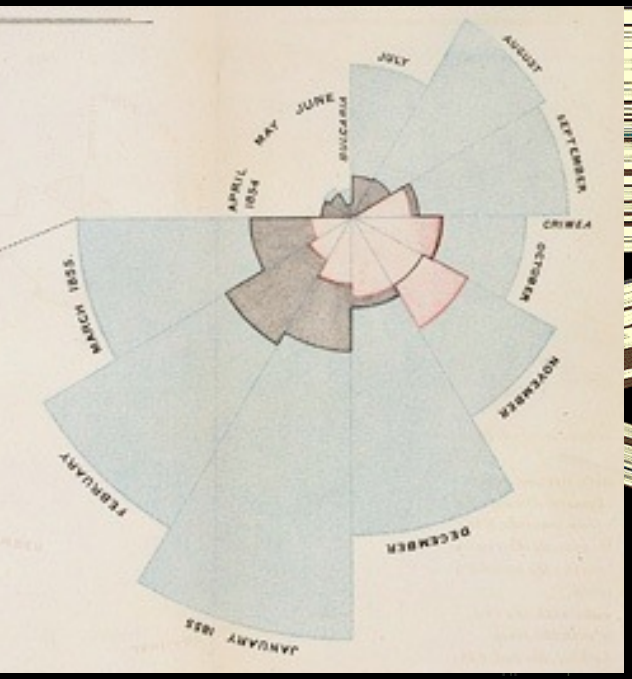
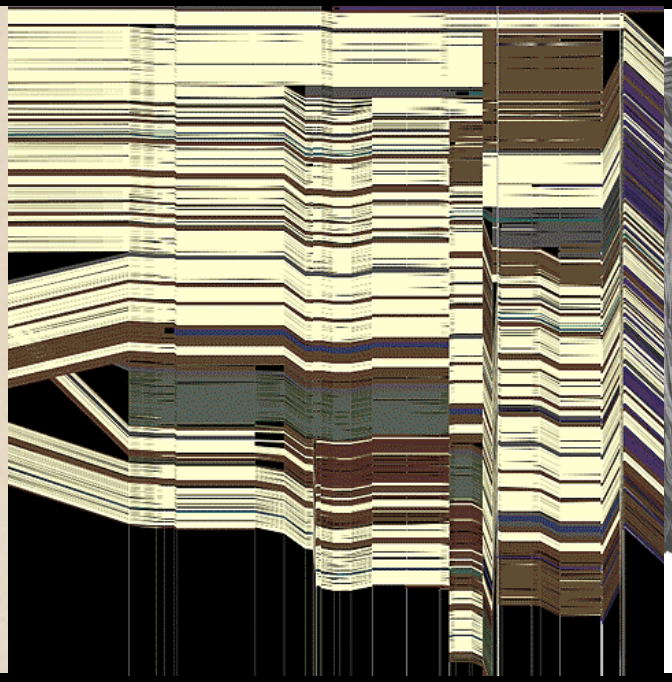
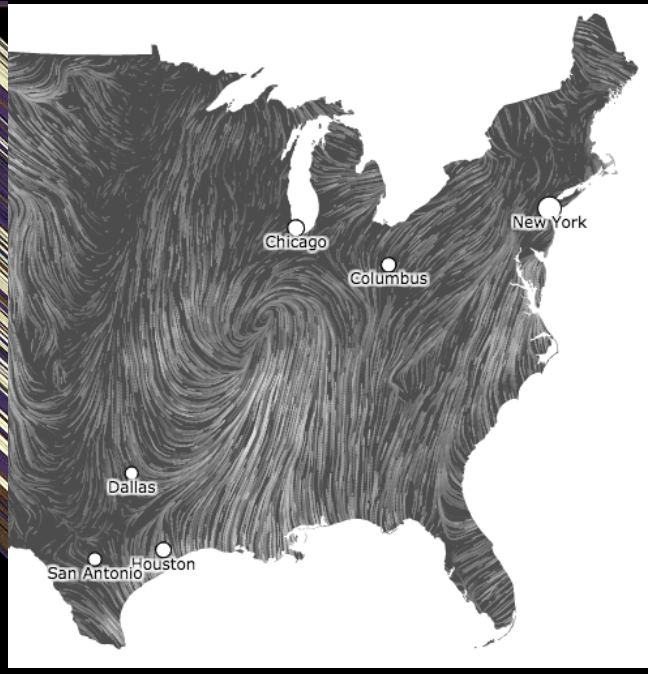
CSE 412 - Intro to Data Visualization

Graphical Perception Pt. 2







Jane Hoffswell University of Washington

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

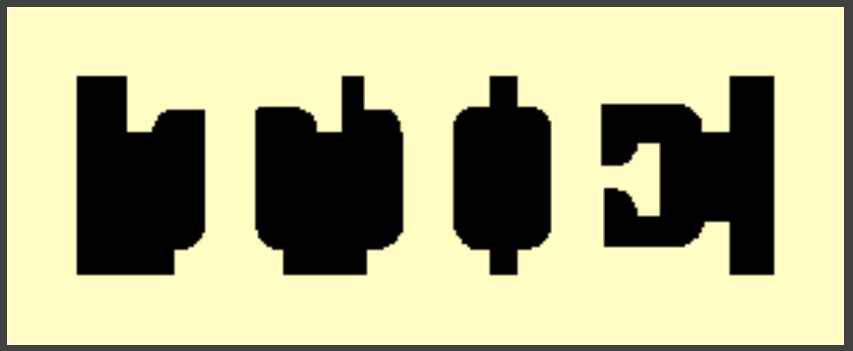
Gestalt Grouping

Gestalt Principles

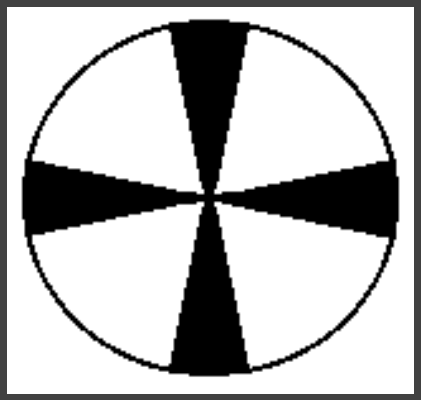
Figure/Ground
Proximity
Similarity
Symmetry
Connectedness
Continuity
Closure
Common Fate
Transparency

