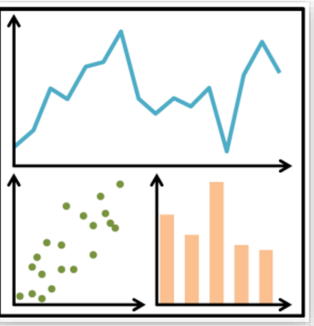
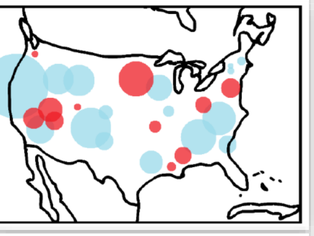
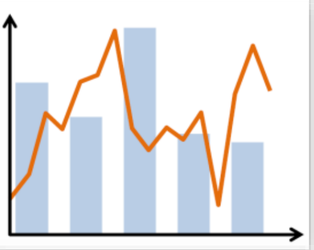
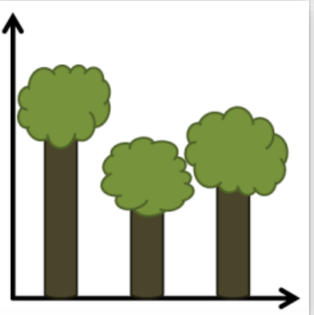
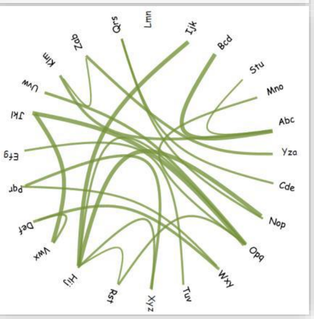






Lecture 9: Arrange Tables

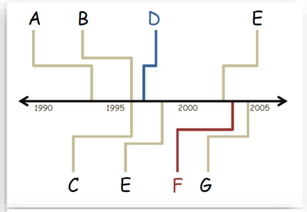
CS 7250

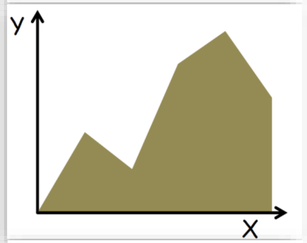
SPRING 2021

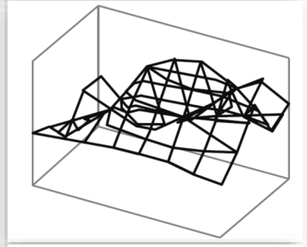
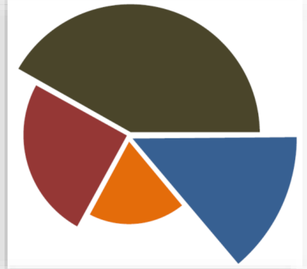
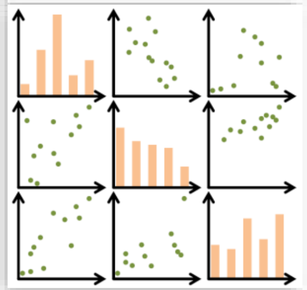
Prof. Cody Dunne

NORTHEASTERN UNIVERSITY

Slides and inspiration from Michelle Borkin, Krzysztof Gajos, Hanspeter Pfister, Miriah Meyer, Jonathan Schwabish, and David Sprague



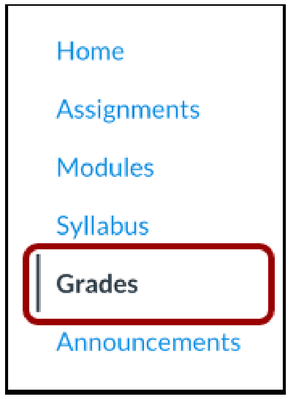


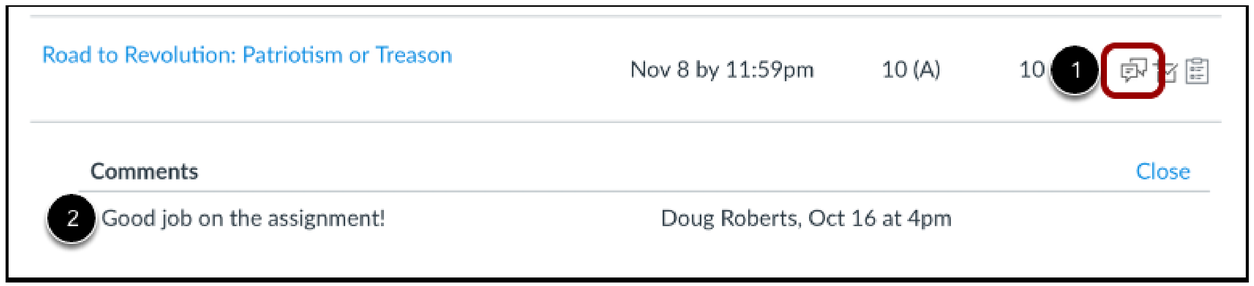





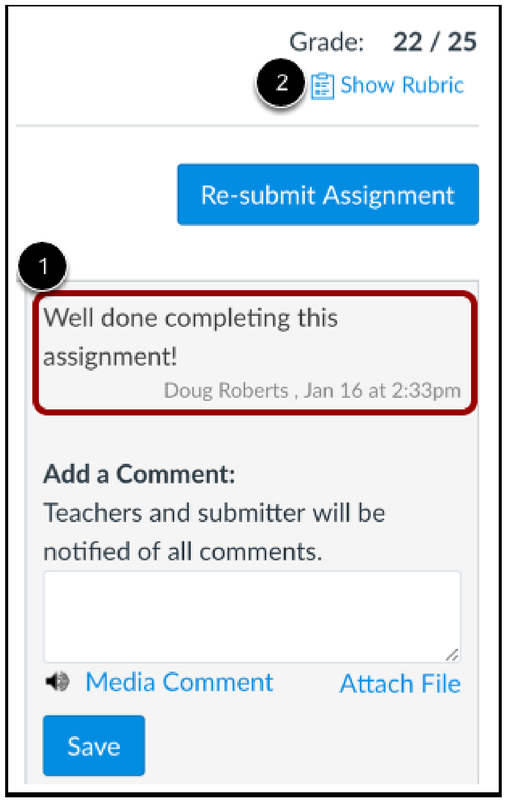
Checking In

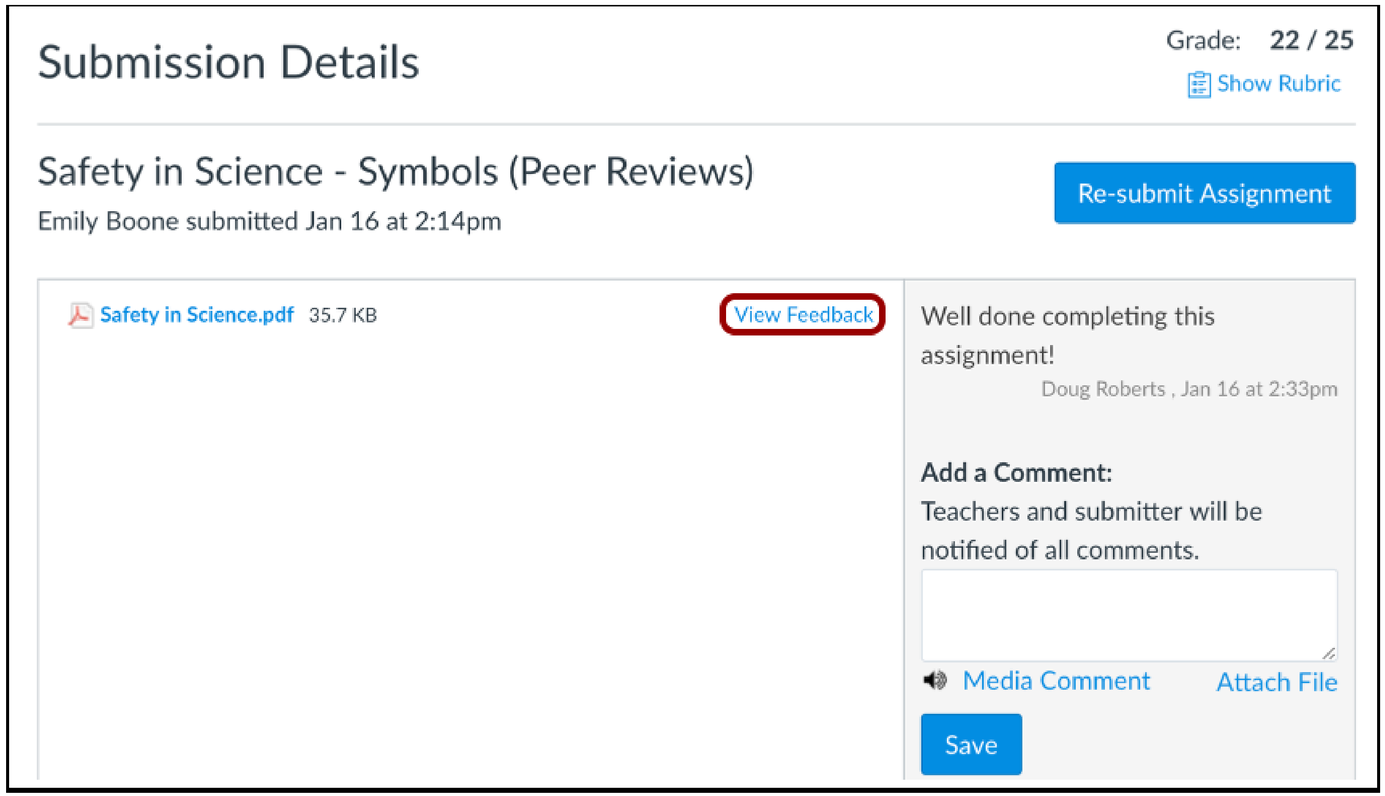
Including about projects

Viewing Feedback on Canvas



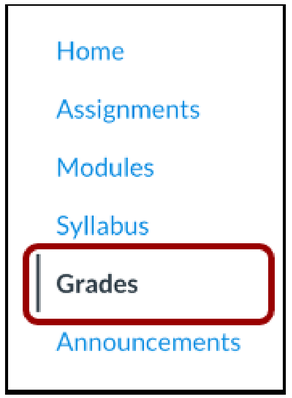


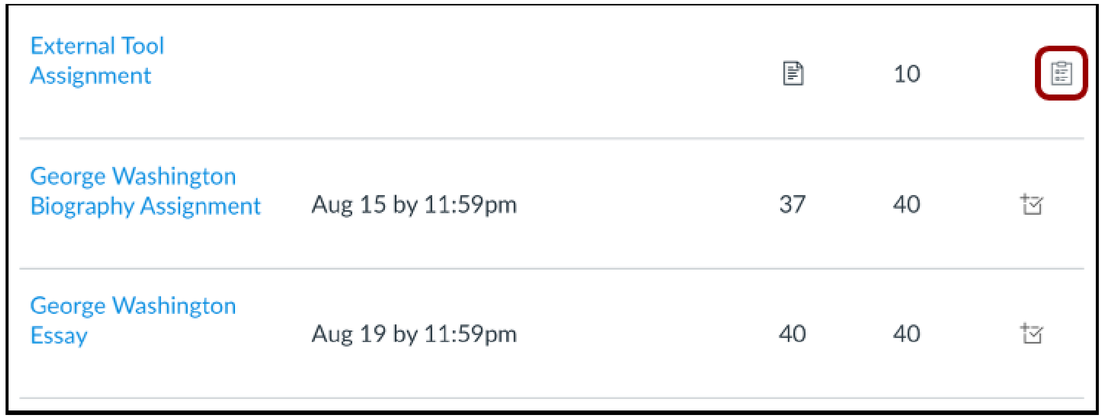


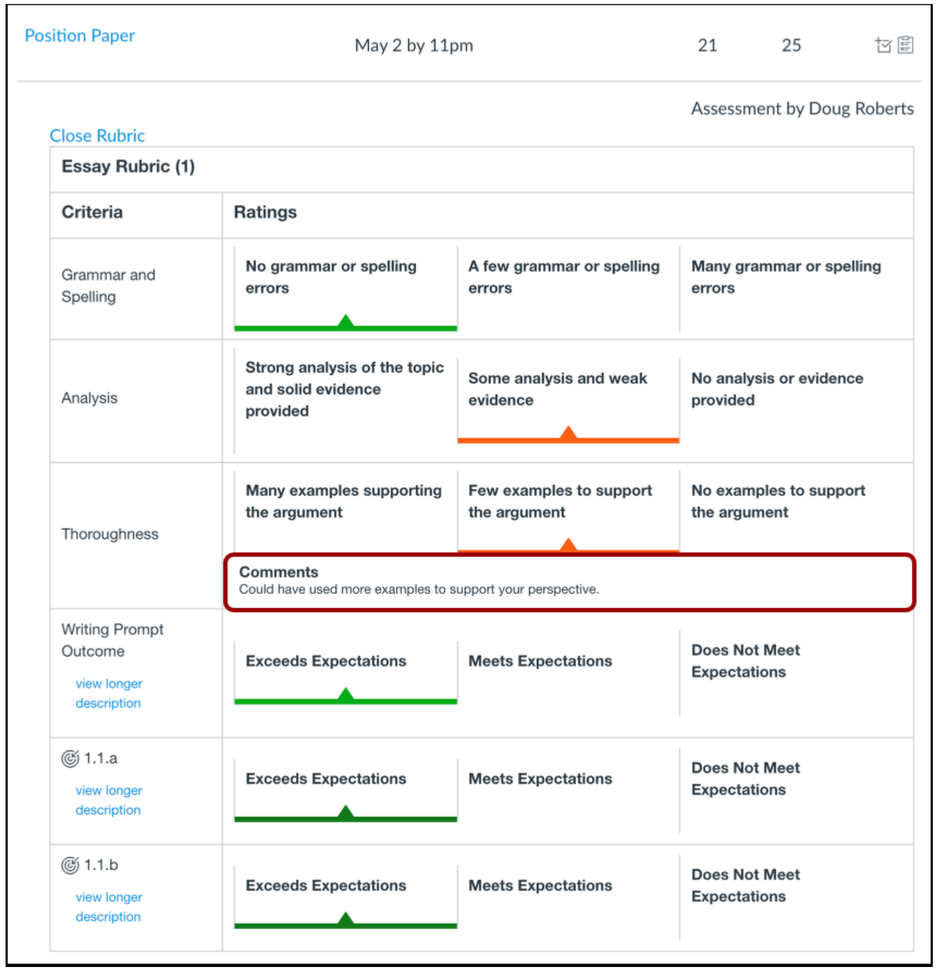


[Canvas PDF annotations docs]

