Cody Dunne
Northeastern University

TABLEAU, DATA ABSTRACTION

Checking In

READING QUIZ

6 min

TABLEAU TUTORIAL

~20 min total

In-Class Exercise

In-Class Tool Introduction—Tableau

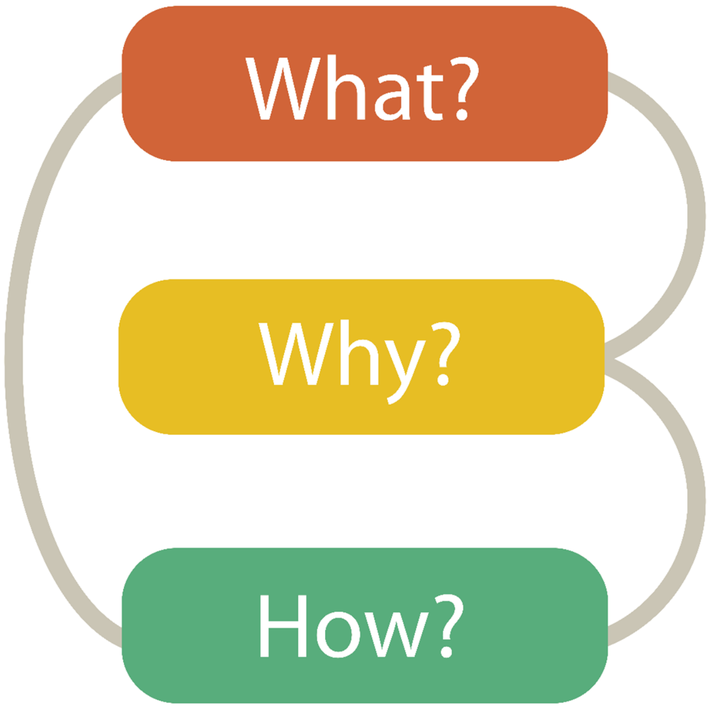
30 min

Data Types

Goals for Today

- Learn what are data types and dataset types
- Learn what are attribute types
- Learn how to pick appropriate visual representations based on attribute type and perceptual properties

Analysis

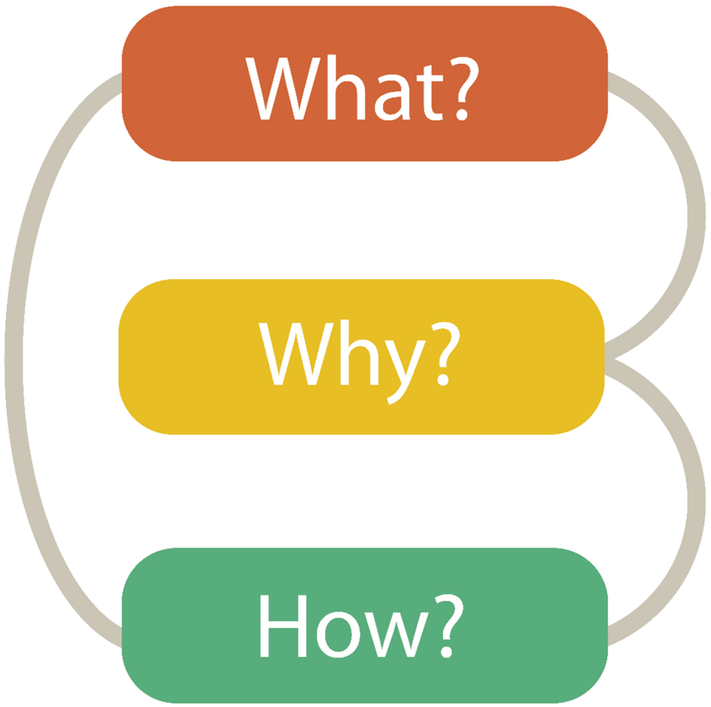


What data is shown?

Why is the user analyzing / viewing it?

How is the data presented?

Analysis



What data is shown?

DATA ABSTRACTION

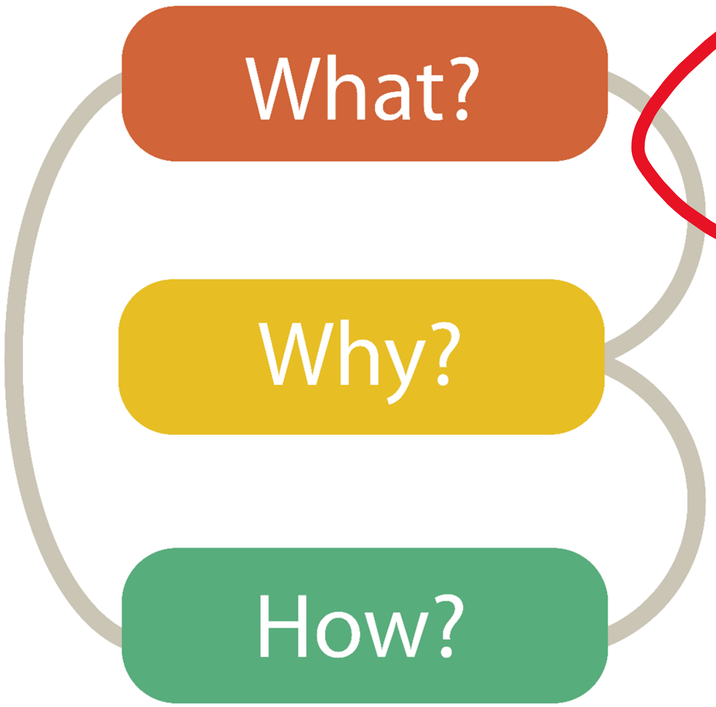
Why is the user analyzing / viewing it?

TASK ABSTRACTION

How is the data presented?

VISUAL ENCODING

Analysis



What data is shown?
DATA ABSTRACTION

Why is the user analyzing / viewing it?
TASK ABSTRACTION

How is the data presented?
VISUAL ENCODING

Data Types

TYPE = structural or mathematical interpretation of the data

Data Types

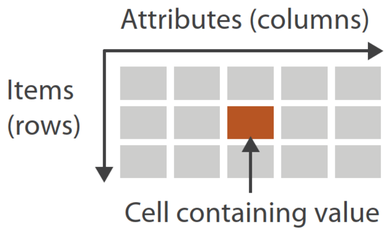
- Items *(row, node)*
- Attributes *(variable, data dimension)*
- Links *(relationship)*
- Positions *(spatial location)*
- Grids *(sampling)*

Data Types

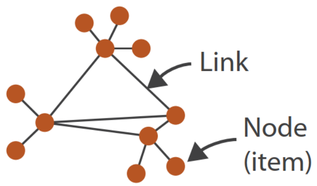
DATASET = collection of information that is the target of analysis

Dataset Types

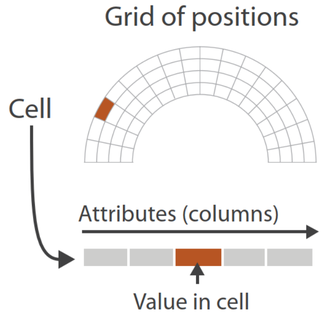
- Tables



- Networks

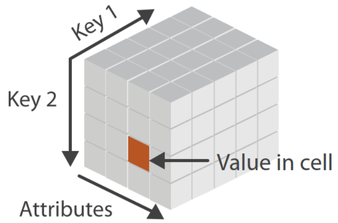


- Fields (Continuous)



