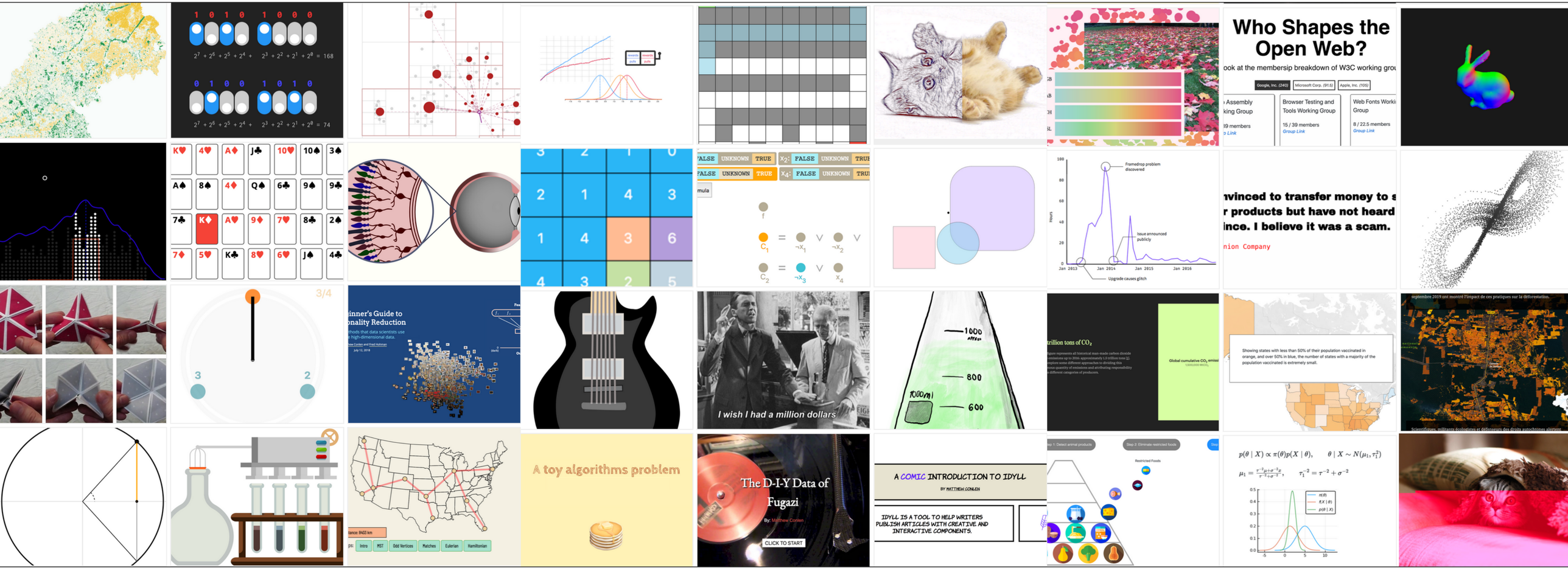
CSE 442

Narrative Visualization



Matthew Conlen

(with material from Jeff Heer, Edward Segel, and Jessica Hullman)

About Me

Ph.D. from UW computer science in 2021
    Advised by Jeff Heer

Work as a data journalist
    past: FiveThirtyEight, CNN, New Yorker,
    current: New York Times

Lecture will be biased toward data journalism but the material is more generally relevant (education, scientific publishing, policymaking).

@mathisonian
mathisonian.com

When Could the United States Reach Herd Immunity? It's Complicated.

Conlen & Smart, New York Times 2021

Motivation

Transparency in journalism

"A sense of the tentativeness of truth."

