Graphical Perception

The ability of viewers to interpret visual (graphical) encodings of information and thereby decode information in graphs.
Topics

Monday:
Magnitude Estimation
Using Multiple Visual Encodings
Pre-Attentive Processing
Signal Detection

Today:
Gestalt Grouping
Change Blindness

Final Project Discussion
Gestalt Grouping
Gestalt Principles

Figure/Ground
Proximity
Similarity
Symmetry
Connectedness
Continuity
Closure
Common Fate
Transparency
Figure/Ground

- Ambiguous
- Principle of surroundedness
- Principle of relative size

http://www.aber.ac.uk/media/Modules/MC10220/visper07.html
Figure/Ground

Ambiguous

Unambiguous (?)

http://www.aber.ac.uk/media/Modules/MC10220/visper07.html
Proximity

[Ware ’00]
Similarity

Rows dominate due to similarity [from Ware ’04]
Symmetry

Bilateral symmetry gives strong sense of figure [from Ware ’04]
Connectedness

Connectedness overrules proximity, size, color shape [from Ware ‘04]
Continuity

We prefer smooth not abrupt changes [from Ware ‘04]

Connections are clearer with smooth contours [from Ware ‘04]
Continuity: Vector Fields

a.
Continuity: Vector Fields

Prefer field that shows smooth continuous contours [from Ware ’04]
Closure

We see a circle behind a rectangle, not a broken circle [from Ware ’04]

Illusory contours [from Durand ’02]
Common Fate

Dots moving together are grouped
Transparency

Requires continuity and proper color correspondence [from Ware ‘04]
Change Blindness
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Change Blindness
Change Blindness

[Example from Palmer 99, originally due to Rock]
Summary

Choosing effective visual encodings requires knowledge of visual perception.

Visual features/attributes
Individual attributes often pre-attentive
Multiple attributes may be separable or integral

Gestalt principles provide high-level guidelines

We don’t always see everything that is there!
Administrivia
A3: Ethical & Deceptive Visualization

Use visualizations to communicate and influence insights.
Design both an ethical and deceptive visualization.

**Ethical Visualization:** honestly and transparently communicate the data with an effective and expressive visualization design that is easy to interpret for viewers.

**Deceptive Visualization:** intentionally influence viewer's perception to mislead their insights, without revealing it's role as the deceptive design.

Due by **11:59 pm PST, next Monday February 8**
A3: Ethical & Deceptive Visualization

**Deliverables** (upload via Canvas; see A3 page)
- Image of your visualization (PNG or JPG format)
- Image file names **should not give away which design is which**
- Write-up including a short description + design rationale

Due by **11:59 pm PST, next Monday February 8th**

**Assignment A3b: Peer Evaluation** (see course website)
- Provide constructive feedback on **four peer designs**
- Guess which visualization designs are deceptive and ethical
- Due by 11:59pm PST, Monday February 15th
A3: Ethical & Deceptive Visualization

Must use the same dataset, but can ask different questions

Both visualizations should emphasize communication

Ethical visualization should be a clear, thoughtful design that is both effective and expressive, demonstrating course principles

Deceptive design should not be incorrect or illegible, but rather subtly misleading. It should not be obviously deceptive!

Image file names should not give away which design is which

Due by 11:59 pm PST, next Monday February 8th

Please submit on time! Assignments submitted late will not receive any peer evaluations (which are due Monday 2/15).
Final Project
Final Project

Produce **narrative web-based visualizations**

Initial **prototype** and **design review**

**Final deliverables** and **video presentation**

Submit and **publish online** (GitHub)

Projects from previous classes (442, 512) have been:
- Published as research papers
- Shared widely (some in the New York Times!)
- Released as successful open source projects
Final Project Theme

Data Visualization for Social Good

Goal: find data of social or scientific import, design visualizations to explore or communicate it effectively.

The specific data domain is open-ended. Possibilities include transportation, housing, public health, education, climate, campaign finance, scientific research, and so on…

You must identify a target audience. May be general (residents, voters) or specialized (scientists, policy makers).
Inspiration...
Professional, Scientific and Technical Services
Transportation and Warehousing
Other Services (Except Public Administration)
Retail Trade
Construction
Health Care & Social Assistance
Arts, Entertainment, & Recreation
Accommodation & Food Services
Administrative & Support & Waste
Wholesale Trade
Manufacturing
Real Estate, Rental & Leasing
Information
Educational Services
Finance and Insurance
Public Administration
Management of Companies and Enterprises
Agriculture, Forestry, Fishing and Hunting
Utilities
Mining
Unclassified

Change In Times (CSE 442, Spring '17)
Gunnar Olson, Halden Lin, Lilian Liang, and Shobhit Hathi
Locations of each train on the red, blue, and orange lines at 5:46 am. Hover over the diagram to the right to display trains at a different time.

