05 Graphic Design

36-721 Statistical Graphics and Visualization

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Last time

- Grammar of Graphics overview
- Tableau and `ggplot` examples
- In-class feedback survey
- HW 2

In-class feedback survey

Thank you!

Changes I can make:

- ▶ Report common HW problems, clearer grading feedback
- ▶ Practice exercises to do at home
- ▶ Slides posted earlier, as PDFs
- ▶ Speak louder

Dissent between surveys:

- ▶ More vs. less class time on R code, examples, exercises
- ▶ More vs. less class discussion and interaction

Today

- Designing multi-part static graphics (infographics, conference posters, etc.)
- Graphic Design elements: text, graphics, color, typography, layout
- Graphic Design principles: contrast, repetition, alignment, proximity
- Page layout and graph editing in Inkscape

Today

Follow along:

- PDFs of graphs in `05_GraphicDesign_STEM.pdf`, `05_GraphicDesign_NonSTEM.pdf`, `05_GraphicDesign_Biz.pdf`
- Output example in `05_GraphicDesign_Layout.svg`

(I made the back-to-back bar charts as in this Learning R tutorial)

Examples of multi-part static graphics

- Hannah Fairfield, **Driving Shifts Into Reverse**
- Scientific American on **Nobel prizes** and on **US health**
- Dorothy Gambrell, **Missed Connections**
- xkcd, **Dominant Players**
- Alberto Cairo's **students' projects**

They contain:

- Headings and body text
- Richly informative, complementary graphs
  (not just **data decoration**)
- Annotations: interesting features; how to read the graph;
  data sources

Graphic Design elements

- Message
- Text: headings vs. body
- Images, symbols, graphs
- Color
- Typography
- Layout

Text

Headings should structure your work. Make them short, informative, and stand out for the reader's first glance.

Body text should be readable, but smaller than headings so it doesn't overwhelm.

Headings and body should be set in contrasting types and sizes, to make their different roles clear.

Graphics

For us, as statisticians. . .

- Graphics should support your message and inform the viewer, **not just draw attention**
- Choose a graph that tells the story clearly, not just a default choice (e.g. having spatial or temporal data doesn't always call for a map or timeline)

"Charts shouldn't be about making the story more eye-catching, but about communicating more efficiently—meaning, showing a pattern in the data that would be too laborious to describe in prose."
—**Mike Bostock**

Color

Use a limited palette to support your structure and subject matter.

Check that they show up well on your final display:
paper? projector? variety of browsers and devices?

Again, **Color Brewer** is helpful

Typography

Typeface categories:

AaBbCc — Sans serif font

AaBbCc — Serif font

AaBbCc — Serif font with serifs highlighted in red

- ▶ Bold sans-serifs: good for headings
- ▶ Readable serifs: good for body text
- ▶ Script or decorative: best for careful limited use

Typography

Limit yourself to a few contrasting fonts
(typeface size, weight, and style combinations)

Ways to contrast with typography:

- ► Size
- ► Weight (regular vs. bold)
- ► Structure, category, form
- ► Direction
- ► Color

Layout

Grids are helpful. To avoid "dull" symmetry and add contrast, try:

- **Rule of thirds**
- **Golden section**

What grid layouts are common for these formats?

- Book
- Magazine
- Conference poster

Layout

Negative space or white space: don't fear it :)

Use it to reduce clutter and guide the viewer's eye

If things don't look great, try removing elements, not adding them

Graphic Design principles

- Contrast
- Repetition
- Alignment
- Proximity

Principles and examples below are from Robin Williams,
The Non-Designer's Design Book
(the whole book is a short, excellent read!)

Proximity

Sally's Psychic Services
Providing psychic support in Santa Fe
Contact lost loved ones, including pets. Get help
with important decisions. Find clarity in a
fog of unknowns.
Special rate for locals
sally@santafepsychic.com
santafepsychic.com
Phone consultations available 555-0978

This postcard is visually boring—nothing pulls your eyes in to the
body copy to take a look, except perhaps the two hearts. But just
as importantly, it takes a moment to find the critical information.

Sally's Psychic Services
Providing psychic support in Santa Fe

Contact lost loved ones, including pets.
Get help with important decisions.
Find clarity in a fog of unknowns.

Sally@SantaFePsychic.com
SantaFePsychic.com

Special rate for locals!
PHONE CONSULTATION 555.0978

Proximity

Group related items together.

Proximity organizes related elements into coherent units.

Relate captions and headings with their graphics or text.

Use empty space to your advantage, as structure.

Alignment

6 Steps to Pie as Art

1. Preparation for creating
2. Building the pie
3. Beautifying the pie as art
4. Cooking to perfection
5. Presenting your creation
6. Eating pie art with joy

There is a nice, strong, invisible line along the left edge of the type, and there is a nice strong line along the left edge of the image. Between the text and the image, however, there is "trapped" white (empty) space, and the white space is an awkward shape, which you can see with the green dotted line. When white space is trapped, it pushes the two elements apart.

