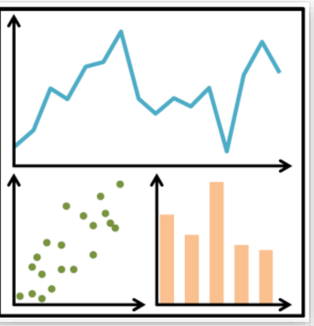
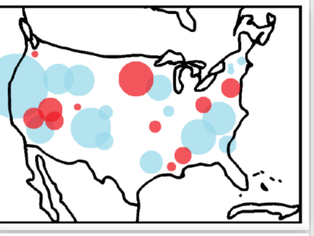
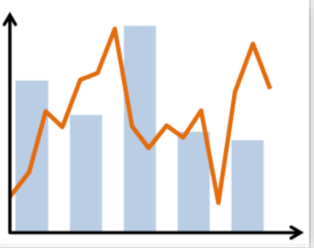
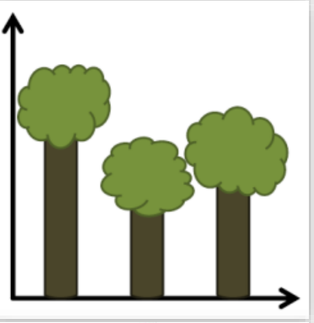
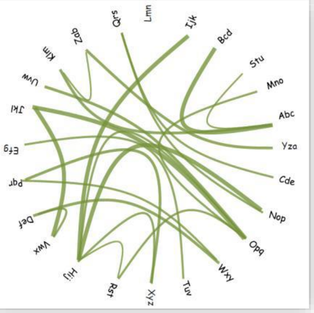






Lecture 4: Tableau, Design Rules of Thumb

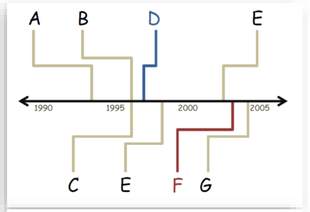
CS 7250

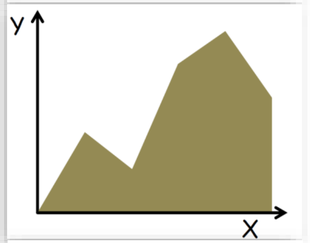
SPRING 2021

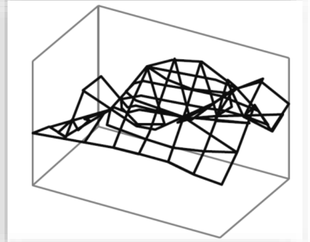
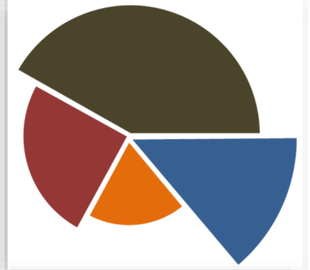
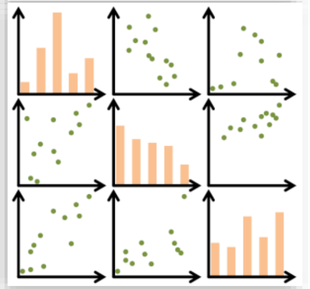
Prof. Cody Dunne

NORTHEASTERN UNIVERSITY

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





Checking In

Previously, on CS 7250…

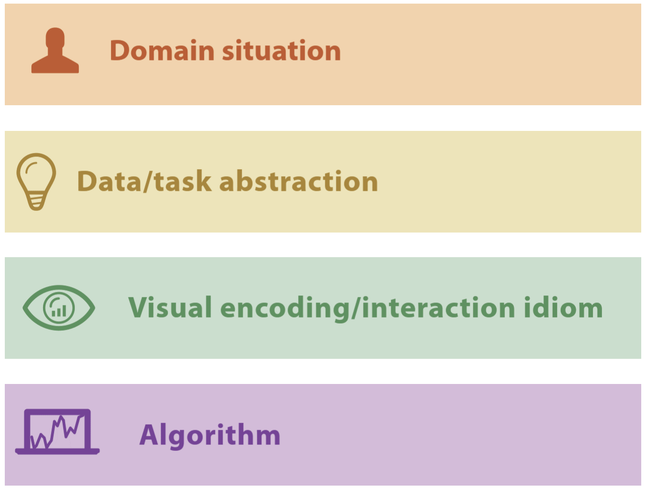
JavaScript Development

PROJECTS

In-class project pitches: F 2021-02-12

Threats to Validity

✓ *Final Project validation*



Threat Wrong problem
Validate Observe and interview target users ✓

Threat Wrong task/data abstraction

Threat Ineffective encoding/interaction idiom
Validate Justify encoding/interaction design ✓

Threat Slow algorithm
Validate Analyze computational complexity

Implement system

Validate Measure system time/memory

Validate Qualitative/quantitative result image analysis ✓
Test on any users, informal usability study
Validate Lab study, measure human time/errors for task

Validate Test on target users, collect anecdotal evidence of utility
Validate Field study, document human usage of deployed system

