# Lecture 9: Storylines, Accessibility and Interactivity

July 13, 2022

### Overview

Course Administration

Good, Bad and Ugly

**Telling Stories** 

Acessibility

Interactive Graphics



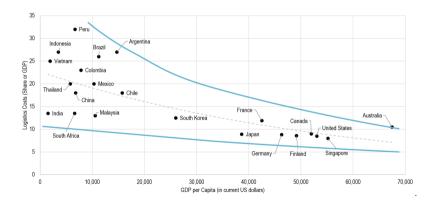
#### Course Administration

- 1. Final papers: July 27 by 11:59 pm
- 2. Presentations: July 20
  - 5 minutes per presentation
  - comment on two presentations within 48 hours
  - comments should be roughly one-half a page-ish
- 3. Regardless of medium, your words must be your own

Good, Bad & Ugly

### Linsi on Jarred's Scatter

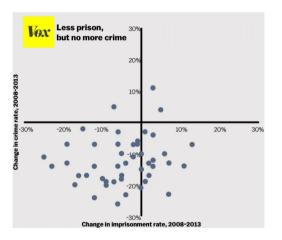
#### Logistics Costs and Economic Development



The Geography of Transport Systems, link here.



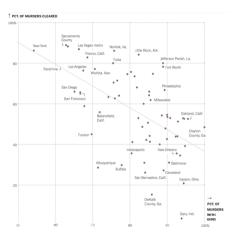
### Brandon on Sarah's Crime and Prison Graphic



Lind, Dara. "One chart that proves mass incarceration doesn't reduce crime," Vox, Feb. 15, 2015. link.



### Dayo on Esther's Scatter



The Learning Network, "What's Going On in This Graph? Solving Gun Murders," *New York Times*, Nov. 4, 2021. link.



# Telling Stories

### Four Parts of Storytelling

- 1. The Details: Few
- 2. The Sequential Story
- 3. The Proportional Story
- 4. A Fix from Knaflic



### Four Parts of Storytelling

- 1. The Details: Few
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- 4. A Fix from Knaflic

In 2 through 4, we'll try to identify sub-component design as in Few.



### 1. The Details: Few

How many small decisions impact the overall look and story. Few's "secondary data component design"

- trend lines
- reference lines
- annotations
- scales

- tick marks
- grid lines
- legends

### 2. The Sequential Story

- Knaflic: narrate a line graph
- Mulbrandon: narrate a set of line graphs

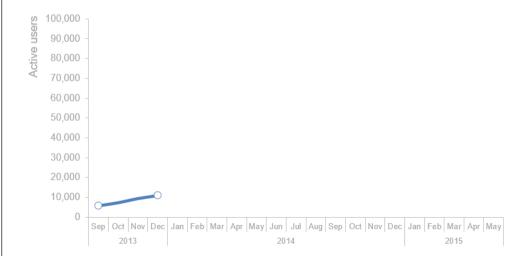


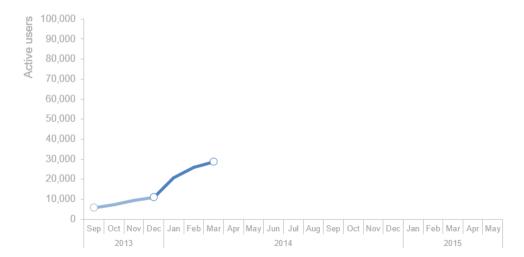
### Sequential Stories

- Tell the story of change over time
- Highlight important inflection points
- Tell the audience how you characterize the change: big, small, steep, not
- Use a different final product for the un-narrated version



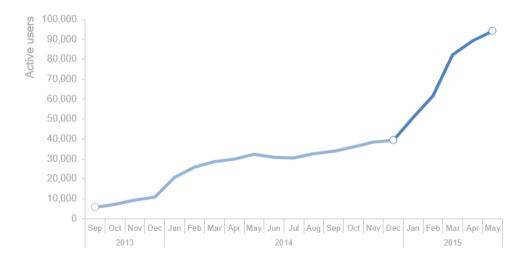




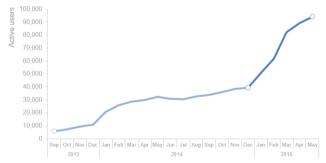








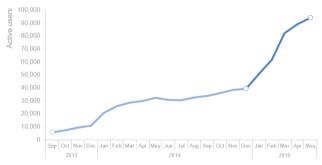
#### Moonville: active users over time



Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

Few's secondary components

#### Moonville: active users over time



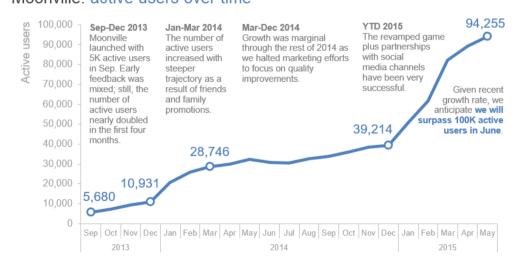
Data source: ABC Report. For purpose of analysis "active user" is defined as the number of unique users in the past 30 days.