Figure/Ground

Ambiguous



Principle of surroundedness

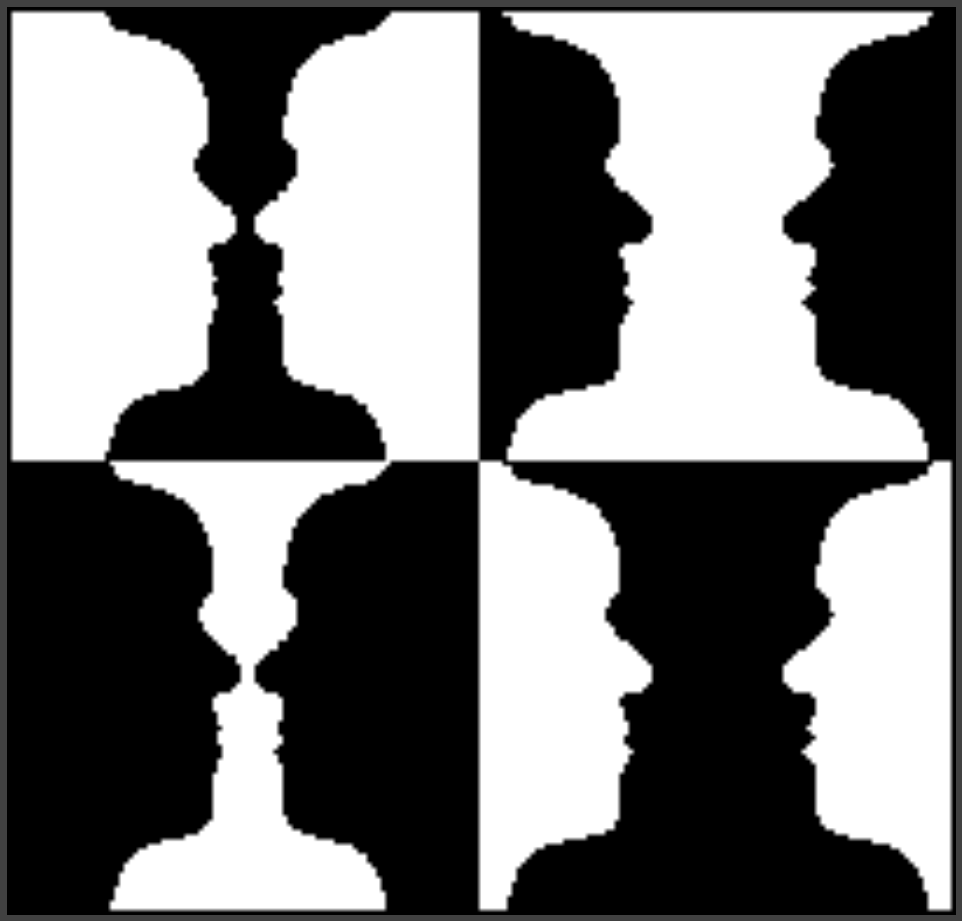


Principle of relative size

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

Figure/Ground

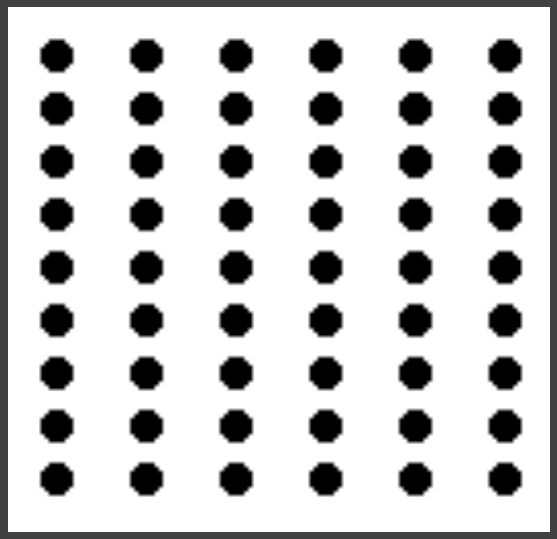
Ambiguous

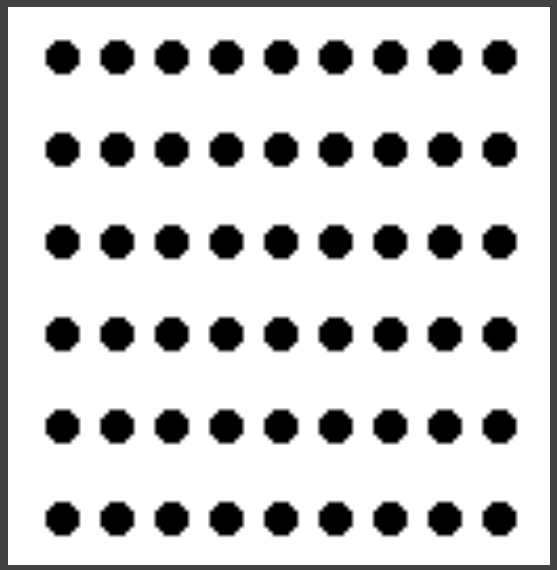


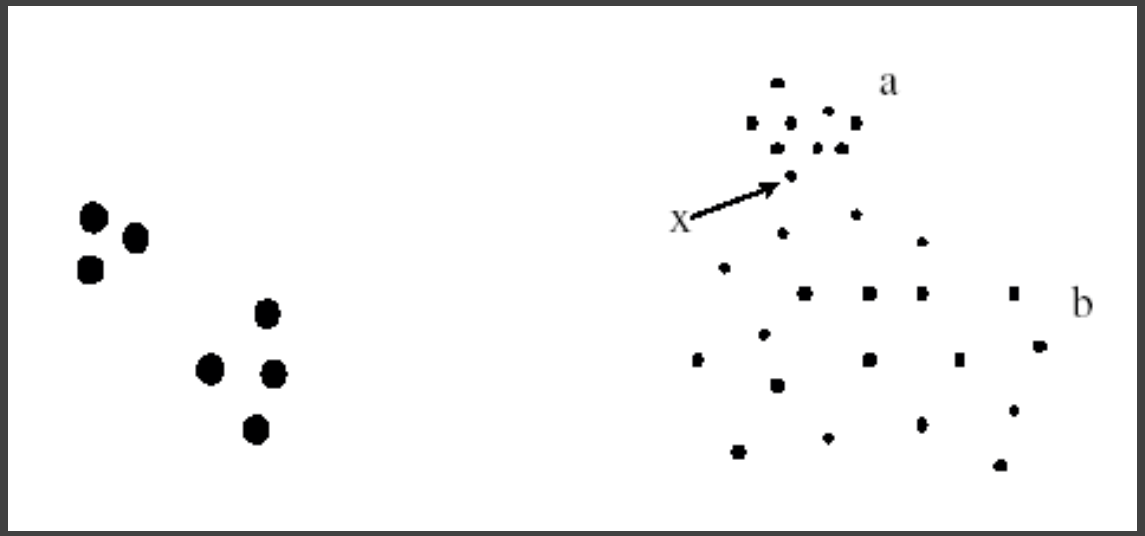
Unambiguous (?)