Validate Observe adoption rates

Final project follow-up

Potential Venue: IEEE VIS 2021 Short Papers

Deadline 2021-06-13

TABLEAU TUTORIAL

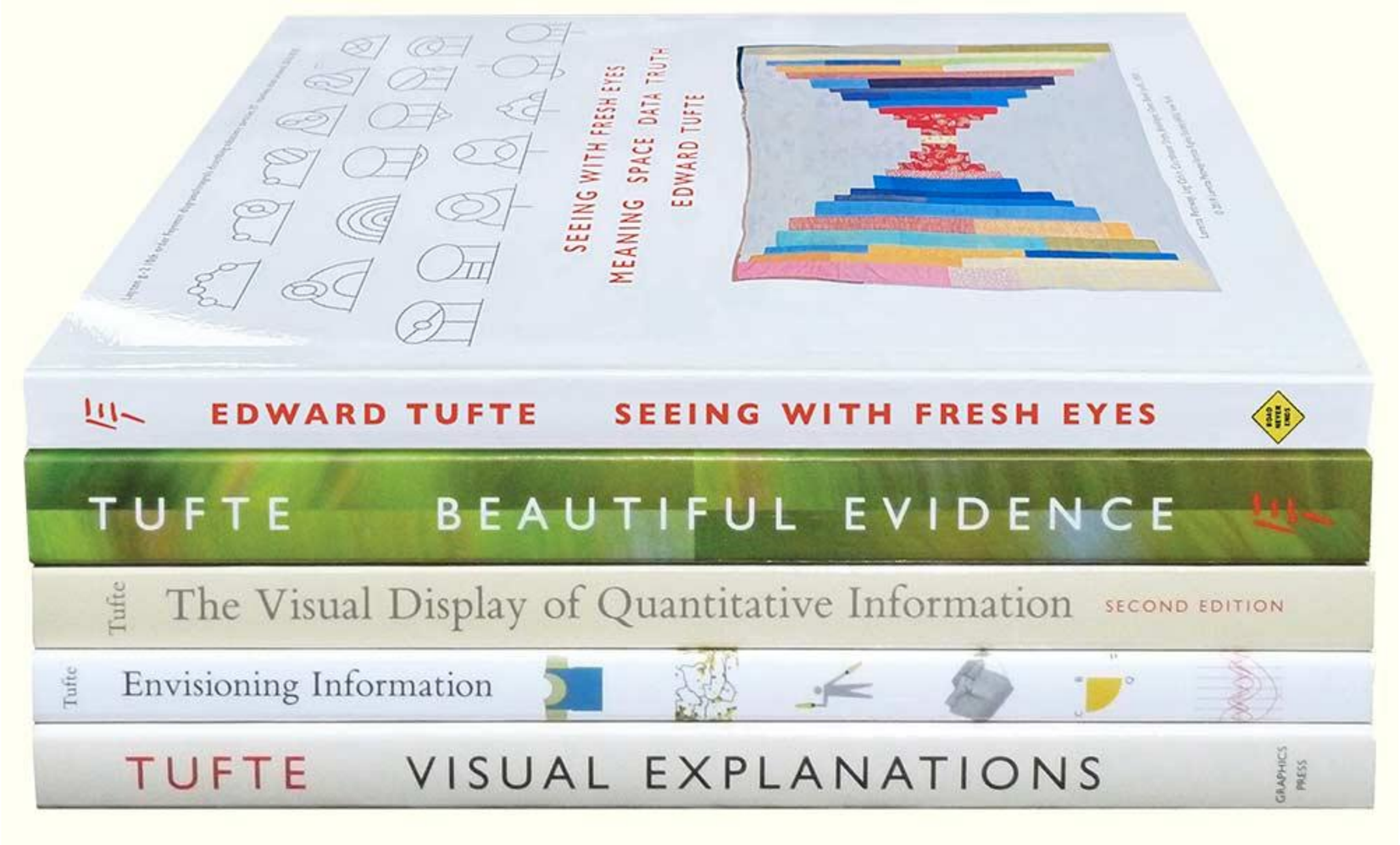
~15 min total

In-Class Tool Introduction — Tableau

~25 min total

Design Rules of Thumb

Edward Tufte



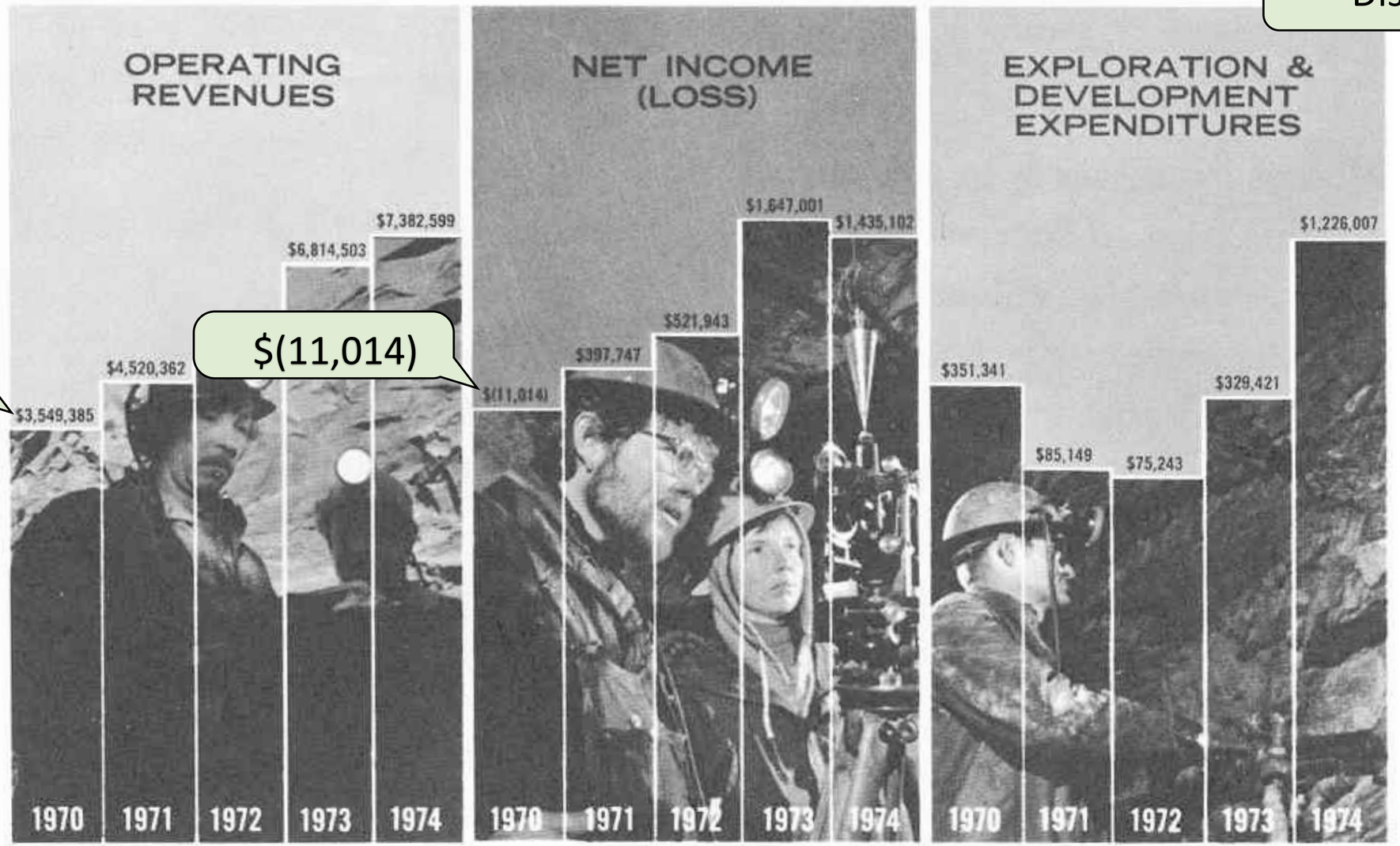
“Graphical Integrity”

“Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data.”

