Interacting with your visualizations

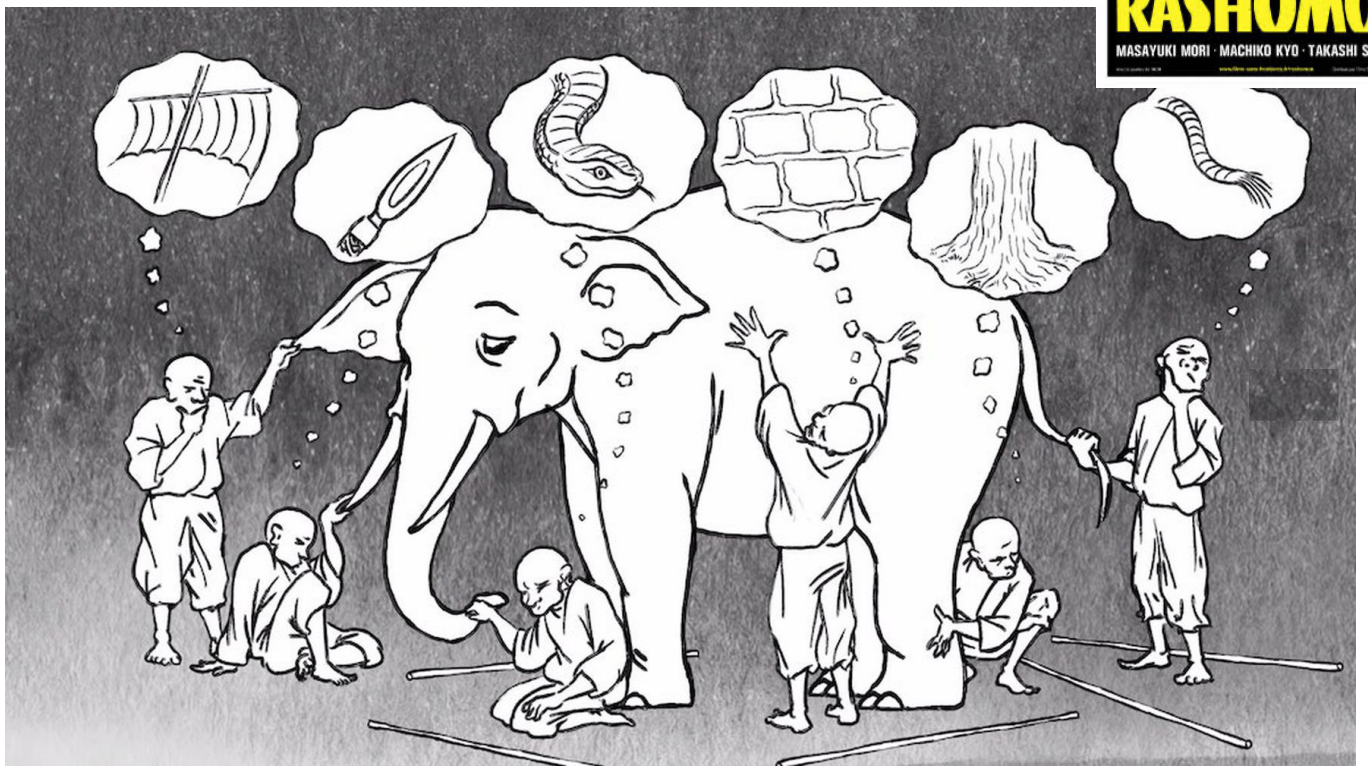
Laura Garrison, University of Bergen

laura.garrison@uib.no

ICTP Workshop 2023

Why visualize?

- Rashomon Effect/»Elephant in the Dark» (Rumi)
  - Different models, parameters, representations, etc. can tell different stories
- Visualization can help us spot and understand reasons for these differences



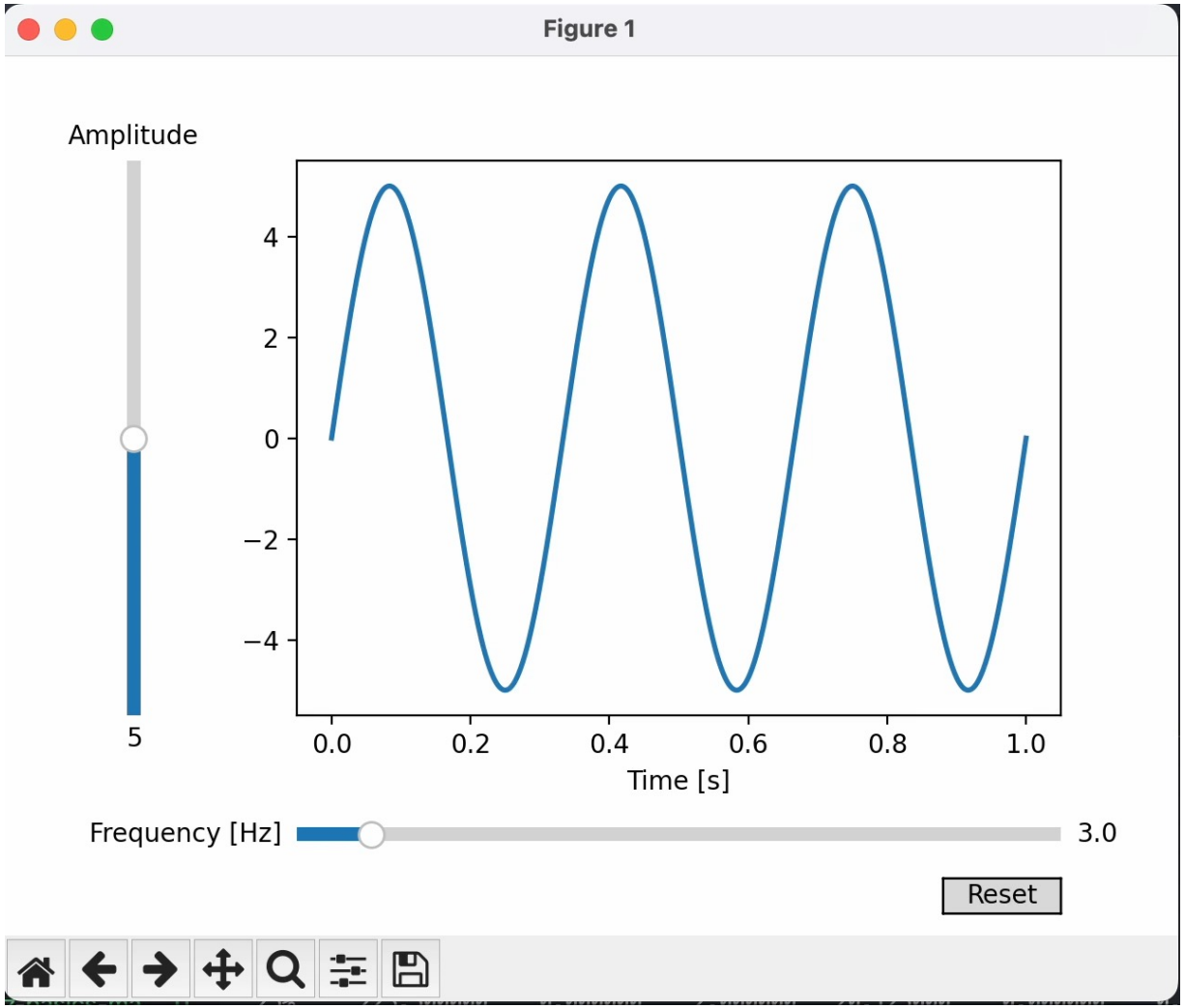
Breiman, L. (2001). Statistical modeling: The two cultures (with comments and a rejoinder by the author). Statistical science, 16(3), 199-231.