- *Philip Meyer, Precision Journalism, 2002*

More engaged audience

Greussing & Boomgaarden, *Digital Journalism 2019*

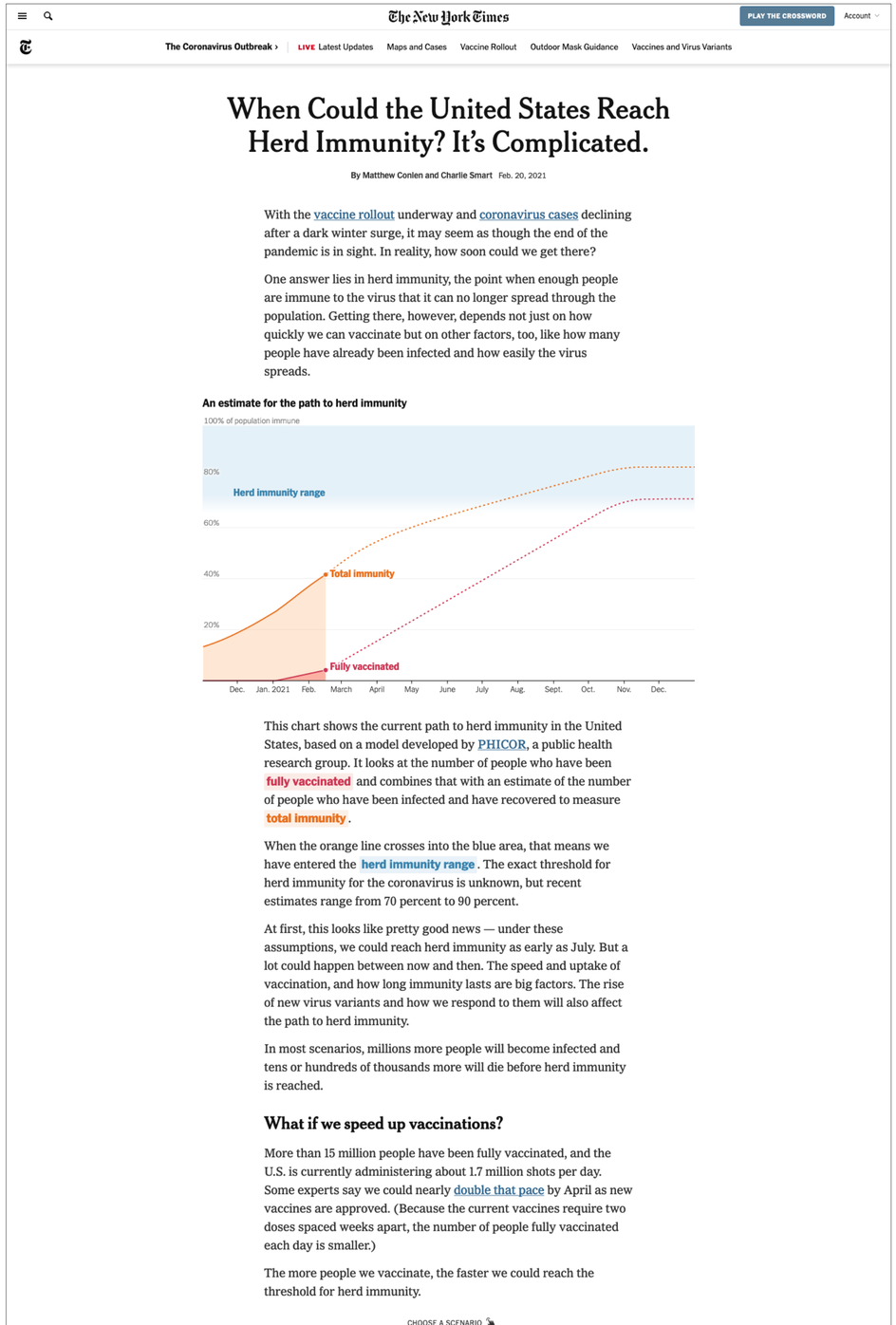
Better learning outcomes

Mayer's Multimedia Principles, 2005

Promote active reading

Victor's "Explorable Explanations", 2011

...also many challenges!



The New York Times

PLAY THE CROSSWORD Account

The Coronavirus Outbreak › | LIVE Latest Updates | Maps and Cases | Vaccine Rollout | Outdoor Mask Guidance | Vaccines and Virus Variants

When Could the United States Reach Herd Immunity? It's Complicated.

By Matthew Conlen and Charlie Smart Feb. 20, 2021

With the vaccine rollout underway and coronavirus cases declining after a dark winter surge, it may seem as though the end of the pandemic is in sight. In reality, how soon could we get there?