(Axes and axis labels, titles, annotations, legends, etc.)

Tufte, “Visual Display of Quantitative Information” (1983)

"Distorted Scales"



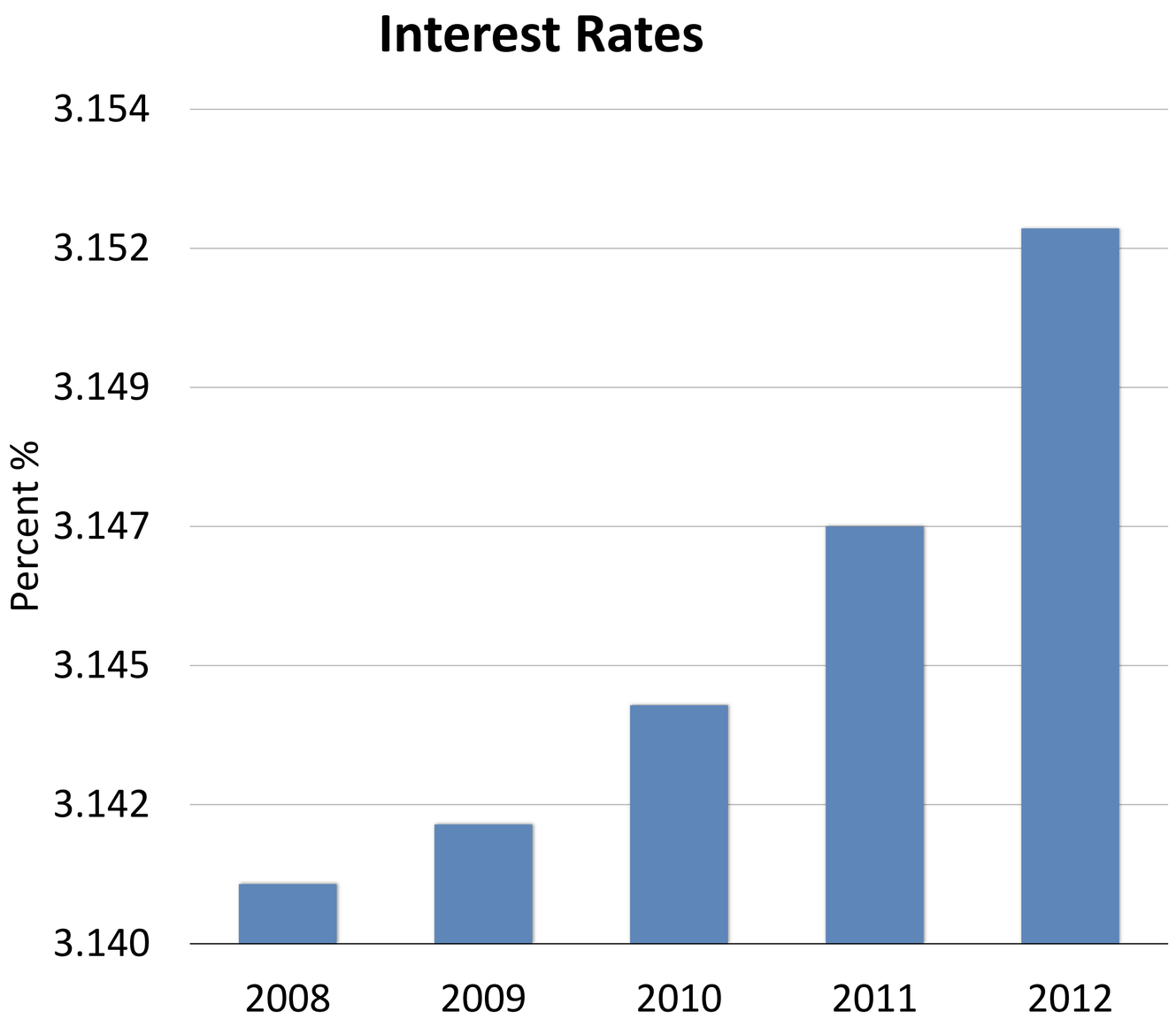
$3,549,385

$(11,014)

y-axis baseline?!

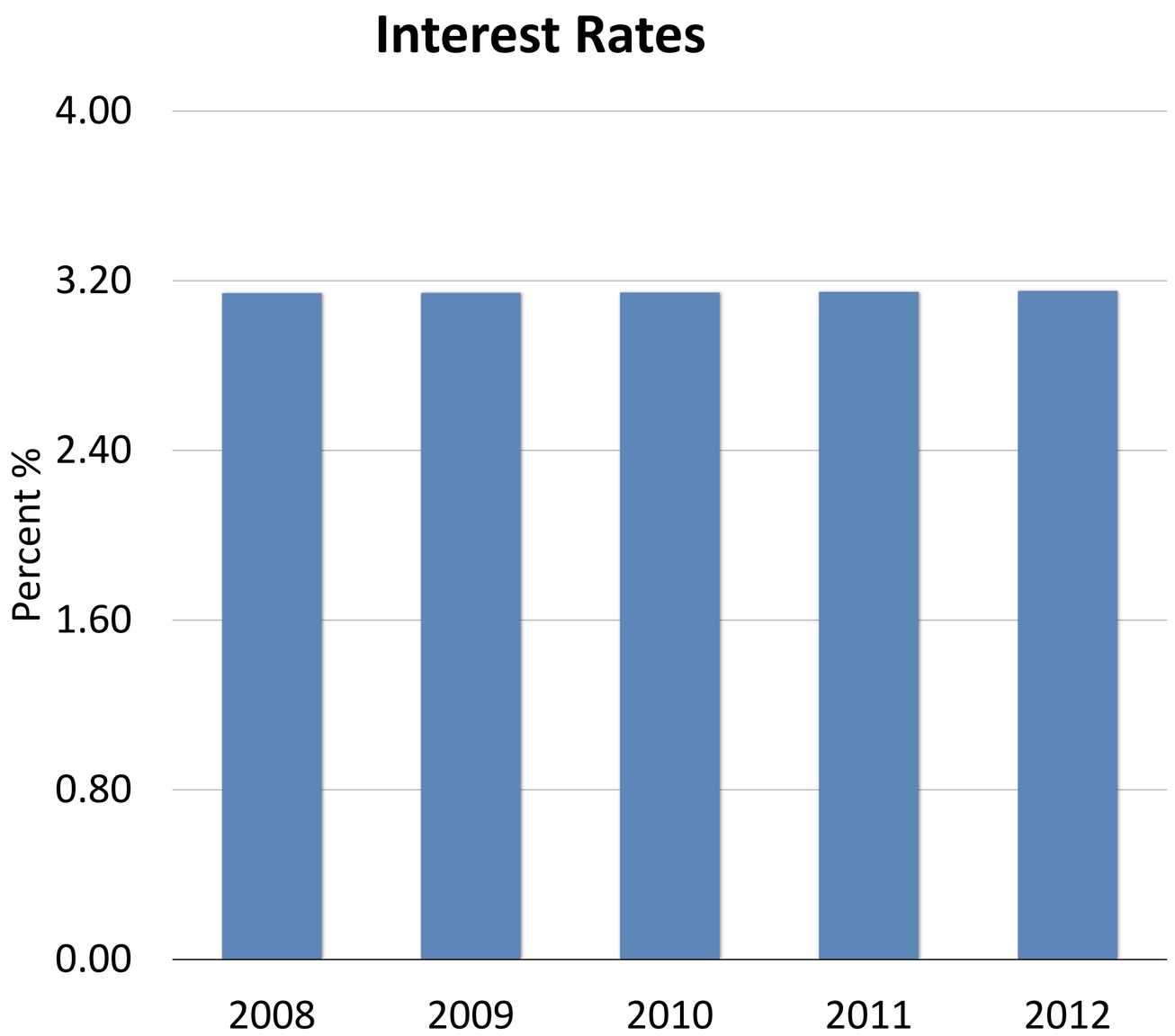
"Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data."

