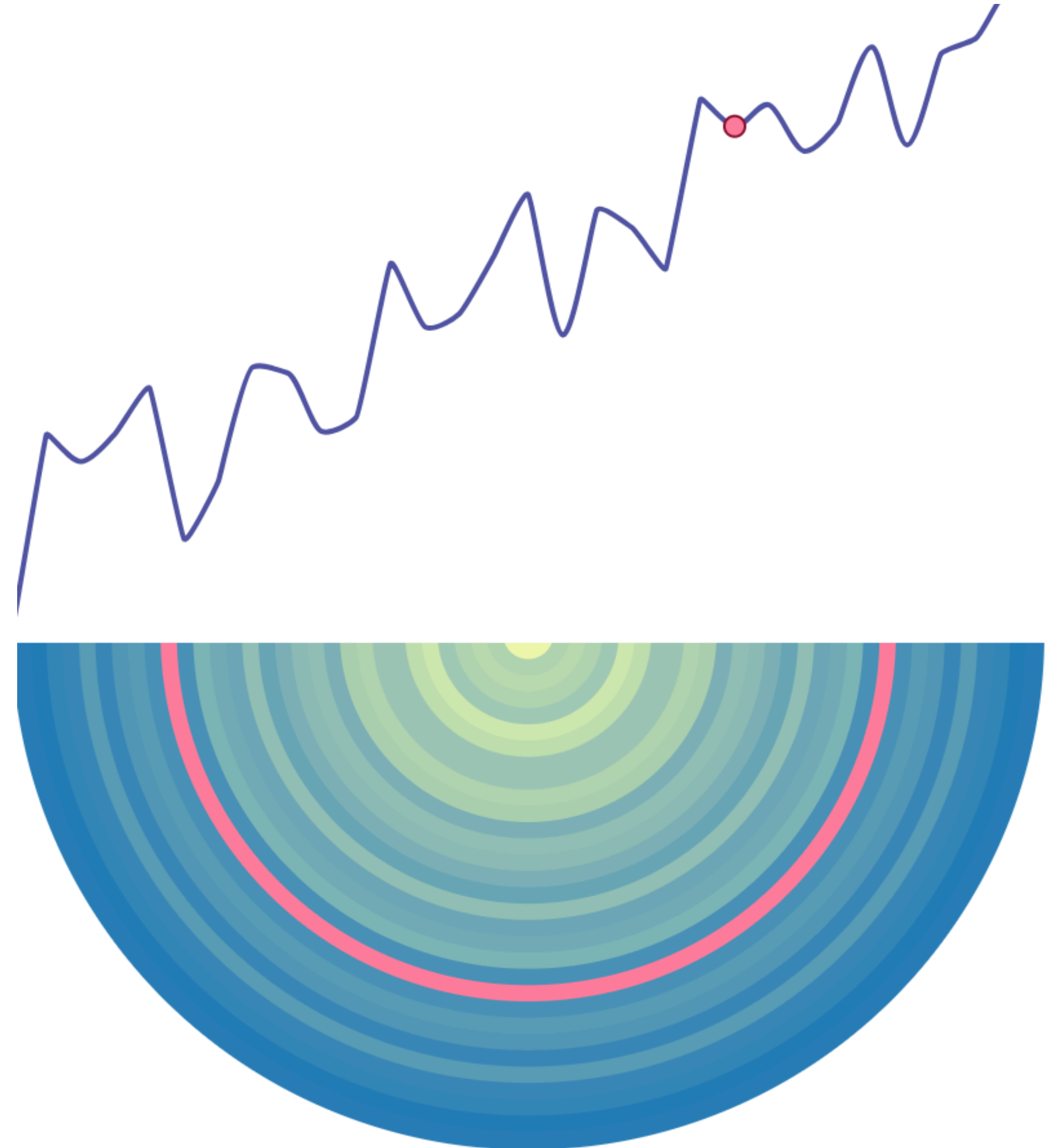
Multiform share-all linked highlighting

Share-all: interactions on one view is reflected on the others

Multiform: different visual encodings are used between the views

Why multiform?

