Matthew Conlen
(with material from Jeff Heer, Edward Segel, and Jessica Hullman)
About Me

Ph.D. student @ UW
Advised by Jeff Heer

Background in data journalism
FiveThirtyEight, CNN, New Yorker, New York Times (current)

Lecture will be biased toward that
Going forward
I carried wax along the line, and laid it thick on their ears. They tied me up, then, plumb amidships, back to the mast, lashed to the mast, and took themselves again to rowing. Soon, as we came smartly within hailing distance, the two Sirens, noting our fast ship, off their point, made ready, and they sang...
**Narrative Storytelling**

**narrative** (n): An account of a series of events, facts, etc., given in order and with the establishing of connections between them.

Effective storytelling “require[s] skills like those familiar to movie directors, beyond a technical expert’s knowledge of computer engineering and science.” - Gershon & Page ‘01
STORYTELLING
across various media

PEOPLE TELL STORIES
WORDS TELL STORIES
IMAGES TELL STORIES
COMICS TELL STORIES
MOVIES TELL STORIES
Generals Wary of Move to Cut Their Ranks
By GINGER THOMPSON and THOM SHANKER

WASHINGTON — Maj. Gen. Paul D. Eaton, a retired Army officer, is familiar with the perks and pitfalls of power, having commanded tens of thousands of troops at Fort Benning, Ga., managed budgets exceeding $2 billion in Iraq, and overseen layers upon layers of staff members who helped manage both his professional duties and his personal life.

He has experienced the full range of lifestyles that come with military leadership, living at one point in an elegant antebellum mansion, and at another, with eight other officers crowded in a marble bathhouse behind one of Saddam Hussein’s old palaces.

When he traveled, he was occasionally able to justify the use of military aircraft, but most times, he said, he flew coach. And today he lives on a pension worth 75 percent of his military salary, with health benefits that cover everything except dental and eye care for himself and his wife.

“We are well compensated, and we live very comfortable lives,” General Eaton said, referring to the military’s most senior leaders. “But when you look at all the things going on around a general, the nation is getting a very, very high return on its money.”

Not everyone at the Pentagon agrees. Two weeks ago, Defense Secretary Robert M. Gates announced a sweeping effort to improve efficiency that, among other things, takes aim at the military’s sacrosanct corps of generals and admirals, ordering his staff to cut at least 50 positions, and making clear that he would be happier if they cut more.
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Anecdotal Lead

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Nut Graph

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Topics

Narrative visualization

Case Study: Coronavirus Testing
Design space
Recent research in narrative visualization

Interactive articles

Case Study: Carbon Footprint
Authoring tools

Design Prompt: Elections
Storytelling... with data?
Privacy and the Internet

Lives of others

Jennifer Stoddard, Canada’s privacy commissioner, warned Facebook in August that the social networking site should do more to comply with the country’s privacy laws. She says Facebook appears to be developing an important new tool, which included granting access to data and easy-to-implement changes to the site’s privacy settings. She wants Facebook to be more transparent with third parties. It’s not clear how Facebook is going to implement these changes, she says. However, she says that if Facebook were to implement these changes, they should become the subject of another round of consultation by the commissioner.

Facebook is currently battling a court case to prevent the sale of its user data. Google is also facing criticism for its handling of user data. This week, it was revealed that Google had collected some personal comments from users and not included them in its expressed datasets. These datasets are used to track user behavior and improve its search results. The commissioner has called for an independent investigation into Google’s practices, claiming that it had simply ignored its privacy obligations.

The issue highlights a broader tension between governments and technology companies. And it reflects concerns among web users about how personal data can be shared. Several prominent internet figures such as Cory Doctorow, a science fiction author, and Lisa Leopold, a professor, have accused Facebook of using data to analyze user behavior. Facebook has denied these allegations, saying it only uses data to improve its services.

Facebook has previously tried to make privacy policies more clear to users and increase users’ control over their data. But as more firms adopt Facebook’s business model, the issues of privacy and security continue to be a concern. The commissioner has called for increased transparency and accountability from technology companies.

The commissioner has also called for increased oversight of social networks, saying that they are increasingly being used as platforms for political and social changes. She has urged Facebook to be more transparent about how it collects and uses data, and to provide users with clear and accessible privacy settings.
CASE STUDY COVID-19 TESTING
Conlen, 2020
CASE STUDY COVID-19 TESTING

Input Data
Daily case and test counts.