Tufte, "Visual Display of Quantitative Information" (1983)



"Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data."

Based on http://data.heapanalytics.com/how-to-lie-with-data-visualization

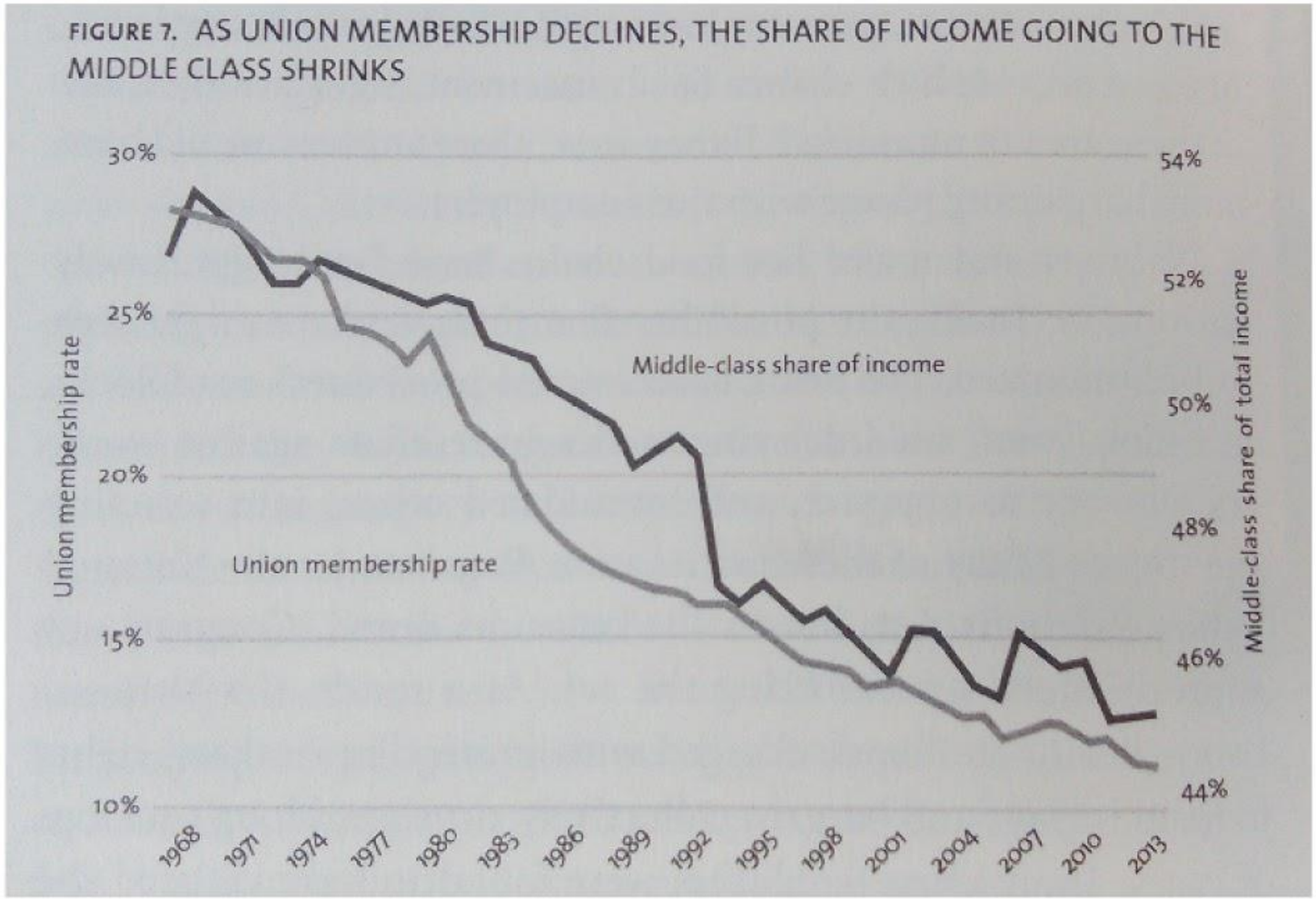


CONTEXT!

"Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data."

Based on http://data.heapanalytics.com/how-to-lie-with-data-visualization

"Double the axes, double the mischief"



"Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data." http://www.thefunctionalart.com/2015/10/double-axes-double-mischief.html

“Graphical Integrity”

“The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities measured.”