Viewing Feedback on Canvas

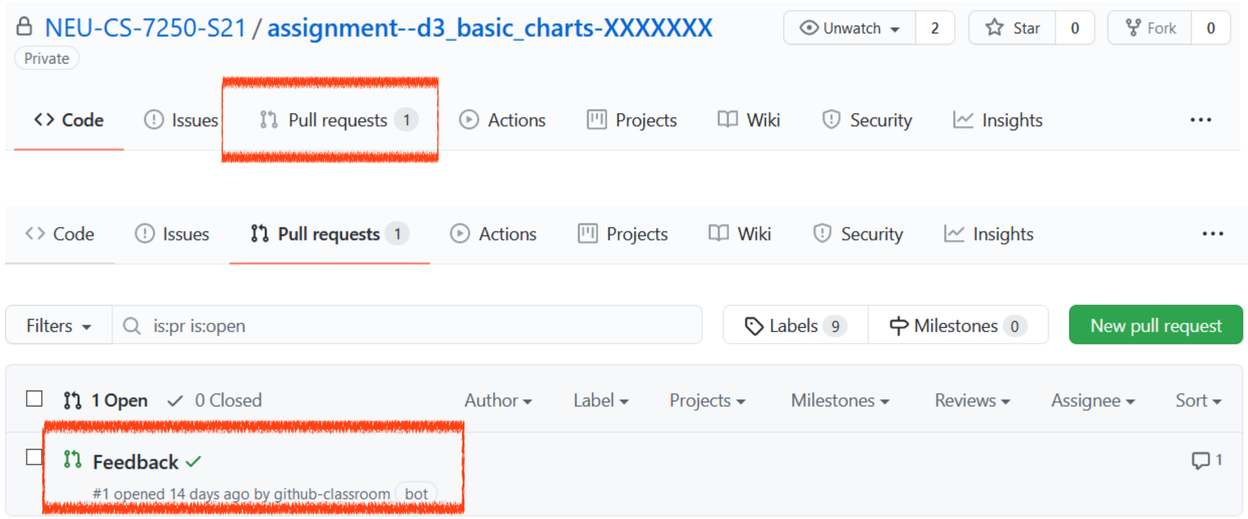


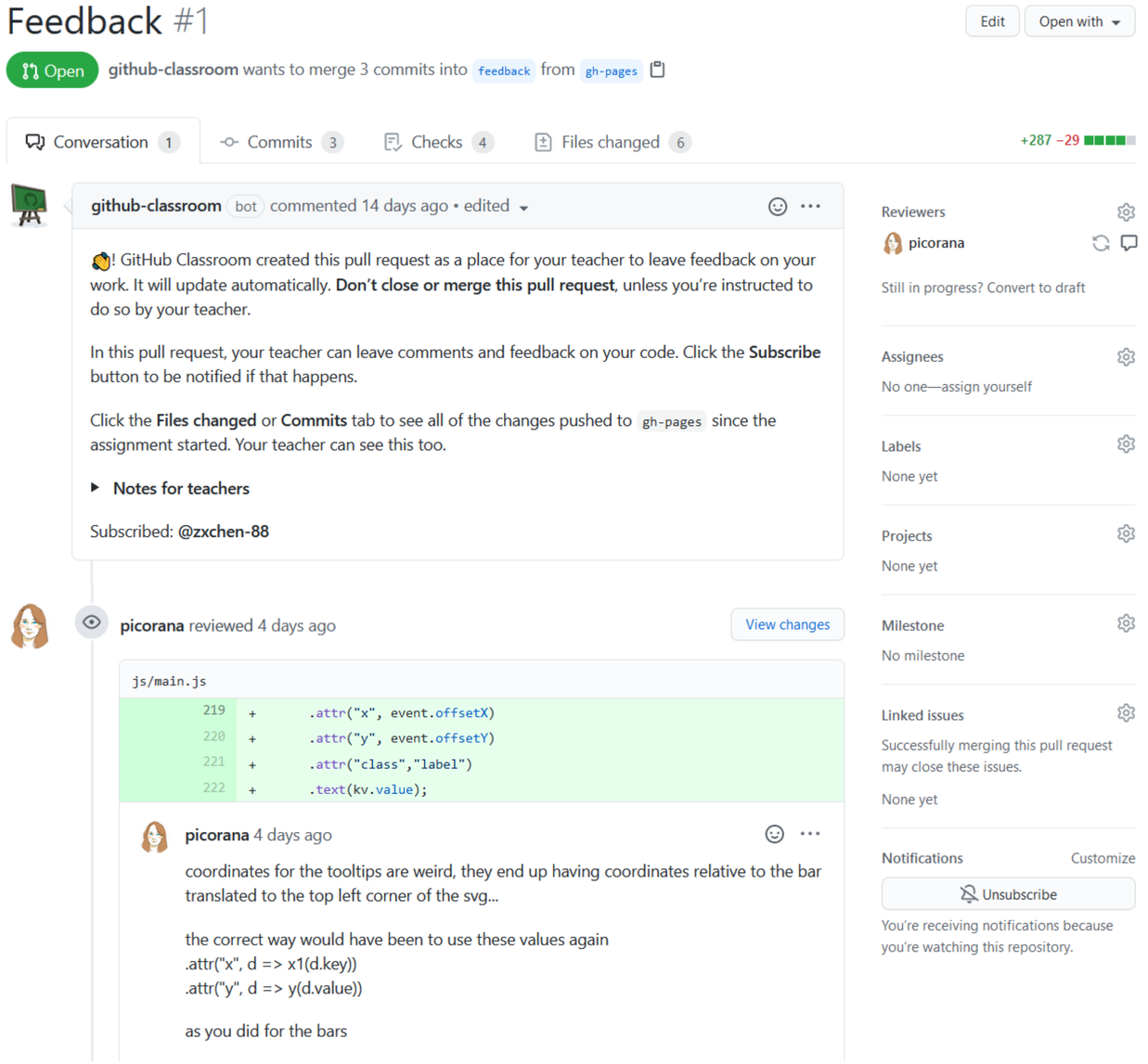




[Canvas rubric view docs]

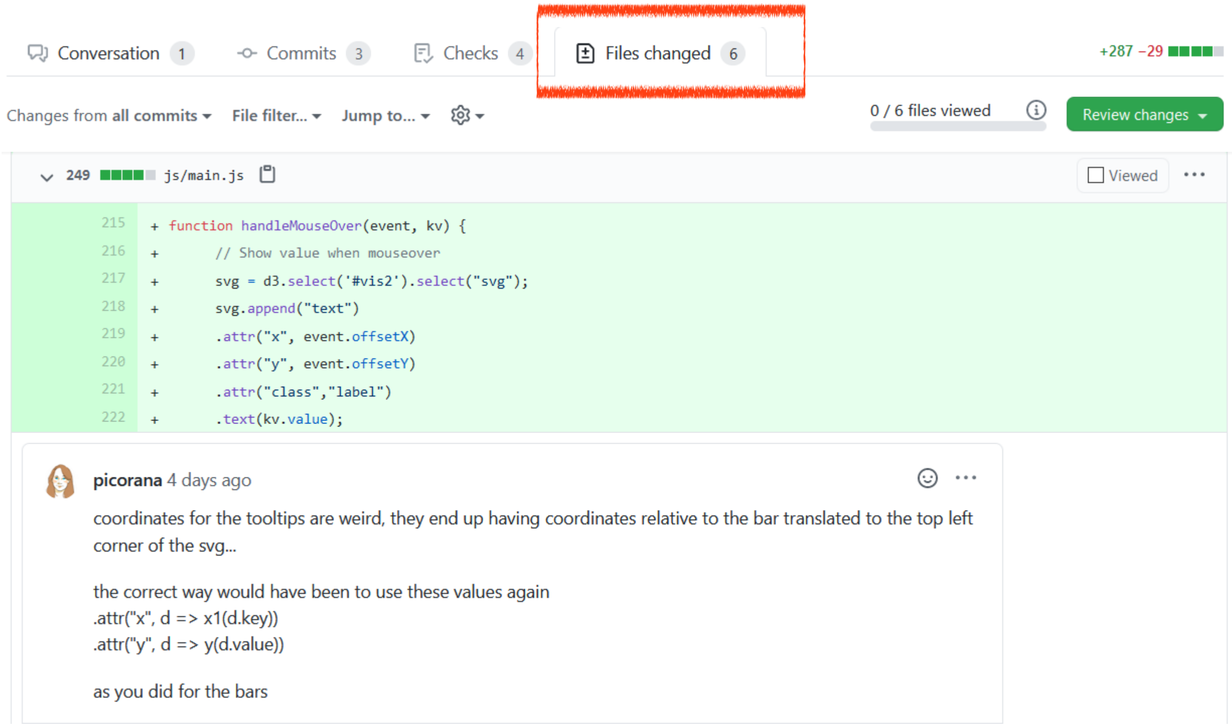
Viewing Feedback on GitHub





[Canvas rubric view docs]

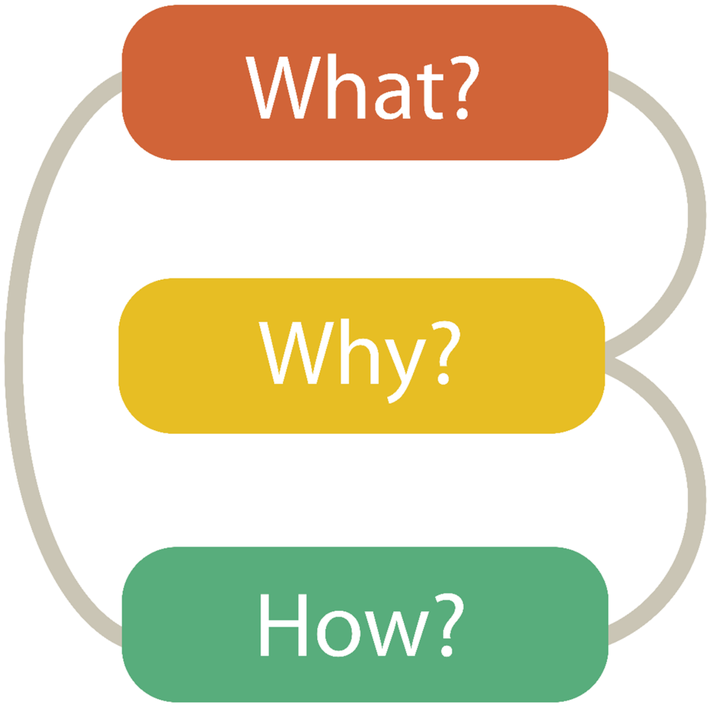
Viewing Feedback on GitHub



[Canvas rubric view docs]

VISUAL ENCODING

Analysis

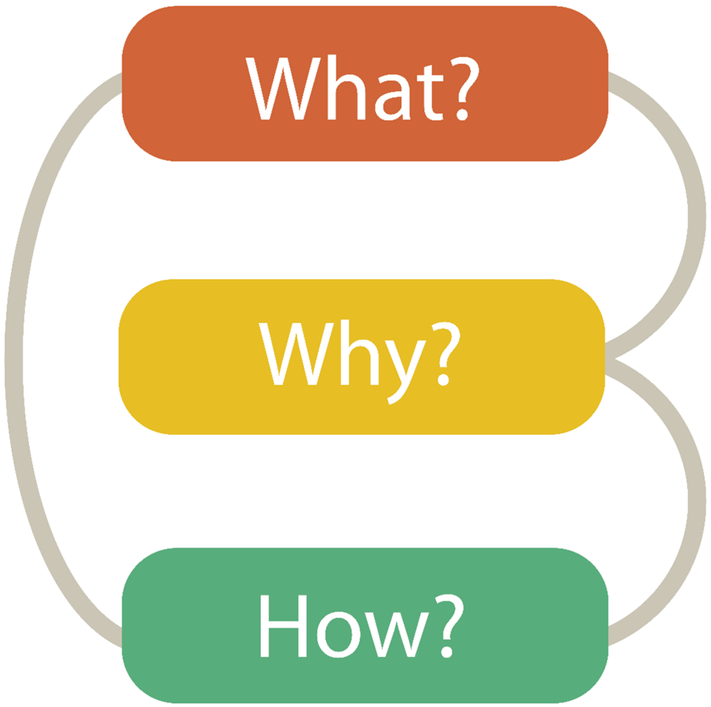


DATA ABSTRACTION

TASK ABSTRACTION

VISUAL ENCODING

Analysis



What data is shown?

Why is the user analyzing / viewing it?

How is the data presented?

Goals for Today

- Learn about visual encodings, esp. arranging tables
- Learn how to pick appropriate visual representations based on attribute type and perceptual properties

Visual Encoding

Now...

How?

Encode

- **Arrange**
  - Express
  - Separate
  - Order
  - Align
  - Use
- **Map**
  from categorical and ordered attributes
  - Color
    - *Hue*
    - *Saturation*
    - *Luminance*
  - Size, Angle, Curvature, ...
  - Shape
  - Motion
    Direction, Rate, Frequency, ...

Manipulate

- **Change**
- **Select**
- **Navigate**

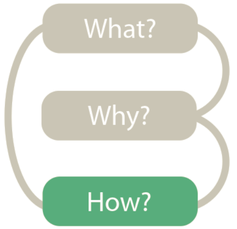
Facet

- **Juxtapose**
- **Partition**
- **Superimpose**

Reduce

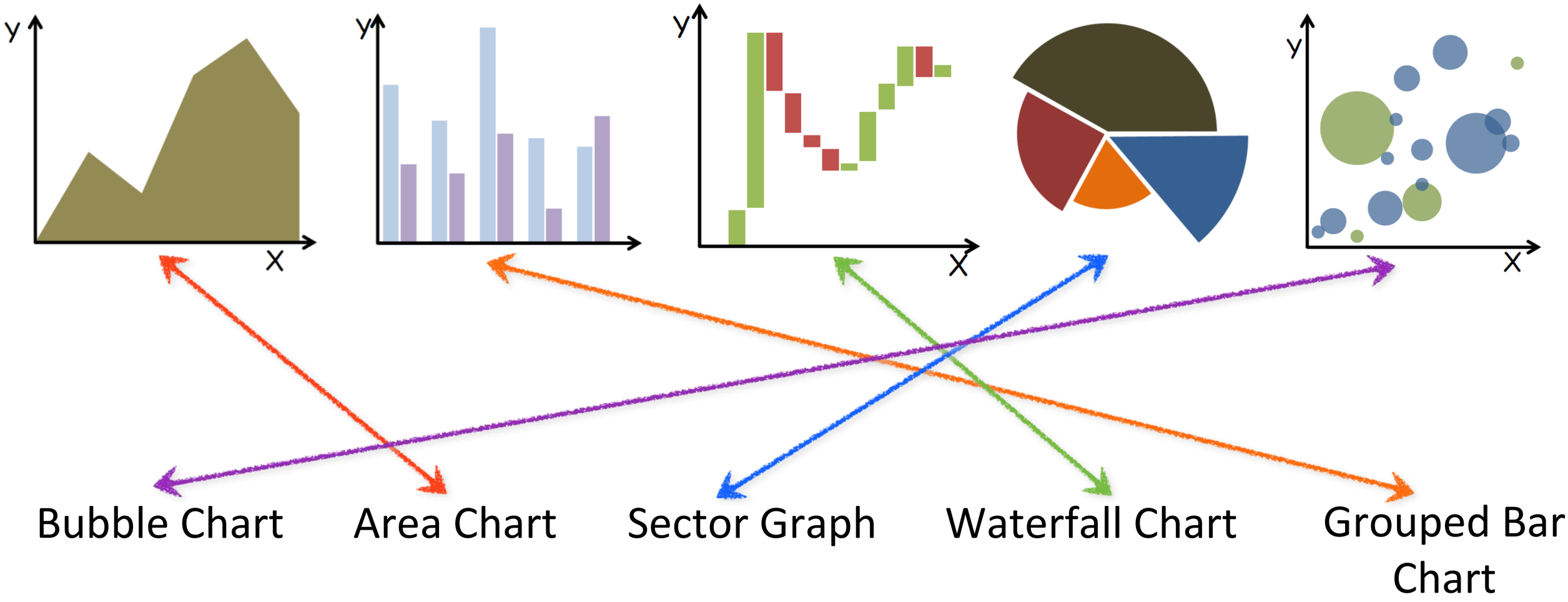
- **Filter**
- **Aggregate**
- **Embed**

Later this semester...

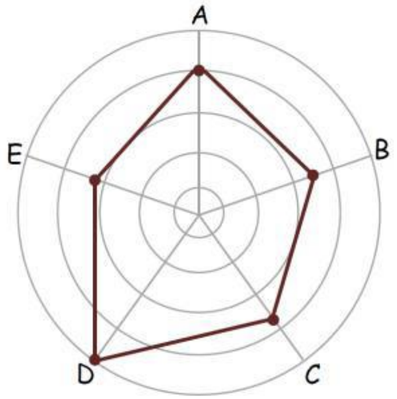


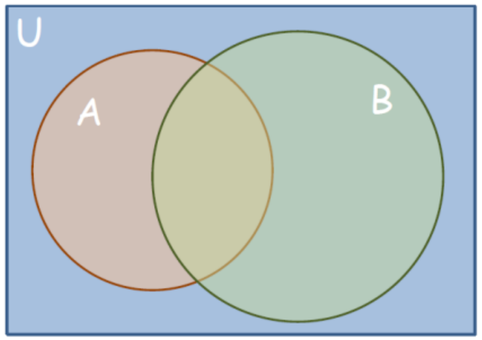
In-class exercise: Encodings Matchup

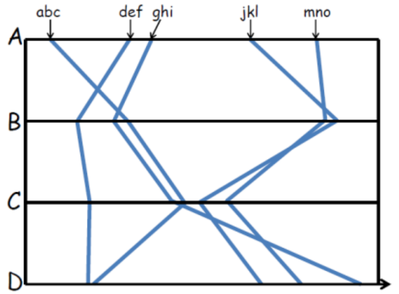
Encoding Match-up

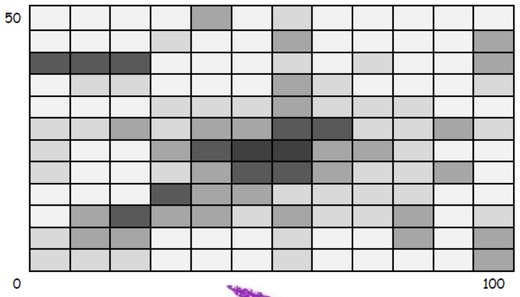


Encoding Match-up









Venn Diagram

Heat Map

Star Plot

Box & Whisker Plot

Parallel Coordinates

How?