Why interact?

- To engage!
- Manage complexity of data
- On-the-fly hypothesis testing

Why interact?

- To engage!
- Manage complexity of data
- On-the-fly hypothesis testing
- **See effects of parameter(s) changes on model**



Efficiency Principle

"The gains from using an **interactive** visual approach should **outweigh** the **computational resources** and **human effort** necessary to carry out the analysis."

Interactive Visual Data Analysis

Tominski & Schumann 2020

Overview first,
zoom and filter,
details on demand

Shneiderman’s Visual Information-Seeking Mantra

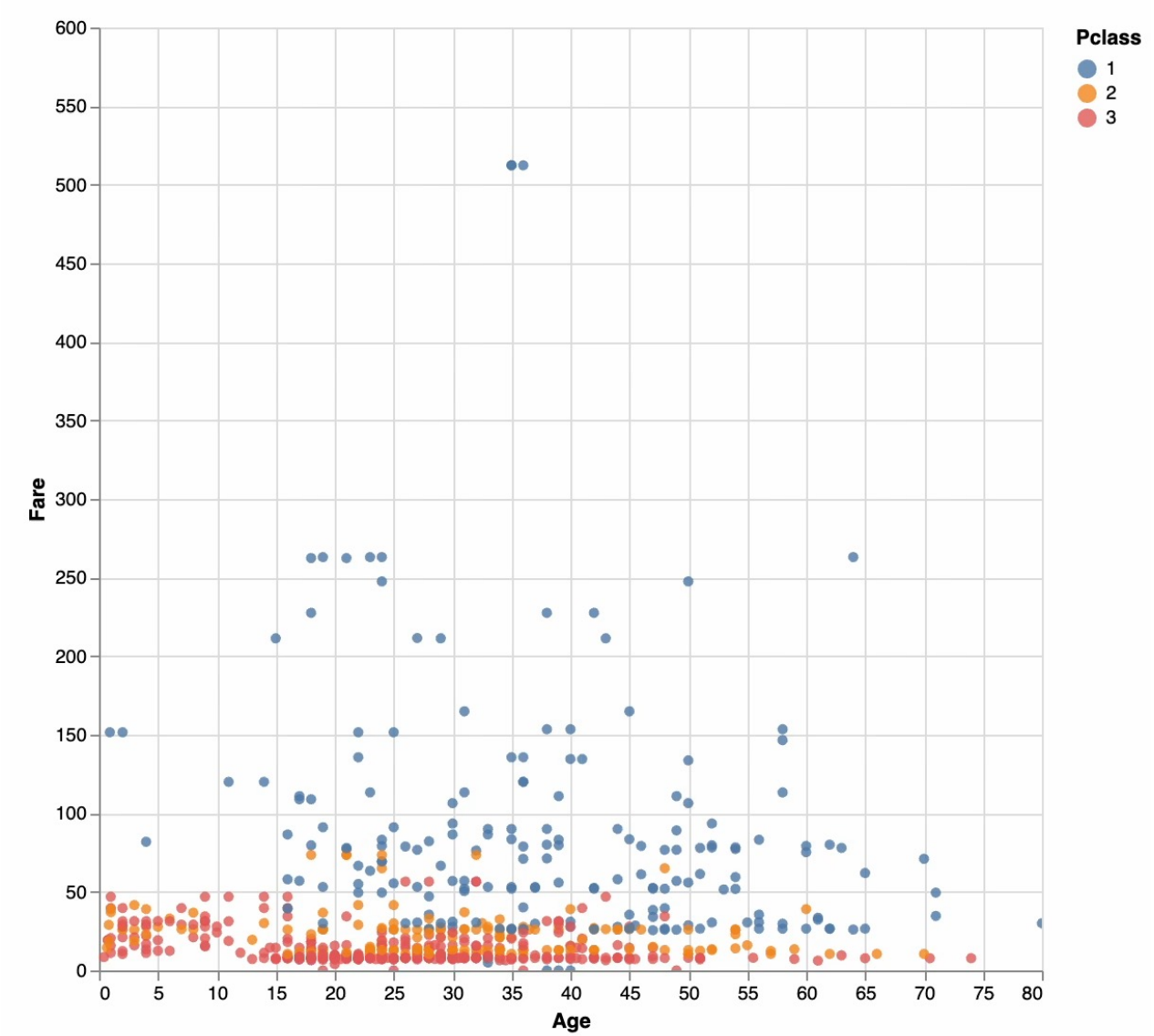
The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations, Shneiderman 1996

Visual information-seeking mantra in action

Overview first,

zoom and filter,

details on demand



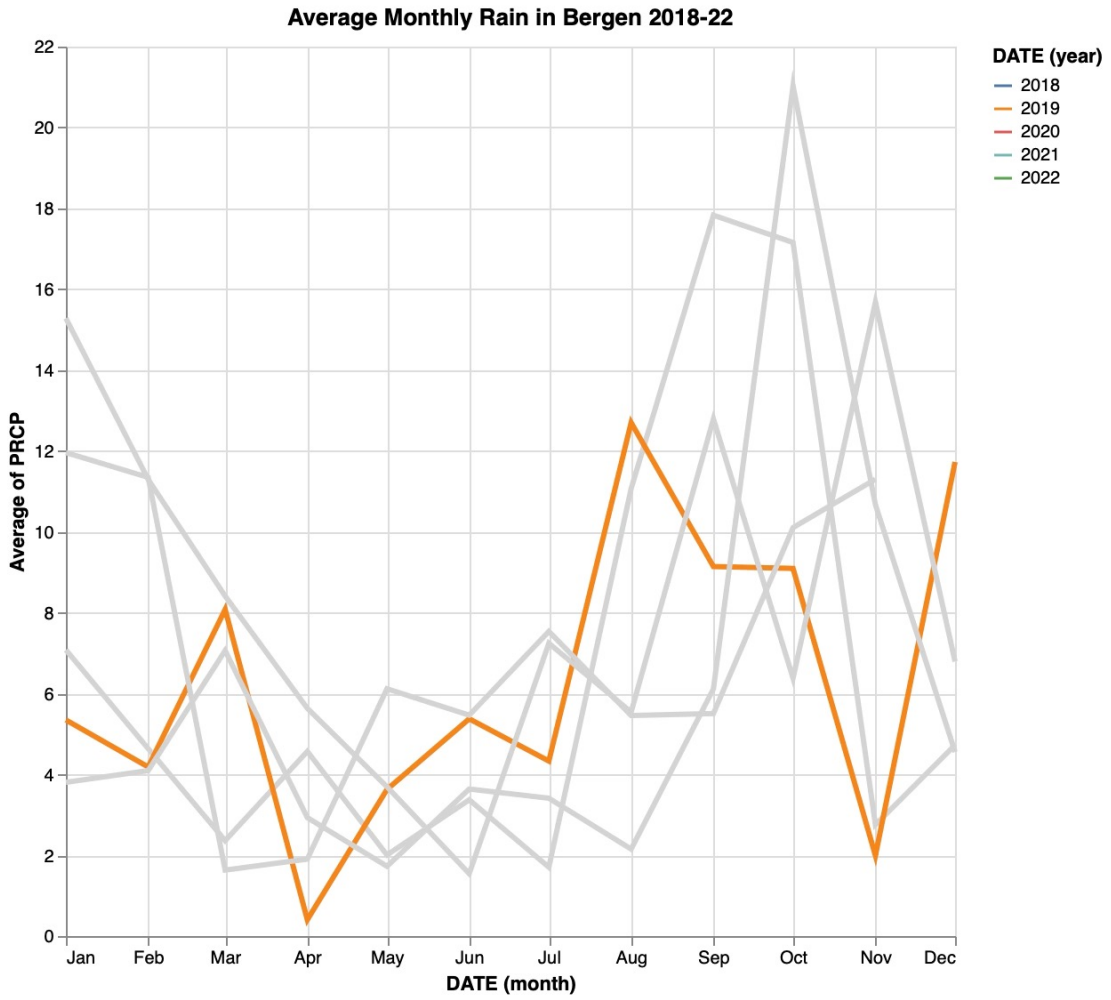
Interaction approaches to explore today

- **Manipulate** view
  - Adjust view
- **Coordinate** faceted views
  - Coordinate manipulations across multiple views
- **Reduce** view(s)
  - Filter
  - aggregate
  - embed information