A single view can be limited on the number of visible attributes



Overview + details

A single view cannot display everything if the data is too big or too complex

Here, general aggregated
overview information +

A view for finer details on the whole or subset of data



Partitioning

Separates the data into groups, typically according to categorical attributes

Questions:

How to choose the number of views?

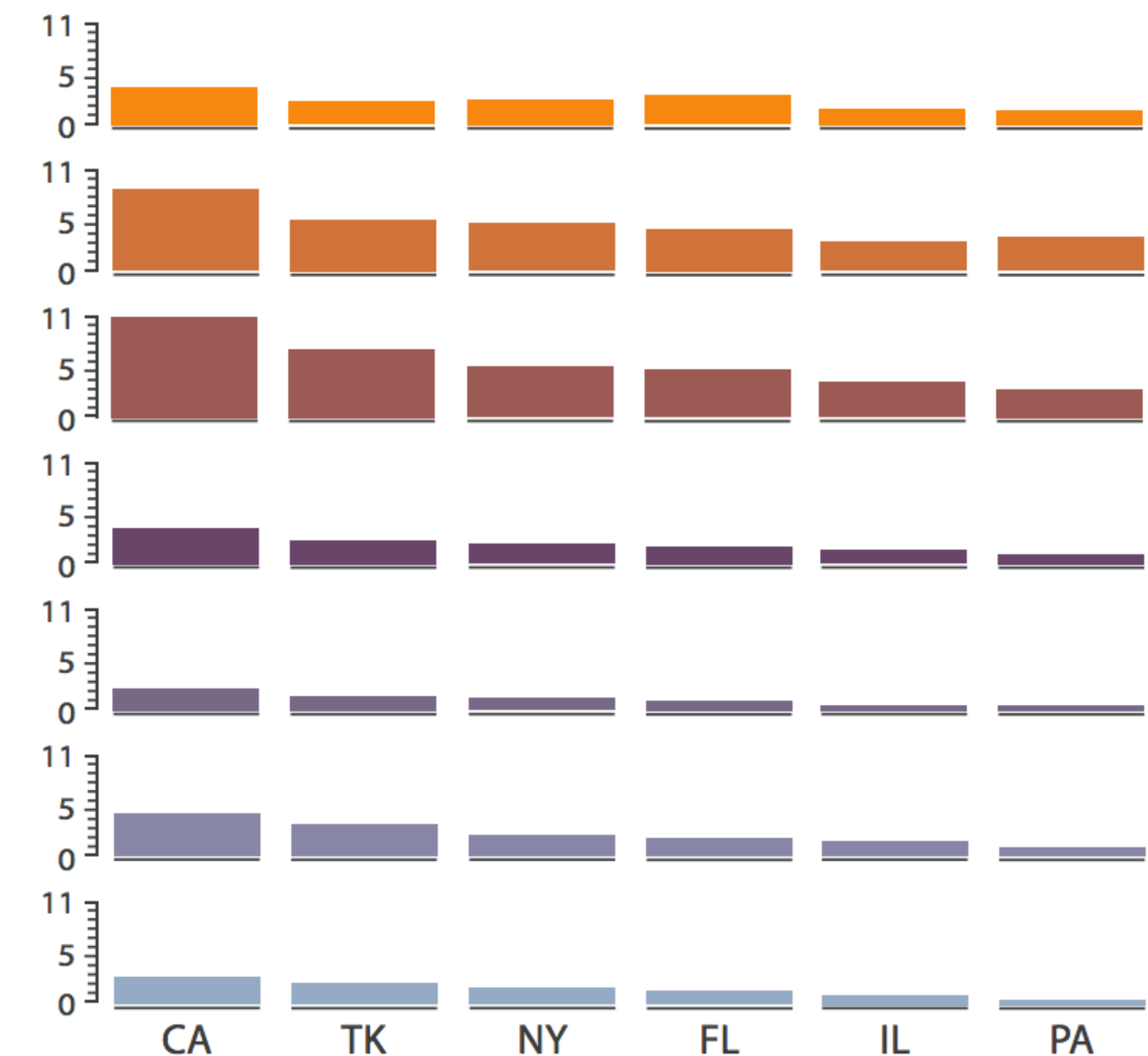
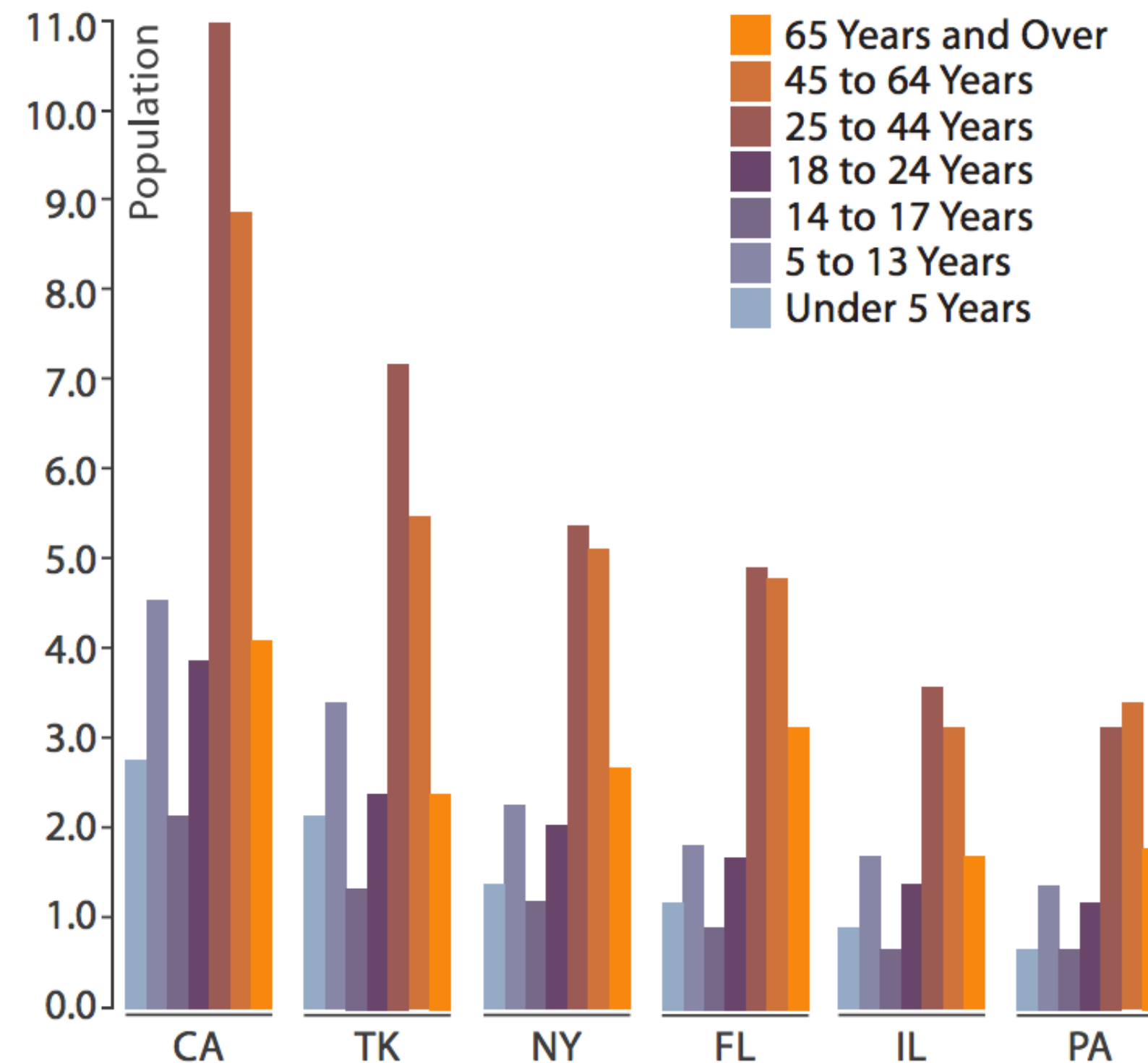
How many splits, in which order?