Encode

Arrange

- Express
- Separate
- Order
- Align
- Use

Map

from categorical and ordered attributes

- Color
  - *Hue*
  - *Saturation*
  - *Luminance*
- Size, Angle, Curvature, ...
- Shape
- Motion

Direction, Rate, Frequency, ...

Manipulate

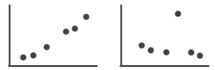
Change

Select

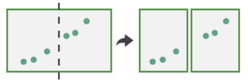
Navigate

Facet

Juxtapose



Partition



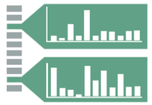
Superimpose

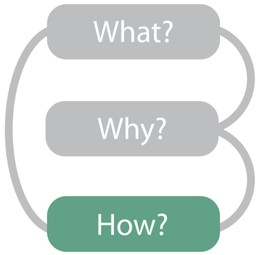
Reduce

Filter

Aggregate

Embed





Arrange Tables

- **Separate, Order, Align Regions**
  - Separate
  - Order
  - Align

  - *1 Key*
    List
  - *2 Keys*
    Matrix
  - *3 Keys*
    Volume
  - *Many Keys*
    Recursive Subdivision

Key: an independent attribute that can be used as a unique index (Tableau Dimension)

Categorical or Ordinal

Value: a dependent attribute (i.e., cell in a table) (Tableau Measures)

Categorical Ordinal, or Quantitative

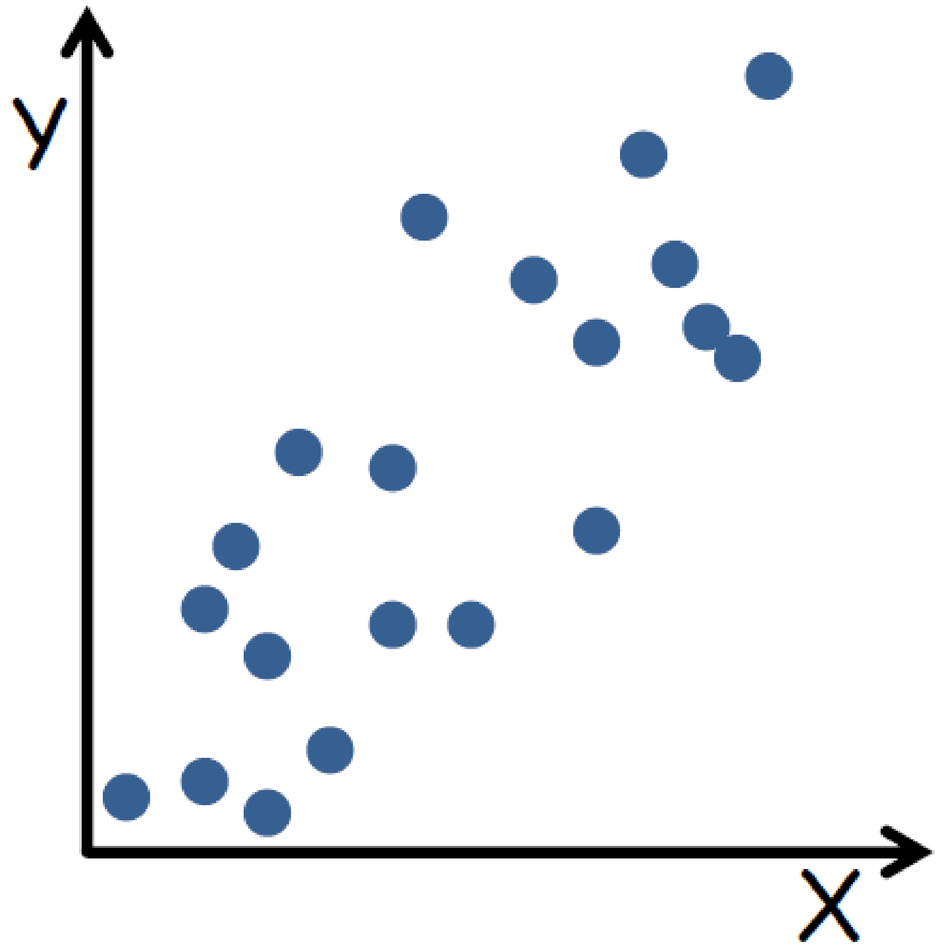
Example Keys

Key

Date	Precipitation	High Temperature
May 1, 2016	0”	60
May 2, 2016	0.3”	62
May 3, 2016	1”	55
May 4, 2016	0”	67

Student	College	HW1 grade (out of 10)
John	COS	9
Jane	Khoury	10
June	Khoury	8
Joe	Khoury	8

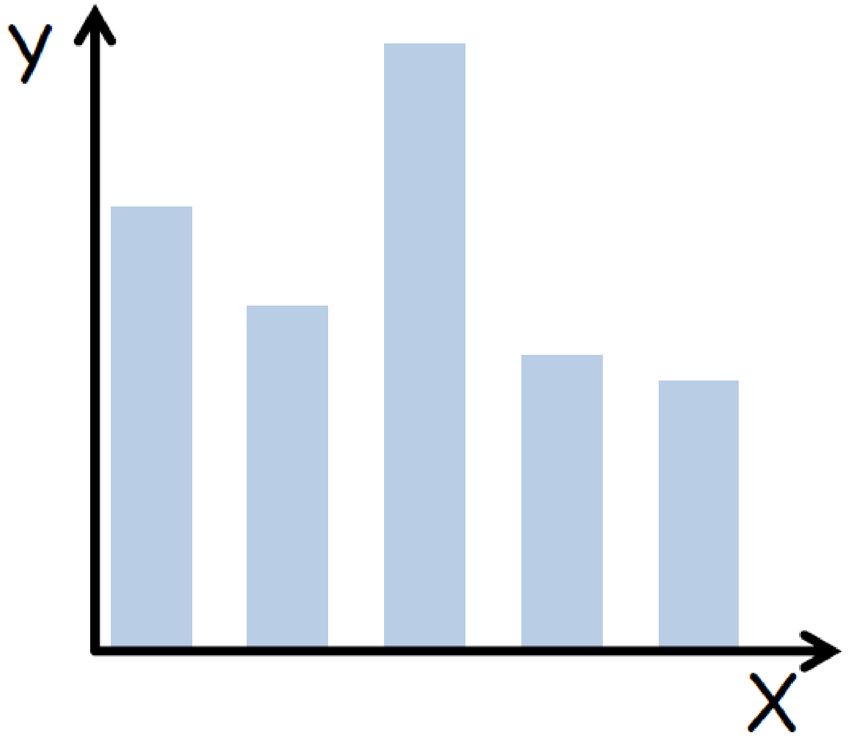
Arrange Tables — No Key



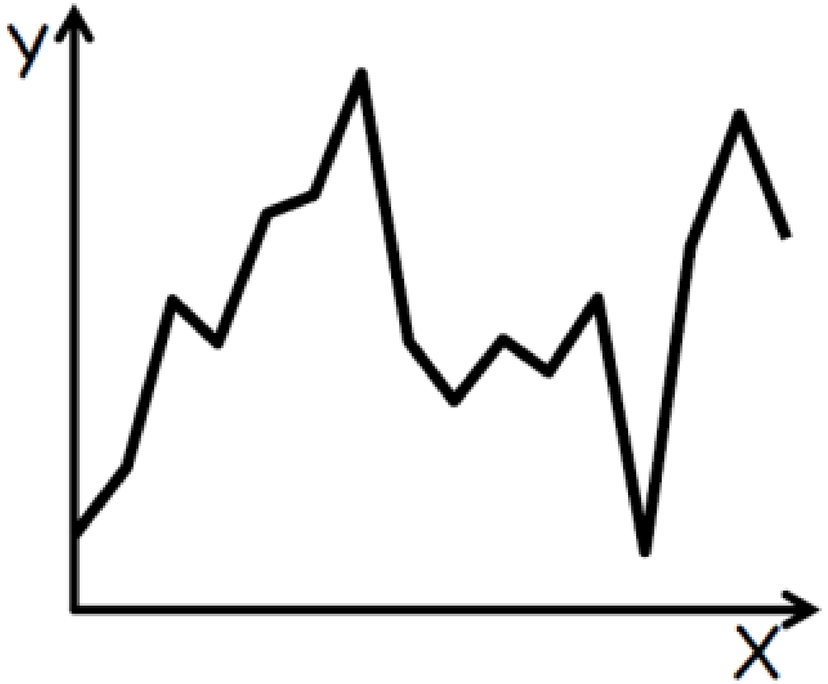
SCATTER PLOT

Arrange Tables — One Key

- *1 Key*
  List



BAR CHART

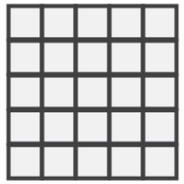


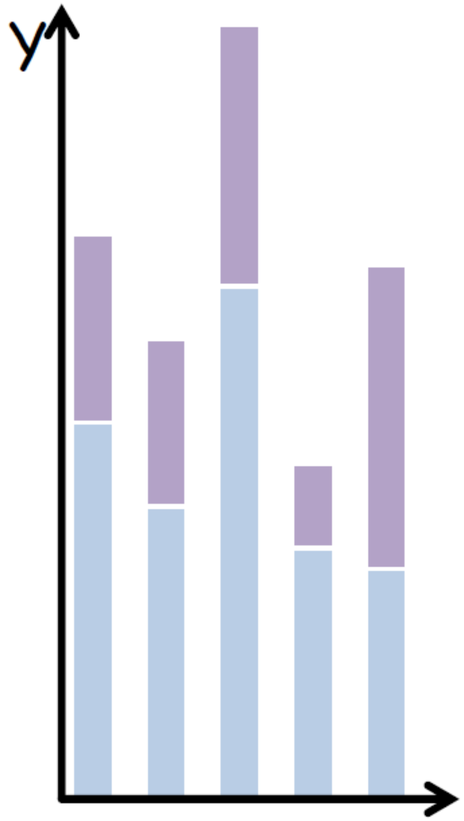
LINE GRAPH

Arrange Tables — Two Keys

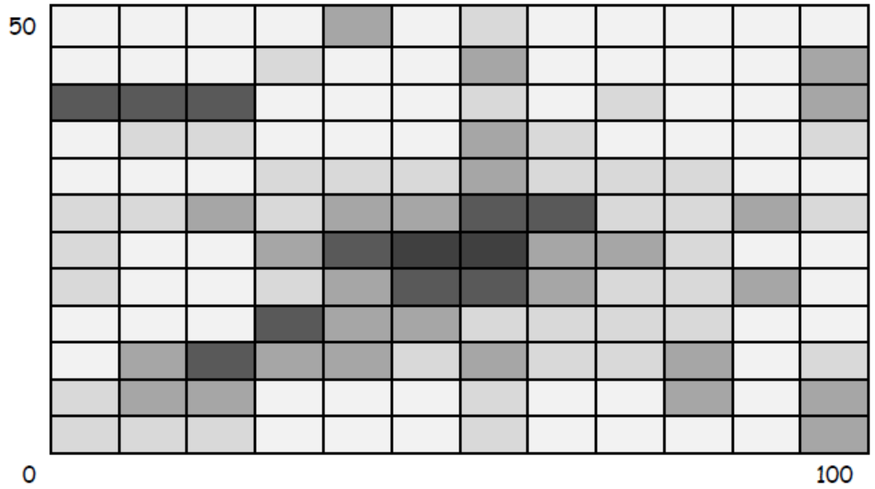
➔ *2 Keys*

Matrix





STACKED BAR CHART

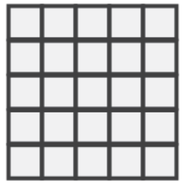


HEATMAP

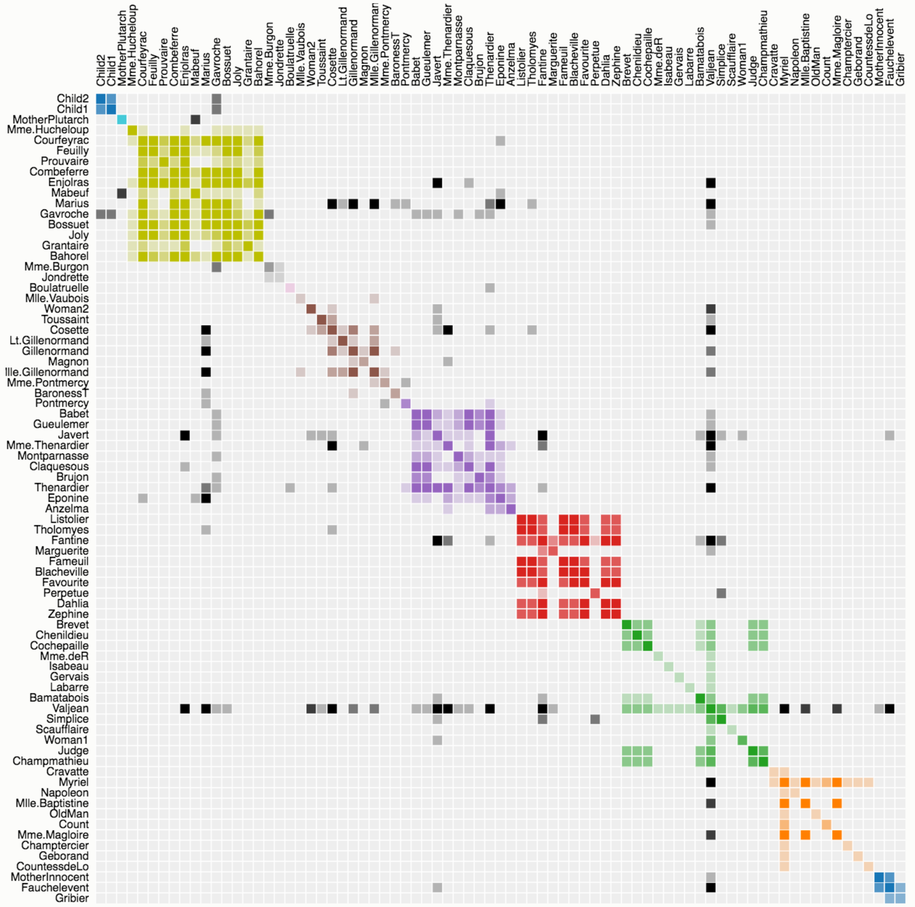
Arrange Tables — Two Keys (Network)

➔ *2 Keys*

Matrix



Les Misérables Co-occurrence



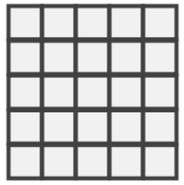
Source: The Stanford GraphBase.