Visualization Analysis and Design, Munzner 2014

Manipulate View

- Select
  - e.g., highlighting
- Change over time
  - e.g., animated transitions



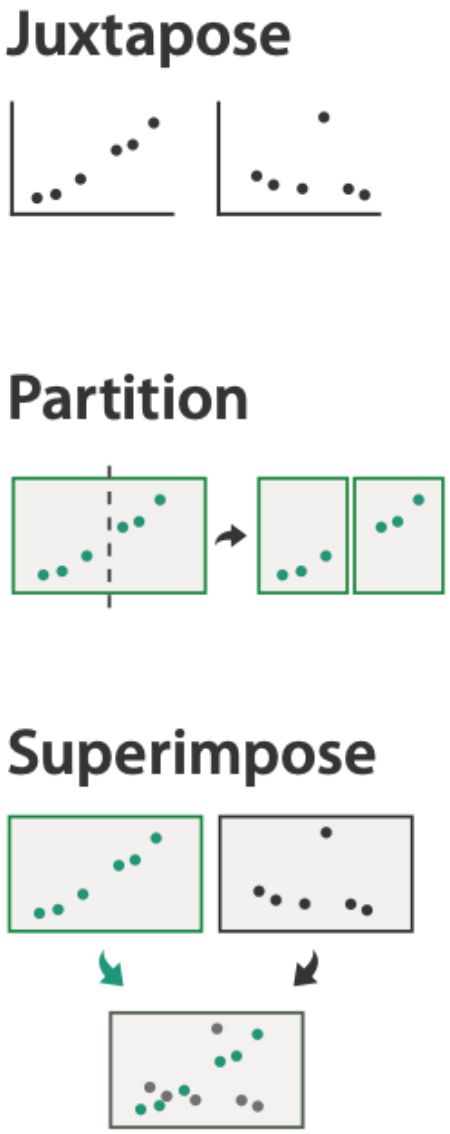
Manipulate View

- Navigate
  - e.g., pan within a view, scrollytelling

View this gorgeously impactful visualization

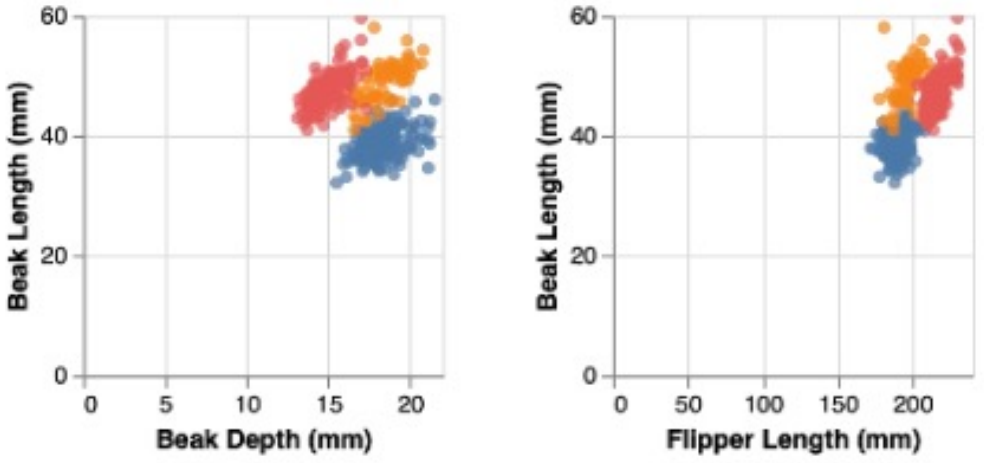
Coordinate Faceted Views

- Faceting –> a separation of information into different views
- Why facet?
  - Eyes > memory
- Approaches
  - Side by side (juxtapose/partition)
  - On top of (superimpose)



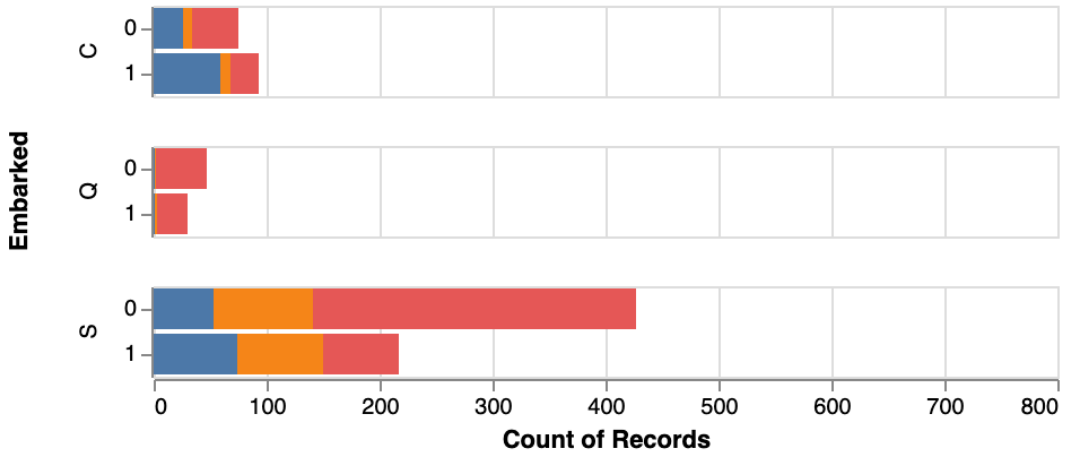
Juxtaposed views

Side by side (can be same/subset/totally different data)