One answer lies in herd immunity, the point when enough people are immune to the virus that it can no longer spread through the population. Getting there, however, depends not just on how quickly we can vaccinate but on other factors, too, like how many people have already been infected and how easily the virus spreads.

An estimate for the path to herd immunity

This chart shows the current path to herd immunity in the United States, based on a model developed by PHICOR, a public health research group. It looks at the number of people who have been fully vaccinated and combines that with an estimate of the number of people who have been infected and have recovered to measure total immunity.

When the orange line crosses into the blue area, that means we have entered the herd immunity range. The exact threshold for herd immunity for the coronavirus is unknown, but recent estimates range from 70 percent to 90 percent.

At first, this looks like pretty good news — under these assumptions, we could reach herd immunity as early as July. But a lot could happen between now and then. The speed and uptake of vaccination, and how long immunity lasts are big factors. The rise of new virus variants and how we respond to them will also affect the path to herd immunity.

In most scenarios, millions more people will become infected and tens or hundreds of thousands more will die before herd immunity is reached.

What if we speed up vaccinations?

More than 15 million people have been fully vaccinated, and the U.S. is currently administering about 1.7 million shots per day. Some experts say we could nearly double that pace by April as new vaccines are approved. (Because the current vaccines require two doses spaced weeks apart, the number of people fully vaccinated each day is smaller.)

The more people we vaccinate, the faster we could reach the threshold for herd immunity.

CHOOSE A SCENARIO

Topics

Storytelling

- How different mediums can be used to tell stories

Design of narrative visualizations & interactive articles

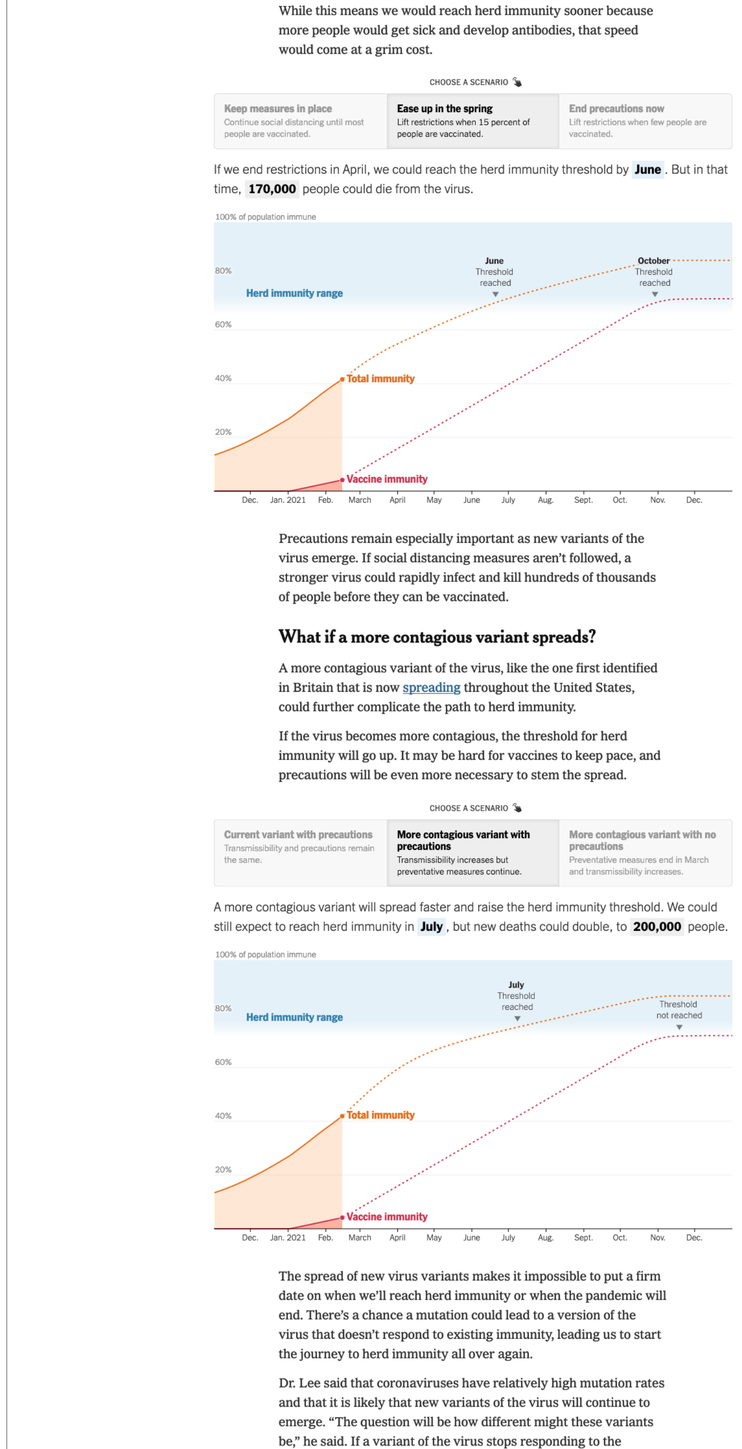
- Segel & Heer, 2010
- Hohman, et al 2020