Trains are on the right side of the track relative to the direction they are moving.

See the morning rush-hour, midday lull, afternoon rush-hour, and the evening lull.

Service starts at 5AM on Monday morning. Each line represents the path of one train. Time continues downward, so steeper lines indicate slower trains.

Since the red line splits, we show the Ashmont branch first then the Braintree branch. Trains on the Braintree branch "jump over" the Ashmont branch.

Train frequency increases around 6:30AM as morning rush hour begins.
Visualizing Galaxy Merger Trees

S. Loebman, J. Ortiz, L. Orr, M. Balazinska, T. Quinn et al. [SIGMOD '14]
Inspiration from the News

The Rise in Testing Is Not Driving the Rise in U.S. Virus Cases

By Matthew Conlon July 22, 2020

New York Times

Emissions of Websites

<table>
<thead>
<tr>
<th>Website Description</th>
<th>Emissions (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parametric Press (you are here)</td>
<td>51 mg</td>
</tr>
<tr>
<td>Google (search result)</td>
<td>10 mg</td>
</tr>
<tr>
<td>The New York Times (interactive article)</td>
<td>60 mg</td>
</tr>
<tr>
<td>Amazon (product page)</td>
<td>64 mg</td>
</tr>
<tr>
<td>Facebook (newsfeed)</td>
<td>188 mg</td>
</tr>
</tbody>
</table>

† A minute scrolling through Facebook is equivalent to driving a car 0.67 kilometers

Each bar represents the carbon emitted when scrolling through a website for 60 seconds. Car distance equivalent is calculated using the fuel economy of an average car. Click each bar to show a preview clip of the scroll.

SOURCE: Aisan et al. 2017 [2], EPA

Parametric Press
**Final Project Schedule**

- **Proposal**: Fri Feb 12 (next Friday!)
- **Milestone**: Fri Feb 26
- **Demo Video**: Wed Mar 10
- **Video Showcase**: Fri Mar 12 (in class)
- **Deliverables**: Mon Mar 15

**Logistics**

- Final project description posted online ([link](#))
- Work in groups of up to 5 people
- Start determining your project topic!
Final Project Poll
Final Project Team Selection (Ed)

https://edstem.org/us/courses/3116/discussion/203211

Post your project ideas and interests on Ed, or respond to classmates about their projects

Mark thread as resolved when you are no longer looking for additional members
Final Project Proposal

Form: https://forms.gle/7cMNTvSvdqt9VHjx6

**Project Name** - short name for GitHub
e.g., food-deserts or solar-panel-manufacturing

**Abstract** - describing goals and motivation

**Team members** - UW email, GitHub username

Due by **11:59 pm PST, next Friday Feb 12th**
Final Project GitHub Repository

Repositories will be created by course staff based on the final project proposal form.

Please accept the GitHub invite as soon as you receive it; invites will expire.

Repositories will be initialized with recommended project structure and initial webpage.

Section on **Thur. Feb 18th** will cover topics around HTML/CSS/GitHub. Come prepared with questions!
Tips for a Successful Project

Focus on a compelling real-world problem. How will you gauge success?

Consider multiple design alternatives. Prototype quickly (use Tableau, R, etc…).

Seek feedback (representative users, peers, …). Even informal usage can provide insights.

Choose appropriate team roles.

Start early (and read the suggested paper!)
Start early
Ask questions often!

https://edstem.org/us/courses/3116/discussion/

Office Hours:
Mon 2-3pm - Kevin
Tue 5-6pm - Yueqian
Wed 12:20-1:20pm - Jane
Thur 5-6pm - Kalyani
Fri 2-3pm - Sonya

By Appointment: Aayush, Naveena
Tips for Asking Questions

Include **all the information** we need to answer. Project name, link to repo, demo in Observable...

**Give context!** Describe what you've already tried and **share resources** you thought might be helpful.

If you're comfortable doing so, **share questions publicly** on Ed to help your fellow students.
Questions?