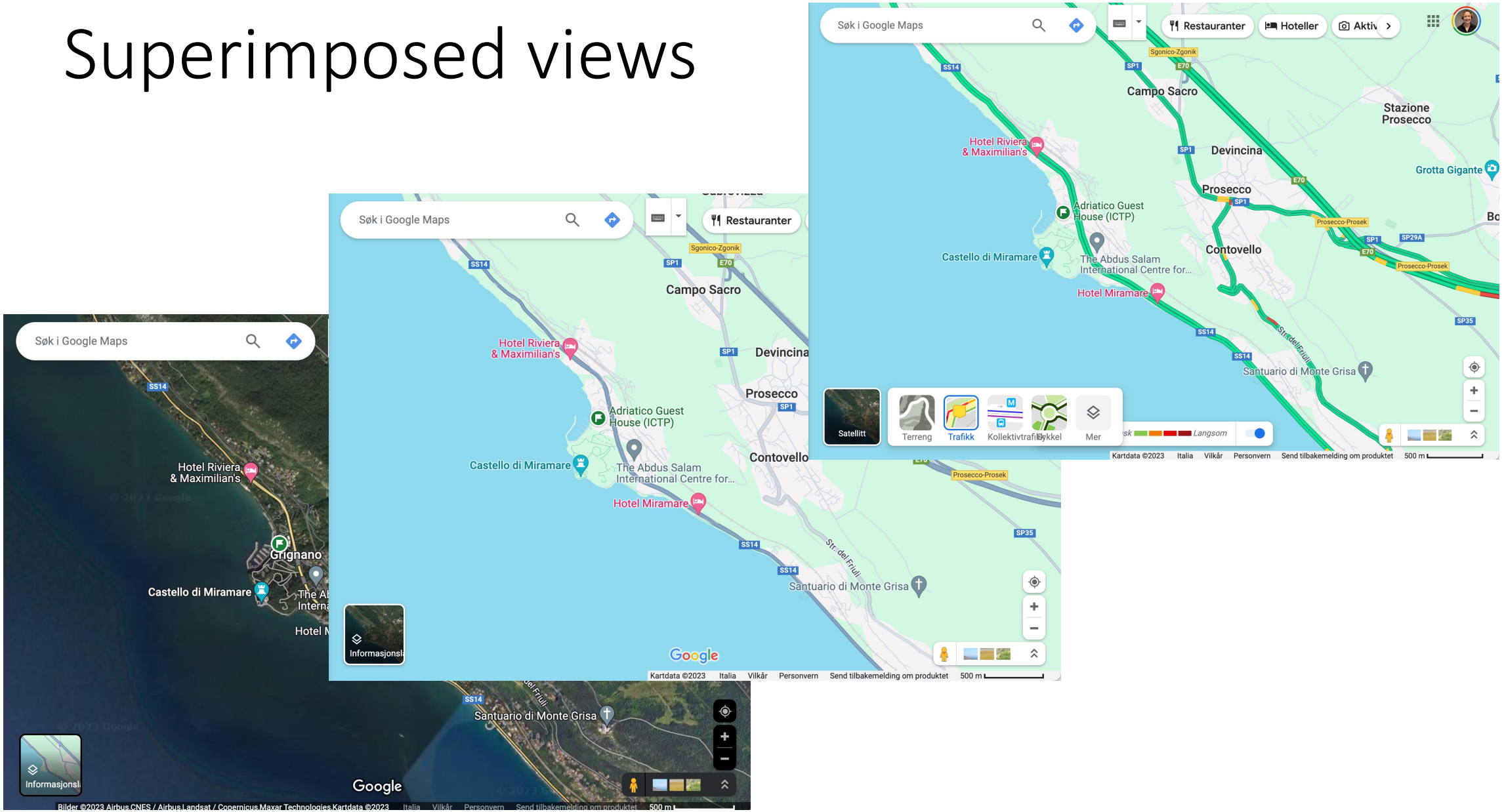
(Palmer penguins dataset)

Partitioned into different categories of one variable in a dataset



(titanic dataset)