Points of Focus
1. Baseline (smoothed average of daily cases)
2. Counterfactual case curve (baseline positivity rate * daily test counts)
3. Actual case curve (daily cases)
Obesity Map Vadim Ogievetsky
Conlen 2014

SHENANIGANS

Change in teen shenanigans from 1993 to 2013. Showing % difference from 2003 levels.
Health

Life expectancy in years

GDP per capita in US

1877

Uganda

Mozambique

Sierra Leone

1810

1709
Narrative Devices
What devices communicates best?
Highly dependent on: audience, context, format

Format
Interactive Article
Animation
Lecture
Still Image
Video
Narrative Visualization Design Space
CASE STUDIES

70% Journalism
20% Business
10% Research

Segel & Heer, 2010
Grab attention with image and position

Matching on content
Visual prominence
Reduced visual priority

Homer Pace After Age 34

If the accusations are correct, Bonds was 34 in his first season on steroids. Here are projected home run paces for each player after age 34.

Projected pace based on average of previous five seasons

Aaron
Actual homers slightly outpace projected homers for five seasons.

Ruth
Averaged 46.4 homers a season from age 30 to 34. Averaged 42.5 for next four seasons.

Bonds
From age 35 to 39, he averaged 14 more homors a season than projected.

Note: Ages as of July 1 of each season.

Differing Paths to the Top of the Record

The top seven players on the career home run list:

- Hank Aaron
- Babe Ruth
- Barry Bonds
- Willie Mays
- Sammy Sosa
- Albert Pujols
- Ken Griffey Jr.

Reduced visual priority

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Visual Design

- Magazine Style
- Annotated Chart
- Science Fair Poster
- Flowchart
- Comic Strip
- Slideshow
- Movie
- Duo-Specific
- Captions
- Attached Article
- Summaries
- Interpret
- Headlines
- Tacit Tutorial
- Selection
- Navigation
- Details on Demand
- Timelines
- Filtering
- Highlighting

Messaging

Interactivity
Genres for Narrative Visualization (2010)

Missing “scrollly-telling” designs...
Genres + Interactivity + Messaging =

**DESIGN SPACE**

**Author Driven**
- strong ordering
- heavy messaging
- limited interactivity

**Reader Driven**
- weak ordering
- light messaging
- free interactivity

**STORYTELLING**
- CLARITY
- SPEED

**ASK QUESTIONS**
- EXPLORE
- FIND

---

martini
glass

interactive
to slideshow

drill-down
story
Interactive Articles
In comparison, only 12% of YouTube’s traffic went through cellular networks, but they were by far the most expensive part of YouTube’s content delivery pipeline, accounting for approximately 8,500 Gigawatt-hours of electricity usage—enough to power over 750,000 U.S. homes [3]. At over 10 times the electricity usage per unit of traffic, the relative inefficiency of cellular transmission is clear.
Communicating with Interactive Articles

Examining the design of interactive articles by synthesizing theory from disciplines such as education, journalism, and visualization.

Hohman, Conlen, Heer, Chau
2020
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5 affordances of the format
- Connecting people and data
- Making systems playful
- Promoting self reflection
- Personalizing reading
- Reducing cognitive load

Hohman, Conlen, Heer, Chau
2020
5 AFFORDANCES OF THE FORMAT

Connecting people and data
Making systems playful
Promoting self reflection
Personalizing reading
Reducing cognitive load

Follow the lives of 932 boys who grew up in rich families...

Grew up rich

...and see where they end up as adults:

<table>
<thead>
<tr>
<th></th>
<th>WHITE MEN</th>
<th>BLACK MEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rich adult</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Upper-middle-class adult</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Middle-class adult</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Lower-middle-class adult</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Poor adult</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Most white boys raised in wealthy families will stay rich or upper middle class as adults, but black boys raised in similarly rich households will not.

Even when children grow up next to each other with parents who earn similar incomes, black boys fare worse than white boys in terms of income, and the gap only increases in high school.
Connecting people and data
Making systems playful
Promoting self reflection
Personalizing reading
Reducing cognitive load

I am female ▼ White ▼ and currently ▼ 23 ▼ years old.

AGE OF DEATH ▼ DIED SO FAR ▼ STILL ALIVE
23 years ▼ 1% ▼ 99%

CAUSE OF DEATH SO FAR
0% Infection
0% Cancer
0% Blood
0% Endocrine
0% Mental
0% Nervous
0% Circulatory
0% Respiratory
0% Digestive
0% Musculoskeletal
0% Genitourinary
0% Perinatal
0% Congenital
0% External Causes
0% Other
Connecting people and data
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5 AFFORDANCES OF THE FORMAT

You Draw It: What Got Better or Worse During Obama’s Presidency

By LARRY BUCHANAN, HAEYOUN PARK and ADAM PEARCE  JAN. 15, 2017

Draw your guesses on the charts below to see if you’re as smart as you think you are.

Under President Obama, the unemployment rate …

Draw the line for the Obama years.
Connecting people and data
Making systems playful
Promoting self reflection
Personalizing reading
Reducing cognitive load

5 AFFORDANCES OF THE FORMAT

When you were born, the Melbourne, Florida area could expect about 53 days per year to reach at least 90 degrees.
Connecting people and data
Making systems playful
Promoting self reflection
Personalizing reading

5 AFFORDANCES OF THE FORMAT

Reducing cognitive load

If job growth had been accelerating...