Research on Authoring Tools

- Idyll, *UIST 2018*
- Idyll Studio, *UIST 2021*

Design exercise

- Prompt similar to real-world task you'd see as a data journalist



While this means we would reach herd immunity sooner because more people would get sick and develop antibodies, that speed would come at a grim cost.

CHOOSE A SCENARIO

Keep measures in place
Continue social distancing until most people are vaccinated.

Ease up in the spring
Lift restrictions when 15 percent of people are vaccinated.

End precautions now
Lift restrictions when few people are vaccinated.

If we end restrictions in April, we could reach the herd immunity threshold by **June**. But in that time, **170,000** people could die from the virus.

Precautions remain especially important as new variants of the virus emerge. If social distancing measures aren't followed, a stronger virus could rapidly infect and kill hundreds of thousands of people before they can be vaccinated.

What if a more contagious variant spreads?

A more contagious variant of the virus, like the one first identified in Britain that is now spreading throughout the United States, could further complicate the path to herd immunity.

If the virus becomes more contagious, the threshold for herd immunity will go up. It may be hard for vaccines to keep pace, and precautions will be even more necessary to stem the spread.

CHOOSE A SCENARIO

Current variant with precautions
Transmissibility and precautions remain the same.

More contagious variant with precautions
Transmissibility increases but preventative measures continue.

More contagious variant with no precautions
Preventative measures end in March and transmissibility increases.