Six Steps to Pie as Art

1. Preparation for creating
2. Building the pie
3. Beautifying the pie as art
4. Cooking to perfection
5. Presenting your creation
6. Eating pie art with friends

typeface
Transat Text Standard

Alignment

Ambrosia Sidney   (505) 555-1212

Sock and Buskin

109 Friday Street   Penshurst, NM

The elements on this card look like they were just thrown on and stuck. Not one of the elements has any connection with any other element on the card.

Ambrosia Sidney   (505) 555-1212

Sock and Buskin

109 Friday Street   Penshurst, NM

Get in the habit of drawing lines between elements to determine where the connections are lacking.

Take a moment to decide which of the items above should be grouped into closer proximity, and which should be separated.

Sock and Buskin
Ambrosia Sidney

109 Friday Street
Penshurst, NM
(505) 555-1212

By moving all the elements over to the right and giving them one alignment, the information is instantly more organized. (Of course, grouping the related elements into closer proximity is also critical.)

The text items now have a common boundary; this boundary connects the elements.

Alignment

Nothing should be placed on the page arbitrarily. Every item should have a visual connection with something else on the page.

Alignment creates unity and organizes the page.

Distant elements can still appear related if aligned to a bold line.

Centered text looks formal and sedate;
left-aligned or right-aligned is bolder and often works better.

Repetition

PIE JUST WANTS TO BE SHARED

WORKSHOPS *for* PIE ARTISTS

SLAB PIES

When you have a large group for sharing,
consider a slab pie.
With a higher proportion of crust to filling
and easy slicing into squares, your crowd will love it.

JAR PIES

Make sweet pies in small wide-mouth jars,
top them with a lid and a ribbon,
and share the pie joy.

POP-TART PIES

Make a batch of pop-tart pies and freeze them.
Pop them into the toaster
when someone drops by for tea.

MERMAID TAVERN PIE SHOP SANTA FE

typefaces
Transat Text Medium
Brioso Pro Regular and *Italic*
Heart Doodles ♥

Repetition

Repeat some aspect of the design throughout the entire piece.

Repetition creates unity and consistency as well as interest.

Find existing repetitions and strengthen them. . .
but not so far they overwhelm.

Contrast

This is nice and neat, but there is not much that attracts your eyes to it. If eyes are not attracted to a piece, few will read it.

Can you feel how your eyes are drawn to this page, rather than to the previous page?

Contrast

Contrast various elements of the piece to draw a reader's eye into the page.

Contrast creates interest and organizes information.

Make contrast dramatic! Small contrast leaves readers guessing.

Contrast your typefaces, colors, line thicknesses, use of space, etc.

Graphic design in practice

First, find your story or message.
Choose the right graphic forms to support it.

Next, sketch layout ideas on paper: set structure before style.
Rough sketching is OK: squiggles for text, X-ed out boxes for images. Try many variations.

Then, choose a visual style: types, colors, non-chart images, etc.

Last, try out on computer.
See **sketch examples** from Alberto Cairo's students.

Practice: sketching

On Blackboard are three PDF graphs I made for the
degrees-by-field-and-gender dataset:

- ▶ 05_GraphicDesign_STEM.pdf
- ▶ 05_GraphicDesign_NonSTEM.pdf
- ▶ 05_GraphicDesign_Biz.pdf

Sketch at least two different layout ideas.
How could you use contrast, repetition, alignment, proximity?

Practice: Inkscape

Inkscape is free and open source software for editing vector graphics and laying out single-page documents.

Industry standard **Adobe Illustrator** is available on CMU campus clusters, but expensive otherwise.

Also useful: **Photoshop** and **GIMP** for editing raster graphics (including photos), or **InDesign** and **Scribus** for complex, multi-page layouts.

Practice: layout in Inkscape

- *File > Document Properties* to choose size
- *View > Grid* to see a grid (and snap elements to it)
- *View > Snap* to toggle snap-to-grid behavior
- Drag from rulers on left and top to create guides for your layout
- Add background boxes or rules (lines) for headings
- *File > Import* to add my PDF graphs from R

Practice: editing graphs and text in Inkscape

- : *S key* for selector tool to move elements, align graphs
- : *T key* for text tool to create and edit text boxes; click and drag before releasing to create a box with text wrap
- : *D key* for dropper tool to select color from on-screen
- *Text > Remove Manual Kerns* on selected textbox if edited text looks smushed together
- Add direct labels, change text colors, delete legends
- Fix negative numbers, add spaces in degree names
- Edit subplots' title text (STEM and Non-STEM), delete Business title text
- Add overall title, subtitle, body text, credits, data sources

Resources

- Cairo textbook DVD
- Robin Williams, **The Non-Designer's Design Book**
- **Lynda.com** online tutorials (design principles, Adobe Illustrator, etc.)—free access through CMU
- **Inkscape tutorials**
- Ian Mitchell, **"Authority or Cliche?"**:
  article on graphic vs. information design

For next time

- We'll learn basic concepts of Interaction Design, how to apply them to your visualizations, and how to implement them in Shiny and D3.js
- Install **Shiny** R package and download **D3.js** if you want to follow along
- Readings: Cairo Ch 9
- HW 3 (Grammar of Graphics) due Saturday at 5pm, through Blackboard