- Geometry (Spatial)

- *Multidimensional Table*



- *Trees*

Data Types

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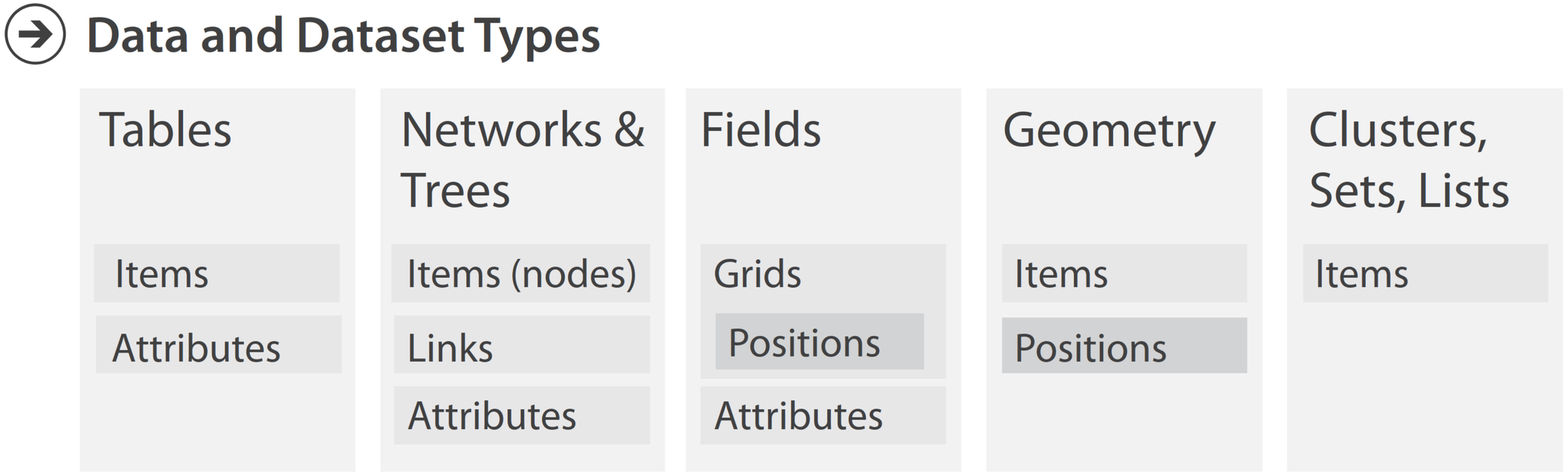
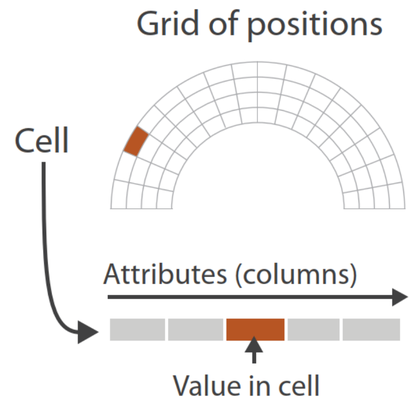


grid types

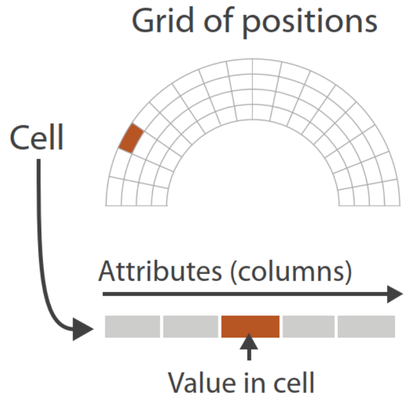
Relevant to anyone in the sciences!

➔ Fields (Continuous)



grid choices impact how continuous data is interpreted

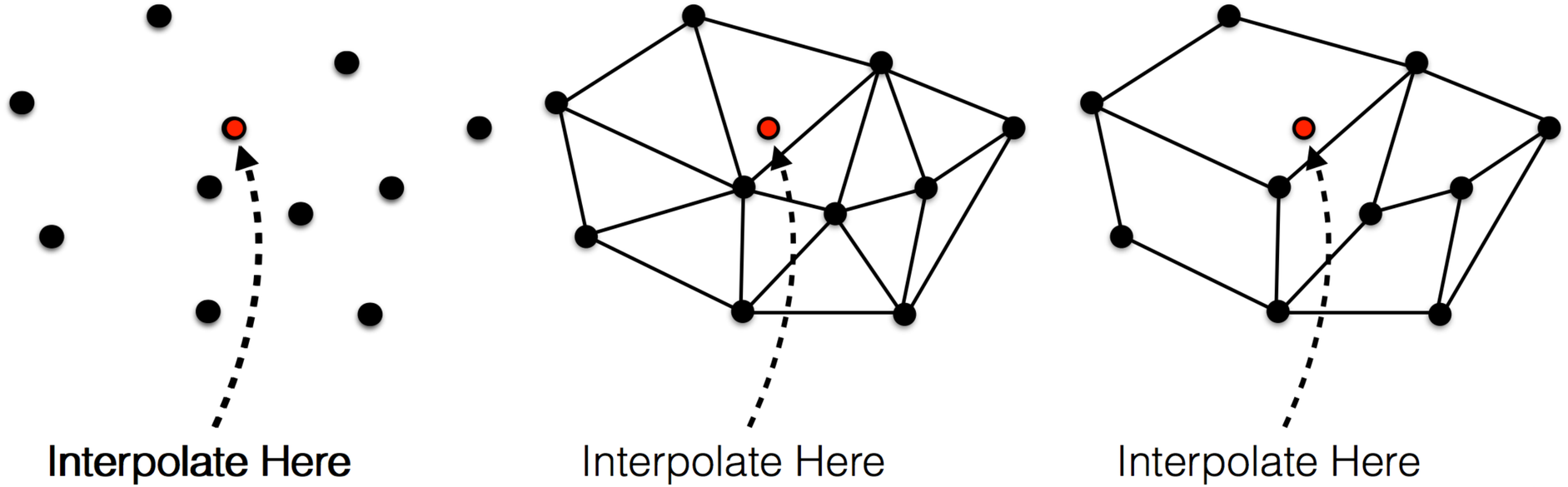
➔ Fields (Continuous)