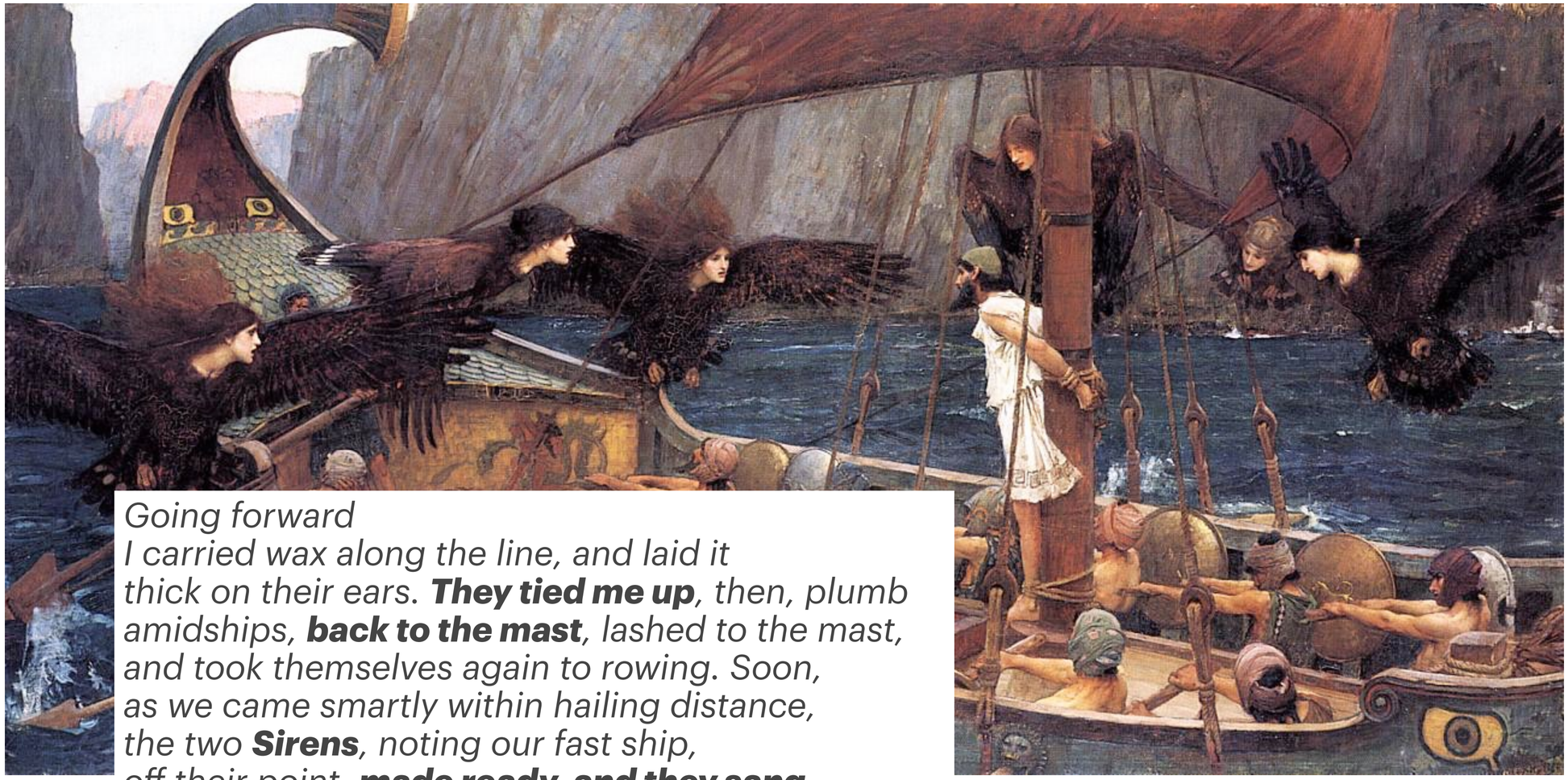
A more contagious variant will spread faster and raise the herd immunity threshold. We could still expect to reach herd immunity in **July**, but new deaths could double, to **200,000** people.

The spread of new virus variants makes it impossible to put a firm date on when we'll reach herd immunity or when the pandemic will end. There's a chance a mutation could lead to a version of the virus that doesn't respond to existing immunity, leading us to start the journey to herd immunity all over again.

Dr. Lee said that coronaviruses have relatively high mutation rates and that it is likely that new variants of the virus will continue to emerge. "The question will be how different might these variants be," he said. If a variant of the virus stops responding to the

STORYTELLING

as ancient as mankind



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

BLAM

Justice Stephen G. Breyer to Retire From Supreme Court

Justice Stephen G. Breyer was appointed to the Supreme Court in 1994 by President

WASHINGTON — Justice Stephen G. Breyer, the senior member of the Supreme Court's three-member liberal wing, will retire, two people familiar with the decision said, providing President Biden a chance to make good on his campaign pledge to name a Black woman to the court.

Mr. Biden is expected to formally announce the retirement at the White House on Thursday, according to one person familiar with the planning for the event.

Justice Breyer, 83, the oldest member of the court, was appointed in 1994 by President Bill Clinton. After the death of Justice Ruth Bader Ginsburg in 2020 and the appointment of Justice Amy Coney Barrett by President Donald J. Trump, he became the subject of an energetic campaign by liberals who wanted him to step down to ensure that Mr. Biden could name his successor while Democrats control the Senate.

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Lede (lead paragraph)

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Nut Graf (nutshell paragraph)