Tufte, “Visual Display of Quantitative Information” (1983)

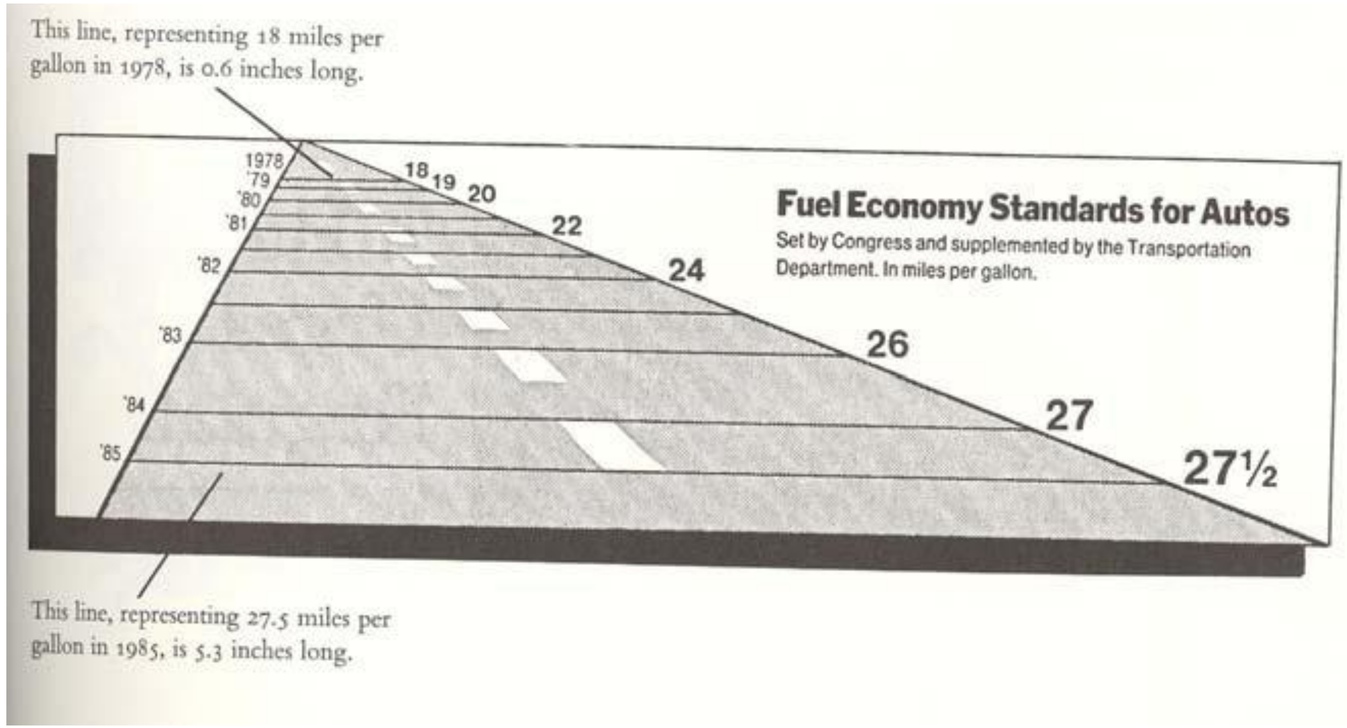
Lie Factor

$$\text{Lie Factor} = \frac{\text{(Size of effect in graphic)}}{\text{(Size of effect in data)}}$$

Lie Factor = >1, overstating

Lie Factor = 1, accurate :-)

Lie Factor = <1, understating



"The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities measured."

Tufte, "Visual Display of Quantitative Information" (1983)

Lie Factor

Lie Factor = $\frac{\text{(Size of effect in graphic)}}{\text{(Size of effect in data)}}$

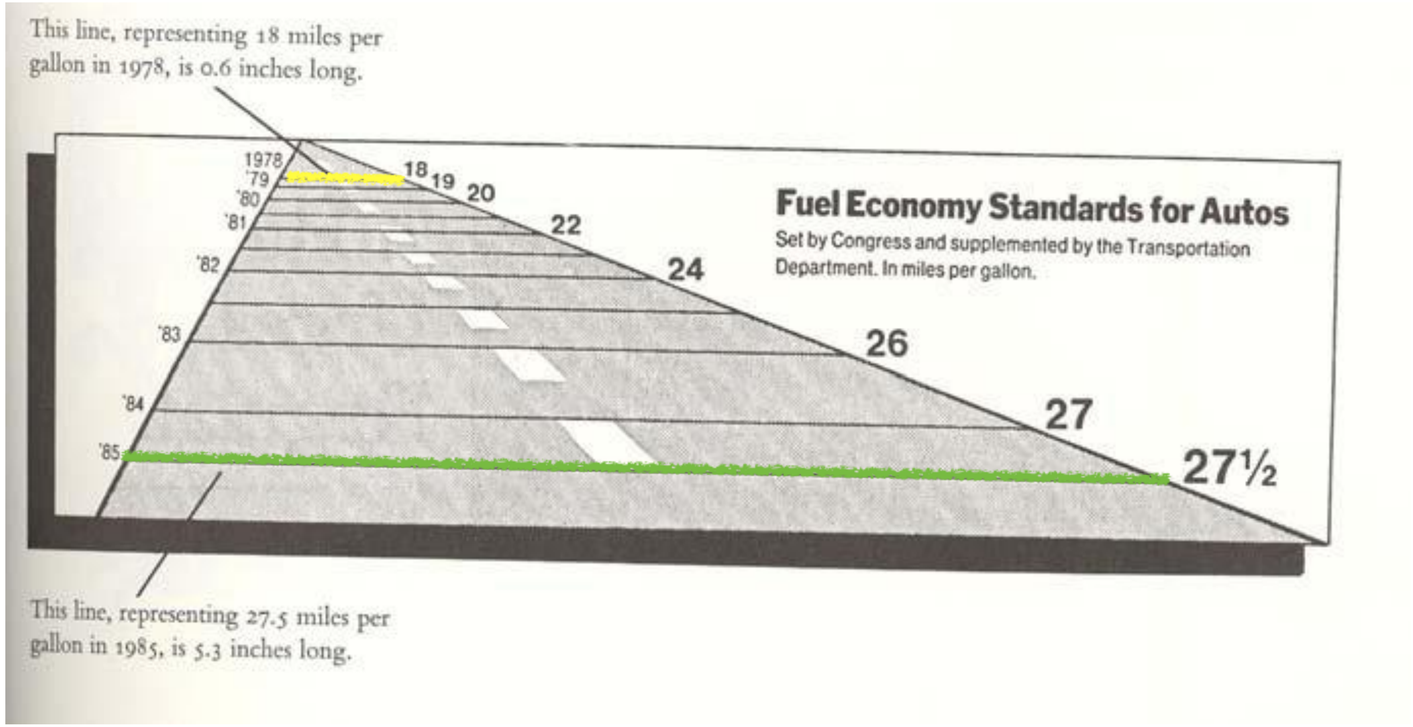


Image = $\frac{5.3" - 0.6"}{0.6"}$ = 7.83 = 783%

Data = $\frac{27.5 - 18}{18}$ = 0.53 = 53%

Lie Factor = $\frac{783\%}{53\%}$ = 14.8

Lie Factor = >1, overstating

"The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities measured."