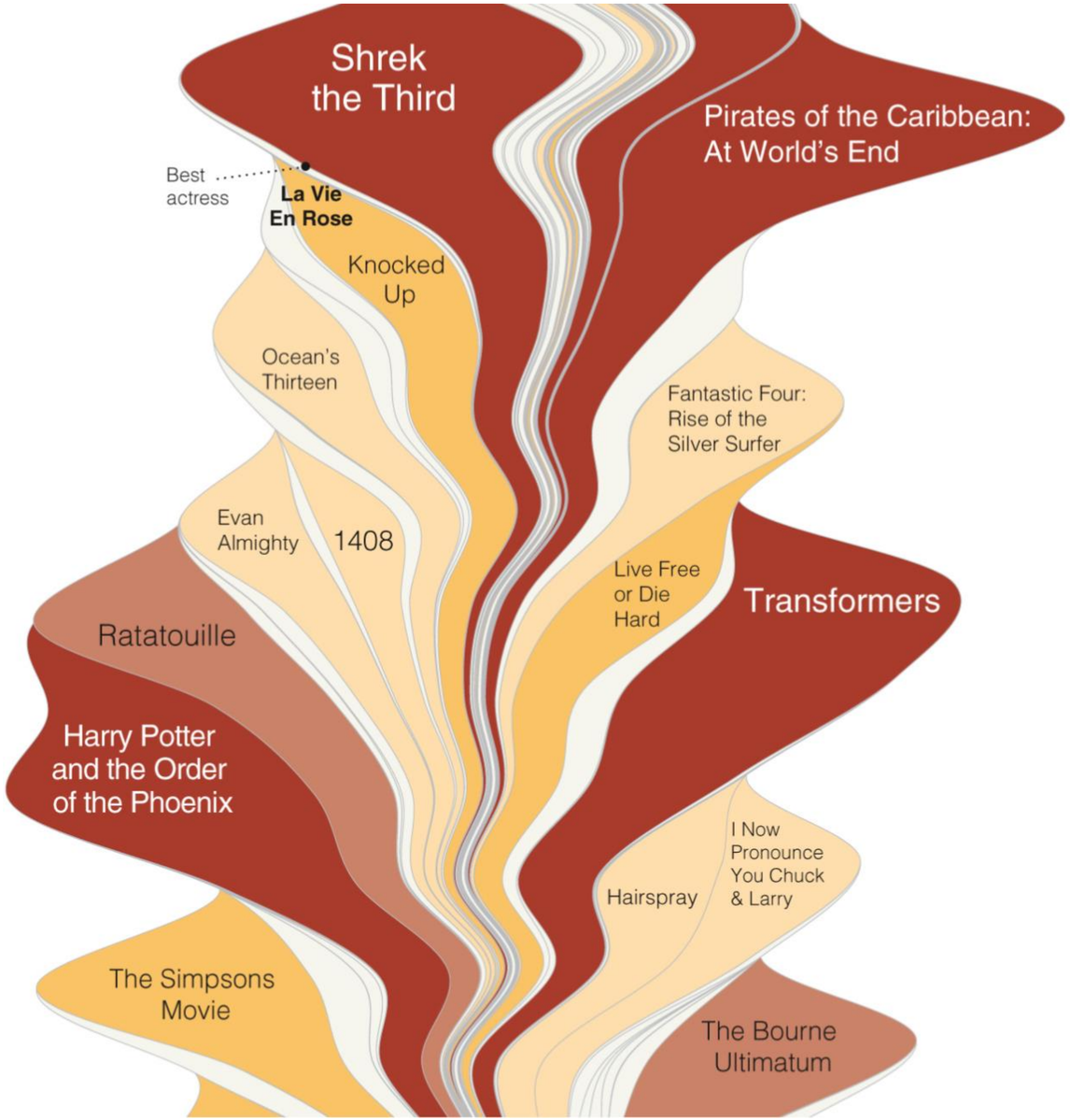
Bostock, 2012

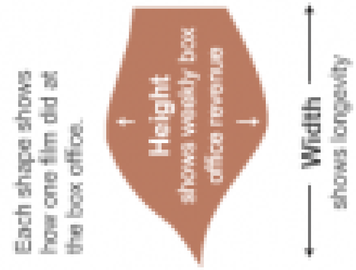
Arrange Tables — Two Keys

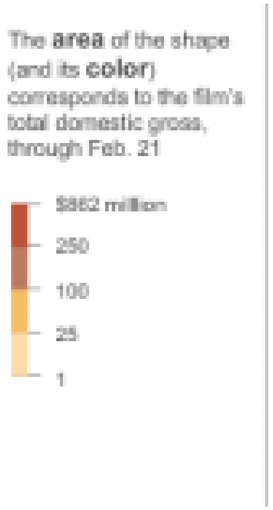
➔ *2 Keys*

Matrix







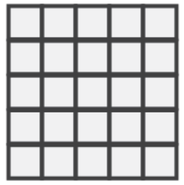


[Byron & Wattenberg, 2008]

Arrange Tables — Two Keys

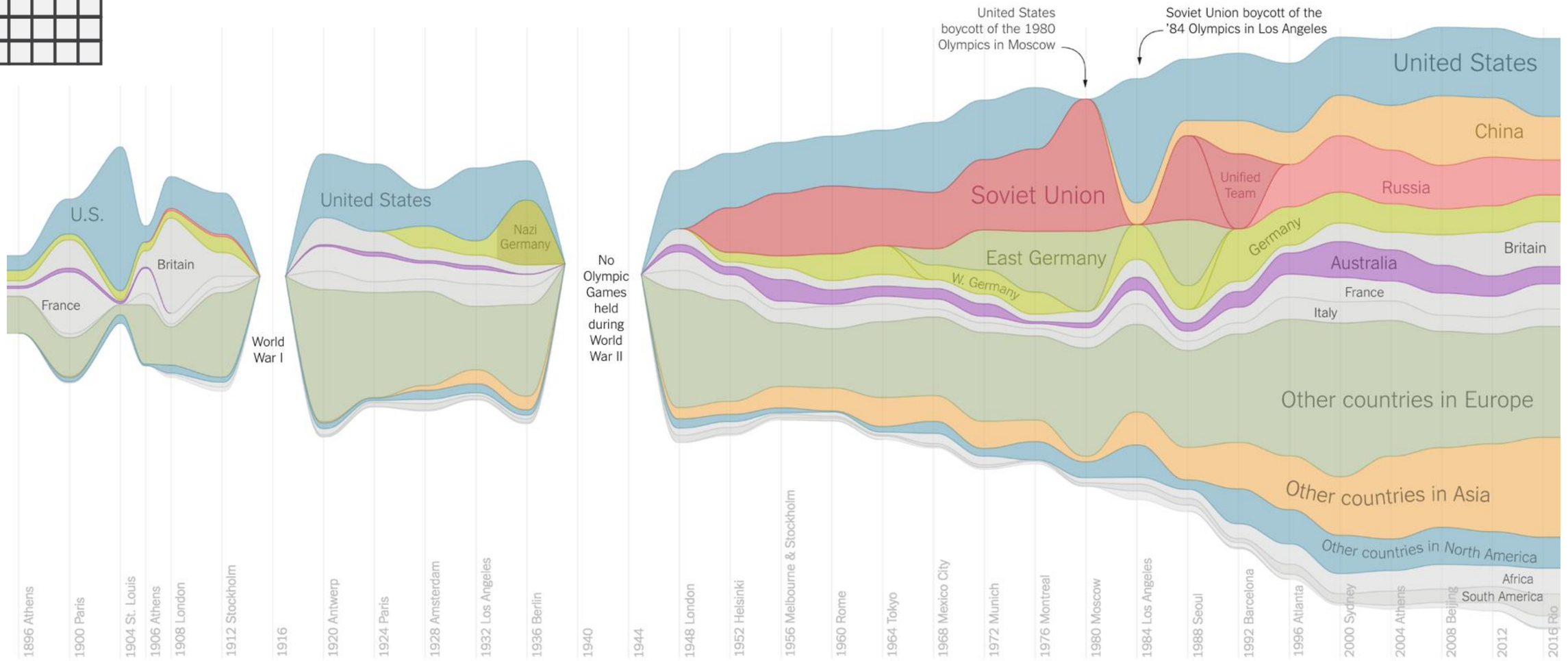
➔ *2 Keys*

Matrix



A Visual History of Which Countries Have Dominated the Summer Olympics

By GREGOR AISCH and LARRY BUCHANAN UPDATED August 22, 2016

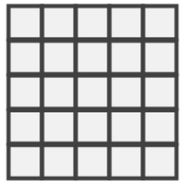


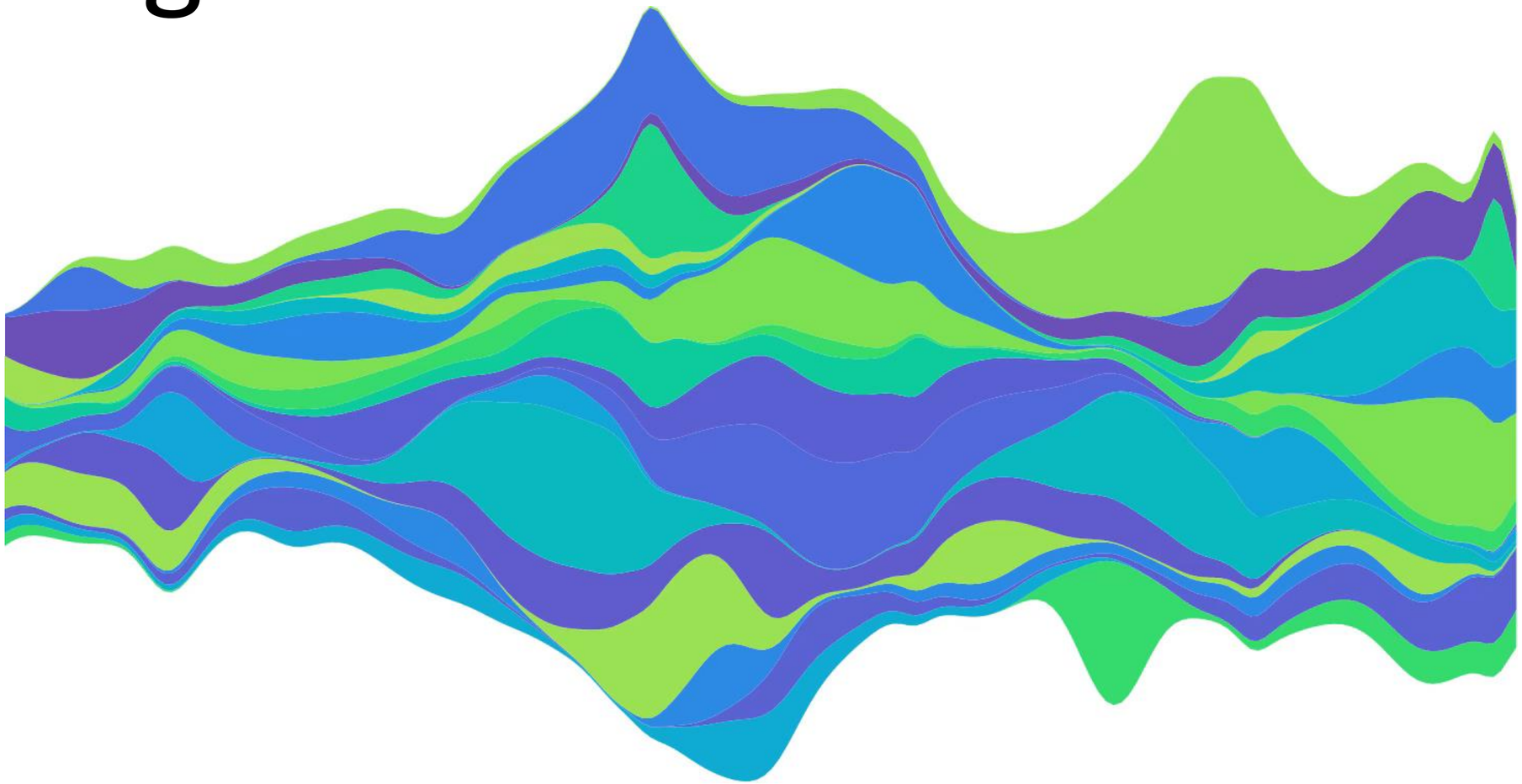
NY Times, 2016

Arrange Tables — ~~Two~~ Three Keys

➔ *2 Keys*

Matrix





STREAMGRAPH

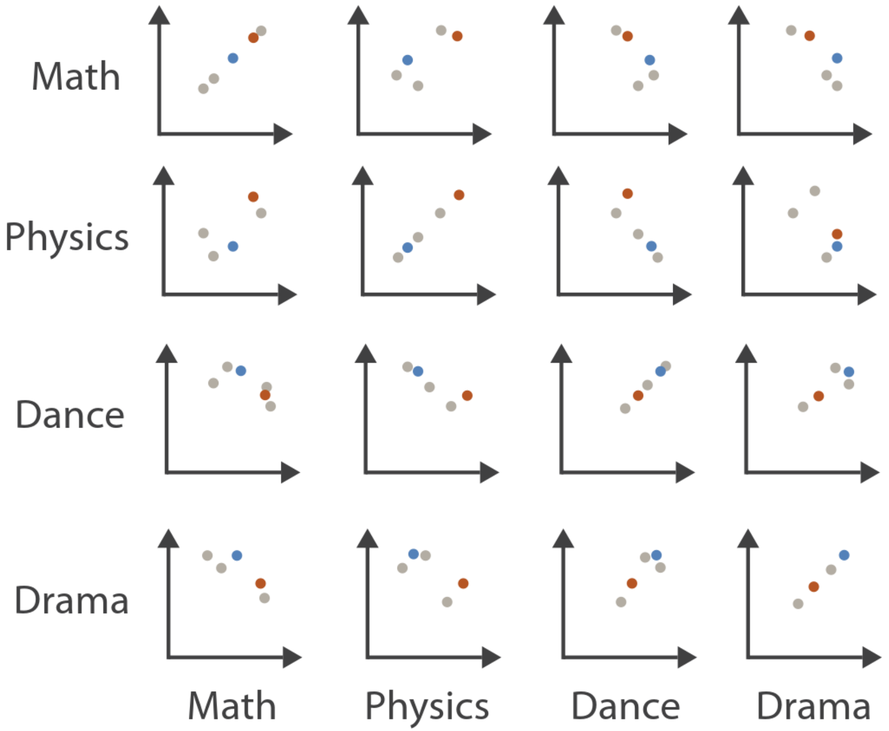
Bostock, 2018

Arrange Tables — Axes

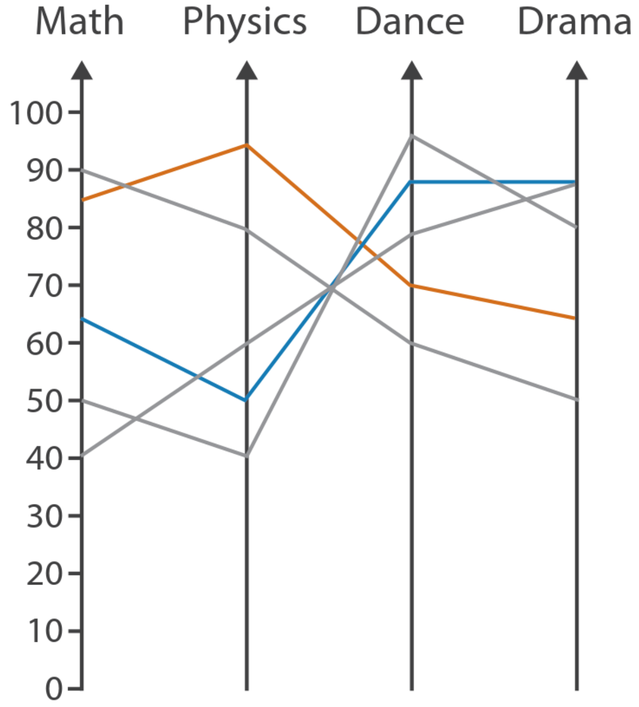
Table

Math	Physics	Dance	Drama
85	95	70	65
90	80	60	50
65	50	90	90
50	40	95	80
40	60	80	90

