Choosing the Right Visualization Design

Today

- **Crayon Exercise & Discussion**
  - Drawing for Communication
- Today’s Reading: "Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message"
- Spark Lines
- Discussion of a Sampling of HW1 Images
- Reading for Tuesday
- Assignment #2
Abstract Visualization Exercise

- Pick one of the following abstract concepts:
  - “a year”
  - “what I accomplished today”
  - “an algorithm”
- Close your eyes, think about that concept. What does your mental visualization look like?
- Grab some paper & markers/crayons/etc. Spend ~10 minutes drawing this mental picture. Don’t discuss or share with your neighbors... yet.
- Take a camera phone photo of your drawing, either:

  **Send by email**
  To: [email on LMS]
  Subject: “year” OR “accomplished” OR “algorithm”

  **Upload to Google Drive**
  - On your phone, go to: [url on LMS]
  - If you’re on the mobile site... need to switch to “desktop site” or “open in web” version of Google Drive.
  - Click on the folder and “Add this folder” to your drive.
  - Then you can go back to the mobile/app version of Google Drive and add the image to the “1/29/16 Abstract Visualization” folder.

“a year”

Bruno  Austin  Noah

Katie  Michael  Isabella
“what I accomplished today”

John

Robert

Osvaldo

“an algorithm”

Peter

Lucas

Sensen
Abstract Data & Spatial Layout

• Some mental pictures are similar, some are quite different
• What previous experience created your mental picture?
• Takeaway: When visualizing abstract data
  – One layout may be very strong & clear for you...
  – Ask other people, learn the more frequent layouts, and respect the variety of different experiences

Drawing for Communication

http://arterior-motives.blogspot.com/

http://idcminnovations.com/facilitation/facilitation-services
Drawing for Communication

http://www.visualcoaches.com/training/fundamentals/

Drawing for Communication

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<table>
<thead>
<tr>
<th>Type/Description</th>
<th>Encoding Methods</th>
<th>Example</th>
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<tbody>
<tr>
<td>Nominal Comparison</td>
<td>Bars only (horizontal or vertical)</td>
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<td>A simple comparison of</td>
<td>Lines to emphasize overall pattern</td>
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<td>the categorical</td>
<td>Bars to emphasize individual values</td>
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<td>subdivisions of one</td>
<td>Points connected by lines to slightly emphasize individual values while still</td>
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<td>or more measures in no</td>
<td>highlighting the overall pattern</td>
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<td>particular order</td>
<td>Always place time on the horizontal axis</td>
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<td>Time Series</td>
<td>Multiple instances of one or more measures taken at equidistant points in time</td>
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<td>Ranking</td>
<td>Bars only (horizontal or vertical)</td>
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<td>Categorical subdivisions</td>
<td>To highlight high values, sort in descending order</td>
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<td>of a measure ordered by</td>
<td>To highlight low values, sort in ascending order</td>
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<td>or ascending)</td>
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<td>Part-to-Whole</td>
<td>Bars only (horizontal or vertical)</td>
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<td>Measures of individual</td>
<td>Use stacked bars only when you must display measures of the whole as well as the</td>
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<tr>
<td>categorical subdivisions</td>
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<td>as ratios to the whole</td>
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</table>

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004
Nice reference for basic visualizations & terms
- Quantitative vs. Qualitative, more than just values, how best to display those values
- Dots vs. lines vs. bars & impact the meaning
  - Similar to gestalt principles (shape, structure, etc.)
  - “Two graphs might convey exactly the same information, but one be ineffective if the graph type is wrong, can send a different message by simply changing the graph type”
- Familiar, intuitive, common sense suggestions
  - Ok for simple data
  - Inefficient use of space (bigger datasets will require much more complex visuals)
  - “Good” examples were obvious, including “bad” examples might have been more educational?
  - Could have included even more diagrams
- Location & line length most effective visually (human perception?)
  - Pie charts are bad because they use color & size (less effective visually)
- What is the origin of these rules (time must be x-axis)?
  Is this a convention? Or is it an aesthetic choice?
About the writing

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

- Provided table is very helpful/immediately useable
  - Good for business data – all graphs you can make in Excel
  - Mastering this “how to & why” information is important for scientists writing reports & research papers
  - “For this message/purpose, use this graph” (rather than the other way around)
  - “Cheat sheet” of 7 types was good, but little prose description of this information
- Article was narrow in focus
- Overall flow of article was good
  - easy to read (unlike some of those SIGGRAPH papers from ACG)
- Lacking references (except to author’s prior work)
- Fig 2. Interval scales example was confusing
  - Bug in figure?
  - Is itself an example of a misleading, poorly explained figure/caption
  - Data is not altered, just organized differently, differently organized is not misinformation, just conveying different meanings, may or may not be useful

Want even more...