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

Proximity

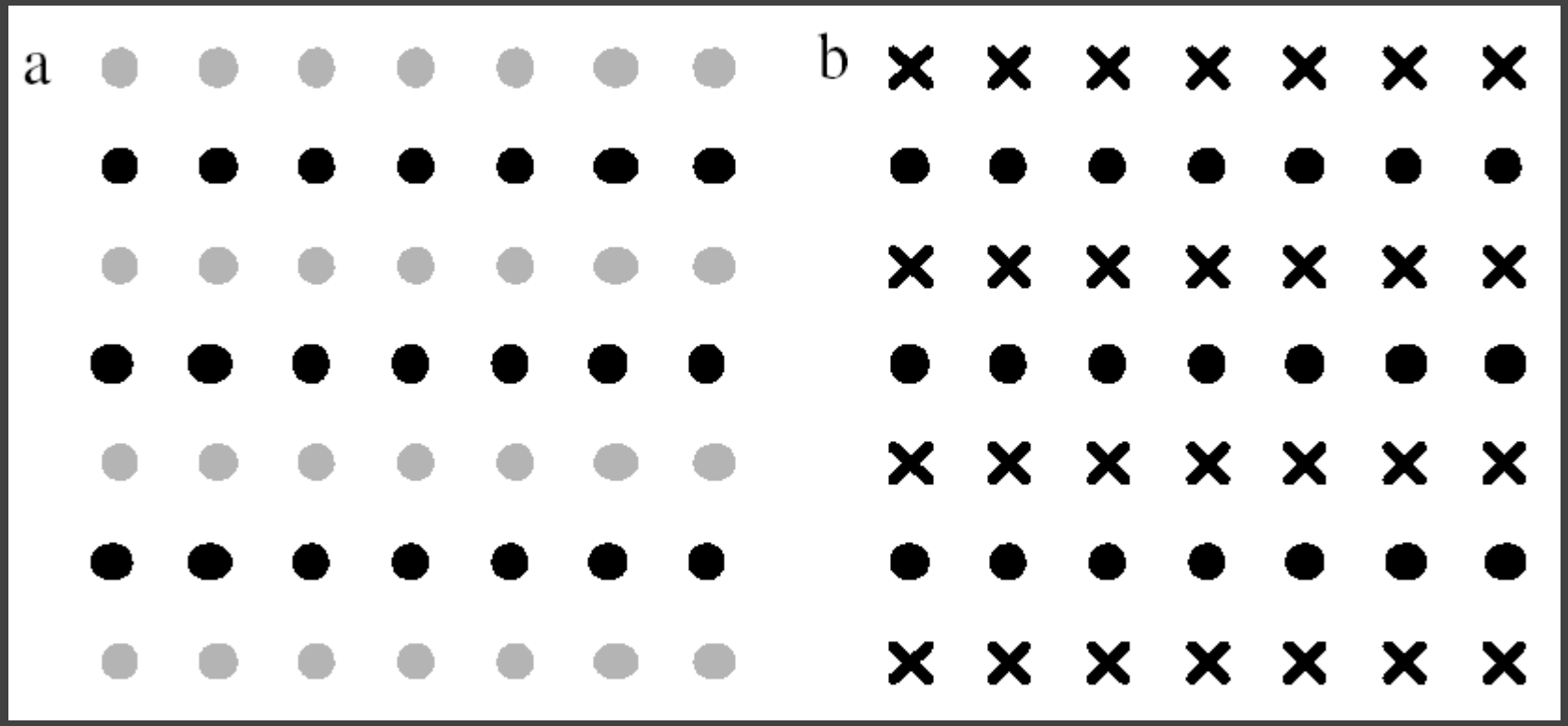






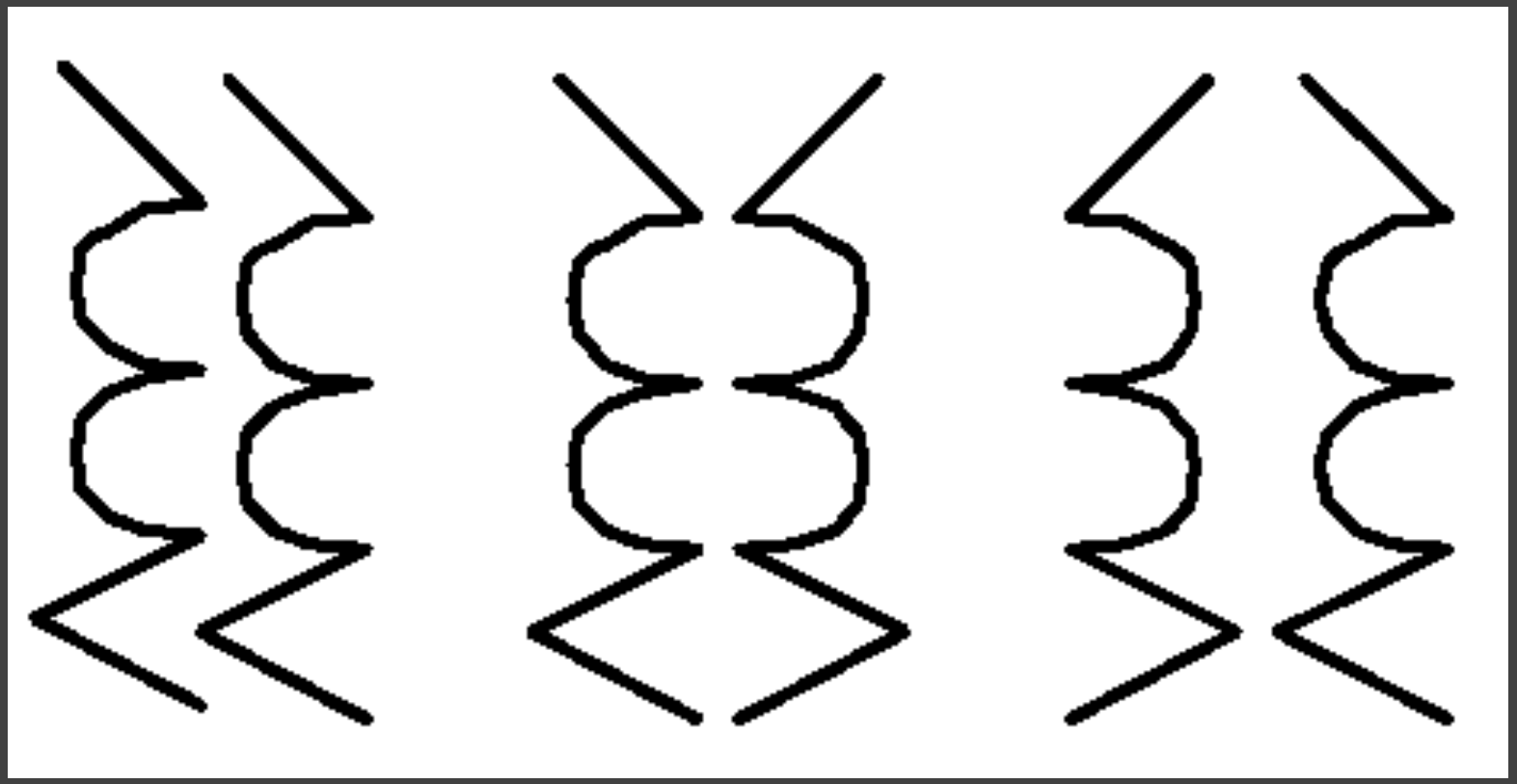
[Ware ’00]

Similarity



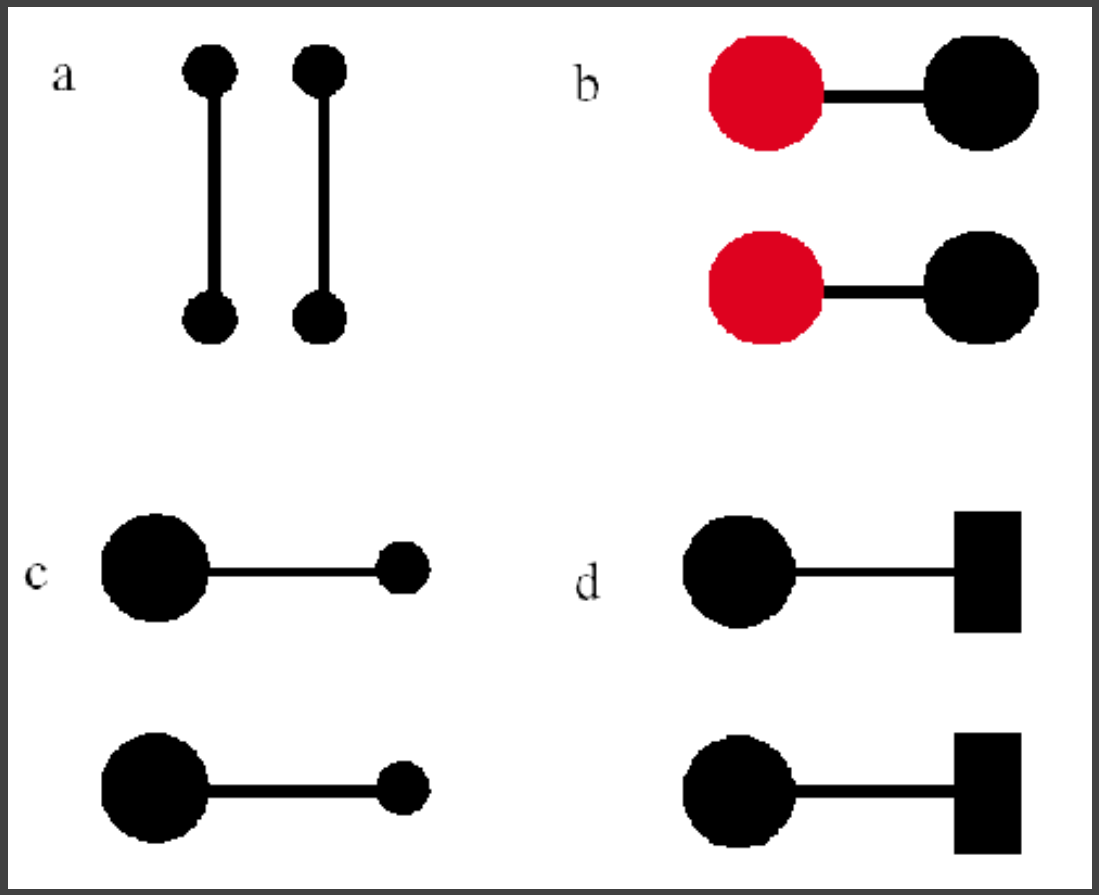
Rows dominate due to similarity [from Ware '04]

