Statistical Graphics and Visualization:

Course Learning Objectives and Rubrics

Jerzy Wieczorek
stat.cmu.edu/~jwieczor/

Department of Statistics
Carnegie Mellon University

Learning Objectives

- Explore **raw data** visually and assess **statistical models'** fit using graphical diagnostics
- **Critique and redesign** statistical graphics based on the principles below
- Produce **legible**, self-contained, informative graphics using statistical software
- Plan effective statistical graphics using the principles of human **visual perception**
- Model statistical graphics according to the **Grammar of Graphics** principles
- Design multi-chart static works (conference posters, infographics) using the principles of **graphic design**
- Generate interactive data visualizations following the principles of **interaction design**
- Synthesize the data visualization **research** literature to justify recommendations for graphical practice

Audience

- Graduate students in Statistics, in CMU's **Master's of Statistical Practice** program (primarily R users)
- Other students taking course as elective: engineers, marketers, statistics undergrads (mix of software backgrounds)

Teaching Approach

- **Active learning**: think-pair-share critiques, perceptual experiments, follow-along demos

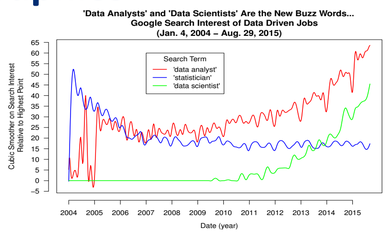
Rubrics and Assessment

- Instead of awarding points, I use **specifications-based grading**, a system designed to give students **control** over their final course grades and **transparency** about their progress.
- Each assignment targets one or two Learning Objectives. Every assignment is **graded on a rubric**, with detailed sub-categories evaluated on levels from Not Yet Competent to Competent to Sophisticated. Each rubric is **software-agnostic**, allowing students to use whatever tool is best for the task.
- To earn a high course grade, students must demonstrate **competence or mastery** on most Learning Objectives. Students unsatisfied with their initial submissions may **revise and resubmit** any assignment.

HWs: targeted practice

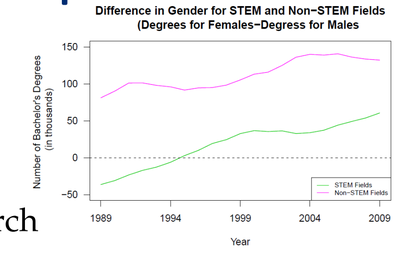
HW1: Legible Graphics

- Legible
- Comprehensible
- Informative
- Reproducible



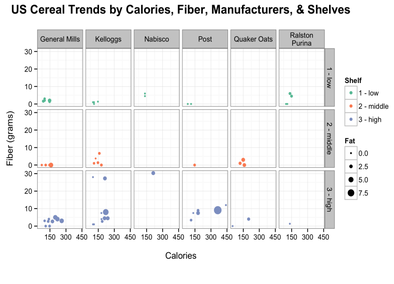
HW2: Visual Perception

- Consistency
- Cognition
- Quantitative Comparisons
- Grouping and Search



HW3: Grammar of Graphics

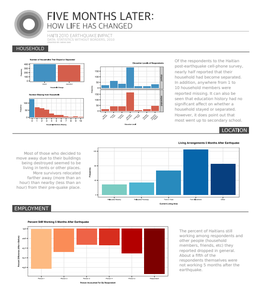
- Description
- Creation



Projects: portfolio fodder

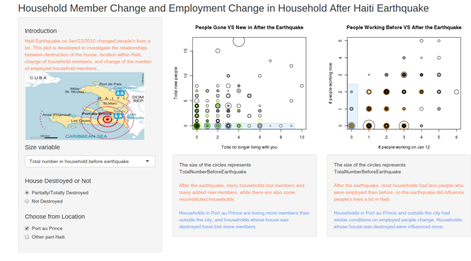
P1: Graphic Design

- Message
- Graphs
- Color & Font
- Layout



P2: Interaction Design

- Message
- Consistency
- Constraints
- Visibility
- Feedback



P3: Research

- Literature Review
- Guidelines
- Application