STORYTELLING

across various media

PEOPLE TELL STORIES

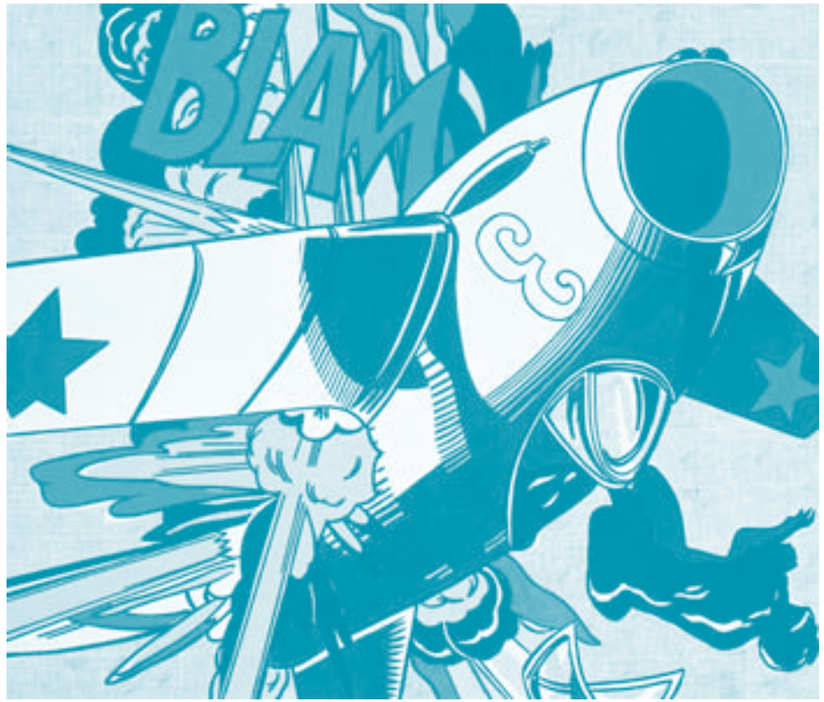
WORDS TELL STORIES

IMAGES TELL STORIES

COMICS TELL STORIES

MOVIES TELL STORIES

DATA TELLS STORIES?



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68 Suing companies
69 The recovery of General Motors
69 Business crime in China
70 Indian retail
70 Japan's drug firms on the move
71 Brazil on tobacco
71 Schumpeter: Overstretched

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Privacy and the internet

Lives of others

Facebook and Google face a backlash from users and regulators alike, over the way they have handled sensitive data

JENNIFER STODDART, Canada's privacy commissioner, is not on nodding terms with Facebook. In August 2009 the social networking site struck a deal, agreeing to change its policies within a year to comply with the country's privacy laws. It now says Ms Stoddart, the watchdog appears to be leveraging an unimportant part of the deal, which involved giving users a clear and easy-to-understand explanation of how they can prevent data with third parties. "I don't seem to see that Facebook is going in the right direction on this issue," she says, hinting that, without a change of course, the firm could soon become the subject of another lawsuit or investigation by her organisation.

Facebook is not the only internet giant to provoke the ire of data watchdogs. Google endured withering criticism this week following news that it had recorded some personal communications sent over unencrypted Wi-Fi data networks in homes and offices in some 30 countries. On May 11th Peter Schaar, Germany's federal commissioner for data protection, called for an independent investigation into Google's behaviour, claiming that it had "deeply disturbed normal rules in the development and usage of software."

The cases highlight rising tension between guardians of privacy and internet firms. And they reflect concern among web users about how private data are made public. Several prominent internet types such as Cory Doctorow, a science-fiction author, and Lee Laporte, a publisher, have abandoned Facebook. Sites such as QuitFacebookDay.com are urging others to do so on or shortly after May 31st, when Facebook "expands".

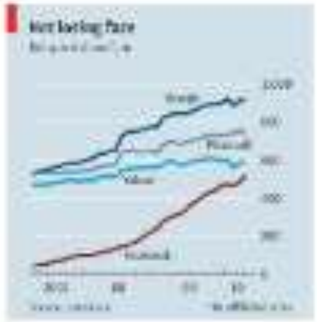
There is likely to be a big new version of Facebook, which is poised to claim half a billion members and which draws even more visitors as a whole to its site (see chart). Its owners have been ranked at the company's headquarters in Silicon Valley, where bosses are mulling over how to respond. Several senior folk are now hinting that Facebook will soon roll out simpler privacy controls to make it easier to keep more data hidden. MySpace, a rival, is already making it controls easy to use in an effort to woo disaffected Facebookers to its service.

A revolt over Facebook's handling of privacy has been brewing for some time. In December the social network changed the default settings on its privacy controls so that individuals' personal information would be shared with "everyone" rather than selected friends. Facebook argued this reflected a shift in society towards greater openness and noted that users could still adjust privacy settings back again. But irritated privacy activists lobbied furiously to be unmoved.