Symmetry



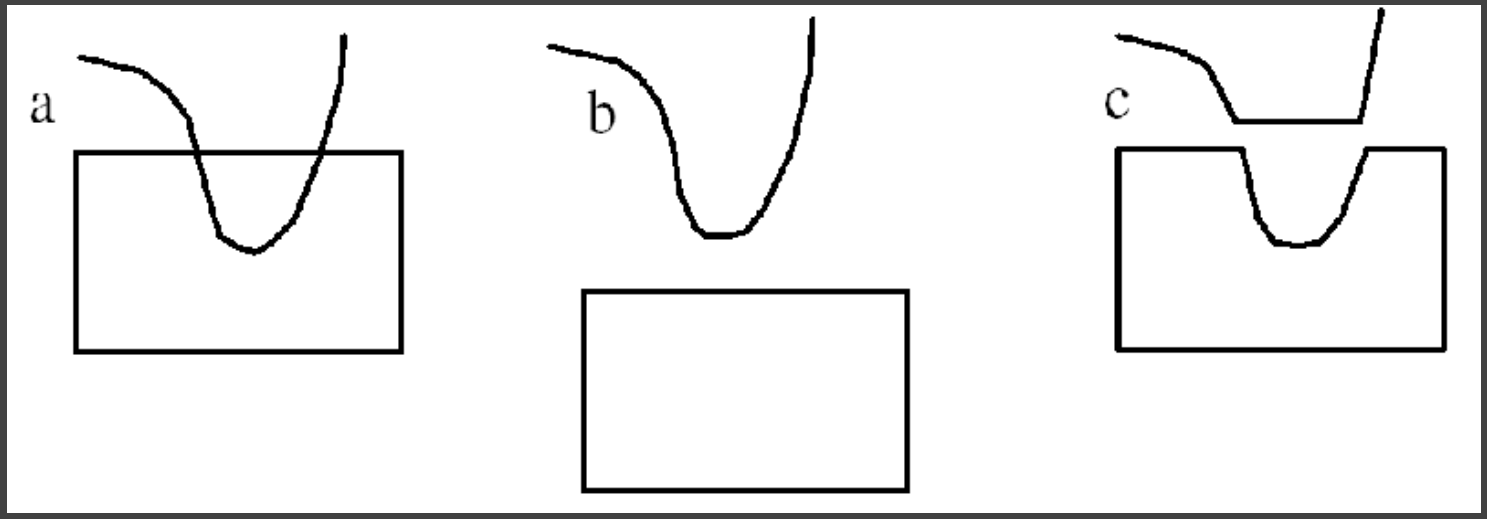
Bilateral symmetry gives strong sense of figure [from Ware ‘04]

Connectedness

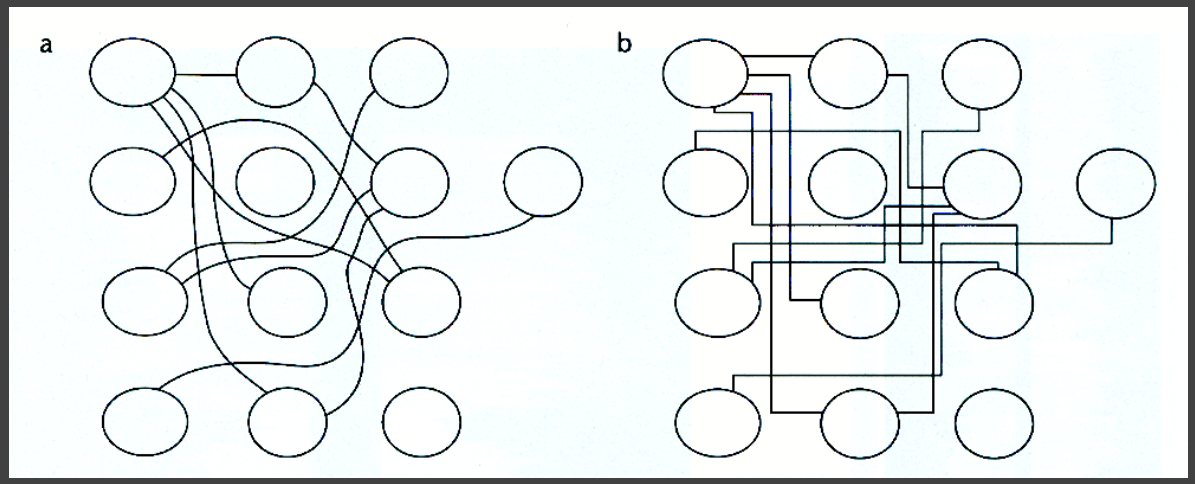


Connectedness overrules proximity, size, color shape [from Ware '04]

Continuity

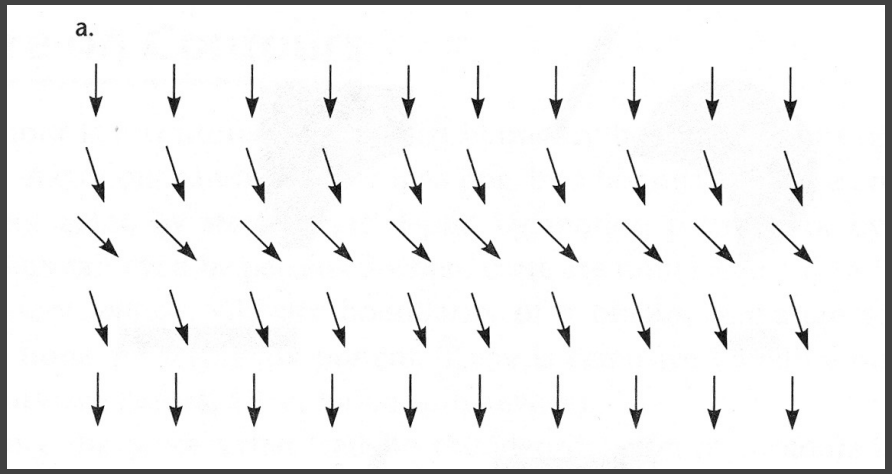


We prefer smooth not abrupt changes [from Ware ’04]