Superimposed views

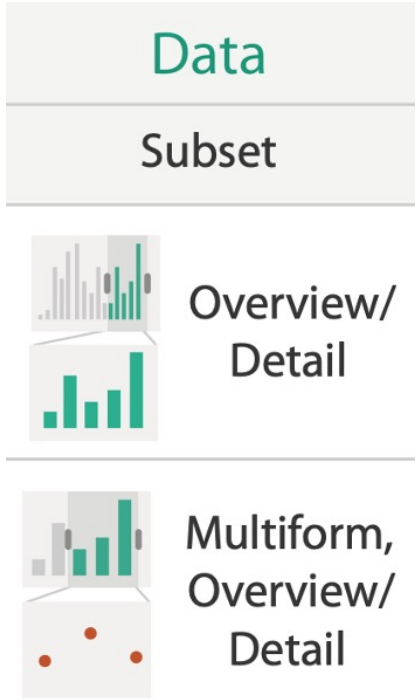


Coordinating your views

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

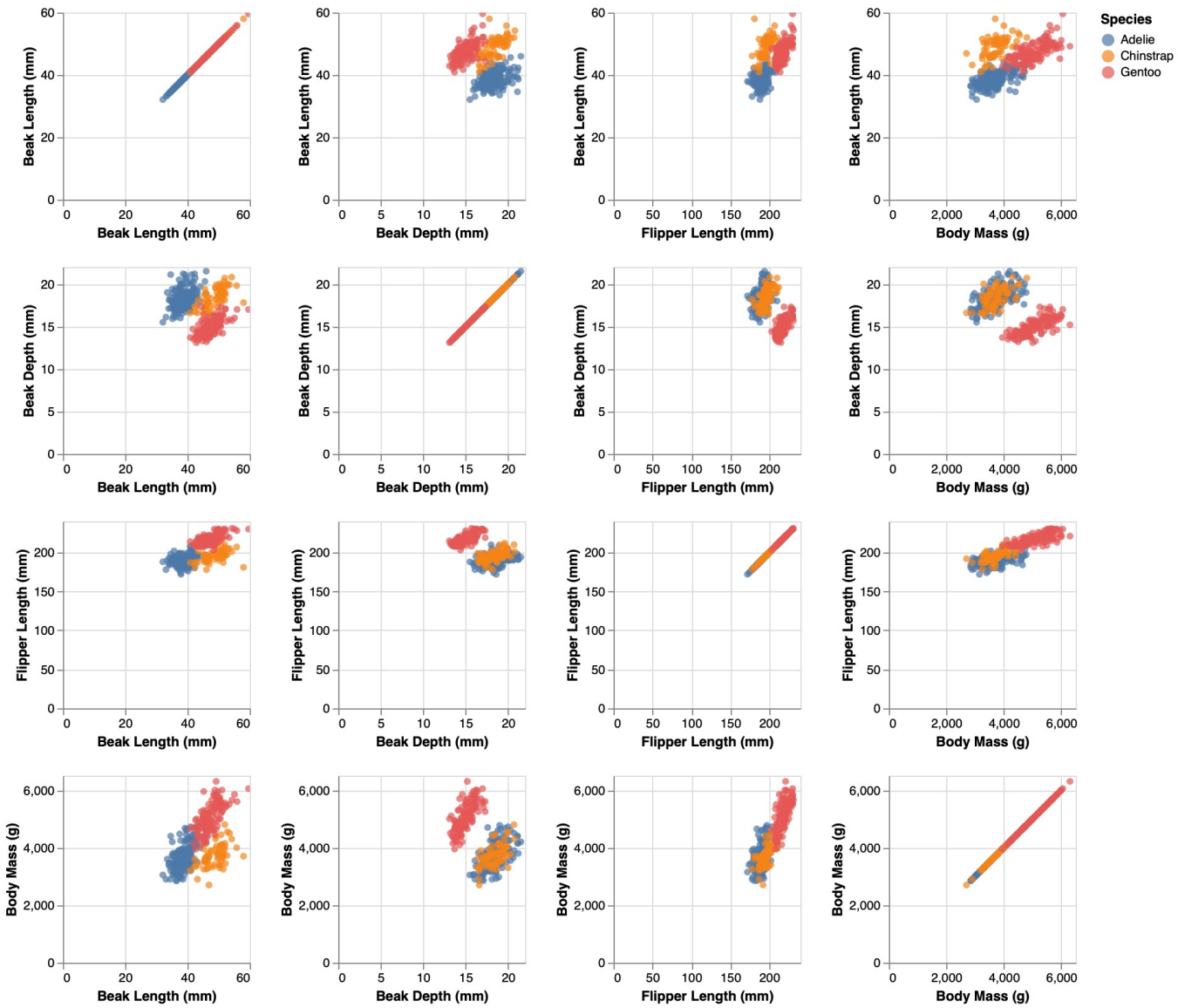
- Share Data: All/Subset/None

- Share Navigation

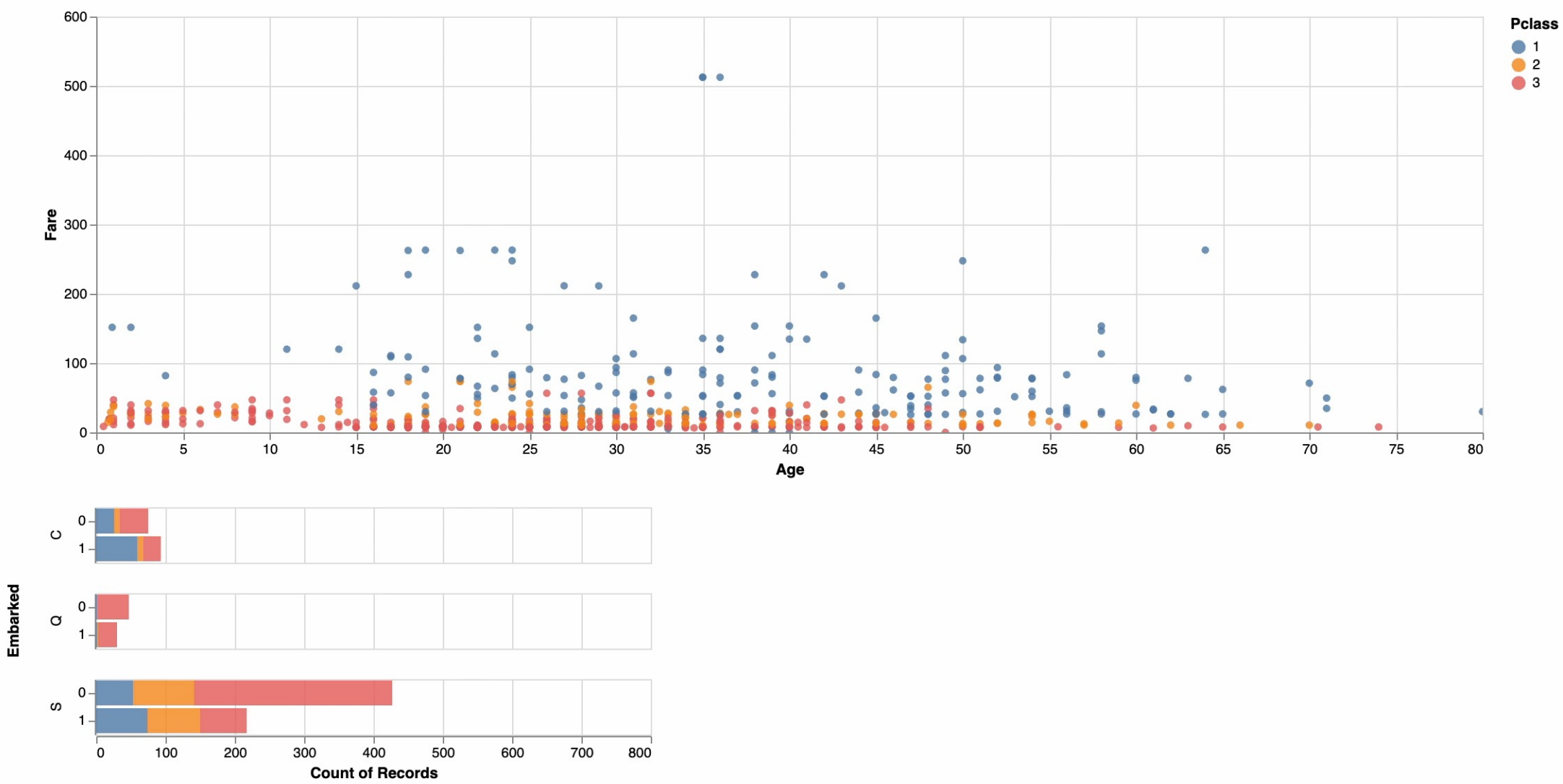


[Visualization Analysis and Design](), Munzner 2014

Shared Navigation



Linked Highlighting

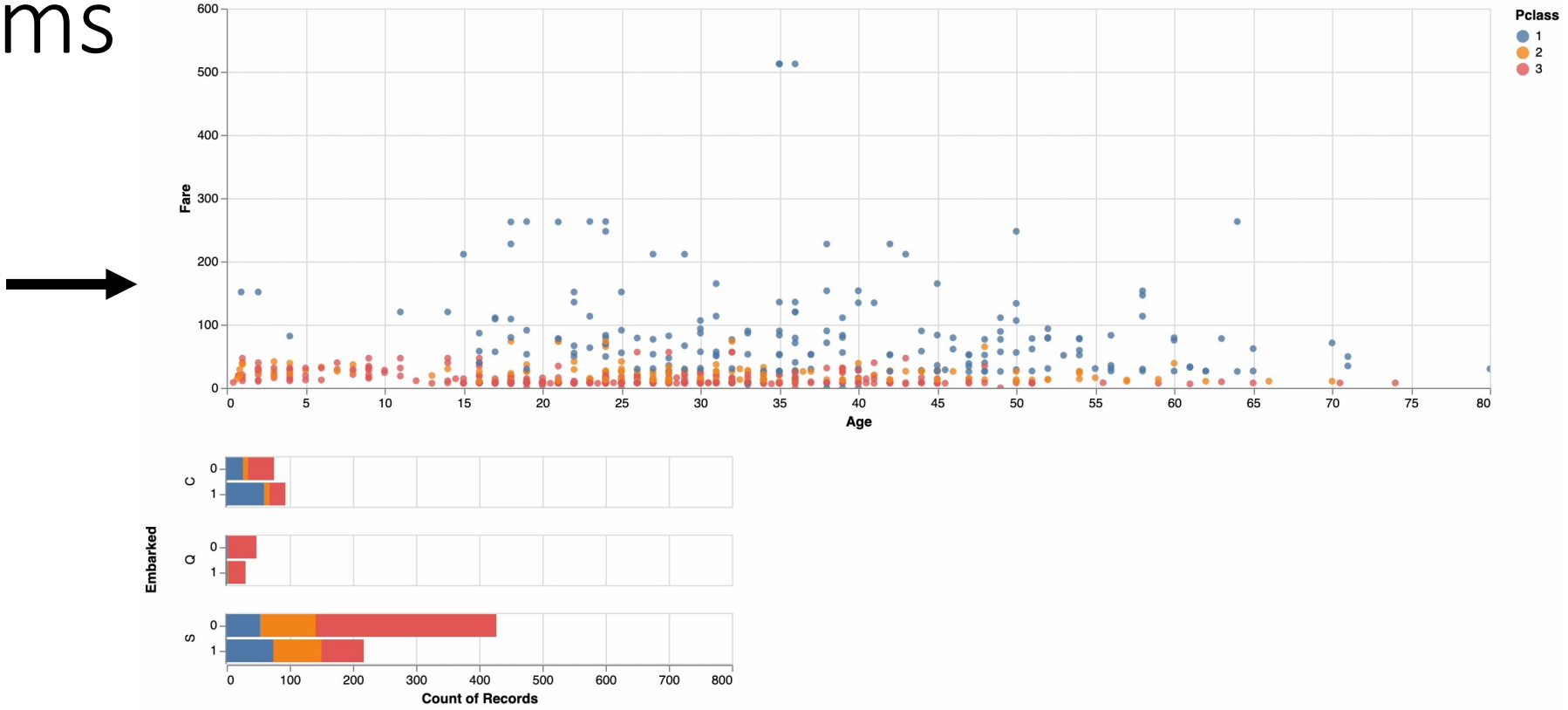


Reduce Items