#### Few's secondary components

- noisy but easy to read ticks
- dots function as annotations



### Knaflic's Sequential Story: Paper Version



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#### Moonville: active users over time



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#### Few's secondary components

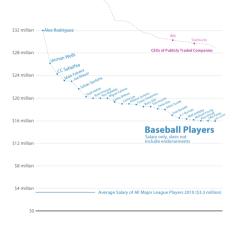
- heavy annotations
- color for main point
- clever: text divides periods

### Sequence in Size: Mulbrandon and Top Salaries

- These charts manage to show things that don't actually fit on the same scale
- Impossible in one graph, but possible in two
- And notice that this is a line graph not in time



### Top Major League Baseball Salaries

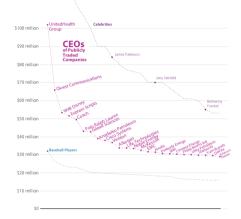


Visualizing Economics.com

Visualizing Economics.com.

26 Sources: AR: Absolute Return + Alpha, "The Rich List," April 2011 - Forbes, "Celebrity 100, 2011" - Forbes, "CEO Compensation, 2011" - USA Today, "USATODAY Salaries Databases"

# Top CEO Compensation



Visualizing Fconomics.com

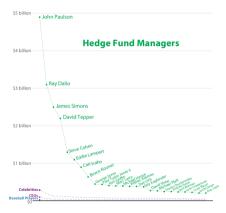
Vocalizing Economics. Com.
Sources: AR: Absolute Return + Alpho, "The Rich List," April 2011 • Forbes, "Celebrity 100, 2011" • Forbes, "CEO Compensation, 2011." • USA Today: "USA TODAY Salaries Databases"

# Top Celebrity Income \$300 million Hedge Fund Managers Oprah Winfrey \$250 million Celebrities \$200 million \$150 million \$100 million Traded \$50 million

VisualizingEconomics.com...

28 Sources: AR-Absolute Return + Alpha, "The Rich List," April 2011 - Forbes, "Celebrity 100, 2011" - Forbes, "CEO Compensation, 2011" - VSA Jodan "USATODAY Salaries Databases"

### Top Hedge Fund Manager Income

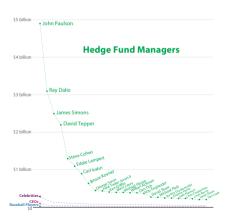


Visualizing Economics.com.

Sources: AR: Absolute Return + Alpha, "The Rich List," April 2011 • Forbes, "Celebrity 100, 2011" • Forbes, "CEO Compensation, 2011" • VS Product "USATODA" Salaries Databases"

### What Would Few Say?

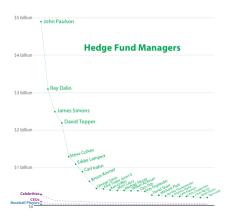
# Top Hedge Fund Manager Income



Few's secondary components

### What Would Few Say?

# Top Hedge Fund Manager Income



#### Few's secondary components

- x axis is rank
- labels on graphs
- colors to divide occupations
- labels for names
- · reference line for baseball
- foreshadowing



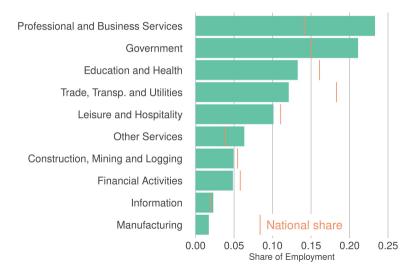
### 3. The Proportional Story

- Me: DC vs the US
- Knaflic: narrate a set of stacked bars
- Mulbrandon: narrate a set of dots

### **Proportion Stories**

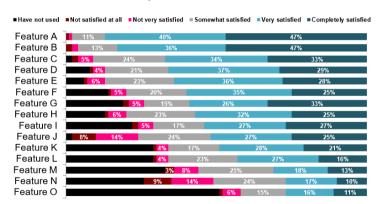
- Show how one item's size relates to another item's size
- For multiple items, call out specific size differences
- Tell the audience how you characterize the relative magnitude: big or small?