Tufte, "Visual Display of Quantitative Information" (1983)

Lie Factor

Lie Factor = $\frac{\text{(Size of effect in graphic)}}{\text{(Size of effect in data)}}$

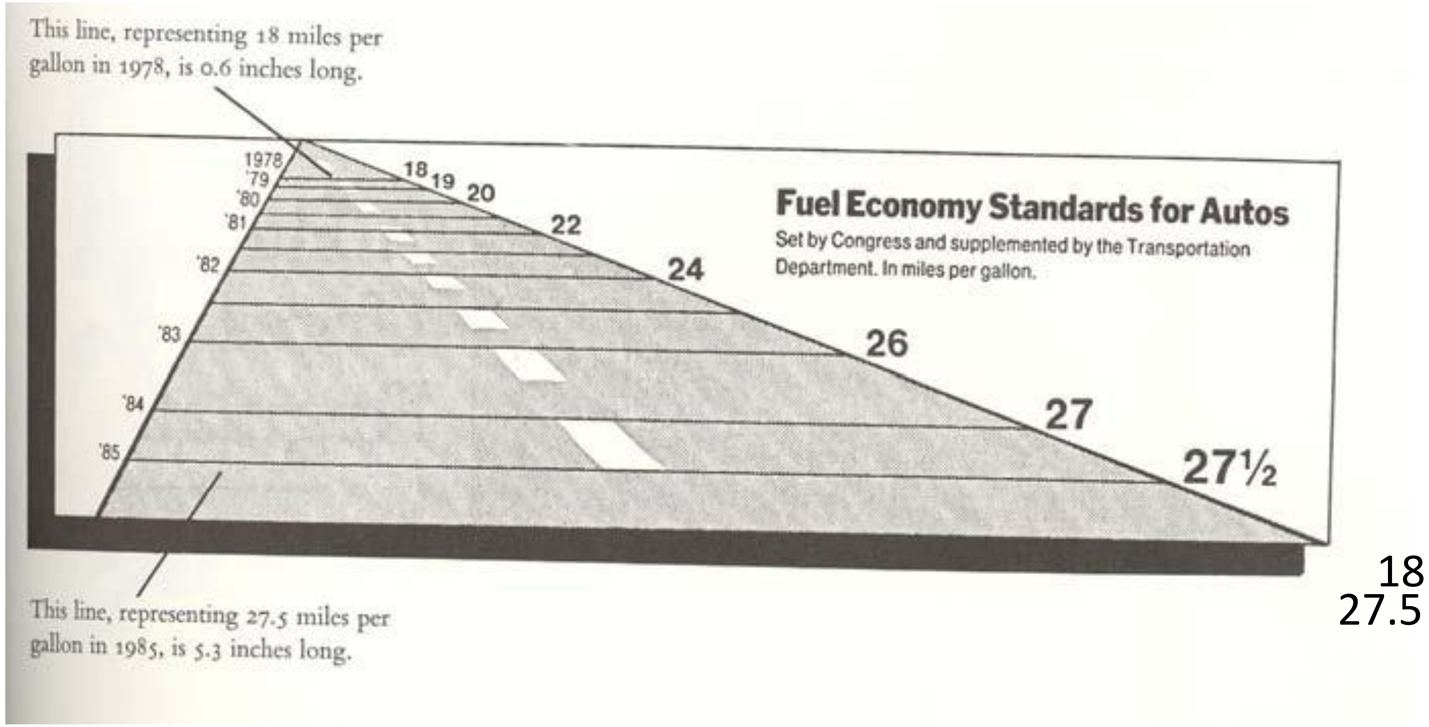


Image = $\frac{5.3'' - 0.6''}{0.6''} = 7.83 = 783\%$

Data = $\frac{27.5 - 18}{18} = 0.53 = 53\%$

Lie Factor = $\frac{783\%}{53\%} = 14.8$

Lie Factor = >1, overstating

18
27.5

"The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities measured."

Tufte, "Visual Display of Quantitative Information" (1983)

IN-CLASS ACTIVITY:
Calculate for yourself!

Lie Factor

$$\text{Data} = \frac{2 - 1}{1} = 1 = 100\%$$

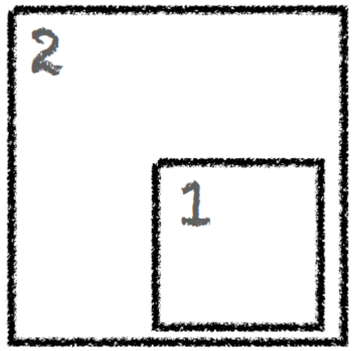
$$\text{Lie Factor} = \frac{\text{(Size of effect in graphic)}}{\text{(Size of effect in data)}}$$

✓

$$\text{Image} = \frac{2 - 1}{1} = 1 = 100\%$$

$$\text{Lie Factor} = \frac{100\%}{100\%} = 1$$

Make sure *area* is proportional to data!

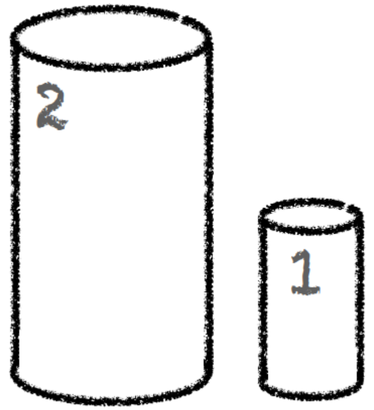


X

$$\text{Image} = \frac{2^2 - 1^2}{1^2} = 3 = 300\%$$

$$\text{Lie Factor} = \frac{300\%}{100\%} = 3$$

Don't use 3D bar charts!



X!!!

$$\text{Image} = \frac{2*\pi 1^2 - 1*\pi 0.5^2}{1*\pi 0.5^2} = 7 = 700\%$$

$$\text{Lie Factor} = \frac{700\%}{100\%} = 7$$

"The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities measured."