Small multiples

Same visual encoding
but show different
dimensions of the
dataset altogether

Eyes beat memory:
easier to compare



[VAD Figure 12.8.]

Trellis plots

Columns: Persona (profile)

Rows: Affiliate, product line

Each chart: profit and sales by year

Attributes encoded in
individual views

Attributes partitioning in
columns, rows, and pages

Order of the partition based
on derived data

Allows to perceive trends
and structure in the dataset

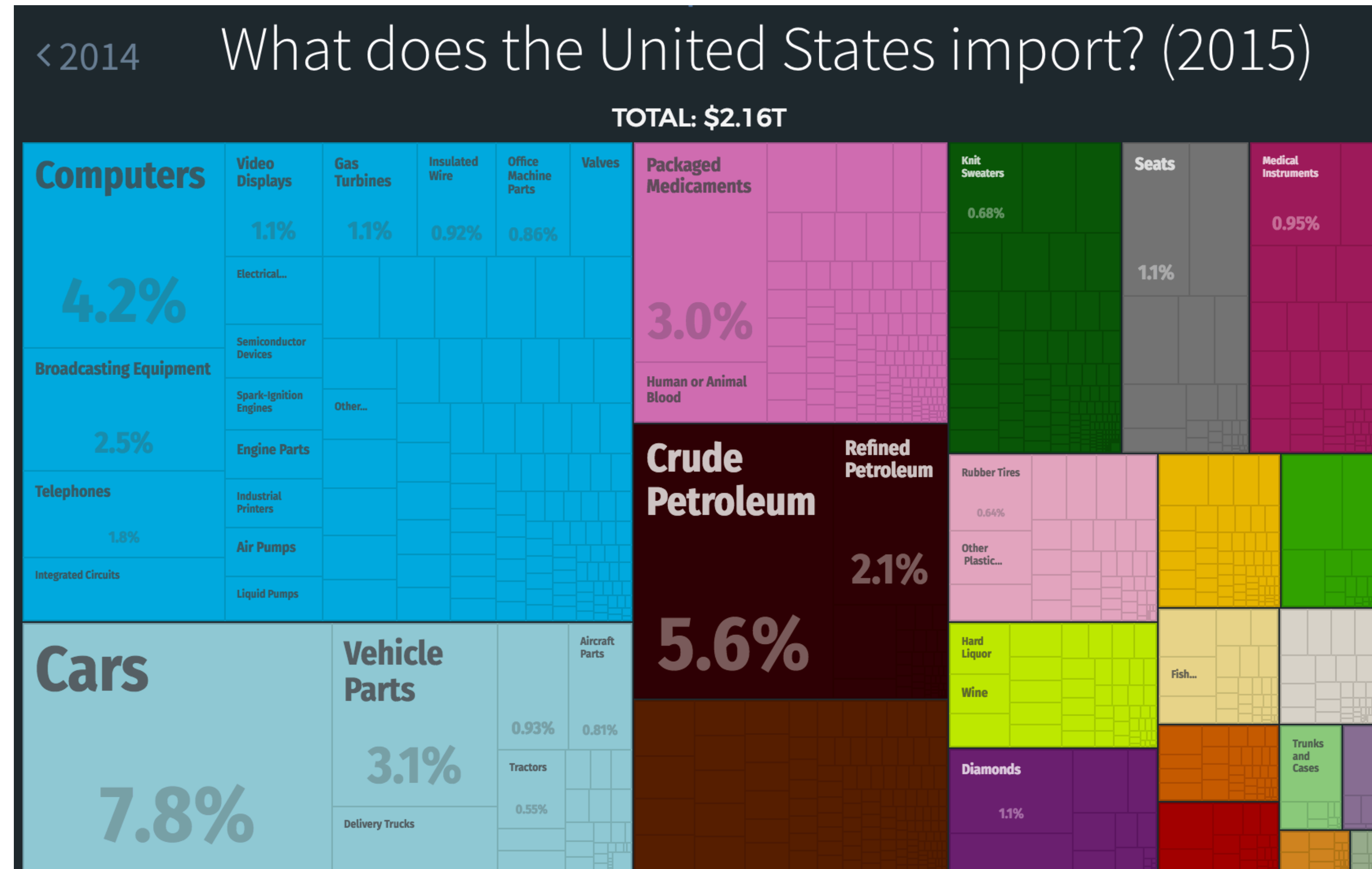


Recursive subdivision

Create a hierarchical structure based on attributes

Use Treemap viz: fill the partitionned space with rectangles

More on this in the following lectures

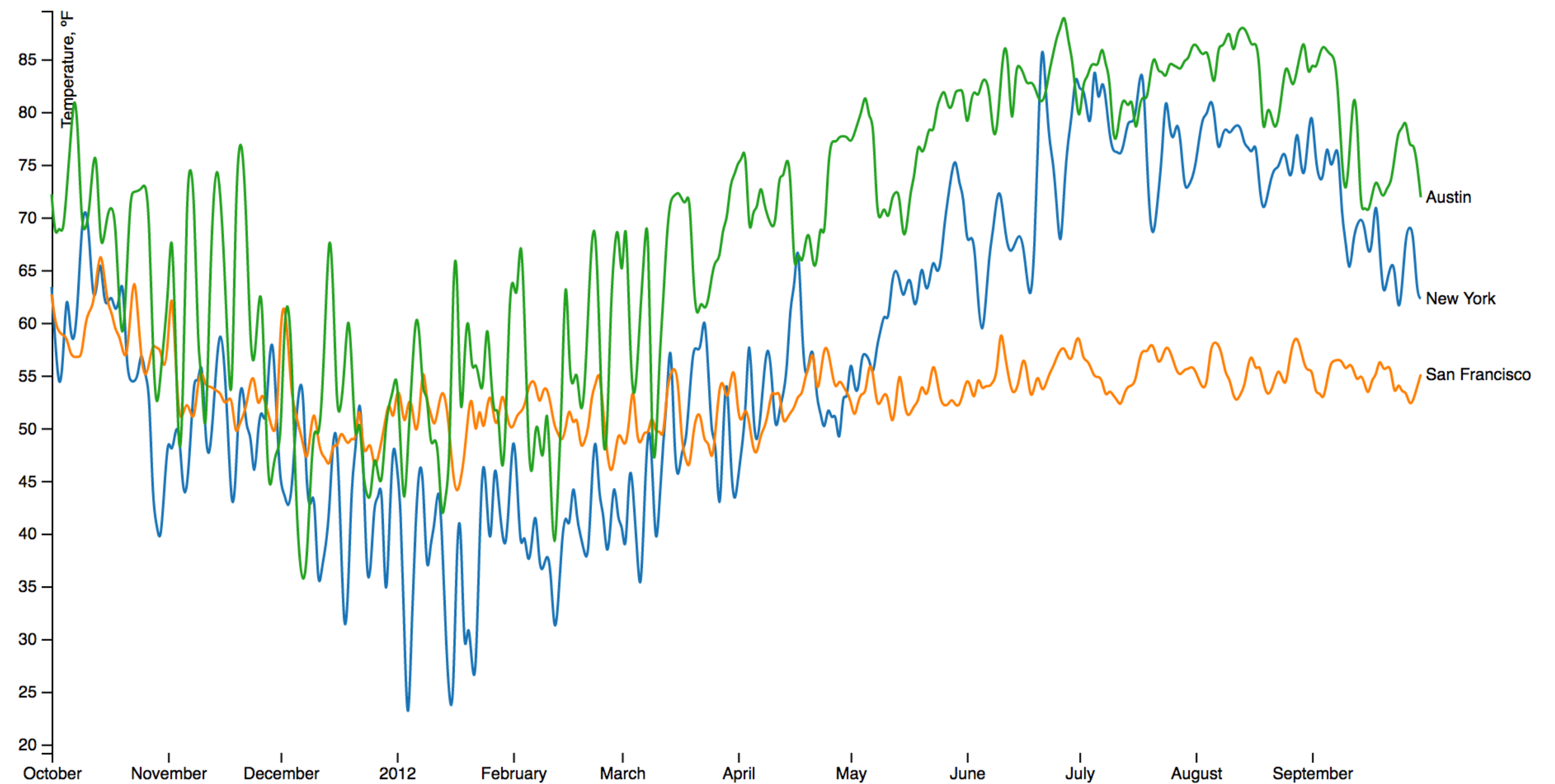


Layering

Create a composite view by stacking different views on top of each other

Pro: support a larger, more detailed view

Con: cannot use any visual encoding, not too many layers



Grafana live example