...the jobs report could look like this:
Interactive Documents: Steppers, Scrollers, …
Gun Deaths In America

By Ben Casselman, Matthew Conlen and Rouben Fischer-Baum

CLICK to advance
Ramadi: The Government Provides an Opening for ISIS

Tensions between this city's residents, who are mostly Sunni, and the central government had been brewing here for at least a year. Then in December, Iraq’s prime minister, Nuri Kamal al-Maliki, ordered security forces to dismantle a protest camp—a outlet for disenchanted Sunnis angered at their treatment by the Shiite-dominated government. The action ignited days of violence and created the opening ISIS needed to seize parts of the city, the provincial capital.

Falluja: A Symbolic Fall

Just days after the raid on the camp in Ramadi, ISIS fighters destroyed the Police Headquarters and mayor's office here, planted their flag on government buildings and decreed the city to be theirs. Ten years earlier, American forces had captured this city from Qaeda-style insurgents at a considerable cost of American lives.
Discrete step vs. Continuous scroll

Different means for narrative navigation. A source of debate among practitioners!

**Step:** sequential frames as in a slideshow
Simple and familiar, but less engaging?

**Scroll:** continuous navigation of page
Parameterize content by scroll position
May cause usability / scrolljacking issues
Narrative Implementation

Do-It-Yourself
Monitor scroll position & element positions
Guidance: M. Bostock, J. Vallandingham

Third-Party Support
Helper Libraries
Interactive Document Formats: Idyll
A toolkit for creating data-driven stories and explorable explanations.
## Hello World

```
[var name:"x" value:5 ]
```

The value of `x` is `[Display value:x format:"d" ]].

```
[Range value:x min:0 max:10 ]
```

---

**OUTPUT**

Hello World

The value of `x` is 6.
28 Built-in Components

Input

Presentation

Layout

Helpers
Fugazi emerged from the Washington D.C. hardcore scene in the late 1980s. They had a profound impact on the music industry without ever joining a major label or breaking into Billboard’s Hot 100.

Musically, Fugazi produced what would come to be known as a seminal post-hardcore sound. Dissonant guitar, complex rhythms, and dueling vocals combine in unorthodox song structures. Harsh tension breaks into blissful, melodic resolution.
Bring your own graphics

A JavaScript component API is exposed to end users.

Use with libraries like D3, Mapbox, Processing (P5), React, Vega-Lite
Built-in static hosting
The average number of cases per day in Texas has been decreasing by 0.64 cases per day over the last 14 days. Based on the data available, the true rate of change may be anywhere from -135.56 to 134.29 new cases per day. There is not enough evidence to show a downward trend in new cases per day.

... OR a downward trajectory of positive tests as a percent of total tests within a 14-day period (flat or increasing volume of tests)
In comparison, only 12% of YouTube’s traffic went through cellular networks, but they were by far the most expensive part of YouTube’s content delivery pipeline, accounting for approximately **8,500 Gigawatt-hours of electricity usage**—enough to power over 750,000 U.S. homes [3]. At over 10 times the electricity usage per unit of traffic, the relative inefficiency of cellular transmission is clear.
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Design Prompt
You want to keep the public as informed as possible of the status of the 2020 presidential election while it happens.

May want to convey:
- current snapshot
- likely outcomes
- awareness of uncertainty
- historical context
- any unusual circumstances (e.g. delayed results).
Design Prompt: PRESIDENTIAL ELECTIONS

Input Data

Vote Counts
candidate, state, method, timestamp, # votes

Race Calls
candidate, state, timestamp

Constraints

Near-real time
Never seen the data before
Data may contain errors
Should not promote public distrust
or aid in the dismantling of U.S. democracy
Design Prompt: PRESIDENTIAL ELECTIONS

Input Data

Vote Counts
candidate, state, method, timestamp, # votes

Race Calls
candidate, state, timestamp

Constraints

Near-real time
Never seen the data before
Data may contain errors
Should not promote public distrust
or aid in the dismantling of U.S. democracy
**Design Prompt** PRESIDENTIAL ELECTIONS

**Input Data**

Vote Counts
candidate, state, method, timestamp, # votes

Race Calls
candidate, state, timestamp

**Constraints**

Near-real time
Never seen the data before
Data may contain errors
Should not promote public distrust or aid in the dismantling of U.S. democracy

**HOW WOULD YOU VISUALIZE THIS?**

You want to keep public as informed as possible of the status of the race while it happens.

May want to convey:
- current snapshot
- likely outcomes
- awareness of uncertainty
- any unusual circumstances (e.g. delayed results)

**WHAT DATA WOULD YOU USE?**

- You want to keep public as informed as possible of the status of the race while it happens.
- May want to convey:
  - current snapshot
  - likely outcomes
  - awareness of uncertainty
  - any unusual circumstances (e.g. delayed results)