Tufte, "Visual Display of Quantitative Information" (1983)

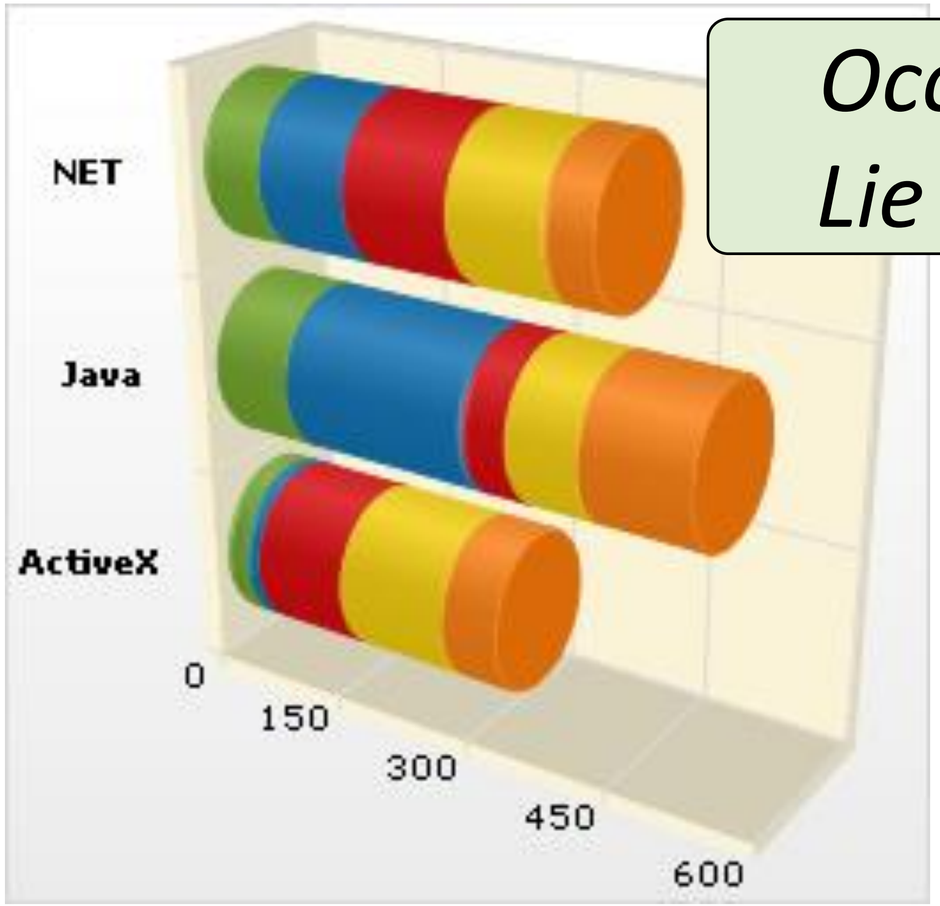
“Graphical Integrity”

“The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data.”

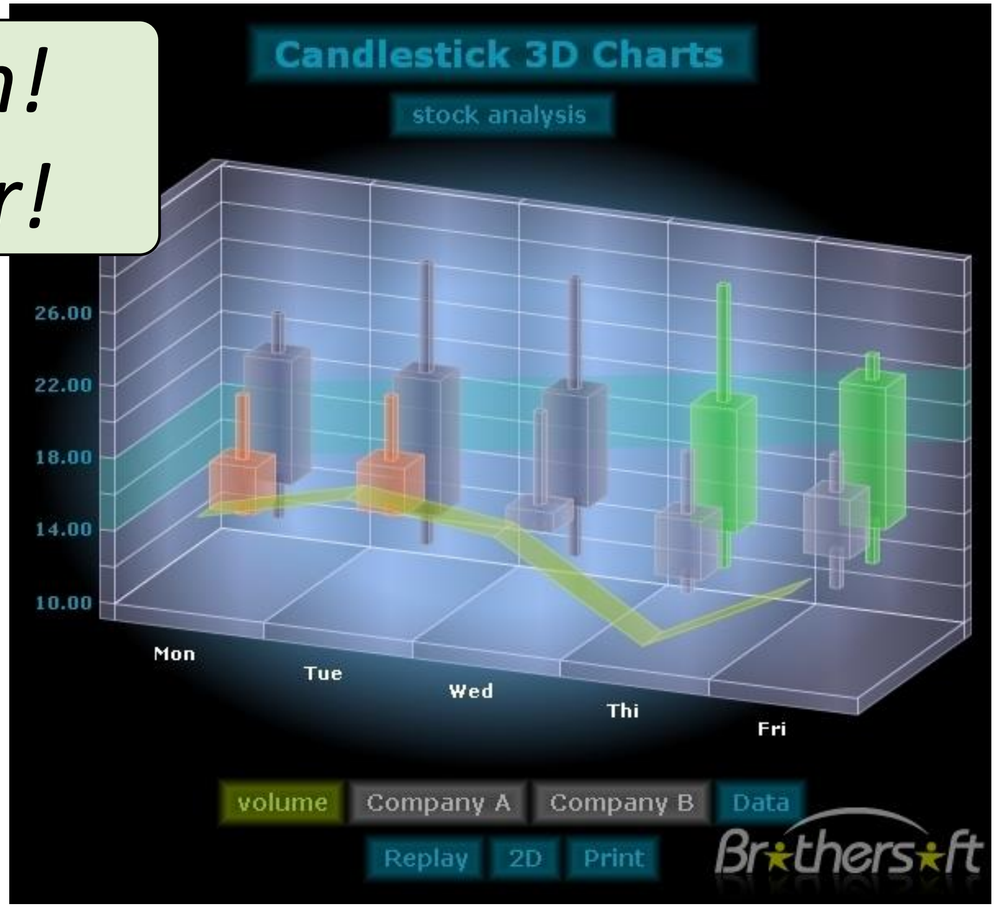
Tufte, “Visual Display of Quantitative Information” (1983)

“No Unjustified 3D”

Occlusion!
Lie Factor!



http://help.infragistics.com/Help/Doc/WinForms/2014.2/CLR4.0/html/Images/Chart_Bar_Chart_03.png



http://img.brothersoft.com/screenshots/softimage/0/3d_charts-171418-1269568478.jpeg

“The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data.”