### DC Industrial Mix vs Rest of the Country



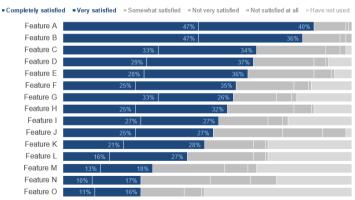
### Knaflic's Proportion Considerations: Presentation version

#### How satisfied have you been with each of these features?



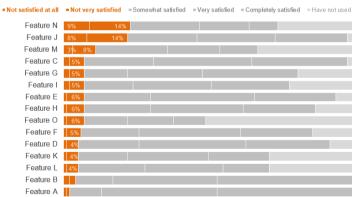
### Features A & B top user satisfaction

#### Product X User Satisfaction: Features



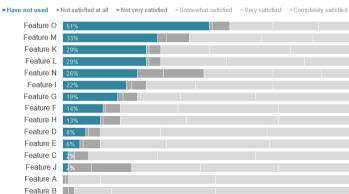


#### Users least satisfied with Features N and J



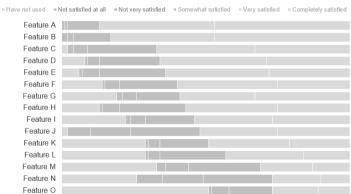


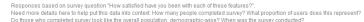
#### Feature O is least used





### User satisfaction varies greatly by feature

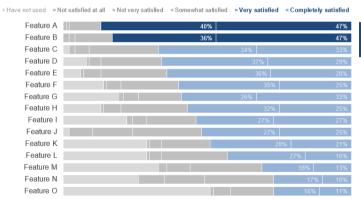






#### User satisfaction varies greatly by feature

#### Product X User Satisfaction: Features



Features A and B continue to top user satisfaction

Responses based on survey question "How satisfied have you been with each of these features?".

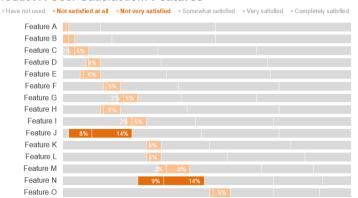
Need more details here to help put this data into context. How many people completed survey? What proportion of users does this represent?

Do those who completed survey look like the overall population, democraphic-wise? When was the survey conducted?



## User satisfaction varies greatly by feature

#### Product X User Satisfaction: Features

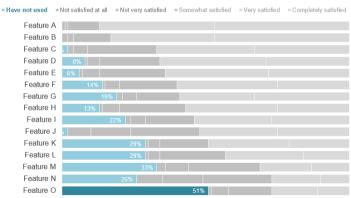


Users are least satisfied with Features J and N; what improvements can we make here for a better user

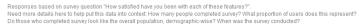


## User satisfaction varies greatly by feature

#### Product X User Satisfaction: Features



Feature O is least used. What steps can we proactively take with existing users to increase utilization?

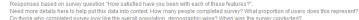




## Knaflic's Proportion Considerations: Paper version

### User satisfaction varies greatly by feature







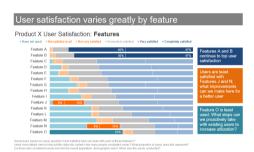


## What Would Few Say?



Few's secondary components

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#### Few's secondary components

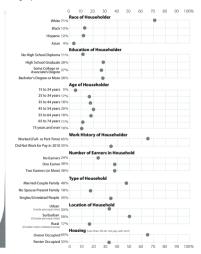
- color and shades of color
- annotation near graphic in matching color
- bright color to emphasize
- no ticks
- no scale!
- labels at top



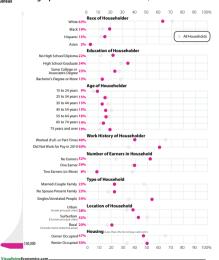
# Mulbrandon on the Relative Size of Things



## Demographics of All Incomes



Source: US Census Bureau, 2006–2010 American Community Survey



#### 4. The Fix

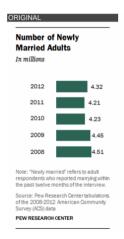
Knaflic's fix of an existing graphic to highlight the story

- Instead of the book's example, another from her website
- Transforming hard-to-read bars to easier-to-read formats
- Many similar ideas apply
- I'll just narrate the first one

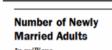


### Pew Charts on Number of Newly Married Adults

What's Wrong and How to Fix?

