Visualization Design and Redesign

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**CS 448B: Visualization**
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**Reading Response Questions/Thoughts**

When can data visualizations be the wrong solution? (When should we opt for text over a graphic?)

How have data viz design principles changed over time, and why, especially as it seems like accessibility is more highly prioritized today? (e.g. Minard’s chart is very info-dense, vs. simpler charts seen more often on outlets today)

What are some safeguards to reduce / prevent misleading visualizations, and / or ensure that a visualization is unbiased (or as Tufte says, “fail to tell the truth”)?
A2: Exploratory Data Analysis

Use Tableau or Vega-Lite to formulate & answer questions

First steps
- Step 1: Pick domain & data
- Step 2: Pose questions
- Step 3: Profile data
- Iterate as needed

Create visualizations
- See different views of data
- Refine questions

Author a report
- Screenshots of most insightful views (8+)
- Include titles and captions for each view

Due before class on Oct 11, 2021
A1 Review

Design Considerations

Guides: Title, labels, legend, captions, source!

Expressiveness and Effectiveness
- Express the facts and only the facts
- Avoid unexpressive marks (lines? gradients?)
- Use perceptually effective encodings that match data type
- Don’t distract: faint gridlines, pastel highlights/fills
- The “elimination diet” approach – start minimal

Support comparison and pattern perception
- Between elements, to a reference line, or to counts
- Use reader-friendly units and labels
Design Considerations

**Group / sort data** by meaningful dimensions

**Transform data** (e.g., filter, log, normalize)
Are model choices (regression lines) appropriate?

**Reduce cognitive overhead**
Minimize visual search, minimize ambiguity
Appropriate size, aspect ratio, legible text
Avoid legend lookups if direct labeling works
Avoid color mappings with indiscernible colors

**Be consistent!** Visual inferences should consistently support data inferences

Line Charts
Which of the Top 10 Majors at Stanford have seen the biggest change in student share?

CS sees greatest rise, Human Bio sees greatest drop

How Have the Number of Students in the Top Stanford Bachelor of Science (BS) and Bachelor of Arts (BA) Majors Changed From 2011-2019?
Bar Charts
How has the representation of the Schools of **Engineering** vs. **Humanities & Sciences** in the Top 10 Stanford Majors Changed Over Time?

![Chart showing the percentage of students in Engineering vs. Humanities & Sciences from 2011-2018/19.](chart-image)

Number of Students Enrolled in the Top 10 Majors at Stanford from 2011-2019

![Bar chart showing the number of students enrolled in each major from 2011-2012 to 2018-2019.](chart-image)
Stacked Area Charts

How Has Enrollment at Stanford Changed Over the Years in the Humanities, Sciences, and Engineering?
Other Chart Types
How Did the 'Fuzzy vs Techie' Major Composition Change Over the Last Decade?

- If the Stanford graduates were a village of ten people in the year of...

2012
2014
2016
2018

Bachelor of Arts only
School of Engineering
School of humanities & Sciences
Major: Computer Science
Major: Other

Changing Relative Popularity of Subjects from Graduating Class of 2012 to 2019

Subject

Computer Science
Mechanical Engineering
Management Science and Engineering
Science, Technology, and Society
Political Science
Economics
Biology
International Relations
Psychology
Human Biology

Percentage of Graduating Classes

change direction:
→ decrease
← increase