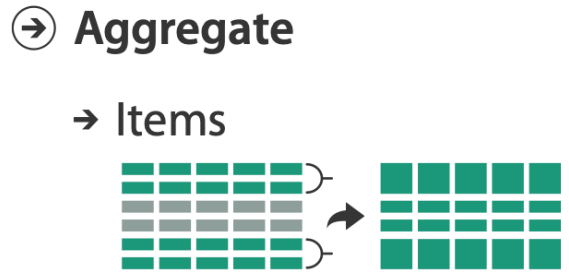
- **Filter**
  - Items

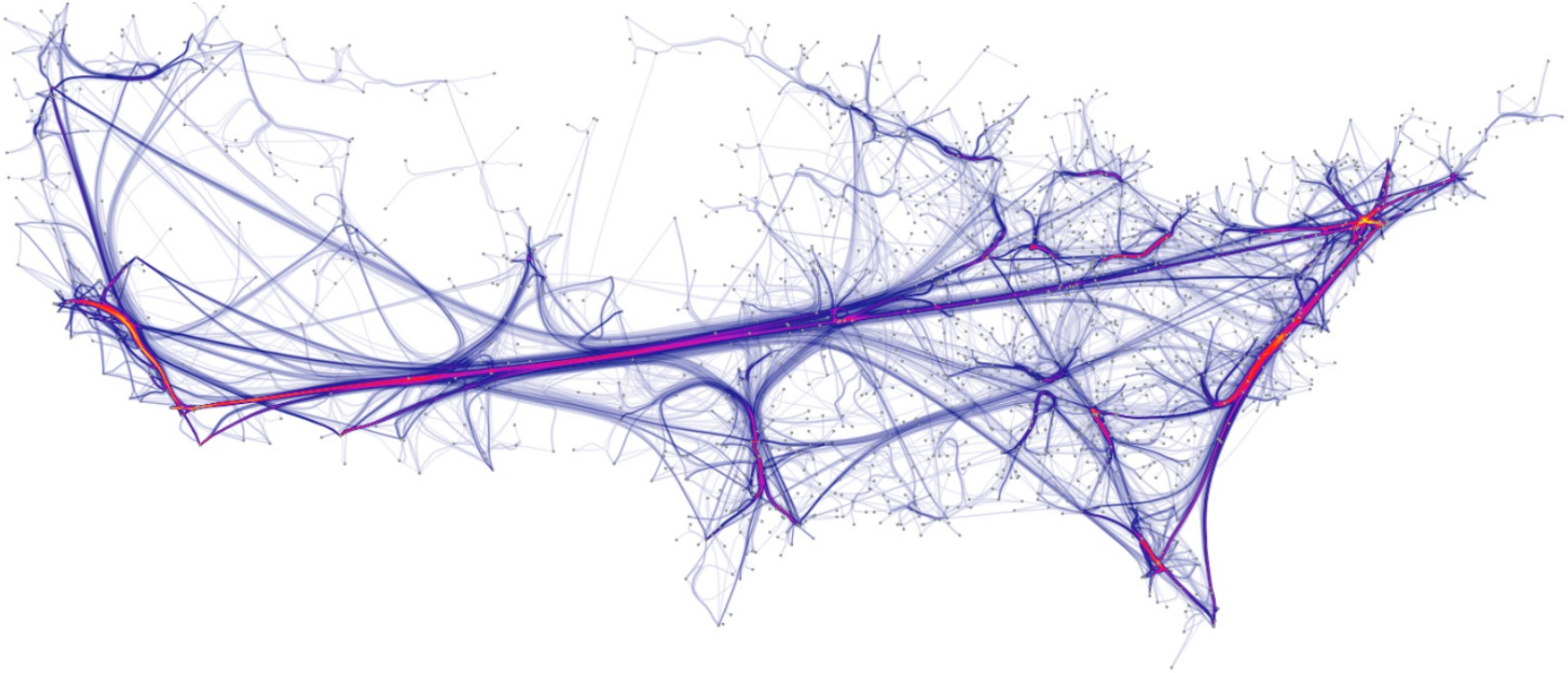
  - Attributes

e.g., an option in interface to remove “Embarked” or “Survived” variables from display in this visualization



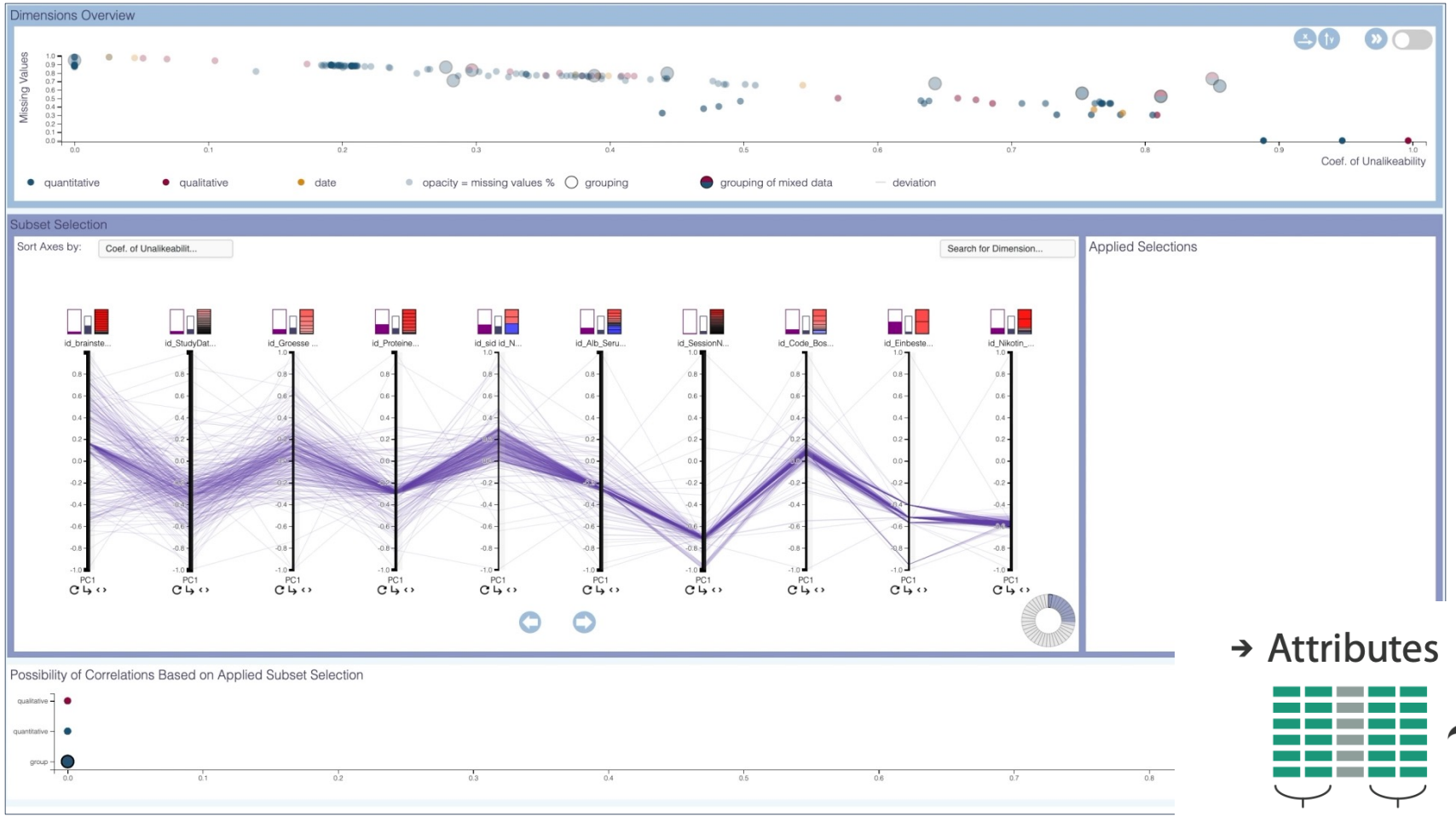
Aggregate: Items





Application of edge bundling on maps
Source: Holten et al. 2009. Force-Directed Edge Bundling for Graph Visualization.