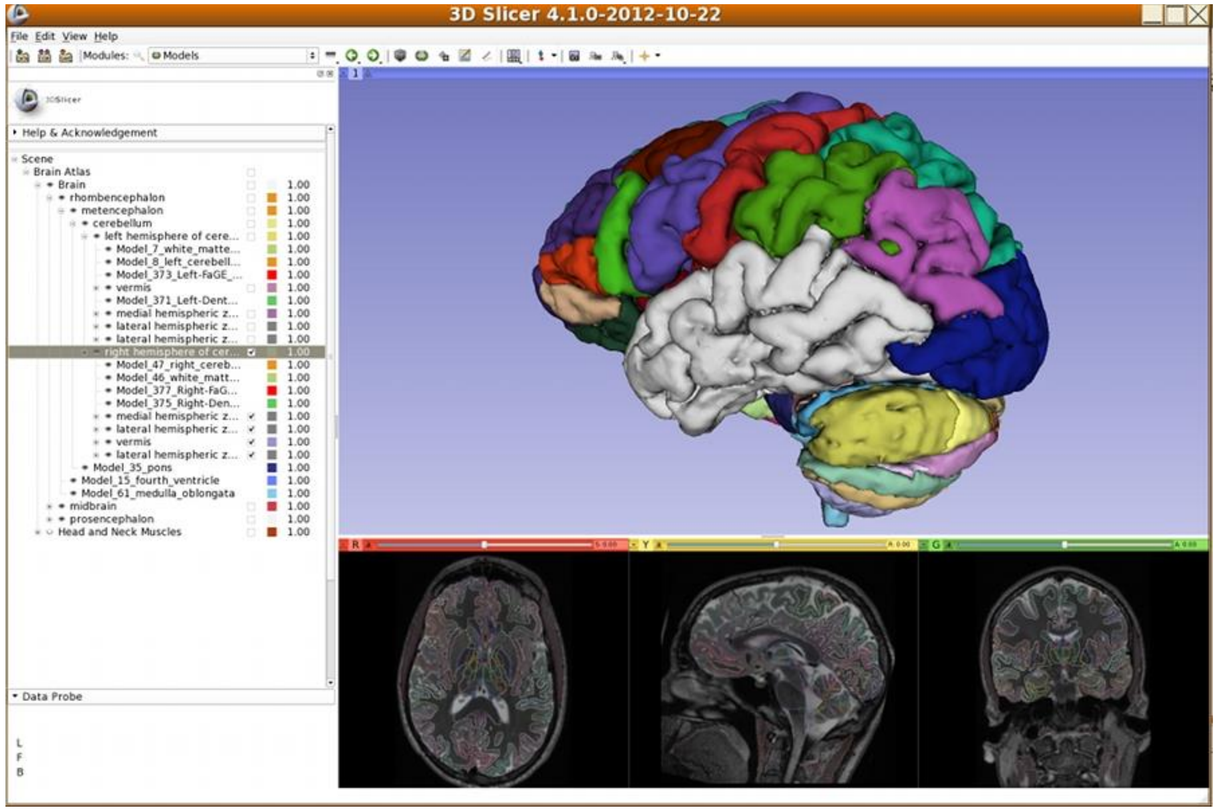
“No Unjustified 3D”

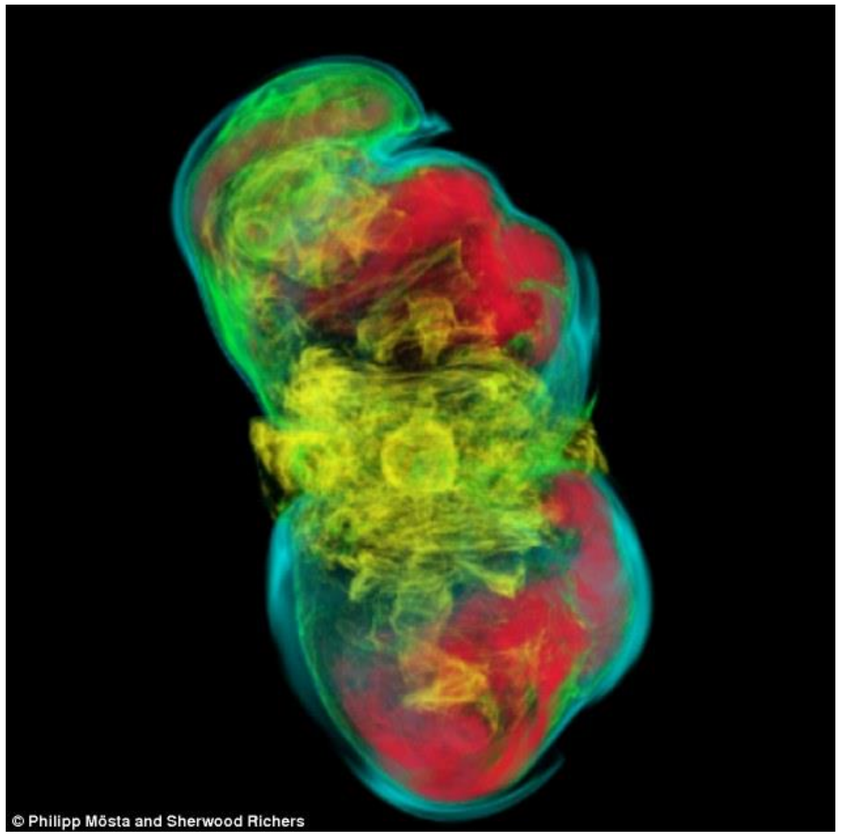
Unjustified 3D!

Lie factor!

http://stats.stackexchange.com/questions/109076/what-is-your-favorite-statistical-graph/109080

“No Unjustified 3D”





“The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data.”

“No Unjustified 3D”

This is not just a design principle, it has lots of experimental and quantitative data to back it up!

“The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data.”

Upcoming Assignments & Communication

https://northeastern.instructure.com/courses/63405/assignments/syllabus

Look at the upcoming assignments and deadlines regularly!

- Textbook, Readings, & Reading Quizzes — Variable days
- In-Class Activities — 11:59pm same day as class
  - Next F: Lecture & in-class activity on D3 (1/2)
  - Next-Next T: Lecture & in-class activity on D3 (2/2)
- Assignments & Projects— Generally due R 11:59pm
  - This R (6 days): Assignments 3a, 3b due
  - Next R (13 days): Project 1 (pitches) due
  - Next-next R (20 days): Project 2 (proposals) due
- Project Overview

Everyday Required Supplies:

- 5+ colors of pen/pencil
- White paper
- Laptop and charger

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!