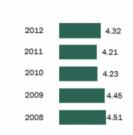


## Show Change Over Time



In millions

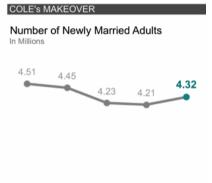
**ORIGINAL** 



Note: "Newly married" refers to adult respondents who reported marrying within the past twelve months of the interview.

Source: Pew Research Centertabulations of the 2008-2012 American Community Survey (ACS) data

#### PEW RESEARCH CENTER



"Newly married" refers to adult respondents who reported marrying within the past twelve months of the interview.

2010

2011

2012

Source: Pew Research Center tabulations of the 2008-2012 American Community Servey (ACS) data.



2008

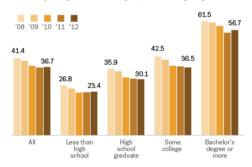
2009

#### Can You Pick Out the Point Here?

#### **New Marriage Rate by Education**

Stories

Number of newly married adults per 1,000 marriage eligible adults



Note: Marriage eligible includes the newly married plus those widowed, divorced or never married at interview. Source: US Census

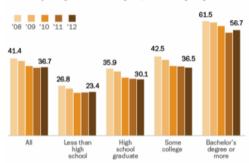


## Highlighting the Increase for You Guys

#### ORIGINAL

#### **New Marriage Rate by Education**

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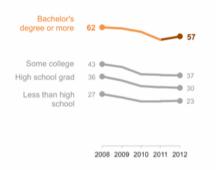
Source: US Census

PEW RESEARCH CENTER

#### COLE's MAKEOVER

#### New Marriage Rate by Education

Number of newly married adults per 1.000 marriage eligible adults



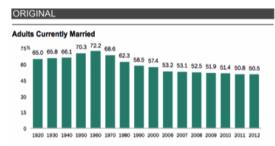
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Stories

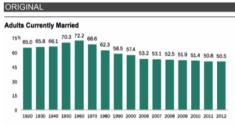
#### What Would You Want to Pull Out?



Notes: Based on adults age 18 and other. Currently married includes respondents reporting "married, spouse absent." Those reporting "secaristics" are not included in "currently married."

Source: Pew Research Center tabulations of the 1920-2000 Decennial Census data and 2006-12 American Community Survey (ACS) Integrated Public Use Micro Samples

## Highlighting Peak and Trough



Notes: Based on adults age 18 and other. Currently manifed includes respondents reporting "manifed, spouse absent." Those reporting "sensorated" are not included in "numerate manifed."

Source: Plew Research Center rabulations of the 1920-2000 Decennial Census data and 2006-12 American Community Survey (ACS) Interinated Public Use Micro Samples

#### PEW RESEARCH CENTER



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Source: Pew Research Center tabulations of the 1920-2000 Decennial Census data and 2006-12 American Community Survey (ACS).



# Accessibility

## GWU's Digital Accessibility Goals

- 1. **Perceivable**: The information should be presented in a way all users can "see" or perceive it. No content should be hidden.
- 2. **Operable**: The user interface should be operable with any device or software tool, such as a keyboard, touchscreen, or screen reader.
- 3. **Understandable**: In addition to being able to operate the user interface, users must be able to understand the information presented.
- 4. **Robust**: Content should adhere to guidelines and best practices to ensure it can be interpreted by a variety of devices and assistive technologies.

Directly from this page



### What Does This Mean for Graphics?

#### Again, from GW's standards

- "Users with visual impairments, cognitive challenges or technical limitations may not be able to see the images that are on a webpage. For this reason, it is necessary to provide alternative text on all images. The alternative text information is then displayed as plain text, read aloud via a screen reader, or output using a braille reader."
- And further on "text on graphics"
  - "When possible, use text rather than images to convey information. Text can be magnified, interpreted as braille, or read aloud using screen readers by visually-impaired users."
  - "Using text on graphics is not best practice and should be avoided when possible.
    However, in instances where text inside of graphics is used (e.g., logos), you must
    provide alt text that communicates the text to screen reader and assistive technology
    users."



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Some of this is diametrically opposed to what I've been teaching you in this class.