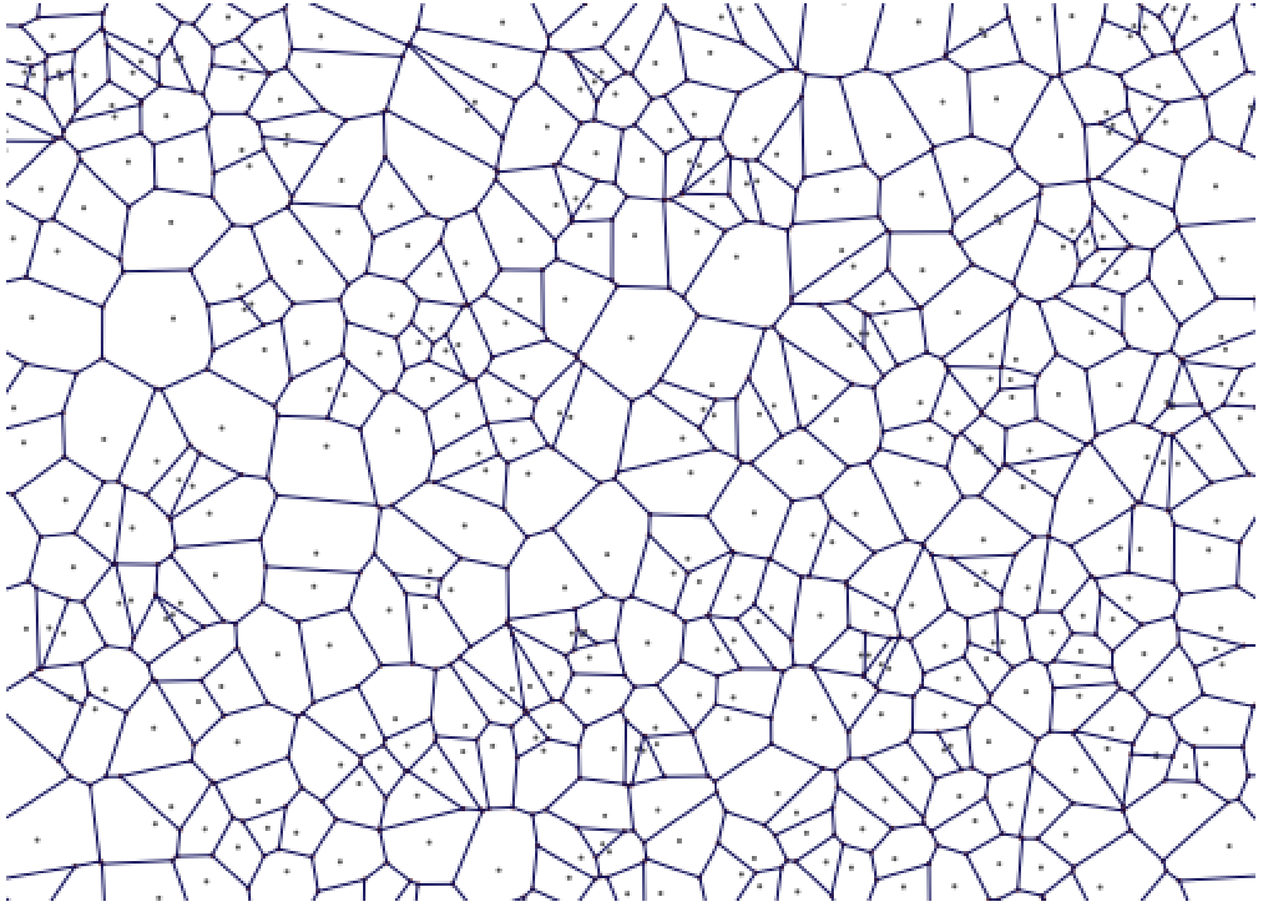
two key considerations:

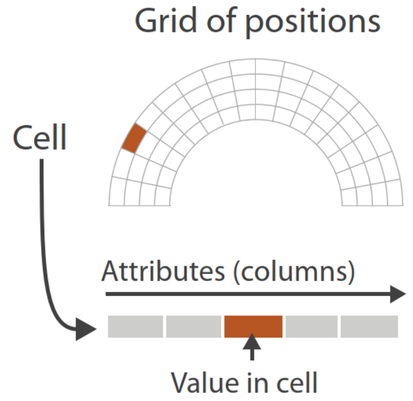
sampling, or the choice of where attributes are measured

interpolation, or how to model the attributes in the rest of space



“Voronoi Tessellation”

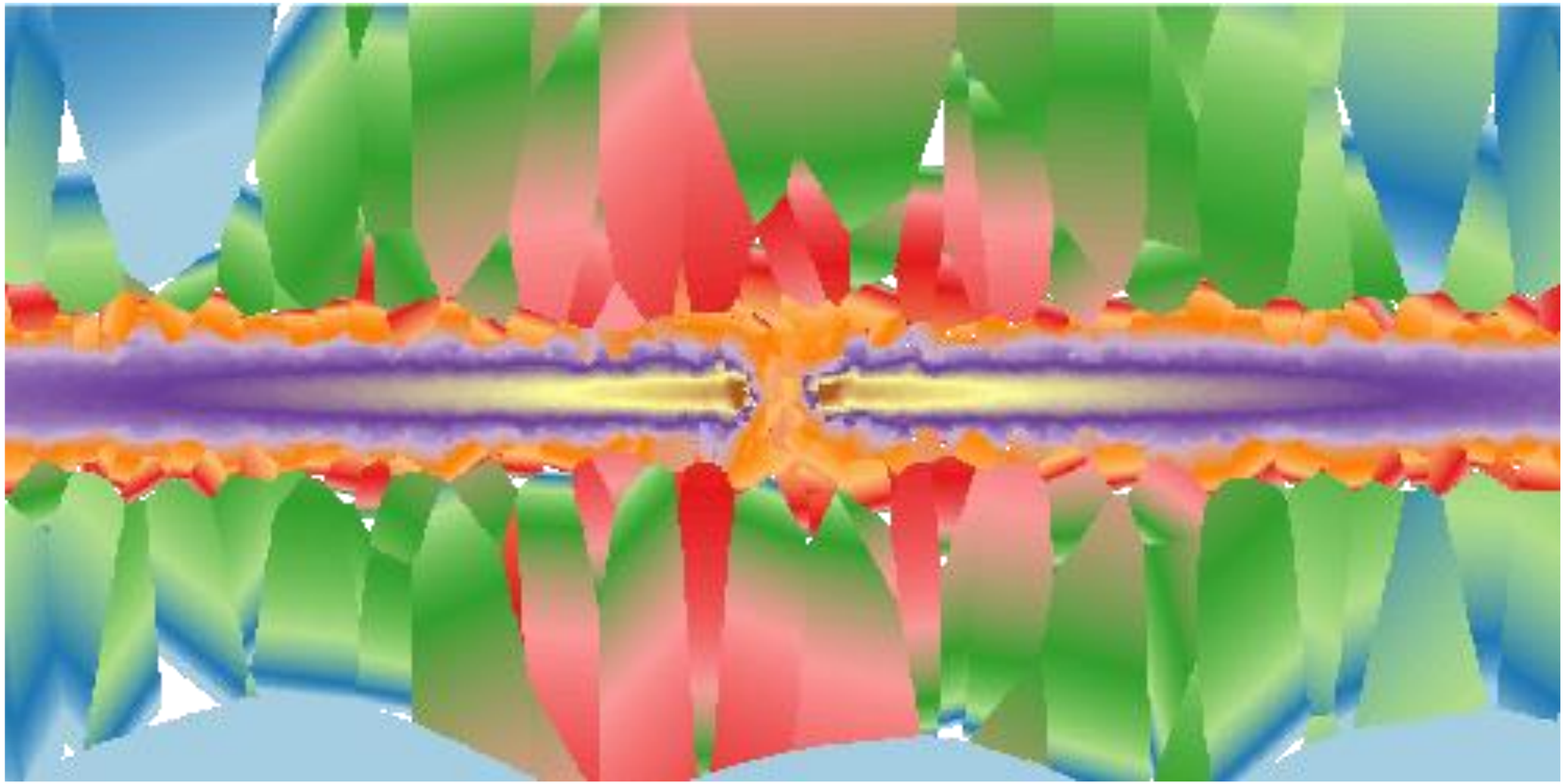




https://en.wikipedia.org/wiki/Voronoi_diagram

➔ Fields (Continuous)