The switch should not have come as a surprise. Early on, many social networks copied flashy but risky privacy policies in order to attract and increase users. But as more join, users are gradually learned to encourage more sharing. As people share more, Facebook can increase the traffic against which it sells advertising. And the more it learns about users' likes and dislikes, the better it can target ads that generate hundreds of millions of dollars.

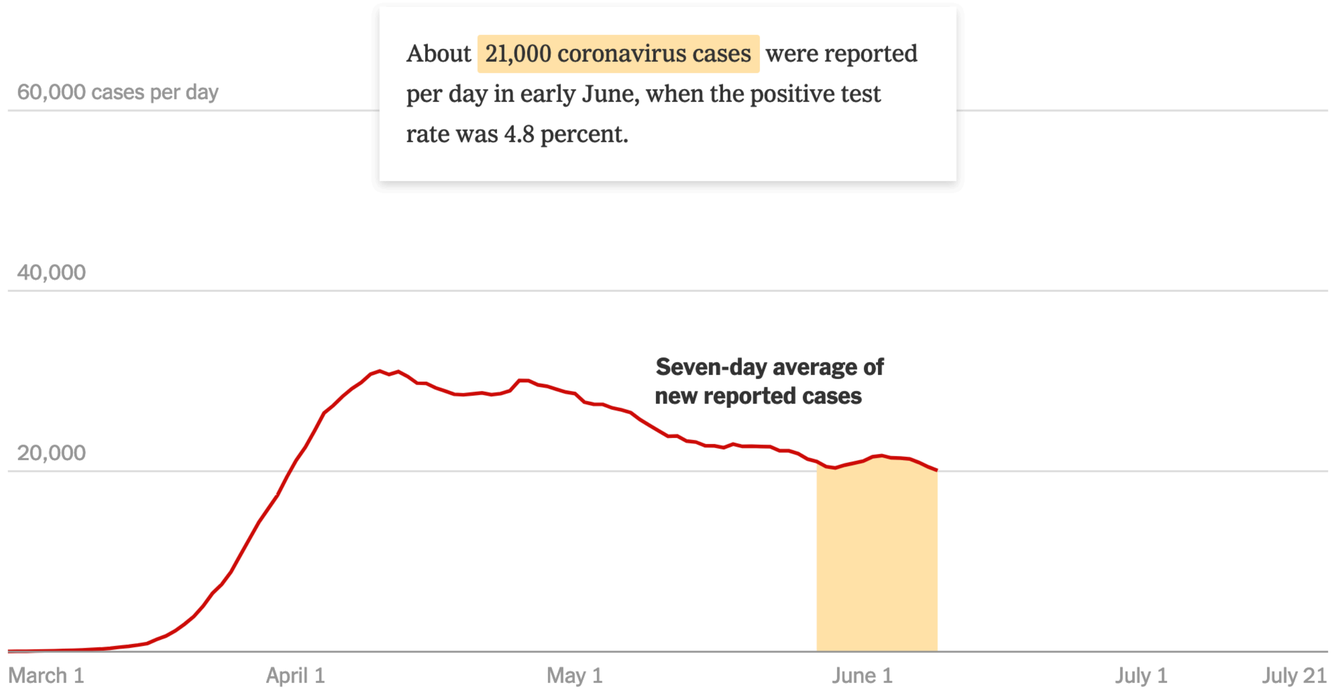
Protests grew louder still following a developers' conference last month at which Mark Zuckerberg, Facebook's boss, announced yet another series of policy changes. One that caused irritation was an "instant personalisation" feature that lets certain third-party websites access Facebook data when people visit. Critics say that Facebook has made it tricky to disable this feature, which may explain why Ms Stoddart claims it is not.

European officials are getting tough with Facebook too. This month a group of data-protection experts who advise the European Commission wrote to the social network, calling on it to force users to leave the default settings "non-accessible". And in the UK



The New York Times

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



CASE STUDY COVID-19 TESTING

Conlen, 2020

CASE STUDY COVID-19 TESTING

Input Data

Daily case and test counts.