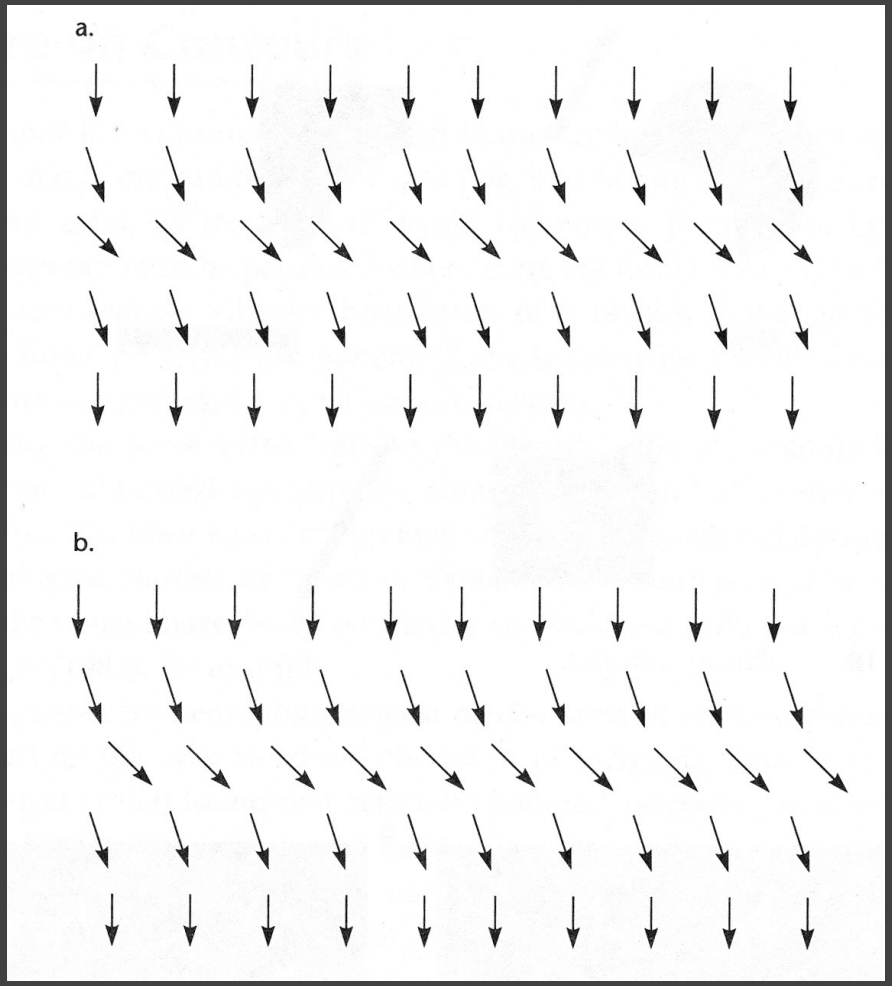


Connections are clearer with smooth contours [from Ware ’04]

Continuity: Vector Fields

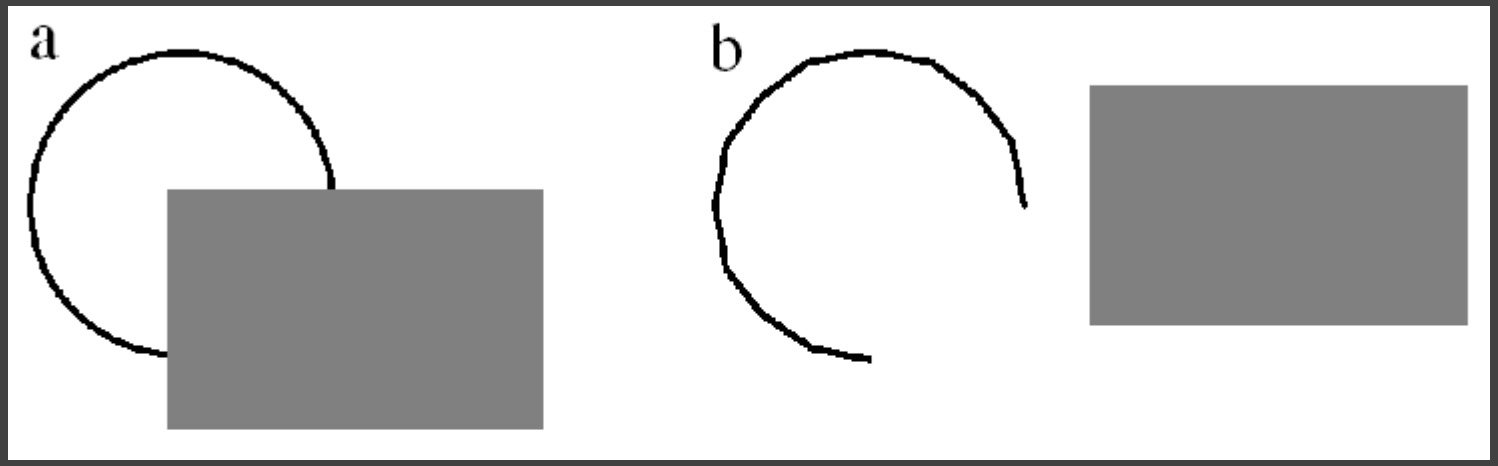


Continuity: Vector Fields

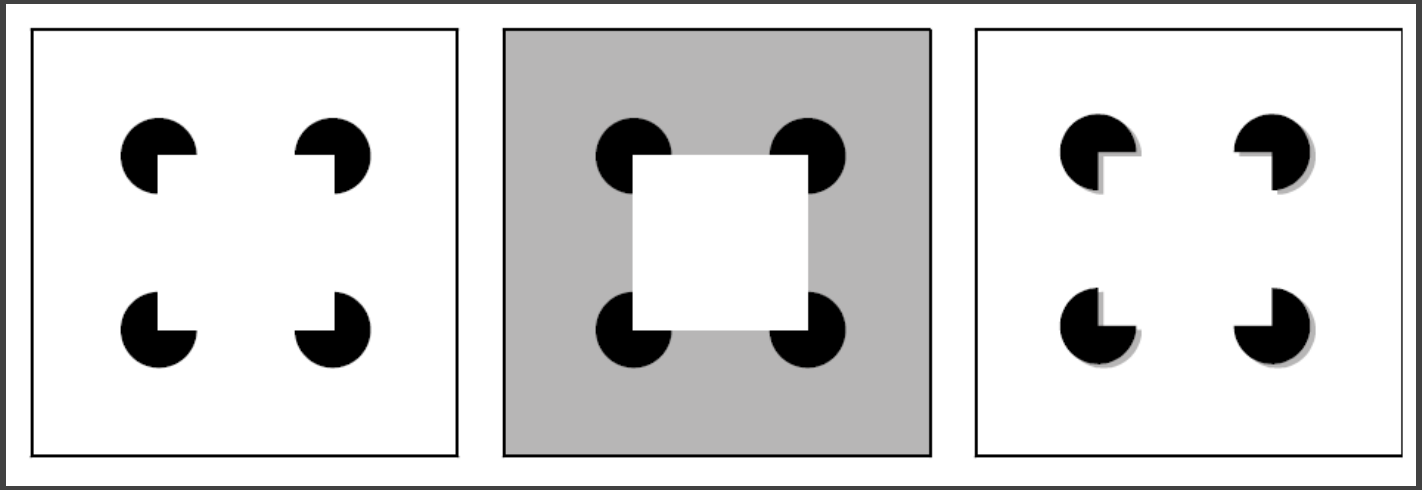


Prefer field that shows smooth continuous contours [from Ware ’04]

Closure

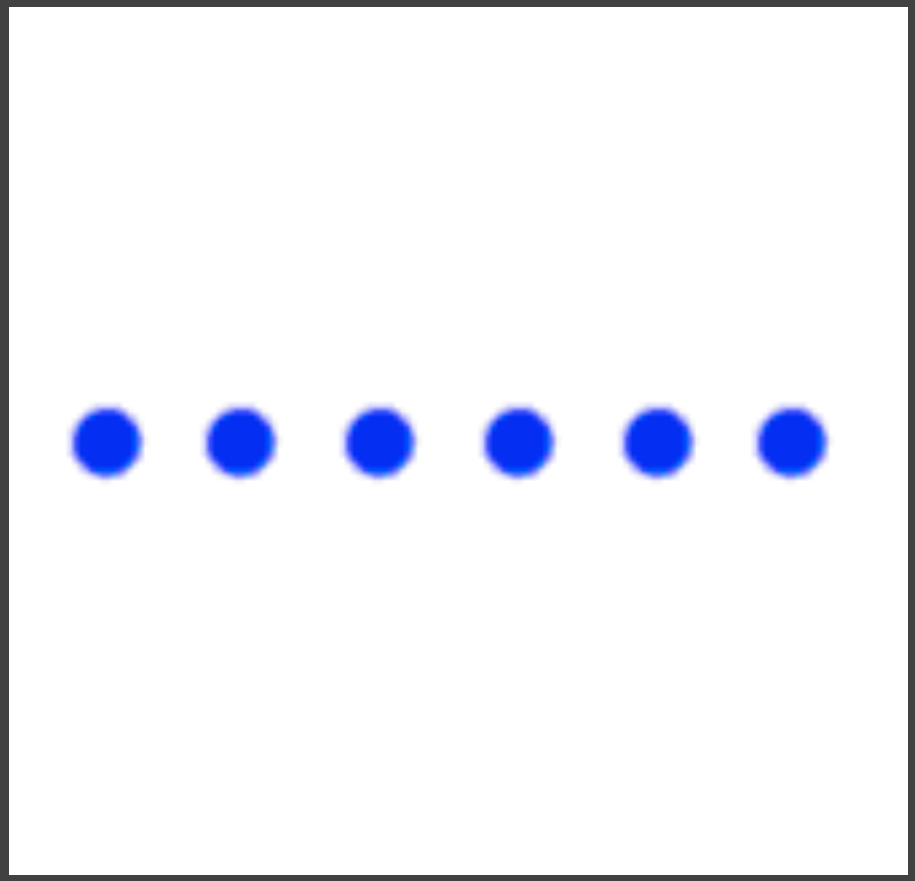


We see a circle behind a rectangle, not a broken circle [from Ware ’04]



