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
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
Narrative Storytelling

**Story:**
The events or facts you want to convey

**Narrative:**
How you convey those facts
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**...
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.
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.”

Anecdotal Lead

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.
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 top career 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.”

Nut Graph

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.
Topics

Narrative visualization

*Case Study: Coronavirus Testing*

Design space

Interactive articles

*Case Study: Carbon Footprint*

Authoring tools

Design Inquiry

Choosing visual forms
Storytelling
... with data?
Lives of others

Jennifer McKee, Canada's privacy commissioner, worries that Facebook, in August 2009, the social networking site issued a deal, agreeing to change its policies within a year to comply with the country's privacy law. She says those policies, the company appears to be issuing an approval of the deal, which involved giving users a clear and easy-to-implement choice about whether to share personal data with third parties. It does not seem to be that Facebook is going in the right direction on this issue, she says, noting that, without a change of course, the issue could soon become the subject of another round of regulation by her organization.

Facebook's recently released report to provide the list of third-party apps and Google and others' data collection this week following news that it had received some personal comments that were not necessary. With data networks in place and offices in some 130 countries, Facebook's policies are being developed in response to a series of new matters which have been raised in the company's background in Silicon Valley. The report is a response to the growing concerns about the way Facebook's data collection policies are being used to control the privacy controls that make it easier to keep in touch with friends. MySpace, a rival, is already releasing it control simply in an effort to use the new technology to its advantage.

A recent report on Facebook's handling of privacy issues has been receiving some attention. In December, the social network changed the default settings on its privacy settings to make it easier for others to share information with anyone who needs to. A new report on Facebook's handling of privacy issues was being released this week. The report highlights some tension between practices of privacy and social networking. It notes, however, concern among web users about how private data can be made public. Several prominent internet users, such as Dave Winer of the website "official" say, "There is a lot of emphasis today on privacy and social networking. But in many cases, controls are gradually becoming more and more invasive. As people share more, they are becoming restricted in what they can choose to share against which is the privacy of advertising. And most of the focus on how people share and what it means to the benefit of the user than that represents hundreds of millions of dollars.

According to Facebook, the deal is still operating. Facebook's spokesman, at a conference last month at which Mark Zuckerberg, Facebook's head, announced the new suite of policies changes. One that was confirmed was an "instant personalization" feature that but would prompt third-party websites across Facebook data when people visit. Facebook says that Facebook has not made it available in this feature, which may explain why the傳言that enables sharing is still not available.

European officials are starting to call for Facebook's response. This month a group of data protection experts released a report on Europe's Constitution on the social networking, calling for response to issues of the Facebook's settings "not applicable". The report also notes that..."
About 21,000 coronavirus cases were reported per day in early June, when the positive test rate was 4.8 percent.
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)
Narrative Devices
What devices communicates best?
Highly dependent on: audience, context, format

Format
Interactive Article
Animation
Lecture
Still Image
Video
Change in teen shenanigans from 1993 to 2013. Showing % difference from 2003 levels.

- VIOLENT ARREST
- PREGNANCY
- ALCOHOL
- NON-VIOLENT ARREST
- DRUGS
- DROPOUT
- ABORTION

Conlen 2014
“Best stats you’ve ever seen”

Hans Rosling

Graph showing life expectancy and GDP per capita over time.
Narrative Visualization Design Space
58 CASE STUDIES

70% Journalism
20% Business
10% Research

Segel & Heer, 2010
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 homers a season than projected.

---

*Note: Ages as of July 1 of each season.*
## Case Studies

### Architecture and Justice (Brooklyn Crime Blocks)
- Politics
- Real Estate
- Crime
- Criminal Justice
- Police
- Gun Control
- Violence
- Drug Abuse
- Poverty
- Military

### Observing Narrative Devices

#### Visualization Description
- Architecture and Justice (Brooklyn Crime Blocks)
- Police
- Real Estate
- Crime
- Criminal Justice
- Police
- Gun Control
- Violence
- Drug Abuse
- Poverty
- Military

#### Observed Narrative Devices

<table>
<thead>
<tr>
<th>Device</th>
<th>Observation</th>
<th>Analysis</th>
<th>Visualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Taxi</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Bicycle</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Police Car</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Crime Scene</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Gun Control</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Violence</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Poverty</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Military</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>
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

- Percentage change, year on year: Drag the slider
- martini glass
- interactive slideshow
- drill-down story
- ASK QUESTIONS
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
Communicating with Interactive Articles

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

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

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.