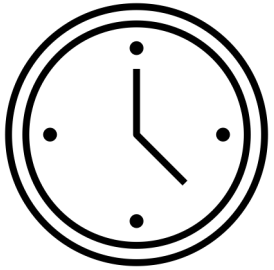
Aggregate Variables (Dimensions), Embed

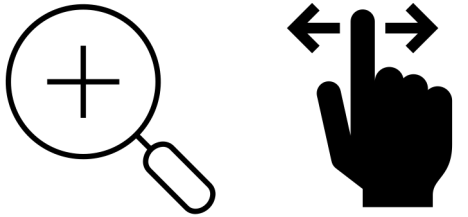


Garrison, L., Müller, J., Schreiber, S., Oeltze-Jafra, S., Hauser, H., & Bruckner, S. (2021). Dimlift: Interactive hierarchical data exploration through dimensional bundling. IEEE Transactions on Visualization and Computer Graphics, 27(6), 2908-2922.

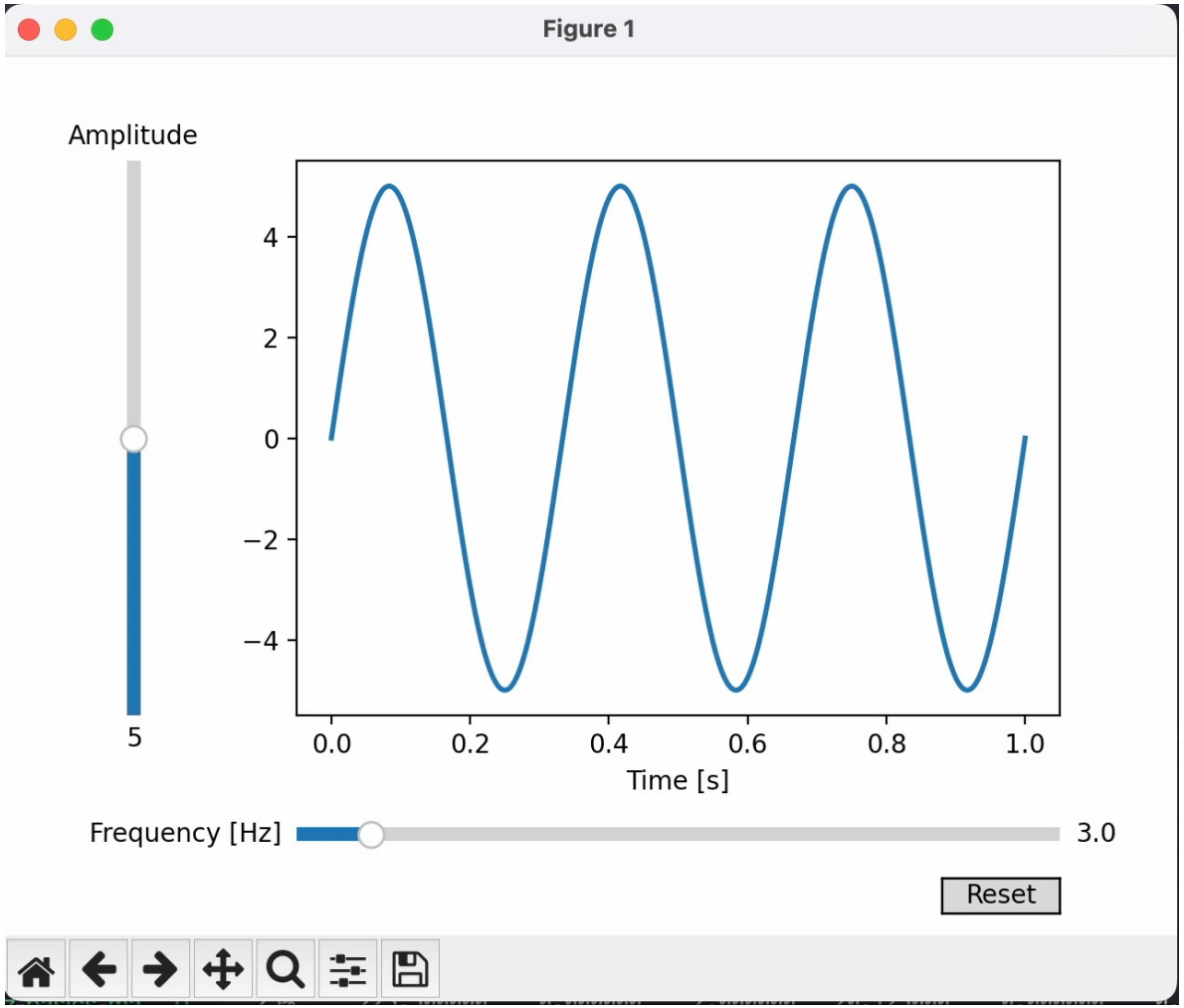
Interaction Caveats!