Illusory contours [from Durand ’02]

Common Fate



Dots moving together are grouped

Transparency

Requires continuity and proper color correspondence [from Ware ’04]

Change Blindness

Change Blindness

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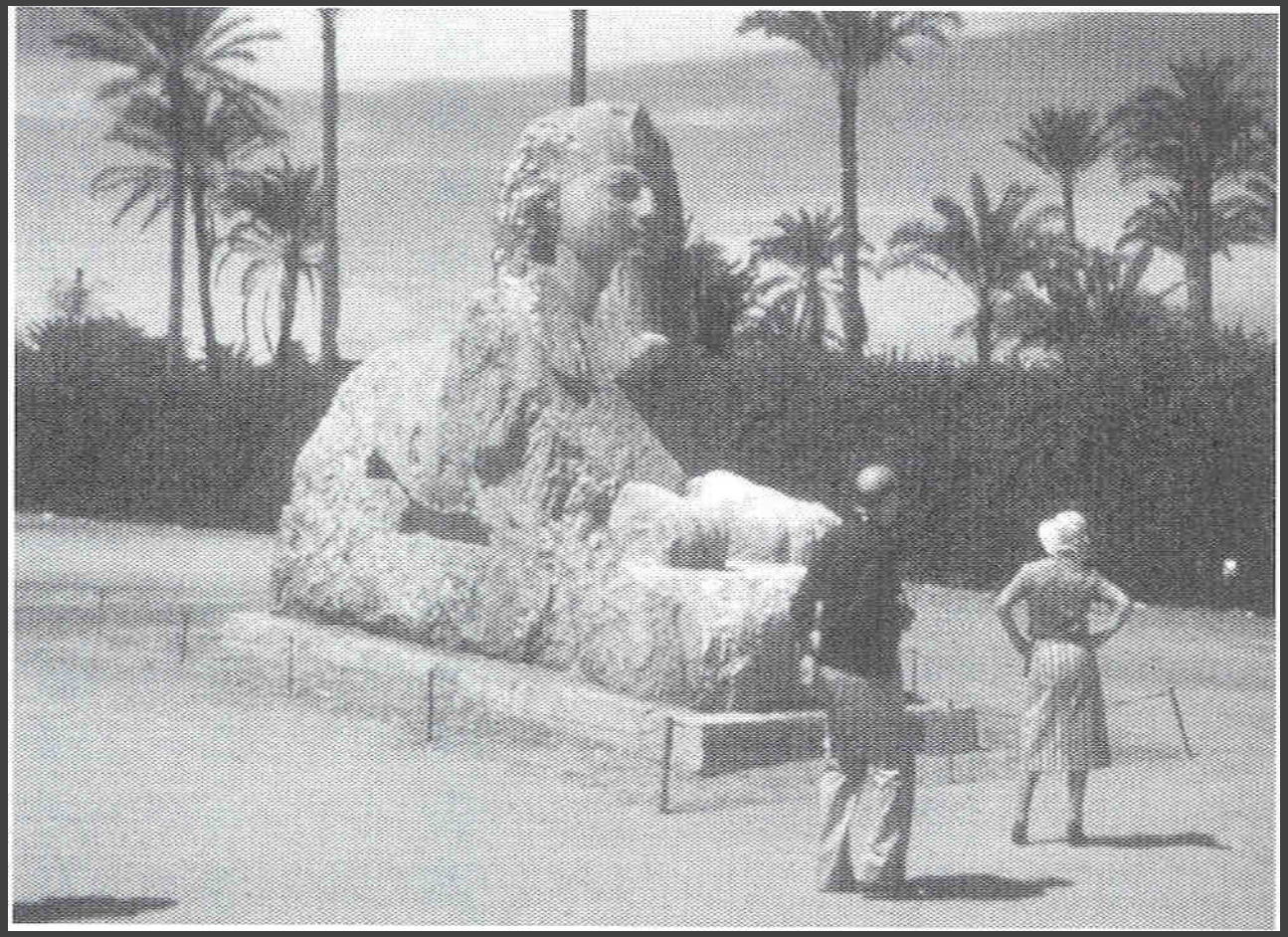
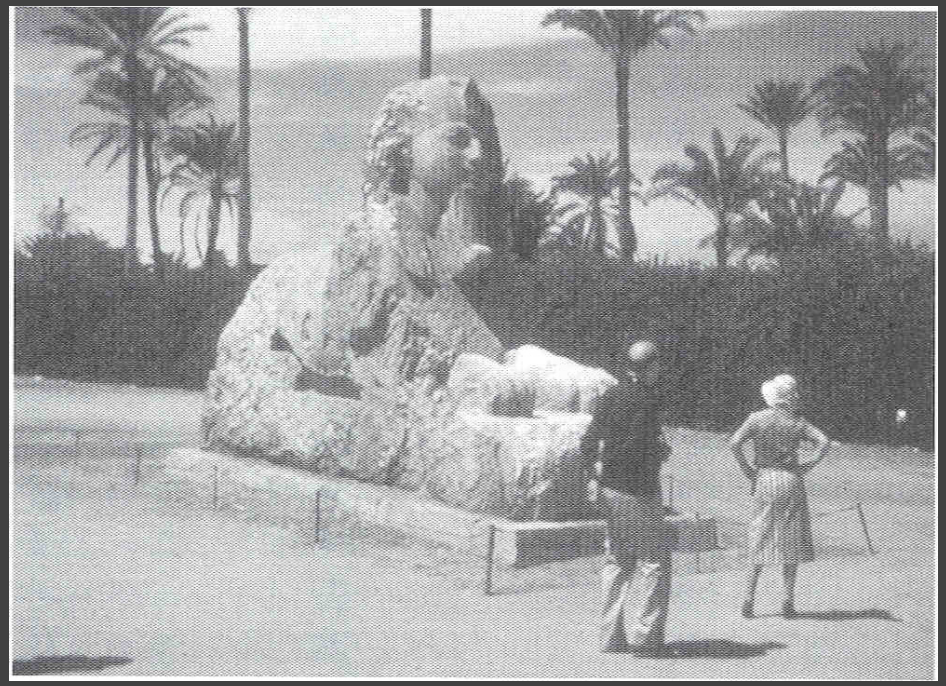