A still-open question

- A still-open question
- People with little numeracy



- A still-open question
- People with little numeracy
  - Titles help
  - Annotations help



- A still-open question
- People with little numeracy
  - Titles help
  - Annotations help
- Color-blind people
  - Prevalence up to 8 percent for White men
  - Lower for non-Whites Xie JZ, et al, Ophthalmology. 2014.
  - Near zero for women



- A still-open question
- People with little numeracy
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  - Prevalence up to 8 percent for White men
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  - Near zero for women
- Visually impaired people



#### Potential Solutions

Things that are better for everyone

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- Labels directly on graphics (apologies to above)
- Line thickness
- Annotations on graphics
- White spaces between colors
- Omit legends only viewable by hovering



#### r otomiai oonation

Things that are better for everyone

- Labels directly on graphics (apologies to above)
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Things that are better for some and worse for others



#### Potential Solutions

#### Things that are better for everyone

- Labels directly on graphics (apologies to above)
- Line thickness
- Annotations on graphics
- White spaces between colors
- Omit legends only viewable by hovering

Things that are better for some and worse for others

- Patterns or fills for bars
- Dashed lines rather than colors
- Lines with different shapes

## What To Do?

#### What To Do?

- Link to the data
- Provide alternative text
- Be careful in choosing colors
  - Color Brewer has colorblind safe colors
  - Colorsafe has accessible palettes
  - Simulate how a colorblind person sees this at Colblindor
- Consult Web Content Accessibility Guidelines

Thanks to the U of Wisconsin's site



## Don't Use An Interactive Chart to Tell a Story

- The point of a chart is for you to tell a specific story
- Don't let readers make up their own story!



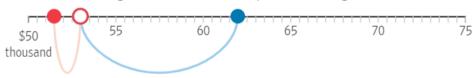
## Don't Use An Interactive Chart to Tell a Story

- The point of a chart is for you to tell a specific story
- Don't let readers make up their own story!
- Interactive charts let readers modify your work
- But they can be excellent for letting people "see" or "play" with the data

# A Great Set of Moving (not Interactive) Charts

### Median household income in ○2008 •2017

Median among Democratic and Republican congressional districts



WSJ: Democrats and Republicans..., 9/19/2019.



# Interactive Graphics in R

- RShiny
- But it's pretty bad!
- Graphs look so-so
- Nightmare to install on a website



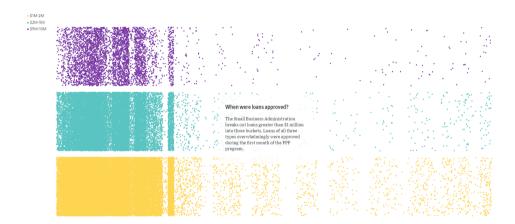
# Interactive Graphics in R

- RShiny
- But it's pretty bad!
- Graphs look so-so
- Nightmare to install on a website
- $\rightarrow$  So we are moving to D3 for this last class

## Overview of Interactive Graphics with D3

- 1. What do they look like?
- 2. Writing a webpage
- 3. D3 from 10,000 feet

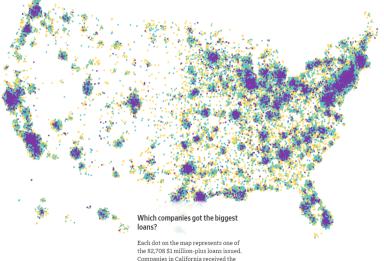
## 1. D3: Using D3 Graphics to Move Around

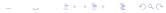






## 1. D3: Using D3 Graphics to Move Around





## 2. HTML

## The language of the web

- Hyper Text Markup Language
- All commands start and end with <>
- Over time, lots of additions but this is the basic

## A tiny tiny example

- $_1$  <!DOCTYPE html>
- 2 You put whatever you want to go on you So I write Hello World.
- 3 </html>

# Writing in HTML

- There are thousands of commands
- We use
  - <div> </div> to divide sections
  - <script> </script> to bring in an external script file

- There are thousands of commands
- We use
  - <div> </div> to divide sections
  - <script> </script> to bring in an external script file
- You might be interested in
  - <head> </head> for header info, including the title and meta info
  - <body> </body> for the displayed content
  - <a href = "put your link here"> text here </a> anchor (link) to another webpage



## 3. Extremely High Level D3 Overview

- You call javascript
- Tell the webpage you have a section for a graphic
- Define the graphic
- Grab the data from somewhere
- Plot it

## 3. Extremely High Level D3 Overview

- You call javascript
- Tell the webpage you have a section for a graphic
- Define the graphic
- Grab the data from somewhere
- Plot it
- Set interactive parameters as you please



## **Next Classes**

- See you for presentations next week
- Office hours available until papers are in
- Best of luck wrapping up