Voronoi Tessellation for Galaxy Evolution Simulation



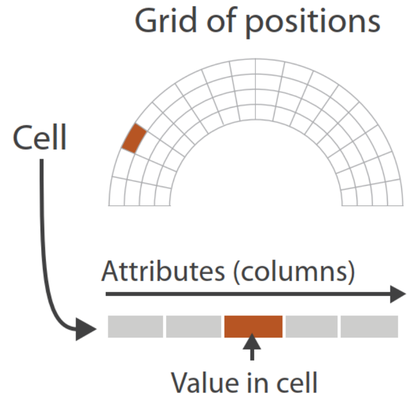


Image courtesy of Patrik Jonsson

Data Types

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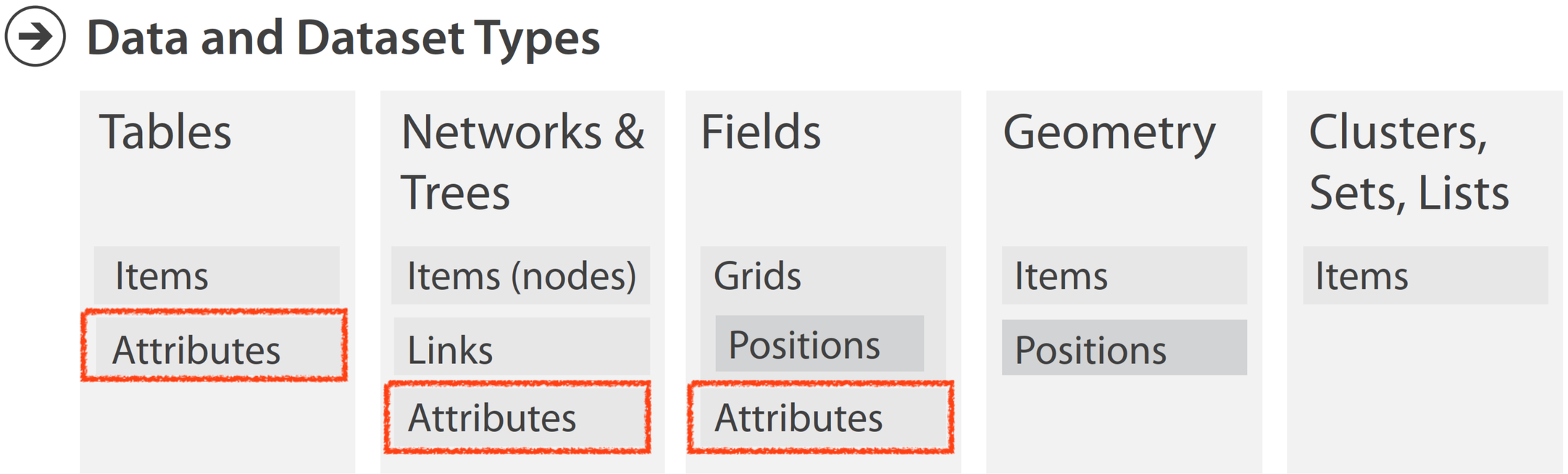


Attribute Types

➔ Categorical

e.g.,
fruit (apple, pear, grape),
colleges (CAMD, Khoury, COE)

➔ Ordered

➔ *Ordinal*

e.g.,
sizes (xs, s, m, l, xl),
months (J, F, M)

➔ *Quantitative* *(continuous)*

e.g.,
lengths (1’, 2.5’, 5’),
population

Ordering Direction

Sequential

e.g.,
height ≥ 0
time: ms since Unix epoch

Diverging

e.g.,
elevation: above and below sea level
deltas: change in value since previous timestep

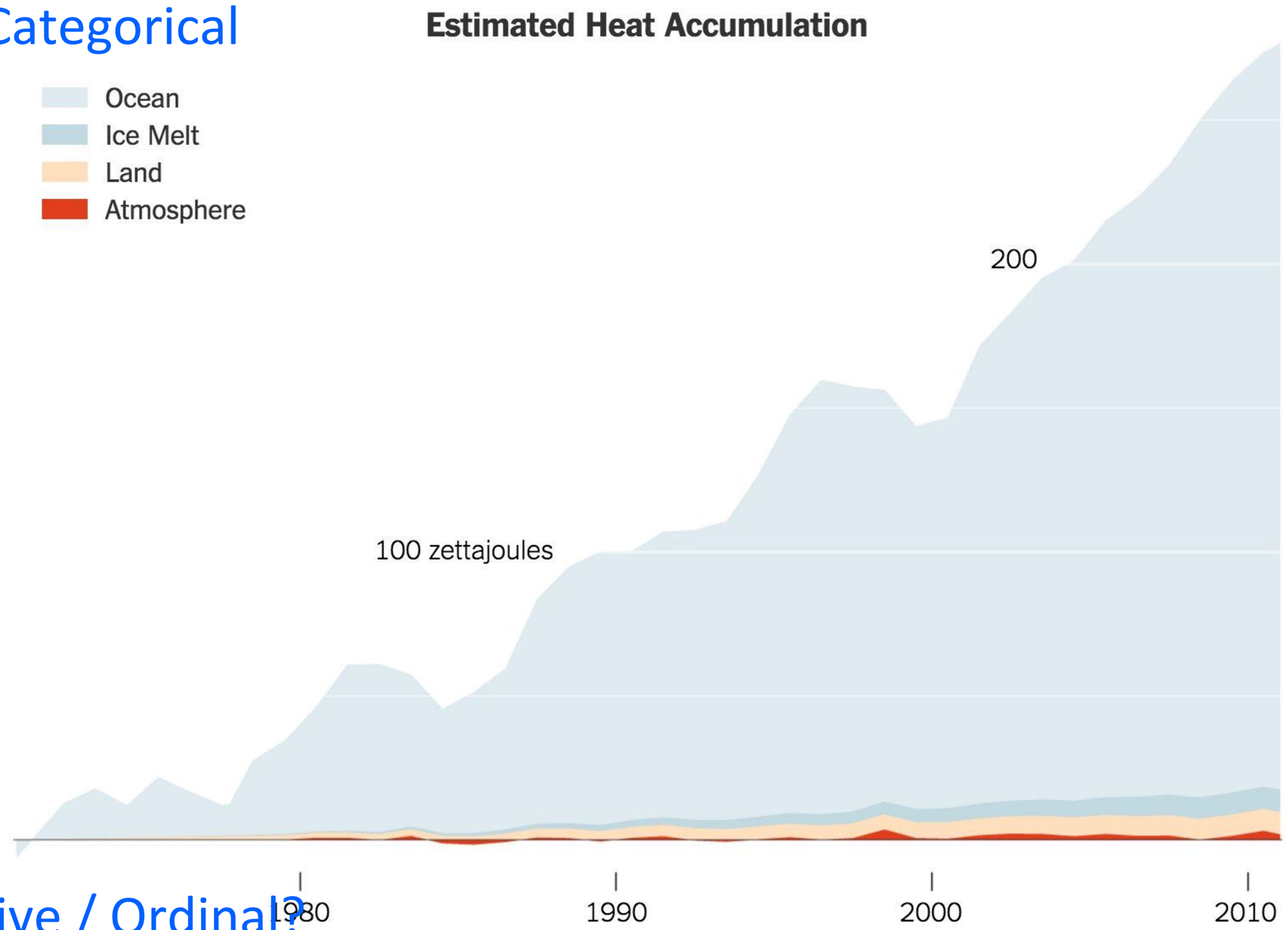
Cyclic

e.g.,
time: hour of the day
packet buffers: round robin
user studies: counterbalancing group