"Eenie, Meenie, Minie, Moe: Selecting the Right Graph for Your Message", Stephen Few, Intelligent Enterprise, 2004

- What about data with >= 2 categories of data?
- What about color? Too important to leave out!
- What about interactivity?
  - “Article is dated. We spend so much of our life in front of screens now, static information is under-utilization of this interface.”
- What about more complex data sets?
- 7 categories... too limited
  - What about creativity? These “rules” are an ok place to start, but sometimes breaking a rule can lead to a very powerful visualization
  - Focuses on scientific data (natural spatial coordinate system), not on abstract information visualization.
What I learned in 7th grade Science Fair: Presenting Scientific Results

Why are the bars sorted in this order?

Why are neighboring data points linked?

Same plant over time (10 days)

10 different plants

These 4 data sets while quite different. Coincidentally all have the same mean, variance, correlation, and regression.

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Spark Lines – intense word size graphics

- Typical Data = word & number
  + Over time!
  + Quantified
    (last measurement)
  + Range of what’s normal

- High resolution
- Integrated with prose
- Multiple spark lines compared to each other

Win/Loss over sports season

http://www.edwardtufte.com/bboard/q-and-a-fetch-msg?msg_id=0001OR&topic_id=1
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Silver Linings Playbook

“Silver Linings Playbook" follows the standard model for trailers, according to Bill Woolery, a trailer specialist in Los Angeles who once worked on trailers for movies like "The Usual Suspects" and "E.T. the Extra-Terrestrial." While introducing the movie's story and its characters, the trailer largely follows the order of the film itself.


https://shannon-lattin.squarespace.com/how-many-guide/
Text Bubbles by Max Einstein

The Cat in the Hat

Brown v. Board of Education

http://datalooksdope.com/text_bubbles

http://i.imgur.com/OjmSWka.jpg
/u/etherealpenguin. “WALL-E.”

http://uwmcooltools.blogspot.com/2011/01/wordle.html
Bhatele "There goes the neighborhood: Performance degradation due to nearby jobs" 2013.

http://www.employmentmetrix.com/.a/6a00e552bc80e98833019aff0d3804970b-800wi
CALLINGS
Proportion of respondents who attribute “very great prestige” to the following professions:

- (57%) Firefighter
- (56%) Scientist
- (53%) Doctor
- (52%) Nurse
- (52%) Teacher
- (46%) Military Officer
- (40%) Clergy
- (28%) Congressman
- (24%) Lawyer
- (20%) Athlete
- (18%) Journalist
- (16%) Actor

http://www.nytimes.com/2008/09/21/magazine/21wwln-lede-t.html?_r=0

Chart by ERIK DE GRAAFF, ArtEZ Academy of Visual Arts, the Netherlands

62% said Latinos have too little influence in American politics

http://www.sandiegomagazine.com/images/2013/november/latinos/political-views-graph.gif

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Reading for Tuesday

• “Force Directed Graph Drawing” chapter by Steven Kobourov from the book Handbook of Graph Drawing and Visualization 2013

![Figure 12.11](image) Examples of force-directed Lombardi drawings: note that every edge is a circular arc and every vertex has perfect angular resolution [CCG+11].
Homework Assignment 2: Graph Visualization w/ GraphViz

due Thursday @ 11:59pm

- Download GraphViz and explore the examples
- Using your favorite programming language, write code to create a range of synthetic input files
  - a tree, a clique, a planar graph, bipartite graph, etc.
  - medium size (a “good, ~optimal” layout could be done by hand)
- Experiment with the visual options (layout, color, line style, label font, shapes, etc.)
- Create a graph (or multiple) of our social network, using the data we gathered in Lecture 1.
- Analyze the quality of the results. Note strengths & weaknesses of GraphViz.

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• Please enter you data (if you haven’t already)

Testing our Hypotheses

• What (if anything) surprised you about the data?
Adjacency Matrix Representation of Weighted Graph