Scatterplot Matrix

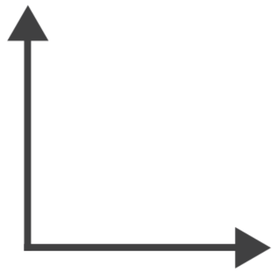


Parallel Coordinates

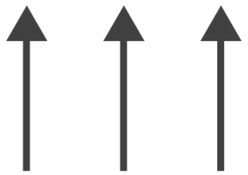


Arrange Tables — Axes

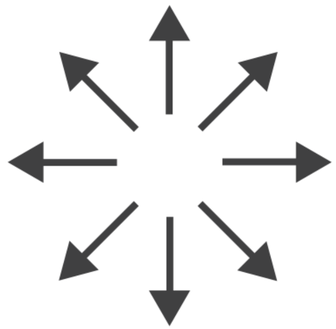
- **Axis Orientation**
  - Rectilinear



  - Parallel

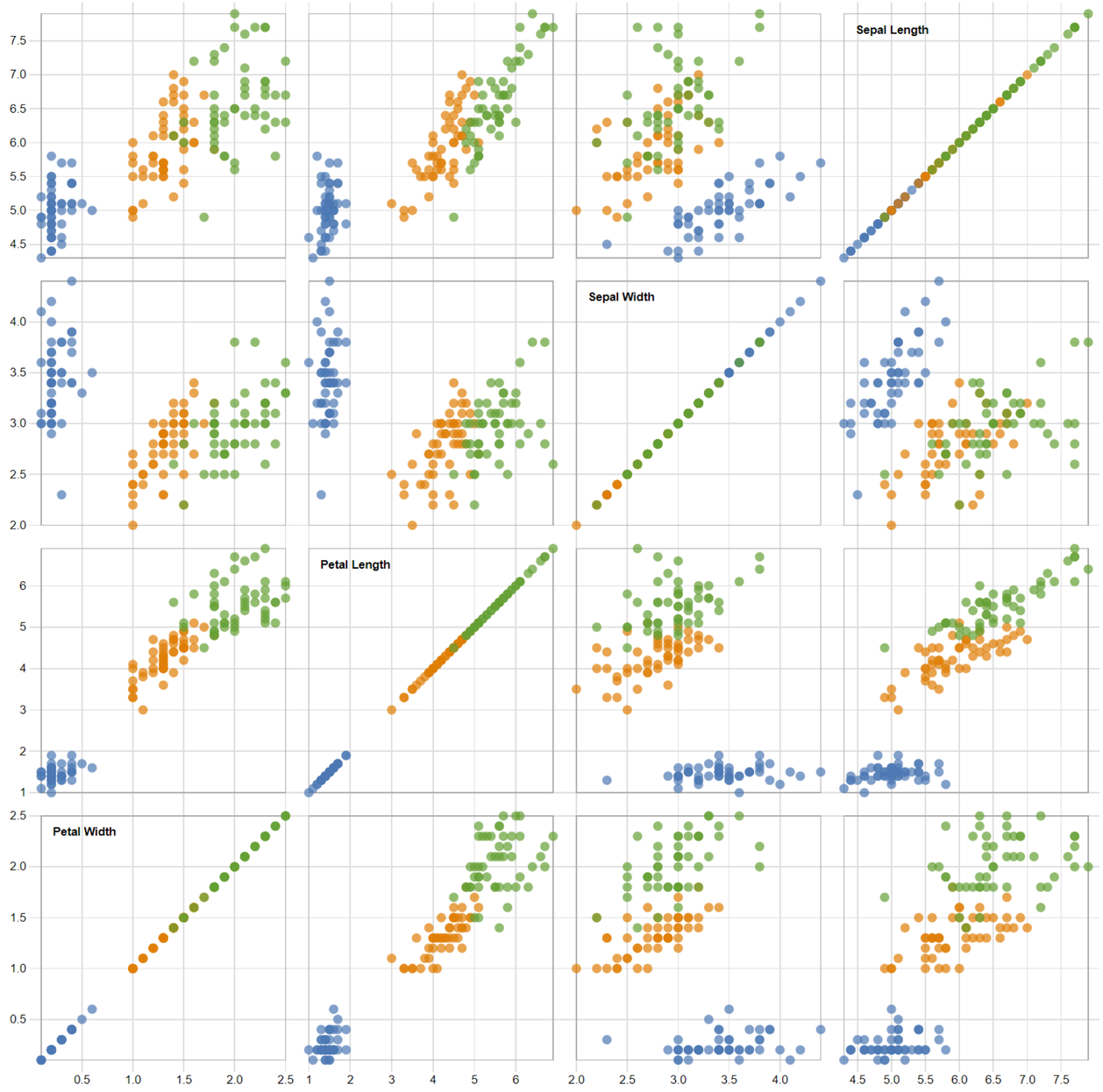


  - Radial



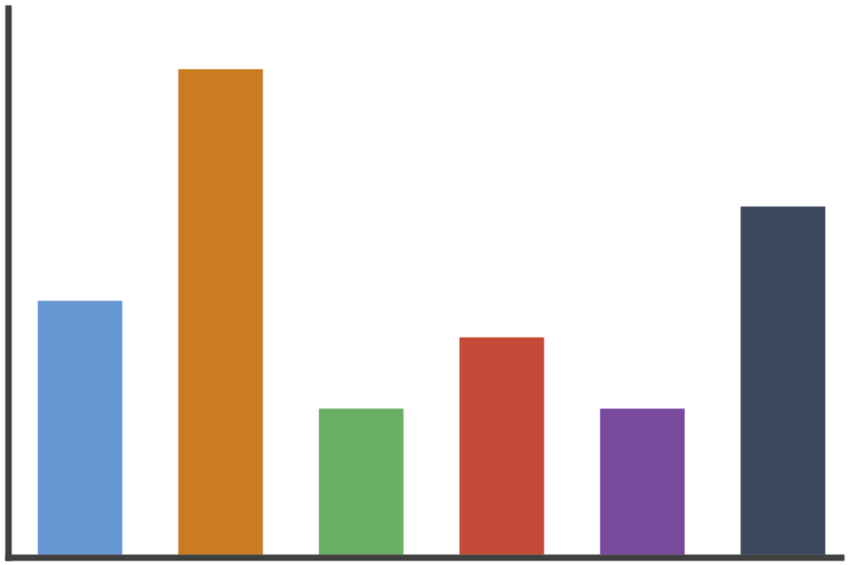
Scatterplot Matrix Brushing

- Rectilinear



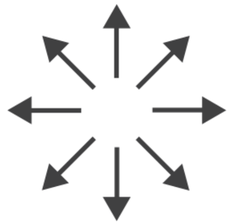
Bostock, Rivière' 2019

Arrange Tables

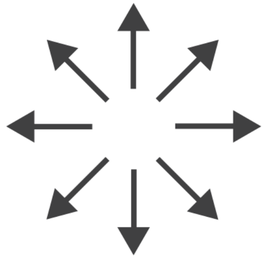


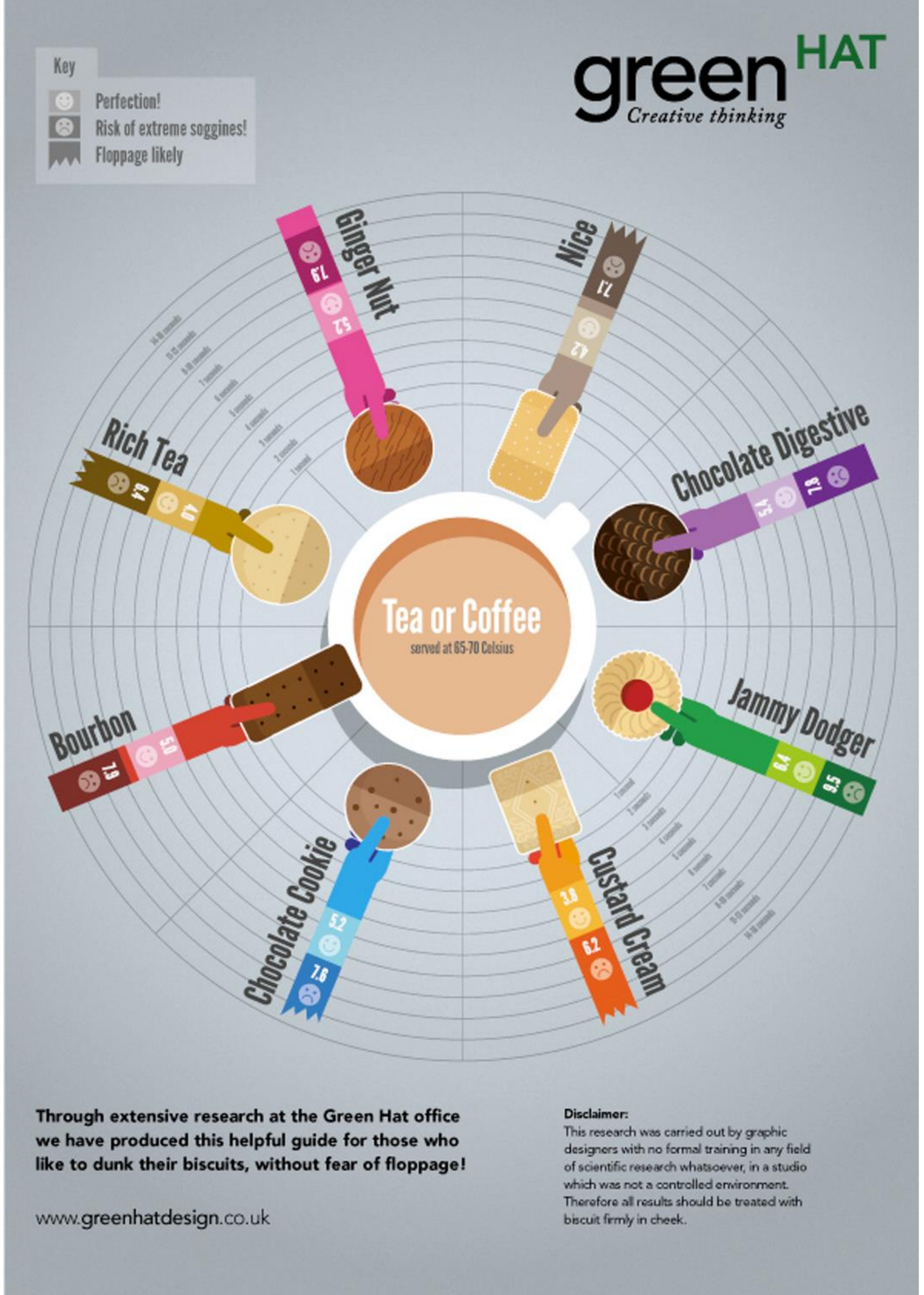
→ Rectilinear

→ Radial

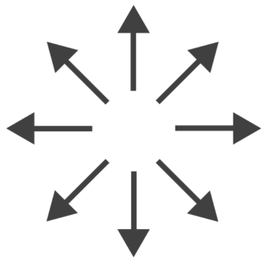


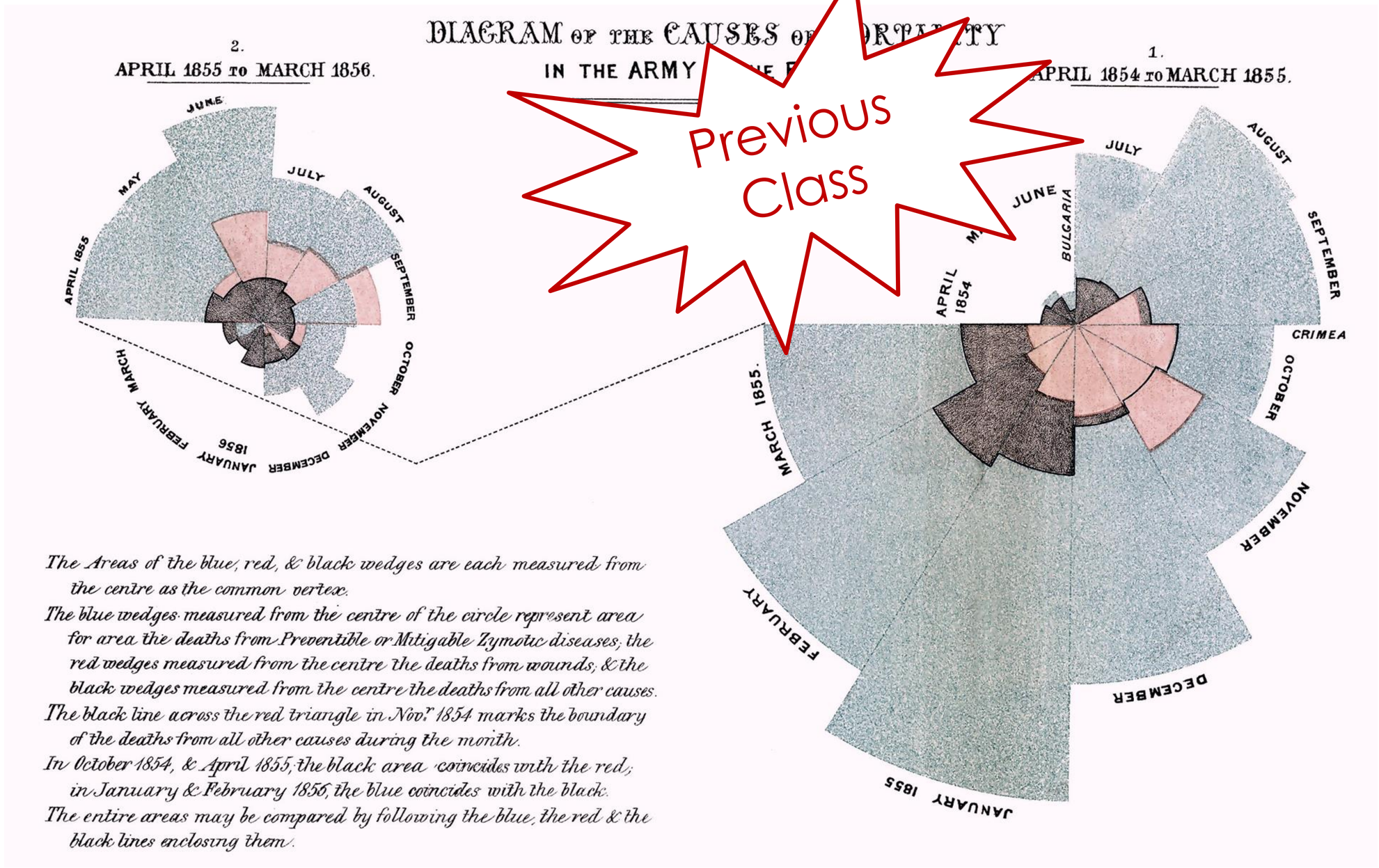
➔ Radial



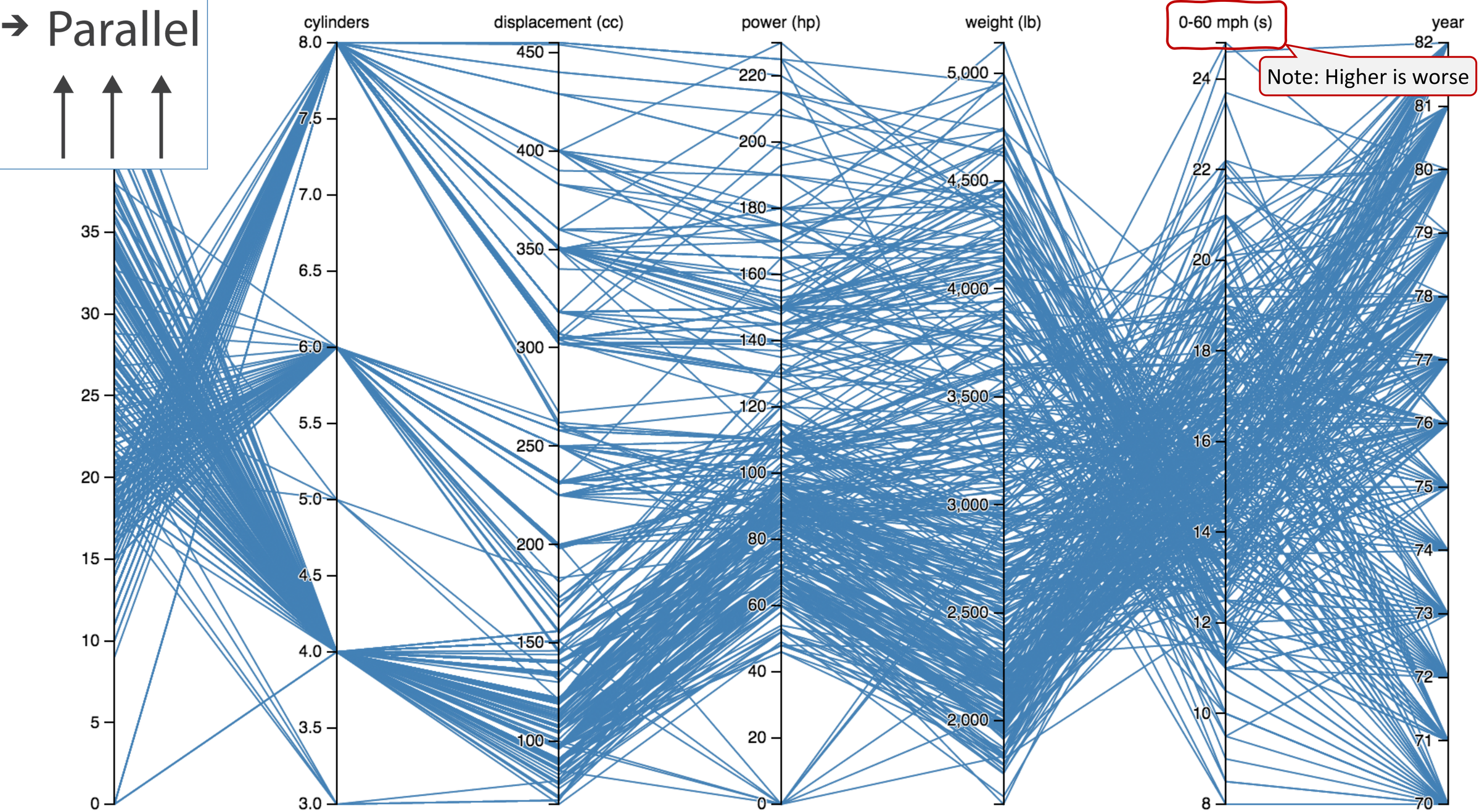

Key
Perfection!
Risk of extreme soggines!
Floppage likely
green HAT
Creative thinking
Ginger Nut
7.9
5.2
Nice
7.3
4.2
Chocolate Digestive
7.5
7.9
Jammy Dodger
7.2
6.5
Custard Cream
7.1
6.2
Chocolate Cookie
5.2
7.6
Bourbon
7.1
6.5
Rich Tea
7.4
7.1
Tea or Coffee
served at 65-70 Celsius
Through extensive research at the Green Hat office we have produced this helpful guide for those who like to dunk their biscuits, without fear of floppage!
www.greenhatdesign.co.uk
Disclaimer:
This research was carried out by graphic designers with no formal training in any field of scientific research whatsoever, in a studio which was not a controlled environment. Therefore all results should be treated with biscuit firmly in cheek.