Categorical

Quantitative

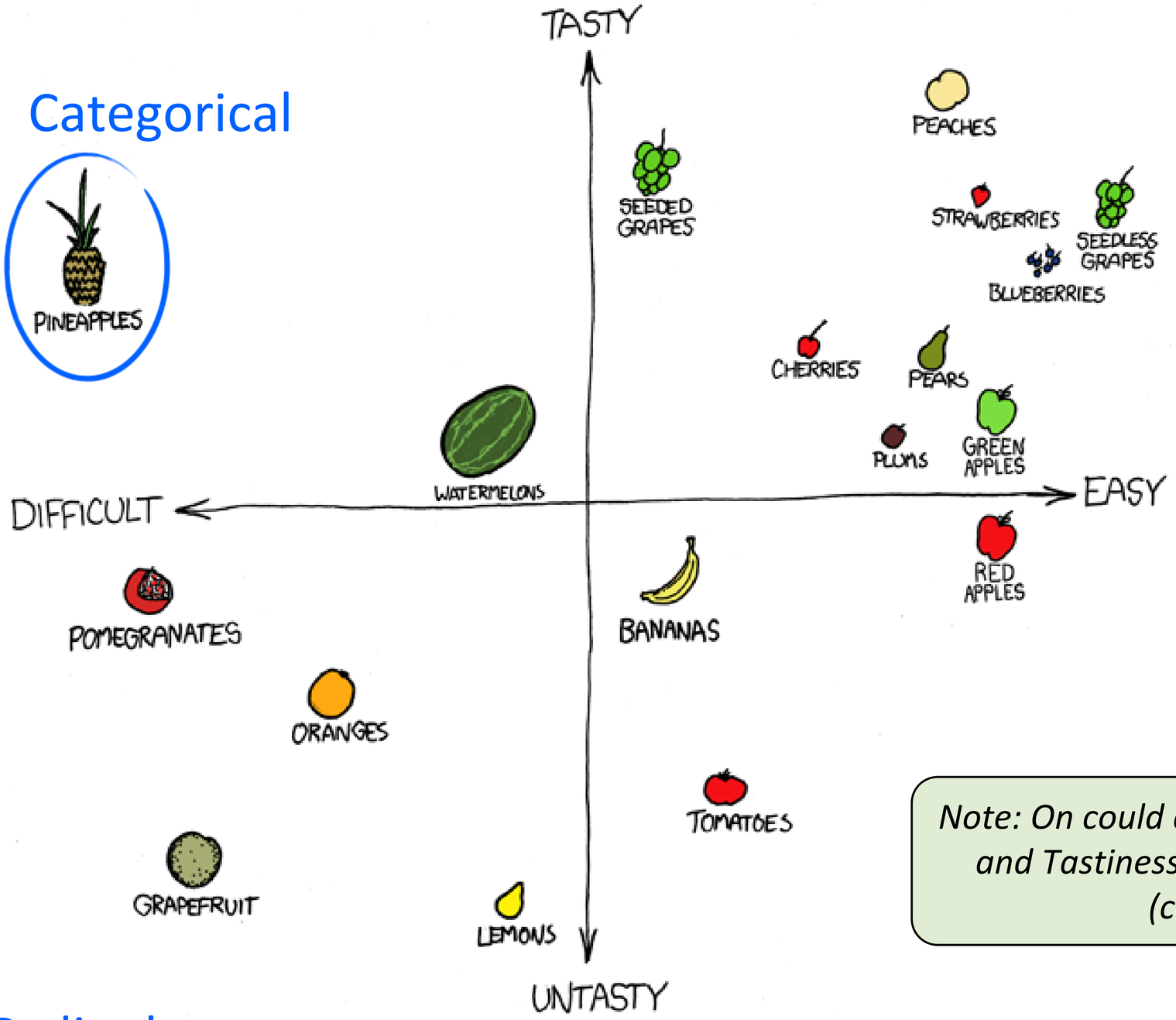
?Quantitative / Ordinal?



http://www.nytimes.com/interactive/2016/09/12/science/earth/ocean-warming-climate-change.html

Categorical

Ordinal



Ordinal

Note: On could also argue that Difficulty and Tastiness could be quantitative (continuous)

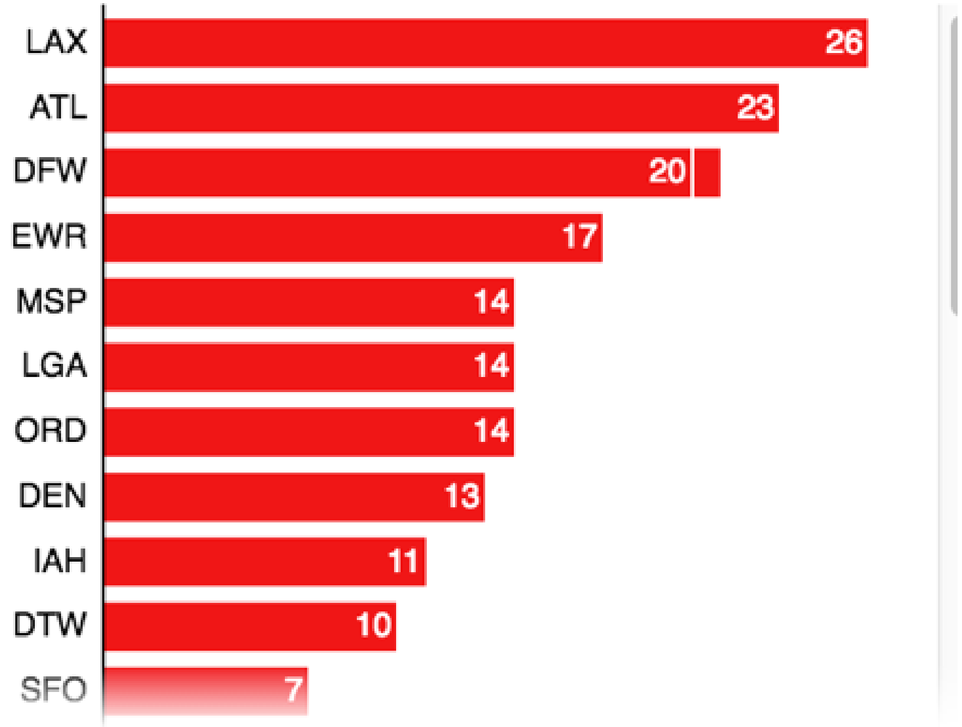
https://xkcd.com/388/

FlightAware MiseryMap
Back to main site

236
DELAYS

1
CANCELLATIONS

between 3 PM and 7 PM (all cancellations today) (all delays today)