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

<table>
<thead>
<tr>
<th>Class</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>

Adult outcomes reflect household incomes in 2014 and 2015.

Even when children grow up next to each other with parents who earn similar incomes, black boys fare worse than white boys in a number of housing-related measures in the United States.
Connecting people and data
Making systems playful
Promoting self reflection
Personalizing reading
Reducing cognitive load

I am female and currently 23 years old.

<table>
<thead>
<tr>
<th>AGE OF DEATH</th>
<th>DIED SO FAR</th>
<th>STILL ALIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 years</td>
<td>1%</td>
<td>99%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUSE OF DEATH SO FAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0% Infection</td>
</tr>
<tr>
<td>0% Cancer</td>
</tr>
<tr>
<td>0% Blood</td>
</tr>
<tr>
<td>0% Endocrine</td>
</tr>
<tr>
<td>0% Mental</td>
</tr>
<tr>
<td>0% Nervous</td>
</tr>
<tr>
<td>0% Circulatory</td>
</tr>
<tr>
<td>0% Respiratory</td>
</tr>
<tr>
<td>0% Digestive</td>
</tr>
<tr>
<td>0% Musculoskeletal</td>
</tr>
<tr>
<td>0% Genitourinary</td>
</tr>
<tr>
<td>0% Perinatal</td>
</tr>
<tr>
<td>0% Congenital</td>
</tr>
<tr>
<td>0% External Causes</td>
</tr>
<tr>
<td>0% Other</td>
</tr>
</tbody>
</table>
You Draw It: What Got Better or Worse During Obama’s Presidency

By LARRY BUCHANAN, HAEOYOUN 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

5 AFFORDANCES OF THE FORMAT

Personalizing reading
Reducing cognitive load

When you were born, the Melbourne, Florida area could expect about 53 days per year to reach at least 90 degrees.
5 AFFORDANCES OF THE FORMAT

Connecting people and data
Making systems playful
Promoting self reflection
Personalizing reading
Reducing cognitive load
Interactive Documents: Steppers, Scrollers, ...
Gun Deaths In America

By Ben Casselman, Matthew Conlen and Rouben Fischer-Baum

CLICK to advance
About **21,000 coronavirus cases** were reported per day in early June, when the positive test rate was 4.8 percent.
Different means for narrative navigation. A source of debate among practitioners!

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

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

**Hybrids:** scroller with discrete sections
Narrative Implementation

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

Third-Party Support
Helper Libraries
Interactive Document Formats: Idyll
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 ]

---

Hello World

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

Input
- Action
- Boolean
- Button
- Dynamic
- Radio
- Range
- Select
- Text Input

Presentation
- Chart
- Conditional
- Display
- Equation
- Gist
- Header
- Link
- SVG
- Table
- Youtube

Layout
- Aside
- Full Width
- Fixed
- Float
- Inline

Helpers
- Analytics
- Meta
- Preload
- 1,234 views
- < />
Fugazi emerged from the Washington, D.C., hardcore scene in the late 1980s. They had a profound impact on the music industry with their ever-changing lineup and adept use of complex rhythms and dexterity vocal styles. Their music ranged from melodic to abrasive, combining elements of hardcore punk, noise, and post-punk into a cohesive, multilayered sound.

Mathematical equation: \( f(x) = x + \mathbb{R}, \cos(3\pi / (4 + x)) \)
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 -1.35 to 1.34 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.
Design Inquiry
How to choose visual forms?
What works well for one dataset or audience might be ineffective for another.
Both articles consider “serious” data on urgent topics. One uses simple, familiar forms. Why?
Thanks!

Feel free to reach out with questions:

mconlen@cs.washington.edu