→ Radial





FLORENCE NIGHTINGALE (C. 1858)


Parallel
cylinders
displacement (cc)
power (hp)
weight (lb)
0-60 mph (s)
year
Note: Higher is worse

Davies, 2019

Arrange Tables — Many Keys (Tree)

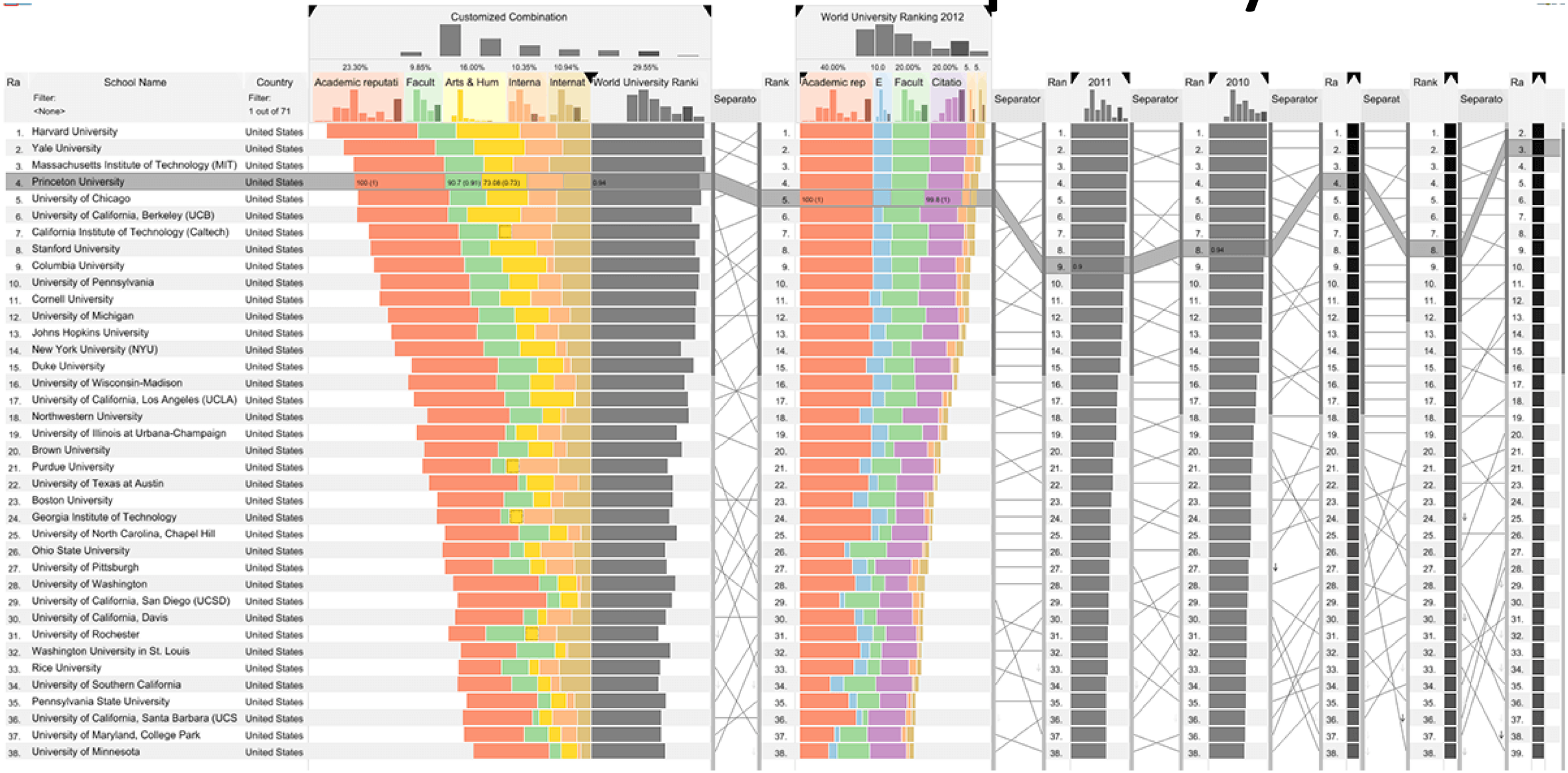
- *Many Keys*
  Recursive Subdivision

finviz, 2020

How to handle multiple keys...?

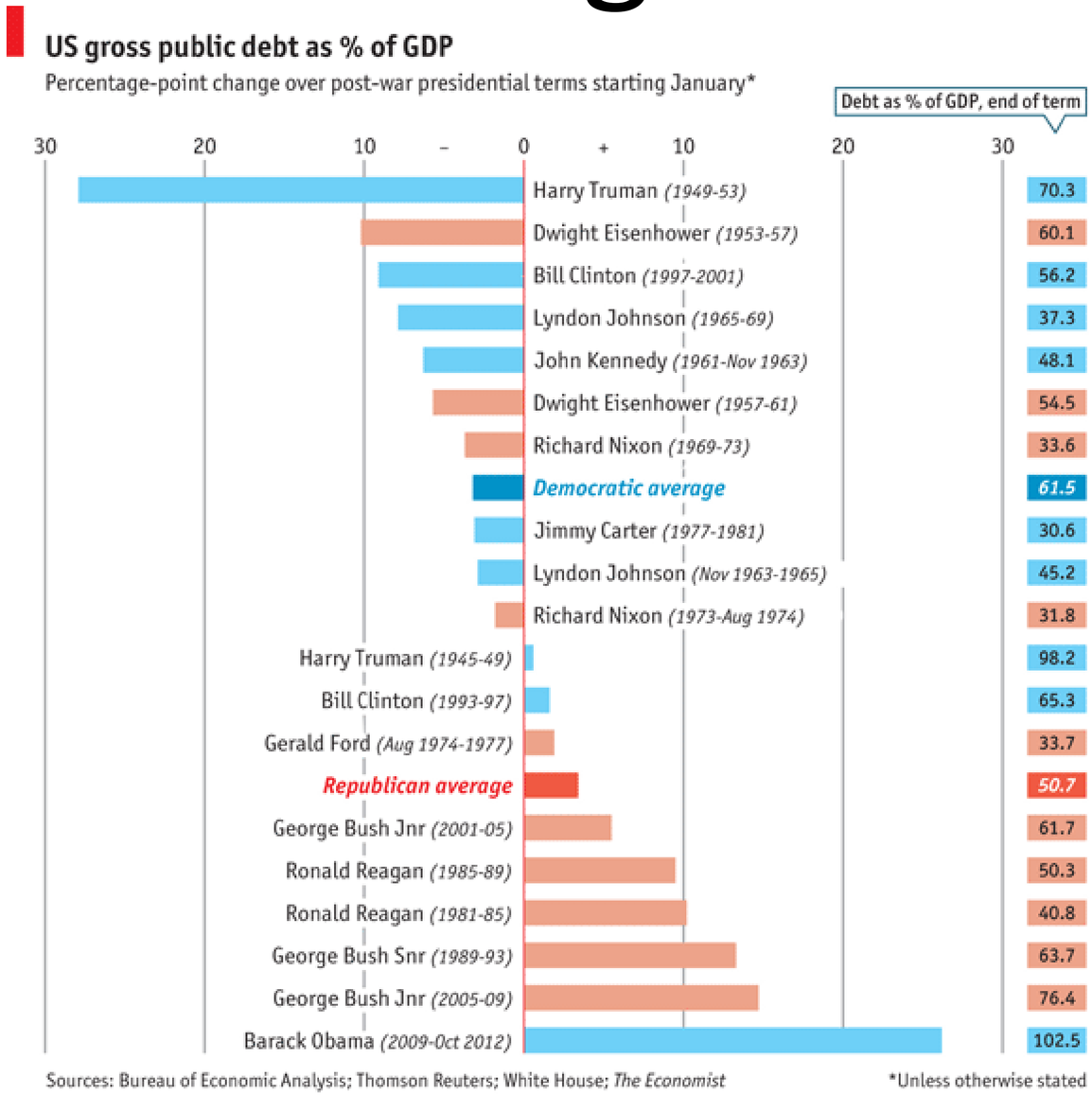

Rankings are omnipresent

How to handle multiple keys...?



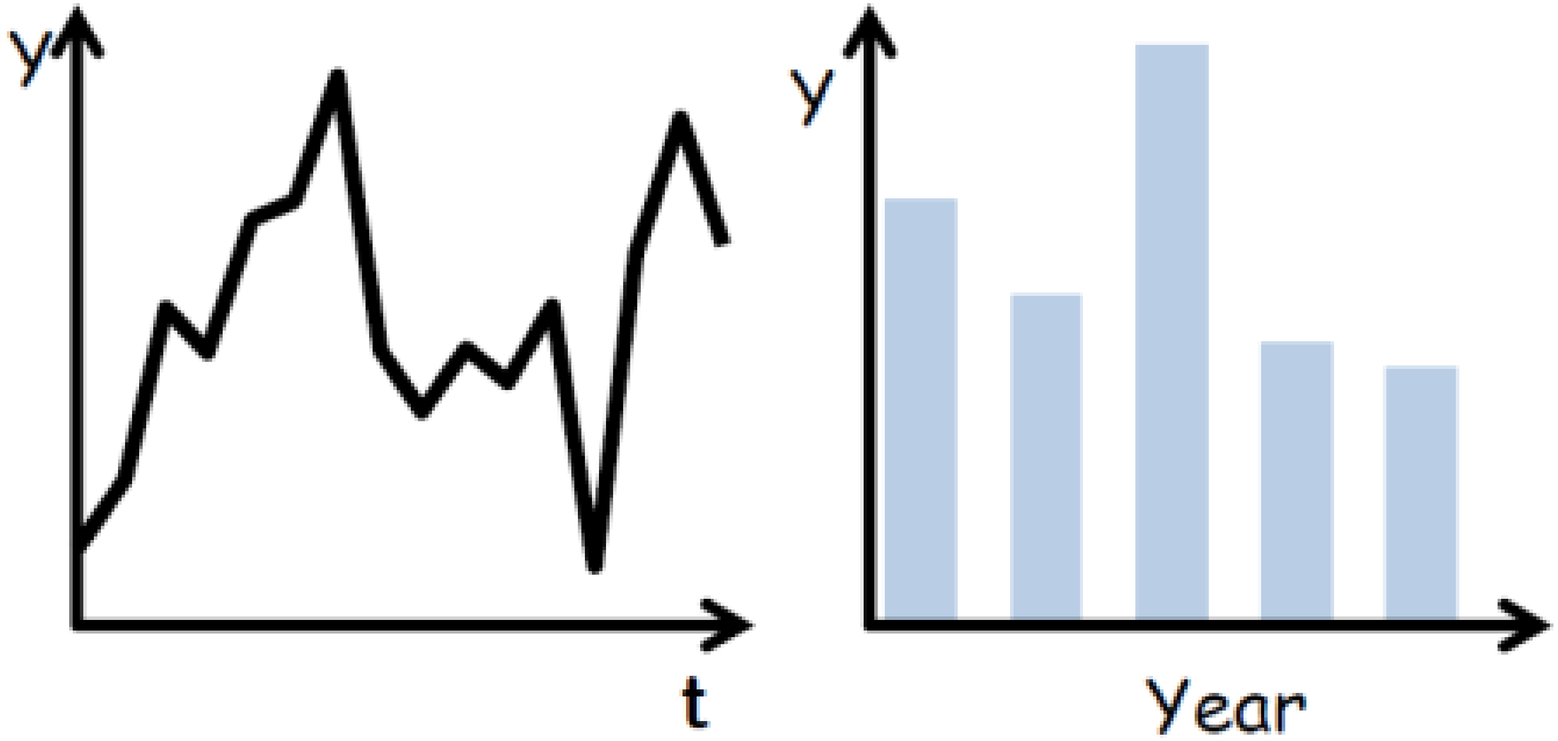
Gratzel et al., 2013

Divergent



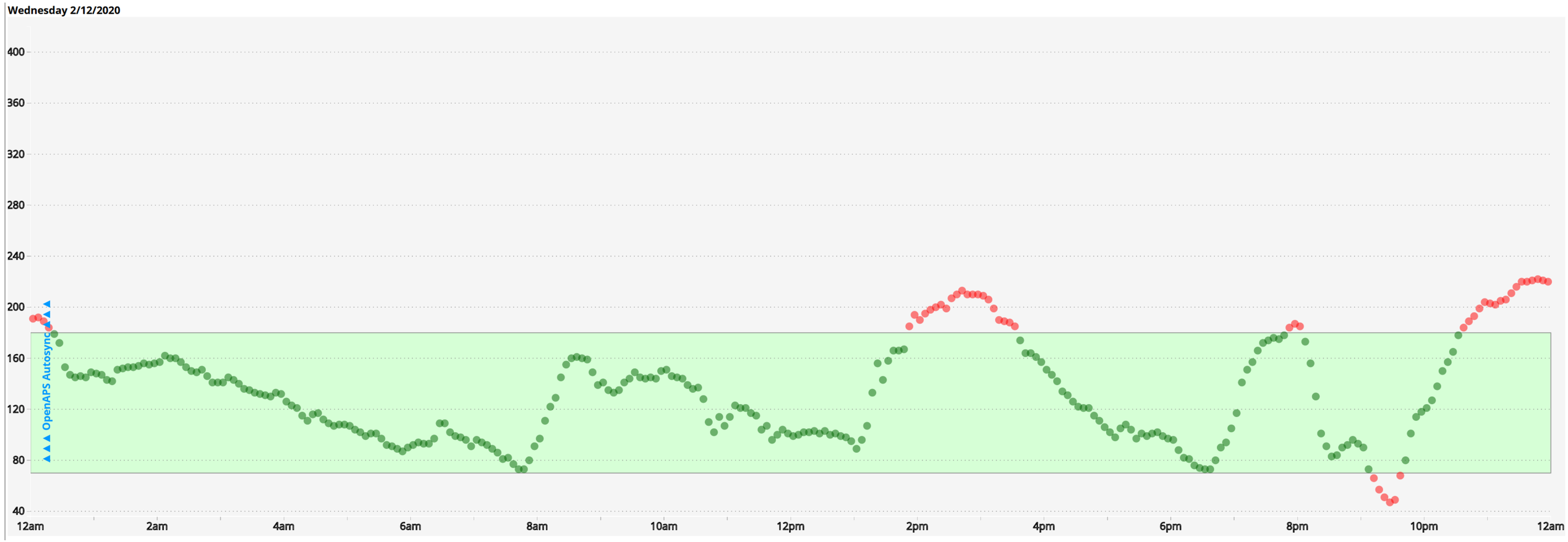
The Economist, 2012

Time Series



(Quantitative data over time)