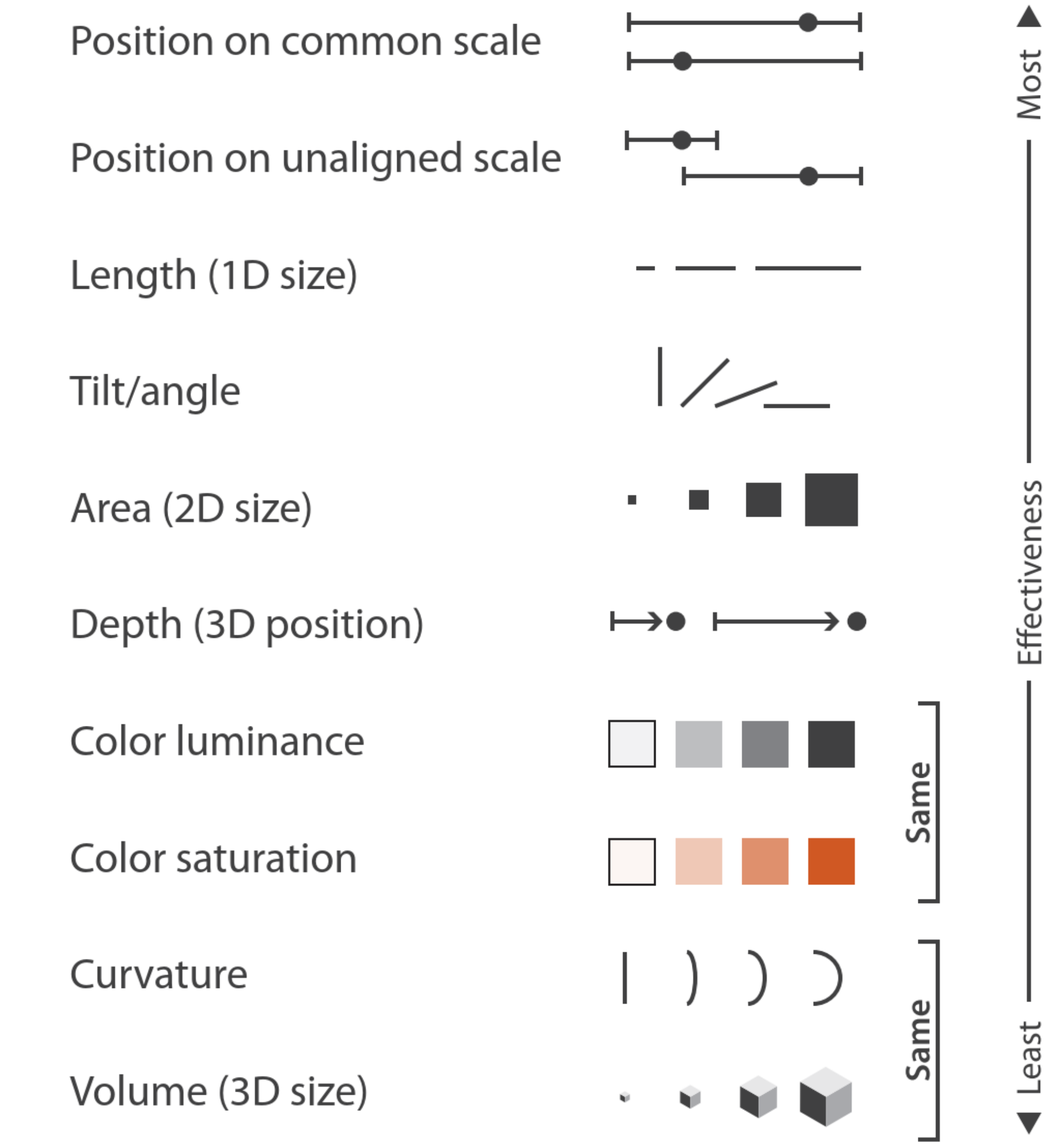


Categorical

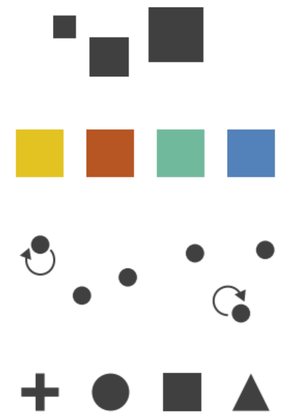
Quantitative

Channels: Expressiveness Types and Effectiveness Ranks

Magnitude Channels: Ordered Attributes



Identity Channels: Categorical Attributes



Summarizes results from [Cleveland & McGill (1984)](), [Heer & Bostock (2010)]()

Channel Ranking by Data Type

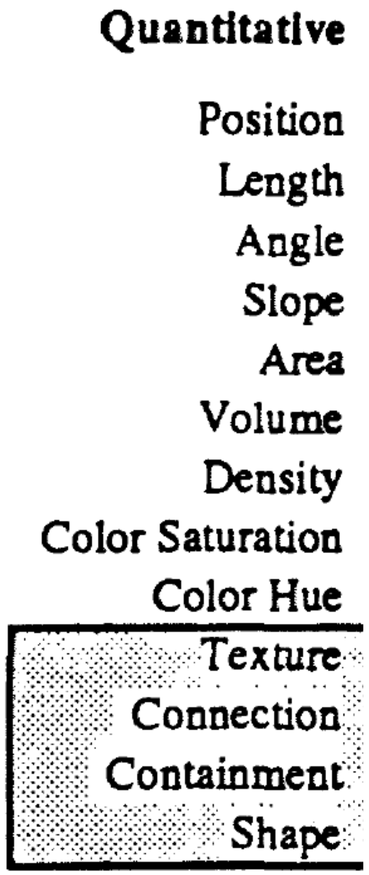
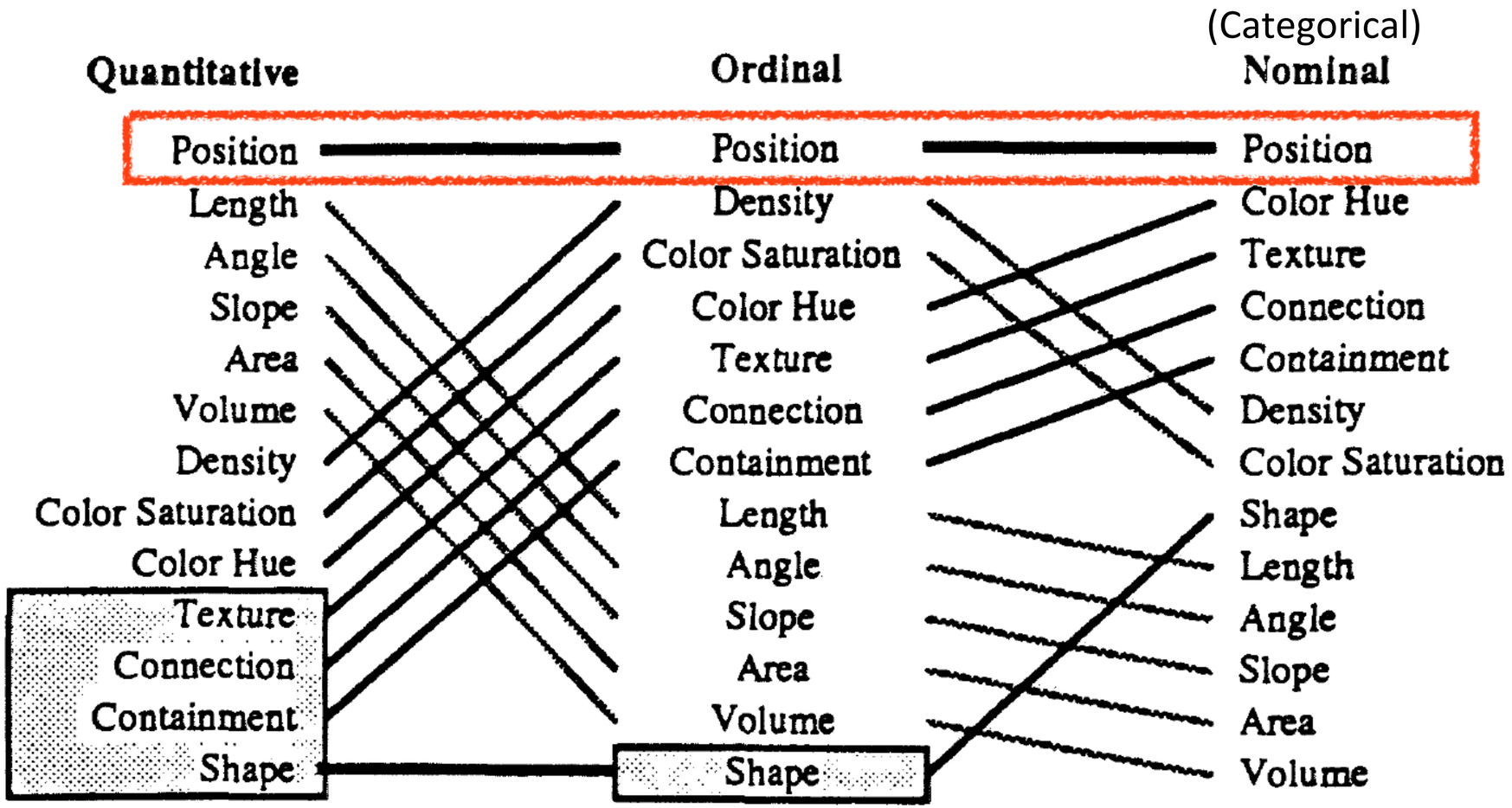