Change Blindness

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

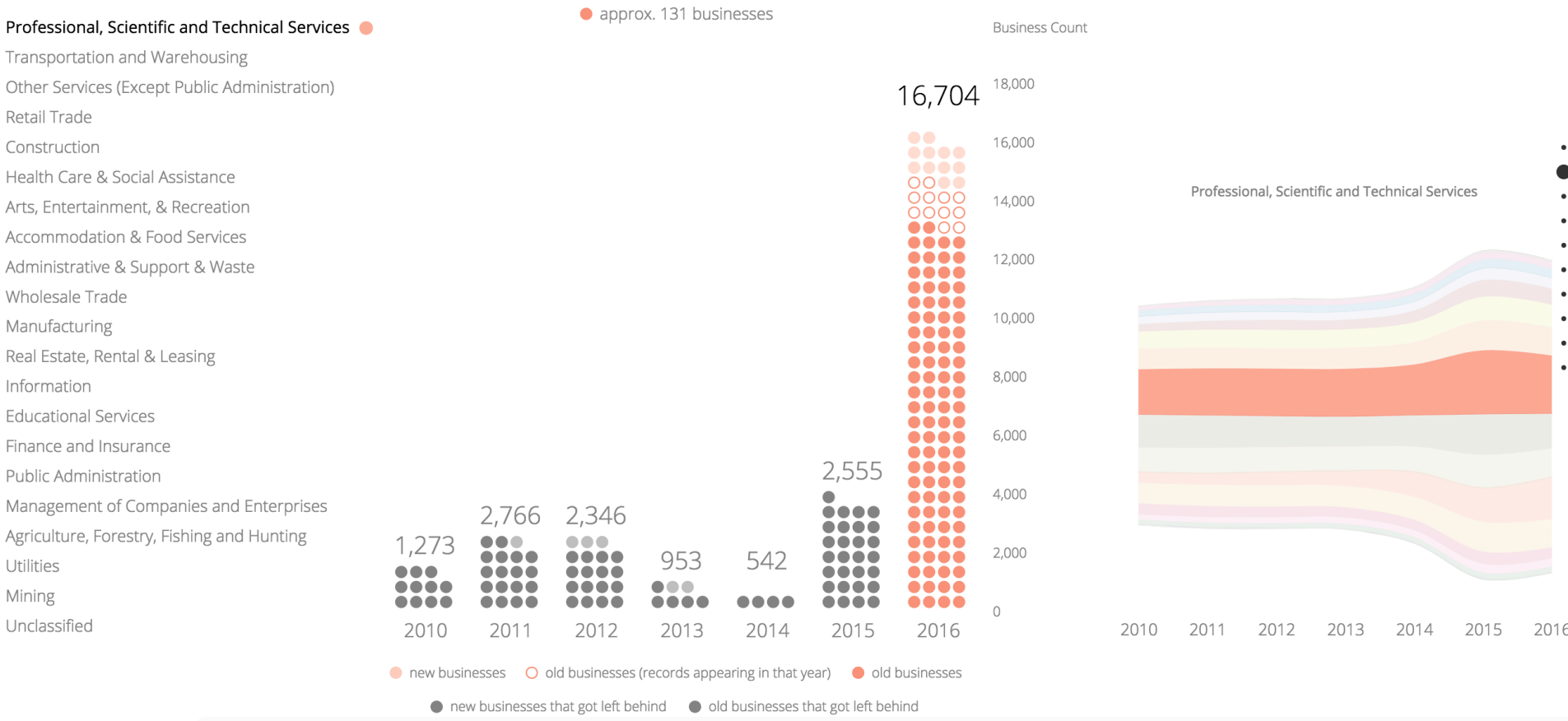
Data Visualization for Social Good

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…

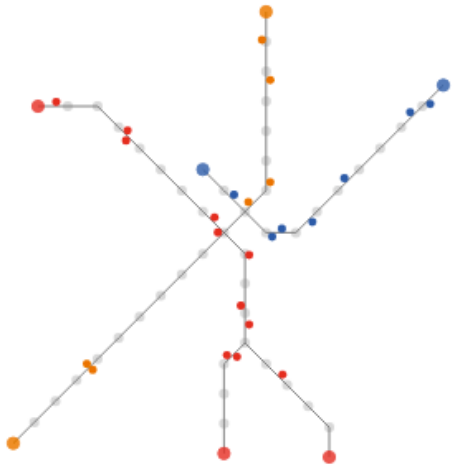
You must identify a target audience. May be general (residents, voters) or specialized (scientists, policy makers).

Inspiration…



Change In Times (CSE 442, Spring '17)

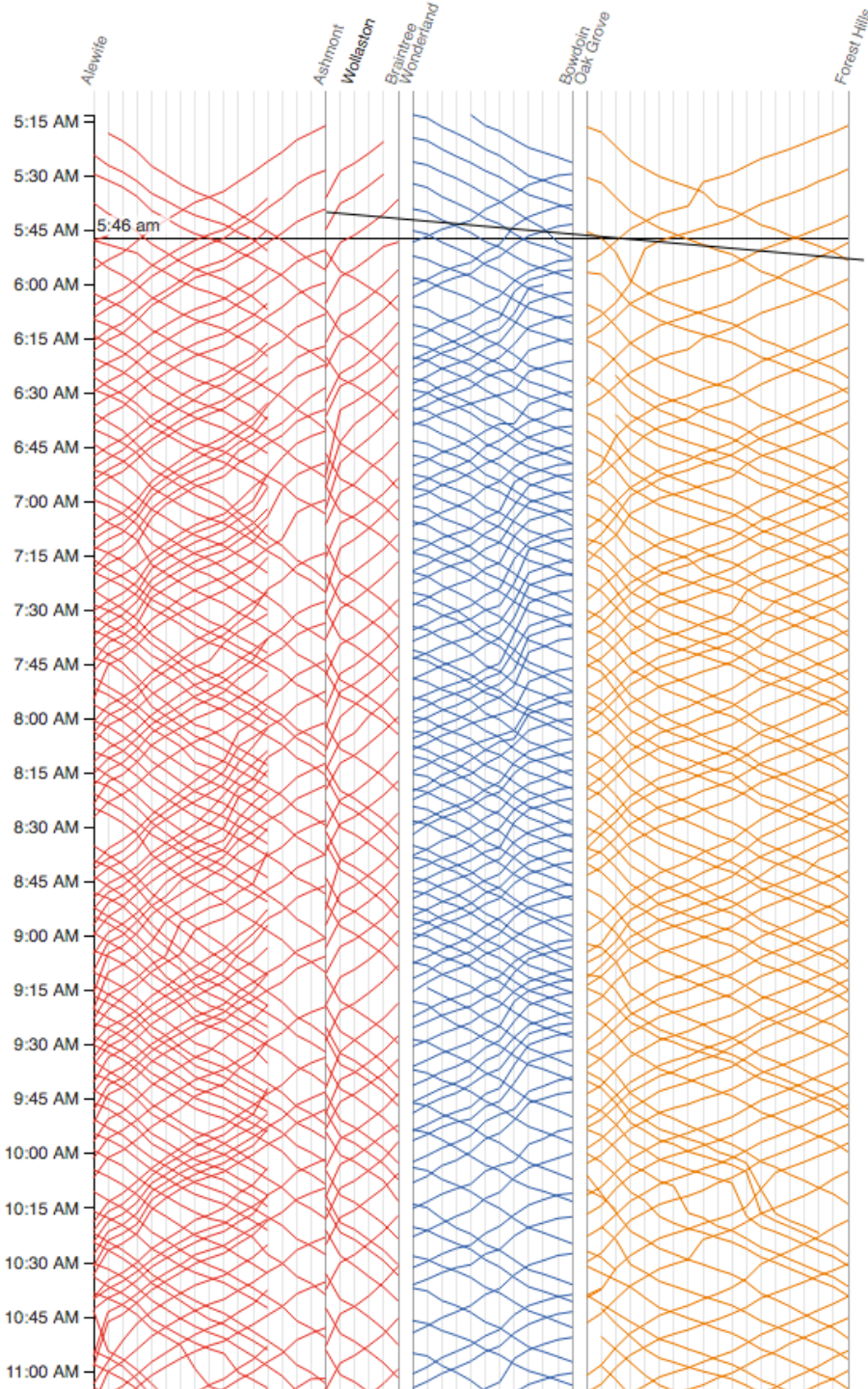
Gunnar Olson, Halden Lin, Lilian Liang, and Shobhit Hathi



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.