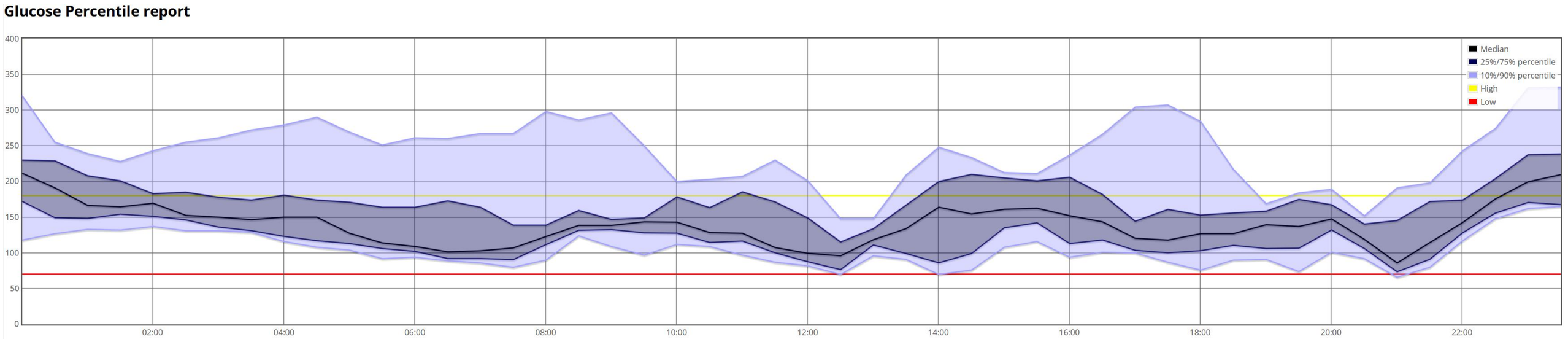
Time Series



(Quantitative data over time)

Cody Dunne, Nightscout Foundation, 2020

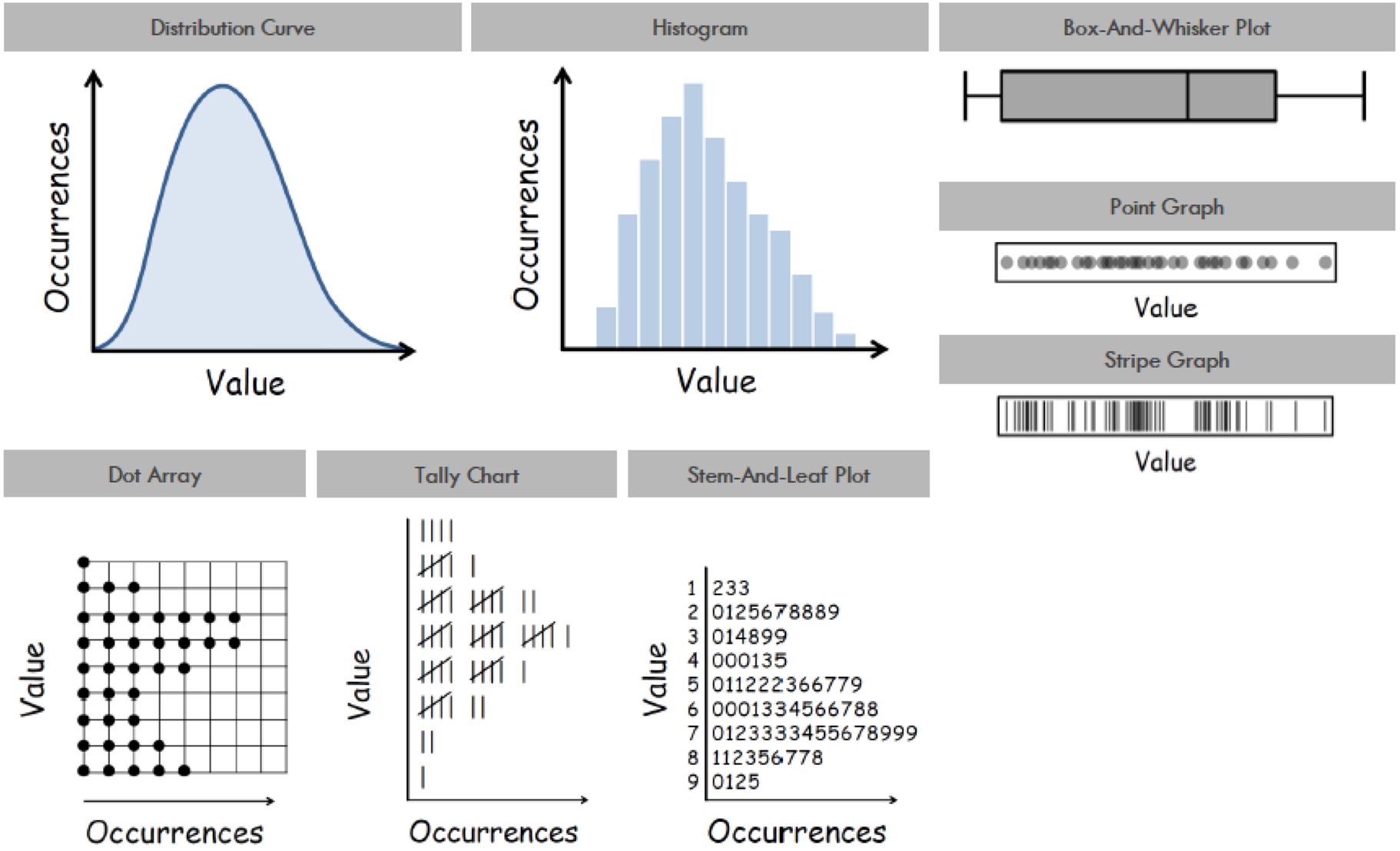
Time Series Distributions



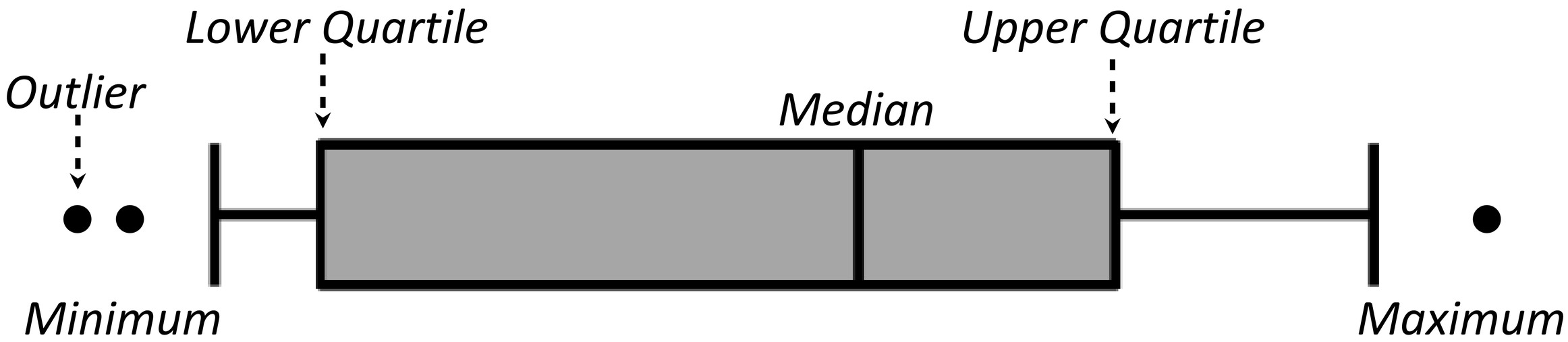
(Quantitative data over time)