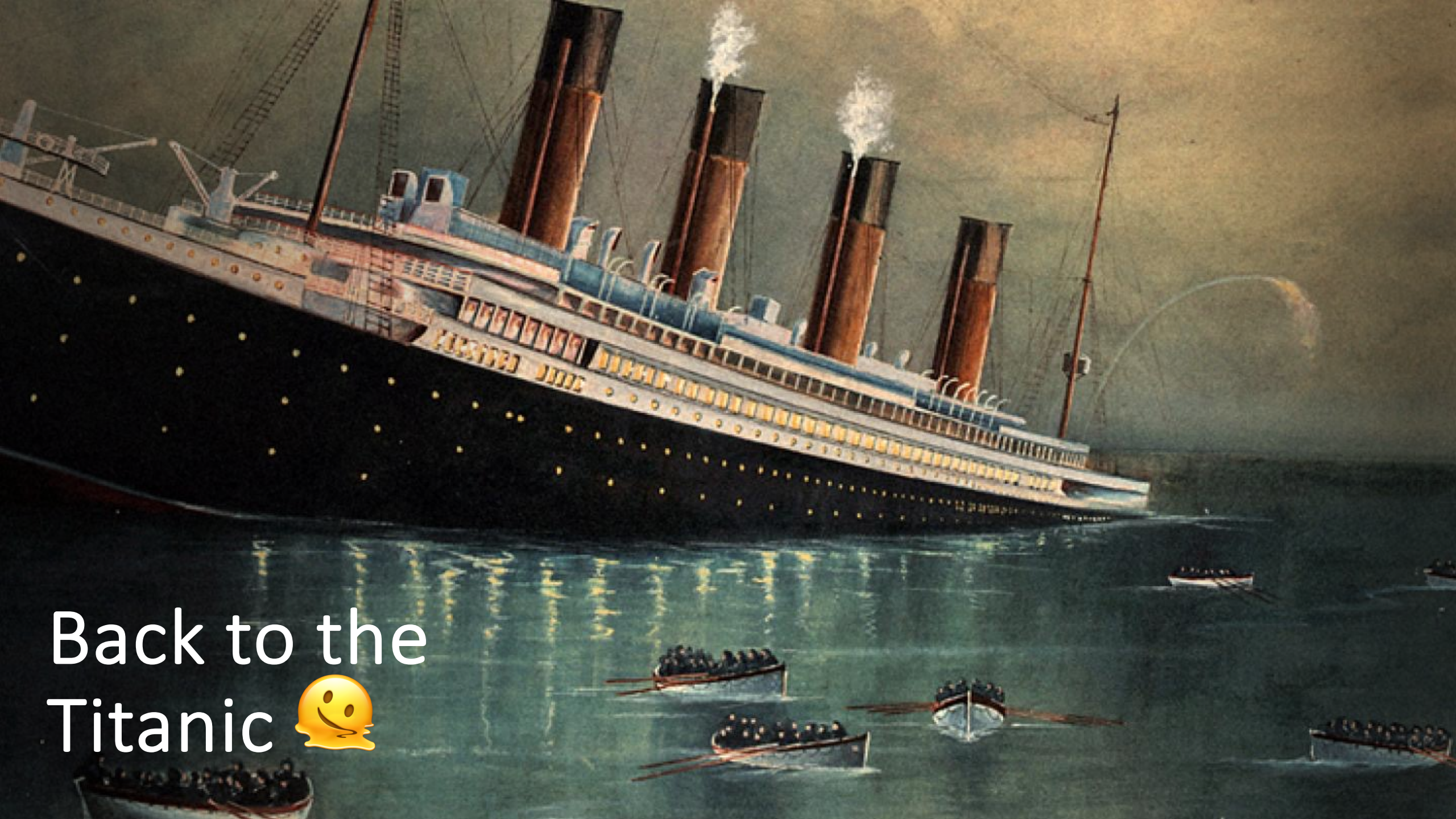
- Interaction costs **time**
- Cognitive load?
- Users may not interact with your visualization (90%?!?! – Aisch 2016)
- Controls vs ”invisible” functionality



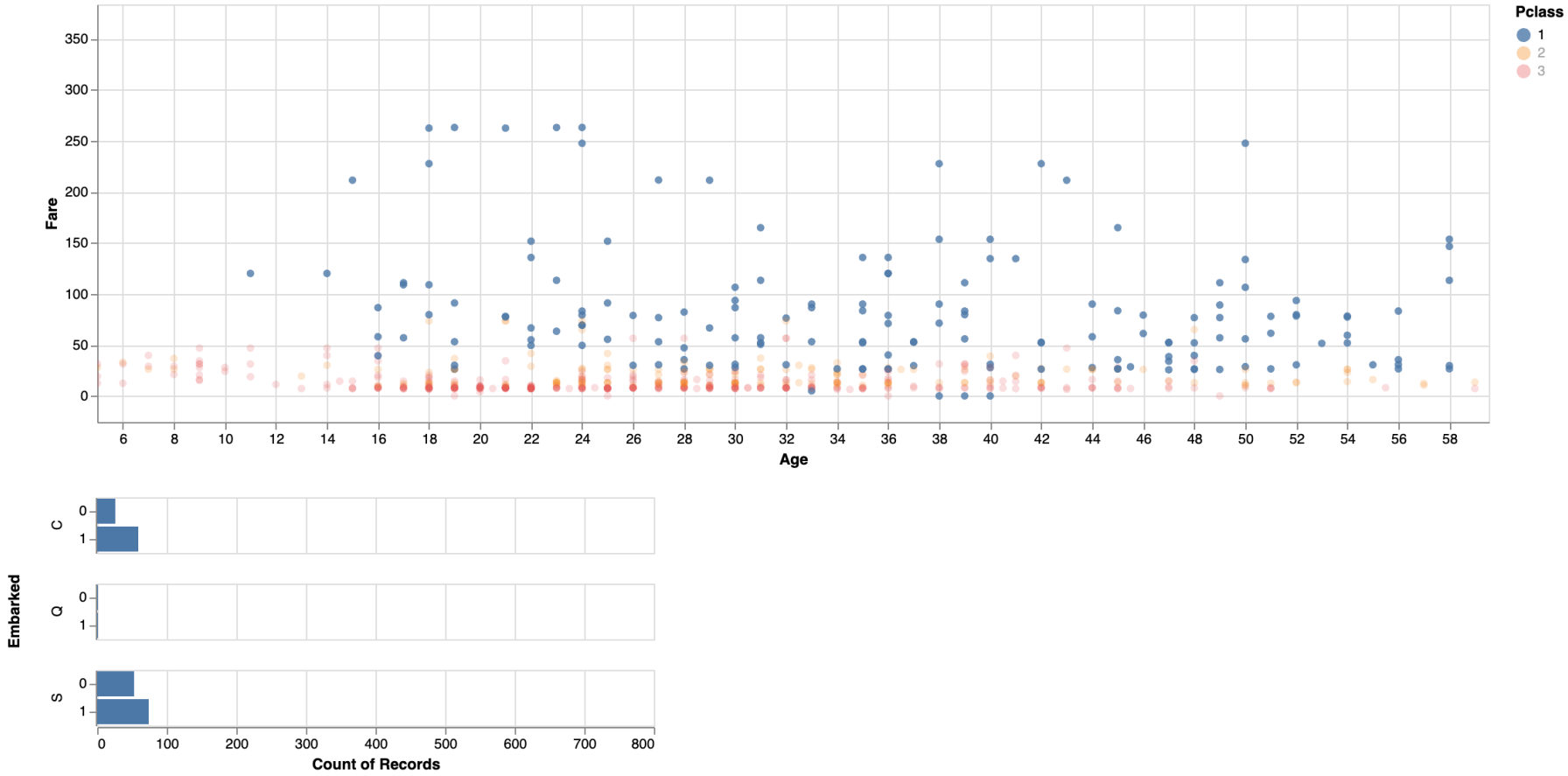


Matplotlib Code Study: Param Adjustment




Back to the
Titanic 🫠

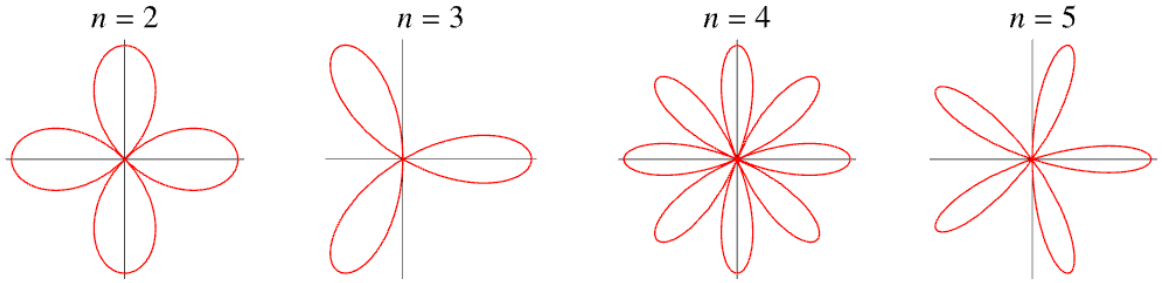
Altair Code Study: Select and Filter



To the lab!

Pick your poison:

1. Interactive parameter adjustment for Rose Curve (https://mathworld.wolfram.com/RoseCurve.html) in Matplotlib



2. Interactive visual exploration that continues your questions from earlier this week on the Titanic dataset