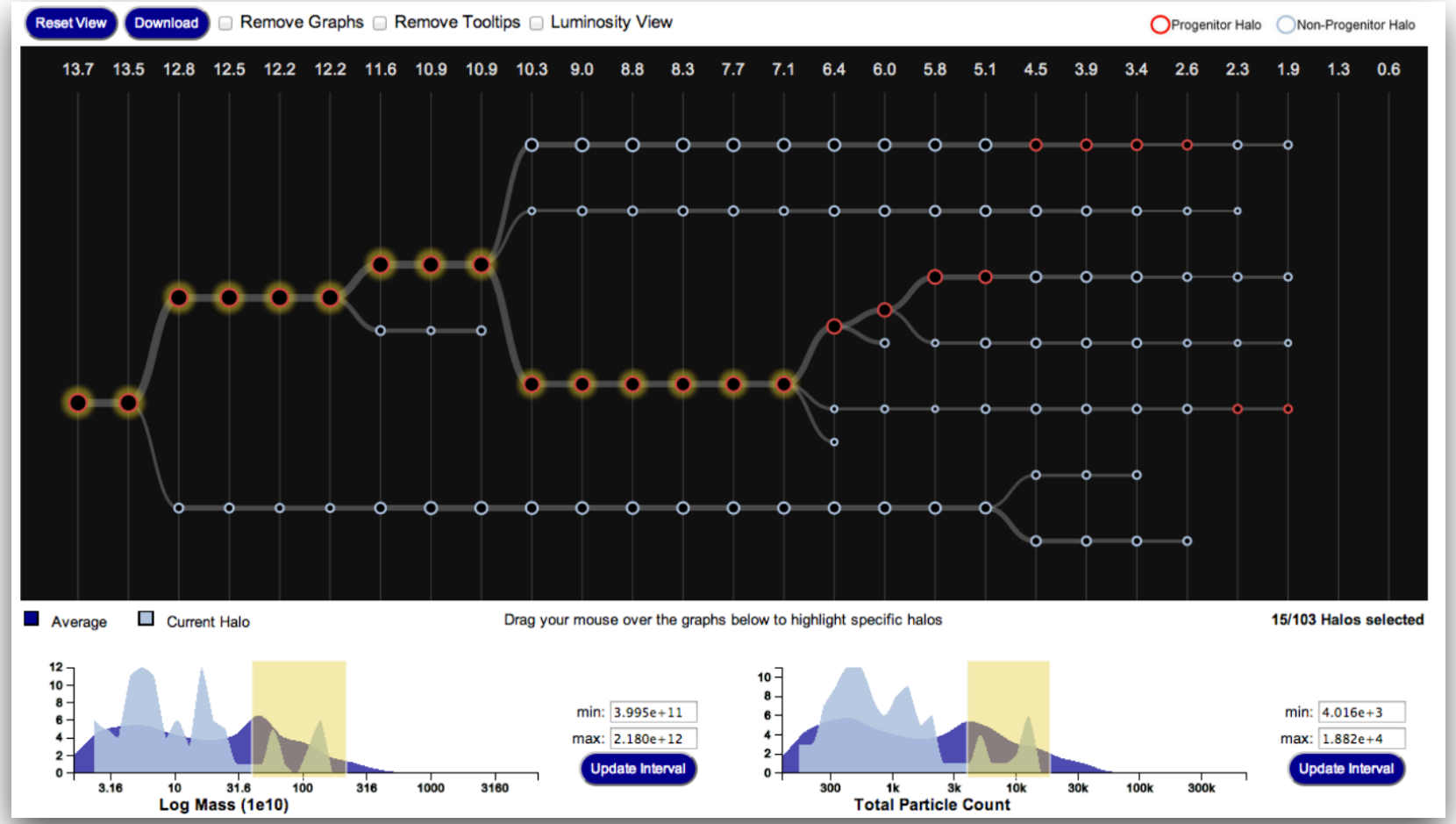
Since the red line splits, we show the Ashmont branch first then the Braintree branch. Trains on the Braintree branch "jump over" the Ashmont branch.

Train frequency increases around 6:30AM as morning rush hour begins.

MBTA Viz

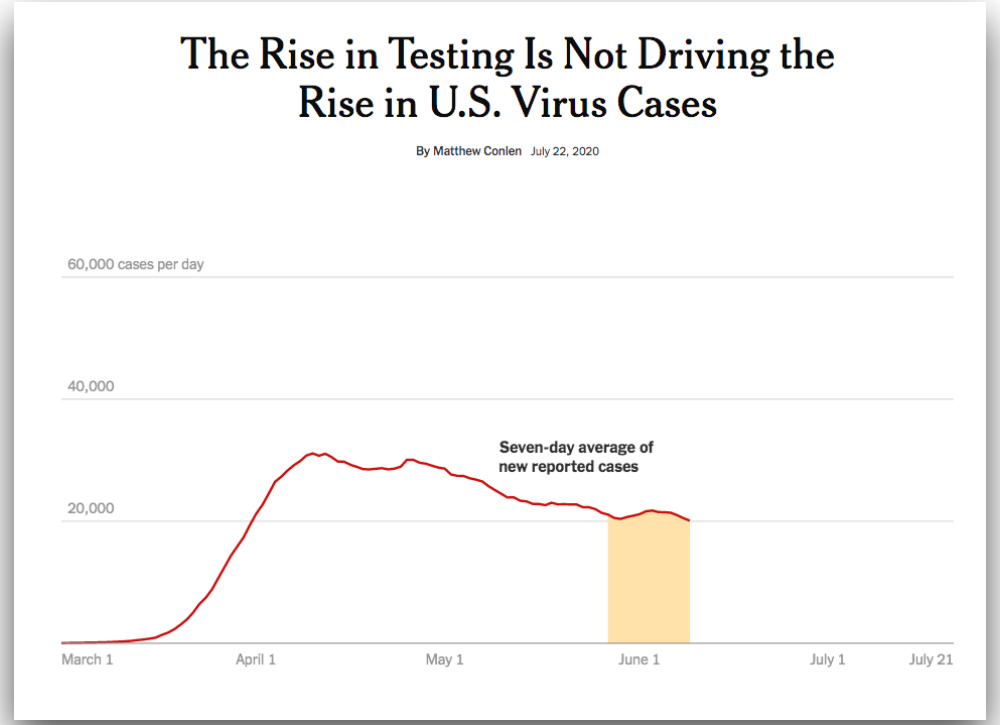
Barry & Card

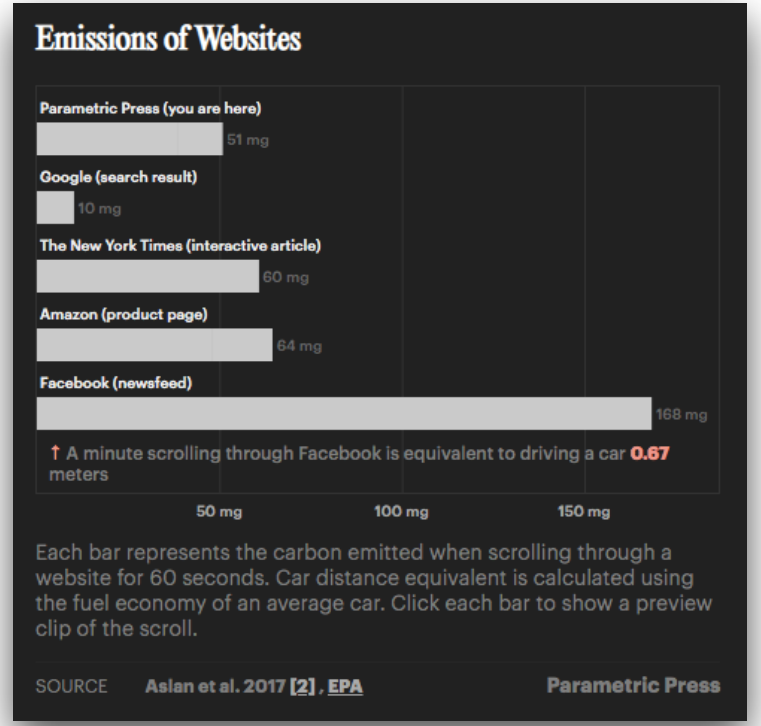
Visualizing Galaxy Merger Trees



S. Loebman, **J. Ortiz**, **L. Orr**, M. Balazinska, T. Quinn et al. [SIGMOD '14]

Inspiration from the News





New York Times

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 Team Selection (Ed)

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

Climate Change

Recidivism

Health

Echo Chambers

Energy Production

Food Deserts

Police Brutality

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?