Cody Dunne, Nightscout Foundation, 2020

Distributions & Correlations

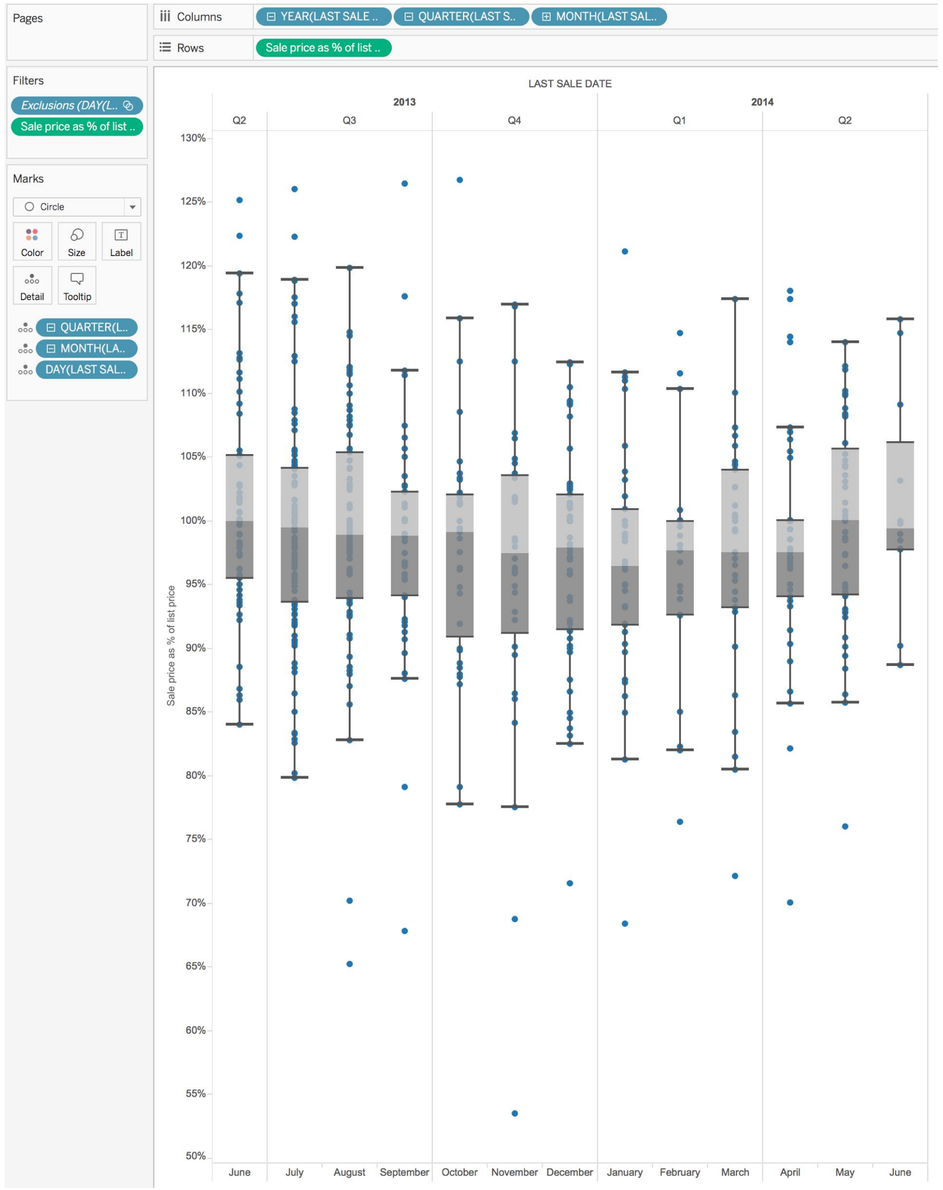


Distributions & Correlations

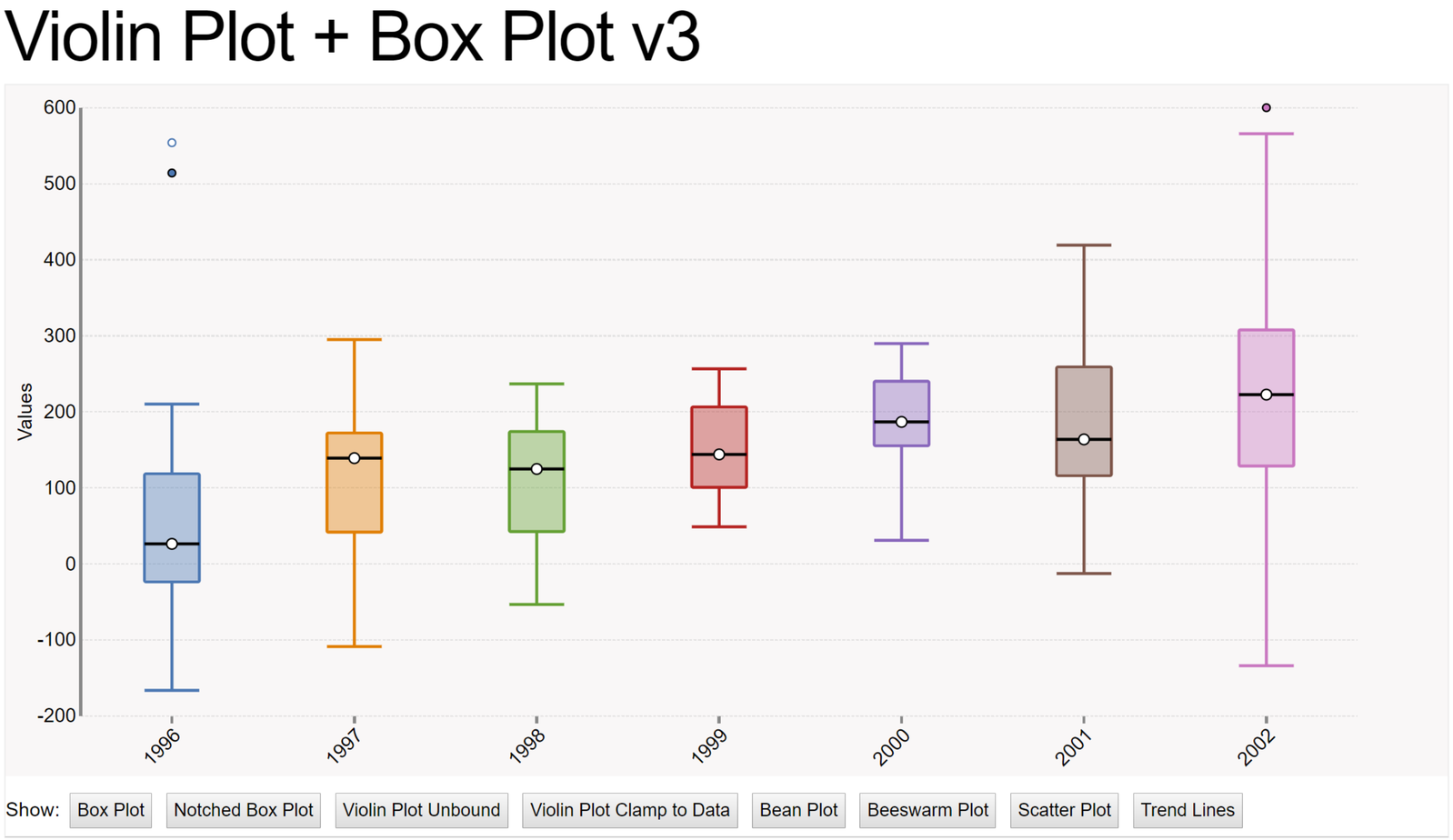


BOX AND WHISKER PLOT

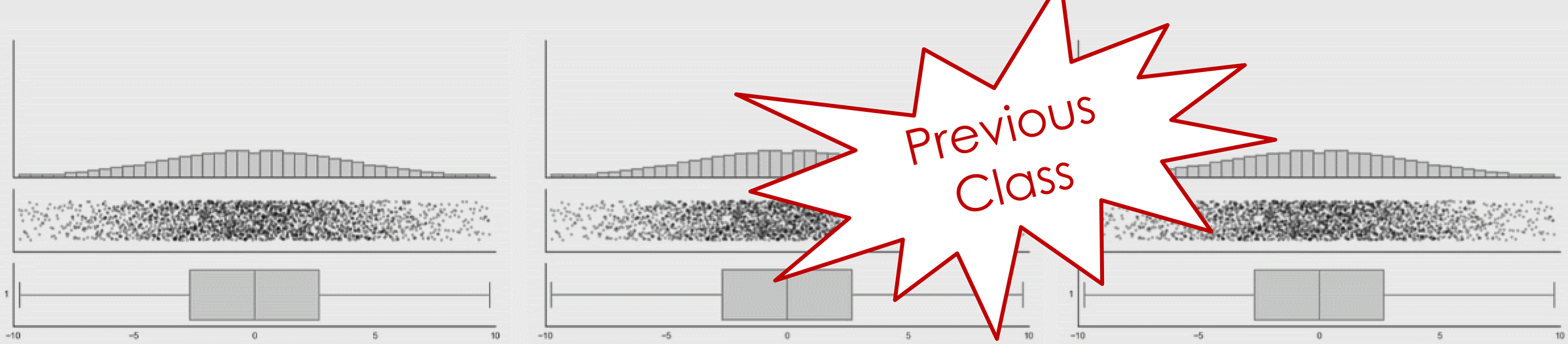
Distributions & Correlations

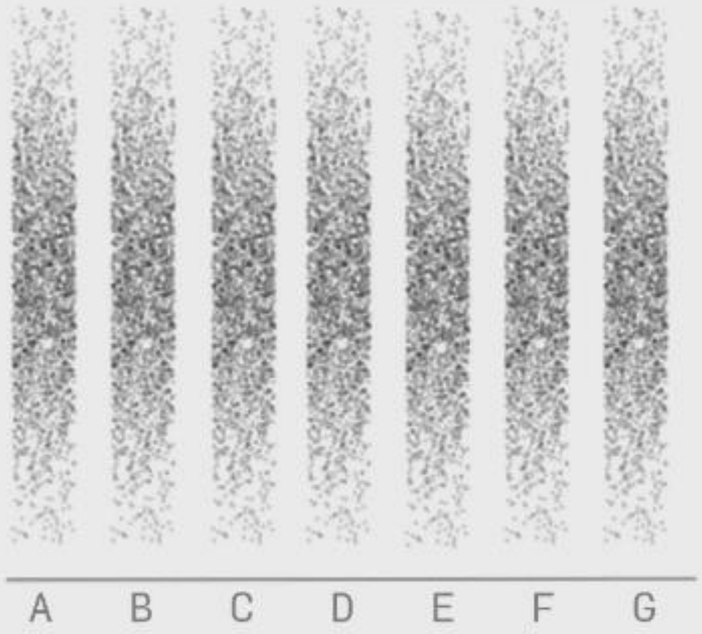


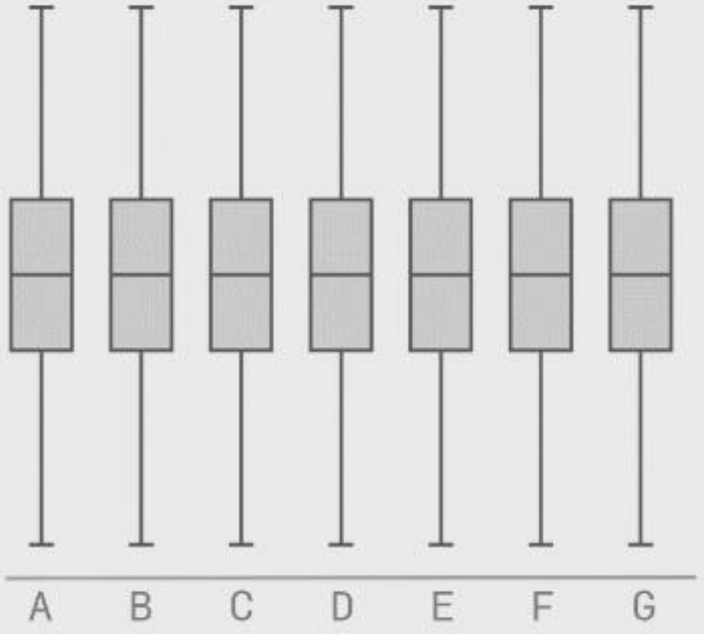
Distributions & Correlations

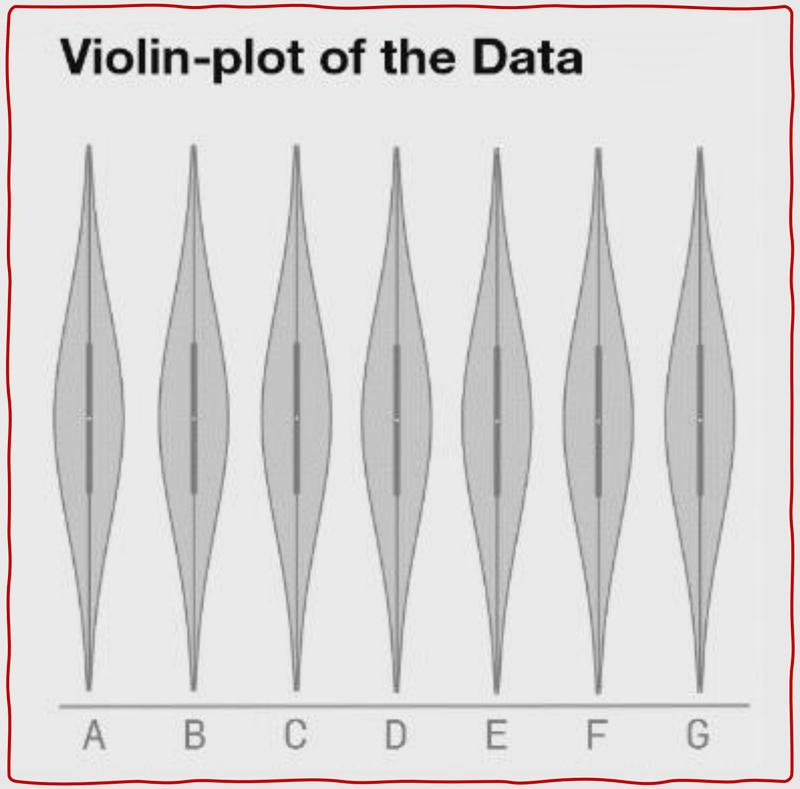


[Interactive online: Sielen, 2018]

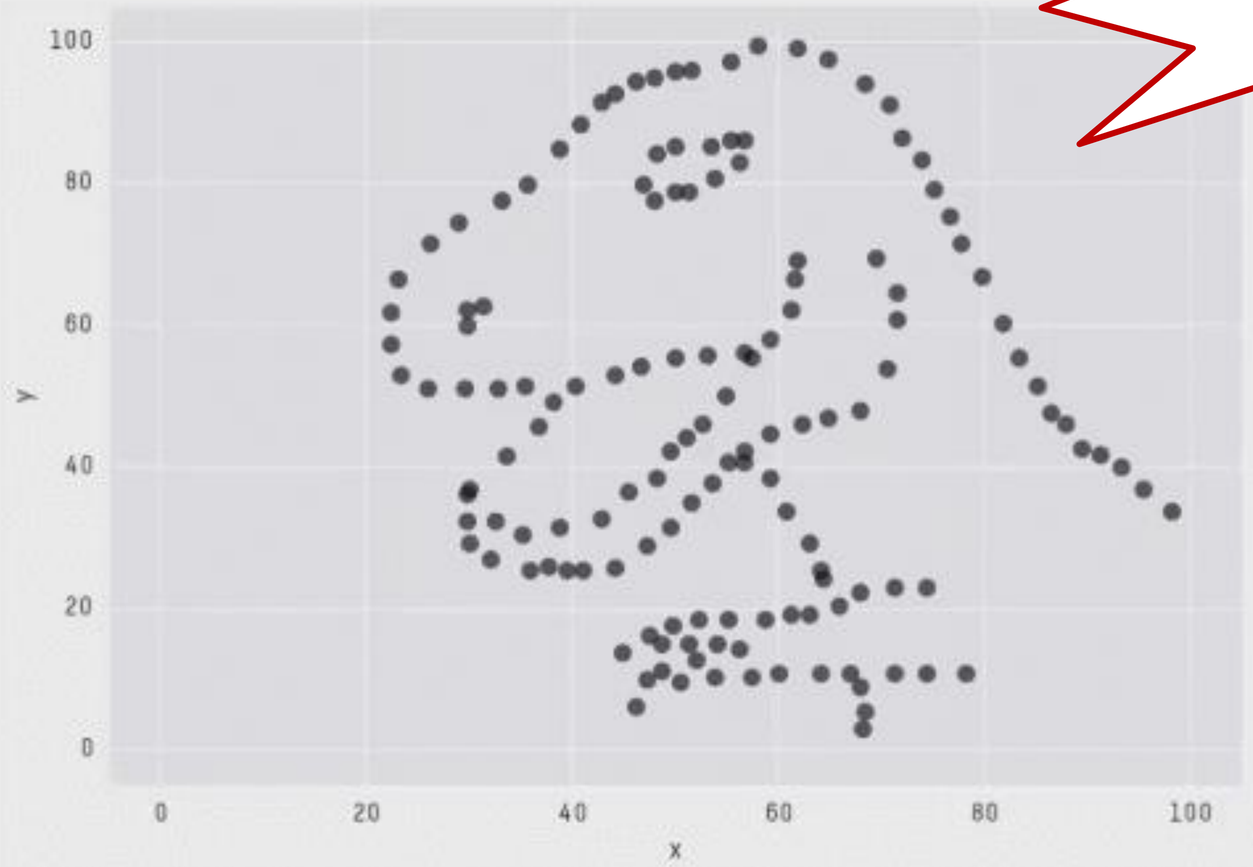








Matejka &Fitzmaurice, 2017

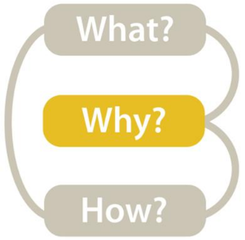


Previous Class

X Mean: 54.2659224
Y Mean: 47.8313999
X SD : 16.7649829
Y SD : 26.9342120
Corr. : -0.0642526

Matejka &Fitzmaurice, 2017

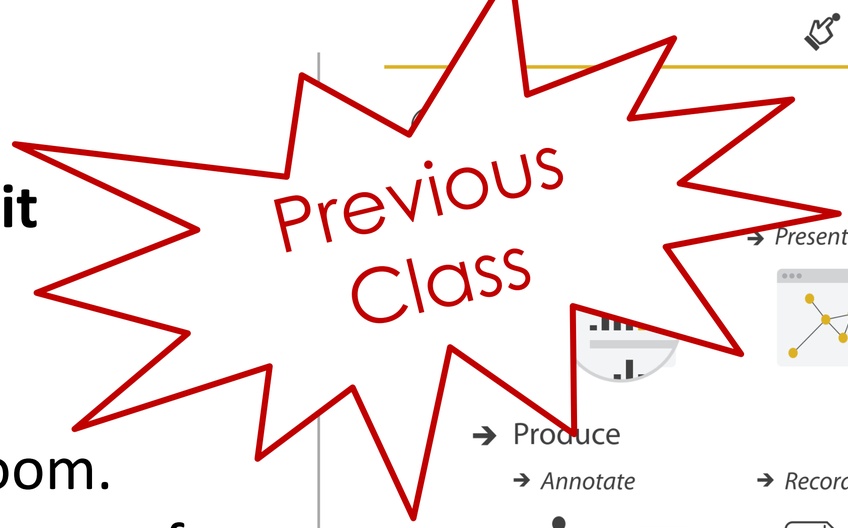
In-Class Exercise:
Design From Task Analysis



Task Analysis

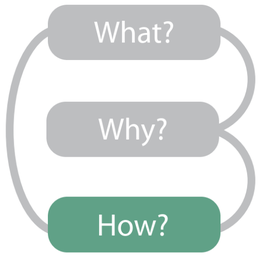
Visualization for Public Transit Development

20m



INSTRUCTIONS:

- We will break you into groups of ~3 on Zoom.
- Pretend you are transportation engineers, e.g., for the MBTA, City of Boston.
- Discuss the user tasks and goals and abstract them using the taxonomy from VAD (right, Fig. 3.2).
- Save your **notes & group members** for a later exercise!!!



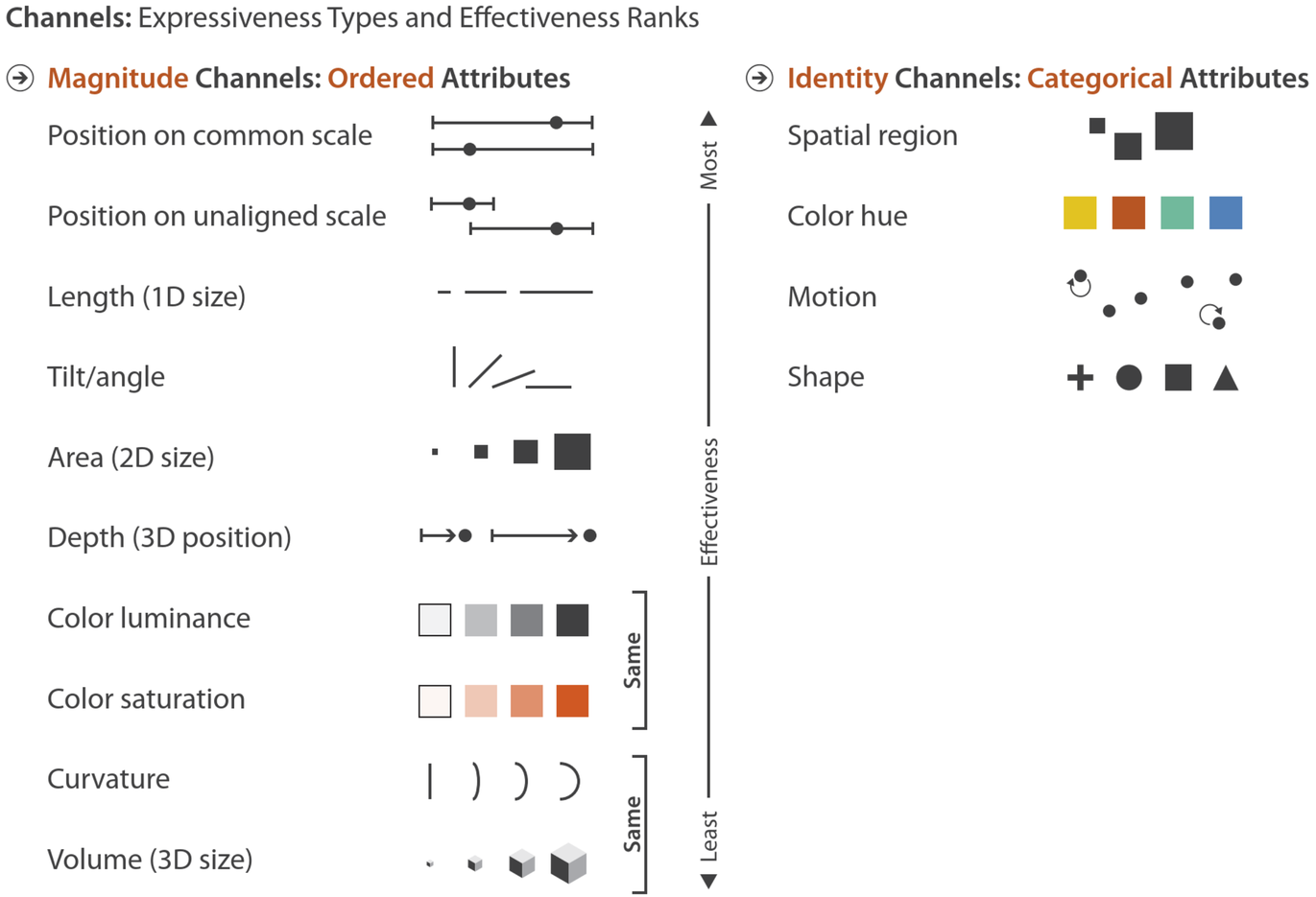
In-Class Design

Task Analysis→Visualization for Public Transit Development

38 min

INSTRUCTIONS:

- In-Class Design — Task Analysis→Visualization for Public Transit Development on Canvas



Upcoming Assignments & Communication

Look at the upcoming assignments and deadlines regularly!

- Textbook, Readings, & Reading Quizzes — Variable days
- In-Class Activities — 11:59pm same day as class
  - F: Lecture
  - T: Lecture
  - F: In-class project feedback meetings & work
  - T: Lecture
- Assignments & Projects— Generally due R 11:59pm
  - R (2 days): Assignments 6a (Altair) and 6b (critique)
  - Next R (9 days): Assignment 7 (D3 Events)
  - **Project 3 — Interview & Task Analysis**
  - Next-Next R (16 days): Project 4 — Data Collection & Exploration, Sketches

Use Canvas Discussions for general questions, email the TAs/S-LTA/instructor for questions specific to you: codydunne-and-tas@ccs.neu.edu. Include links!

If you're emailing about a particular assignment, please **include the URL of the Submission Details page**. (Canvas documentation.)

If you have a project question, **give us your group number**. E.g., include: `Group ## — Topic` with '##' replaced by your group number and 'Topic' replaced by your topic.