Figure 15: Ranking of Perceptual Tasks. *The tasks shown in the gray boxes are not relevant to that type of data.*

Mackinlay (1986)

Channel Ranking by Data Type



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[Mackinlay (1986)](#)

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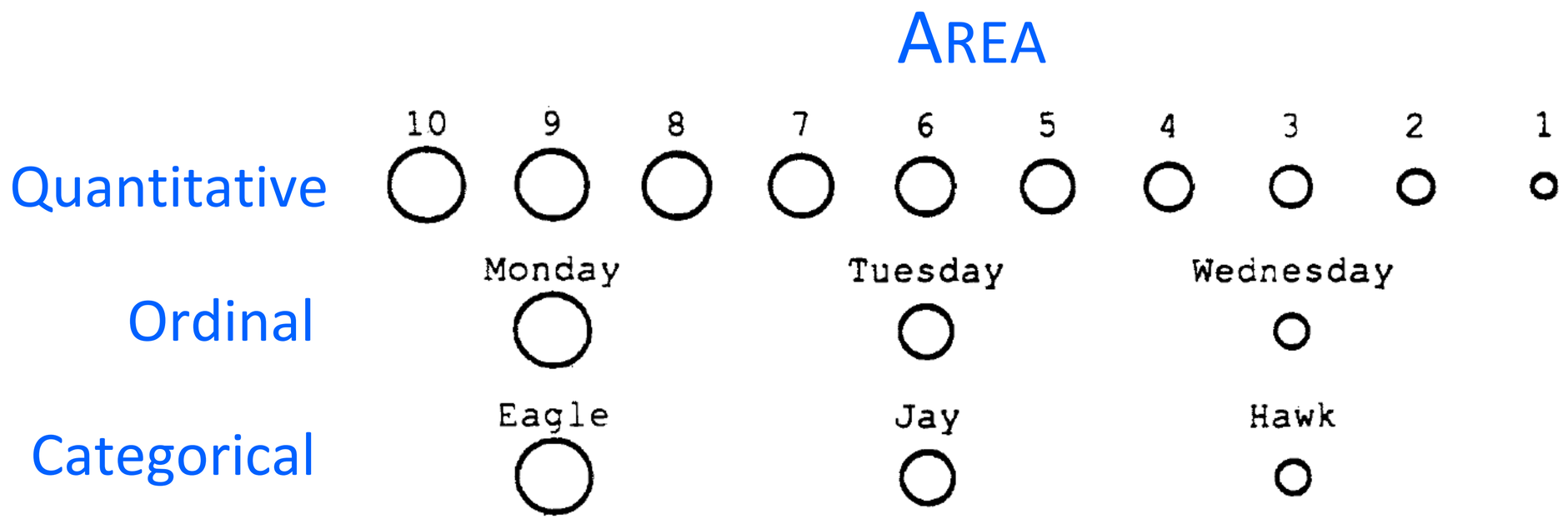
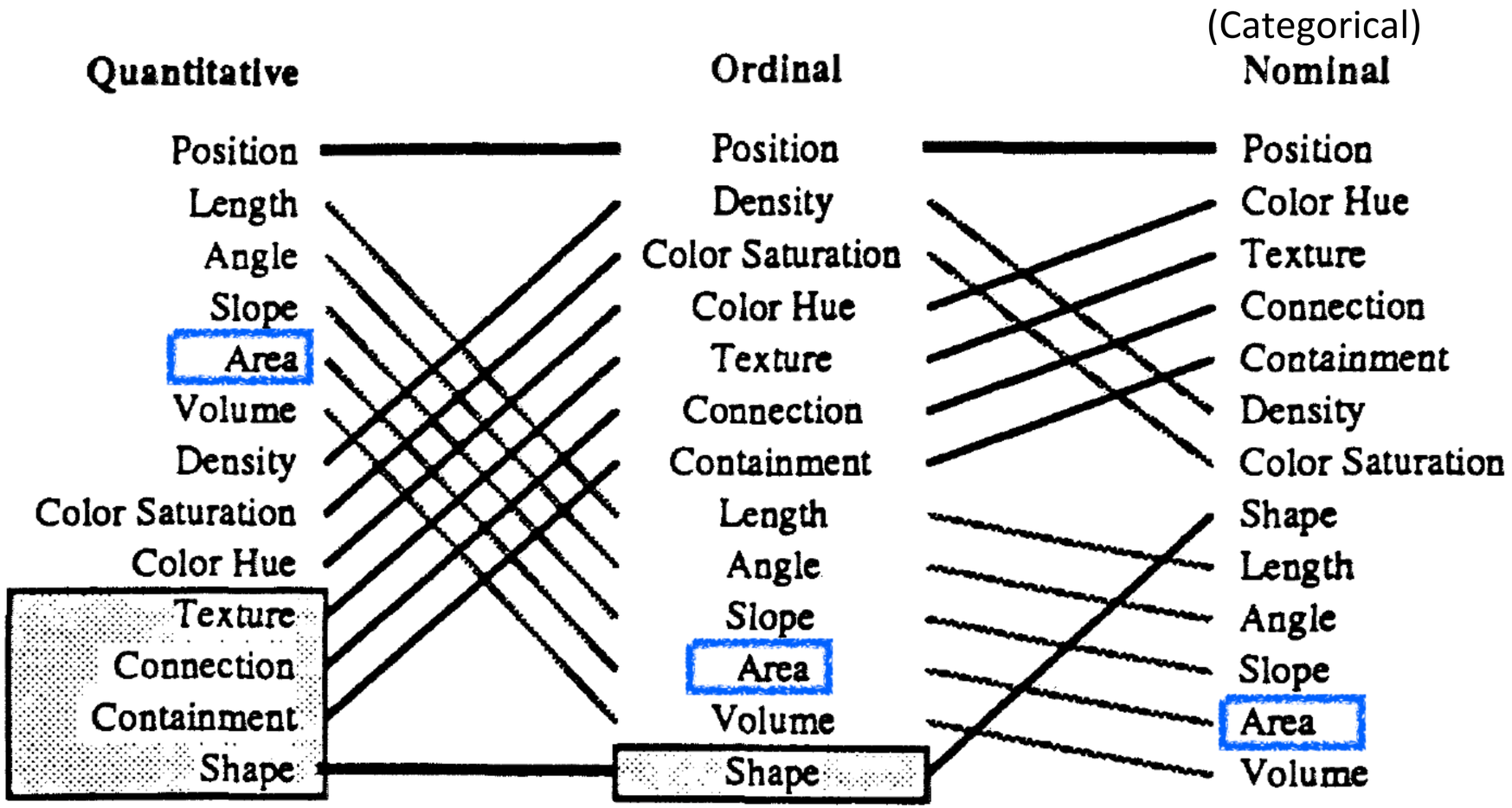


Figure 16: Analysis of the Area Task.

Mackinlay (1986)

Channel Ranking by Data Type



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Mackinlay (1986)

Data Abstraction

What?

Datasets

Data Types

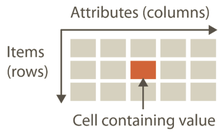
- Items
- Attributes
- Links
- Positions
- Grids

Data and Dataset Types

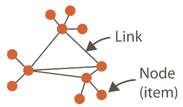
Tables	Networks & Trees	Fields	Geometry	Clusters, Sets, Lists
Items	Items (nodes)	Grids	Items	Items
Attributes	Links	Positions	Positions	
	Attributes	Attributes		

Dataset Types

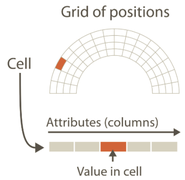
- Tables



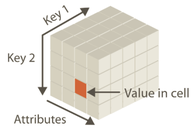
- Networks



- Fields (Continuous)



- *Multidimensional Table*



- *Trees*

- Geometry (Spatial)

Dataset Availability

- Static

- Dynamic

Attributes

Attribute Types

- Categorical

- Ordered
  - *Ordinal*

  - *Quantitative*

Ordering Direction

- Sequential

- Diverging

- Cyclic

For Next Time

neu-ds-4200-f23.github.io/schedule/

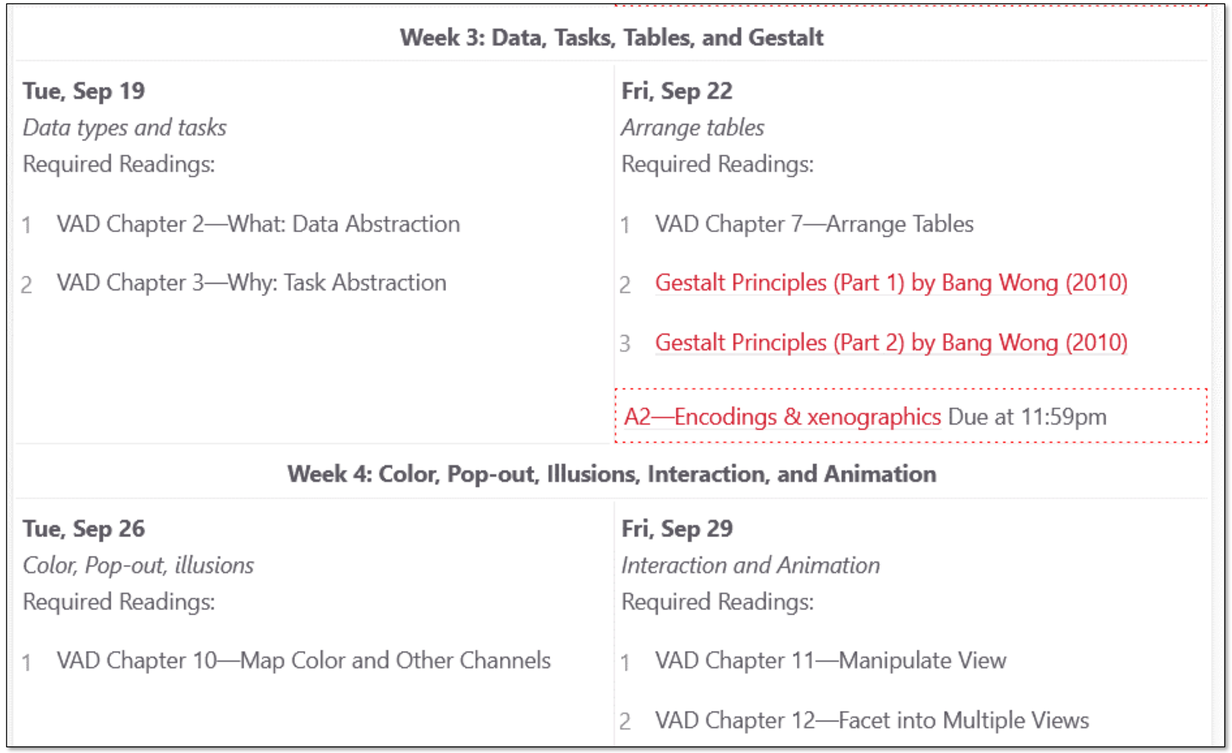
Look at the upcoming assignments and deadlines

- Textbook, Readings, & Reading Quizzes—Variable days
- In-Class Activities—If due, they are due 11:59pm the same day as class

Everyday Required Supplies:

- 5+ colors of pen or marker
- White paper
- Laptop and charger

Use Slack for general questions, email codydunne-and-tas@ccs.neu.edu for questions specific to you.



Week 3: Data, Tasks, Tables, and Gestalt

Tue, Sep 19	**Fri, Sep 22**
Data types and tasks	*Arrange tables*
Required Readings:	Required Readings:
1 VAD Chapter 2—What: Data Abstraction	1 VAD Chapter 7—Arrange Tables
2 VAD Chapter 3—Why: Task Abstraction	2 Gestalt Principles (Part 1) by Bang Wong (2010)
	3 Gestalt Principles (Part 2) by Bang Wong (2010)
	A2—Encodings & xenographics Due at 11:59pm

Week 4: Color, Pop-out, Illusions, Interaction, and Animation

Tue, Sep 26	**Fri, Sep 29**
Color, Pop-out, illusions	*Interaction and Animation*
Required Readings:	Required Readings:
1 VAD Chapter 10—Map Color and Other Channels	1 VAD Chapter 11—Manipulate View
	2 VAD Chapter 12—Facet into Multiple Views

A3