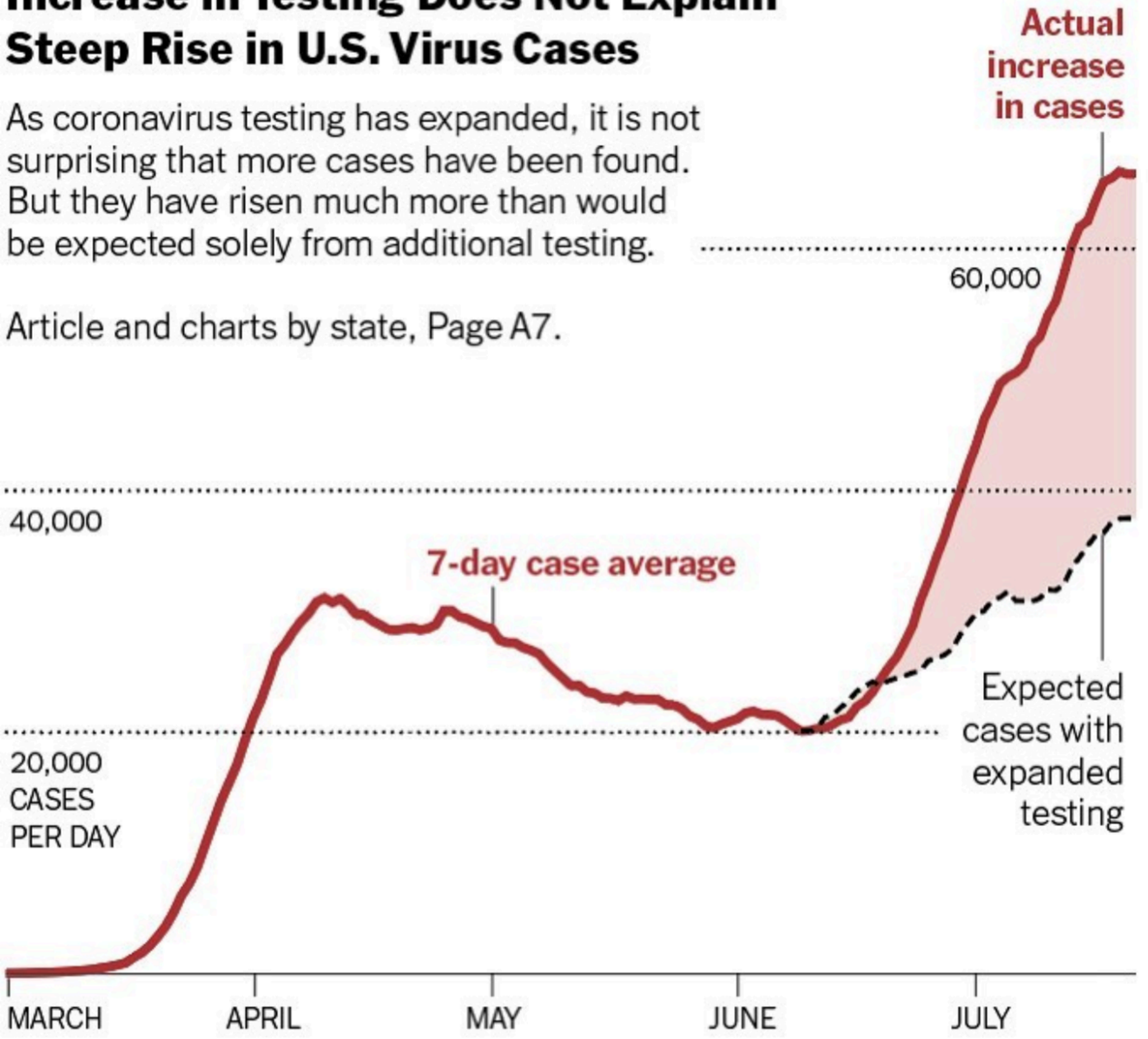
Points of Focus

1. Baseline (smoothed average of daily cases)
2. Counterfactual case curve
   (baseline positivity rate * daily test counts),
3. Actual case curve (daily cases)

Increase in Testing Does Not Explain Steep Rise in U.S. Virus Cases

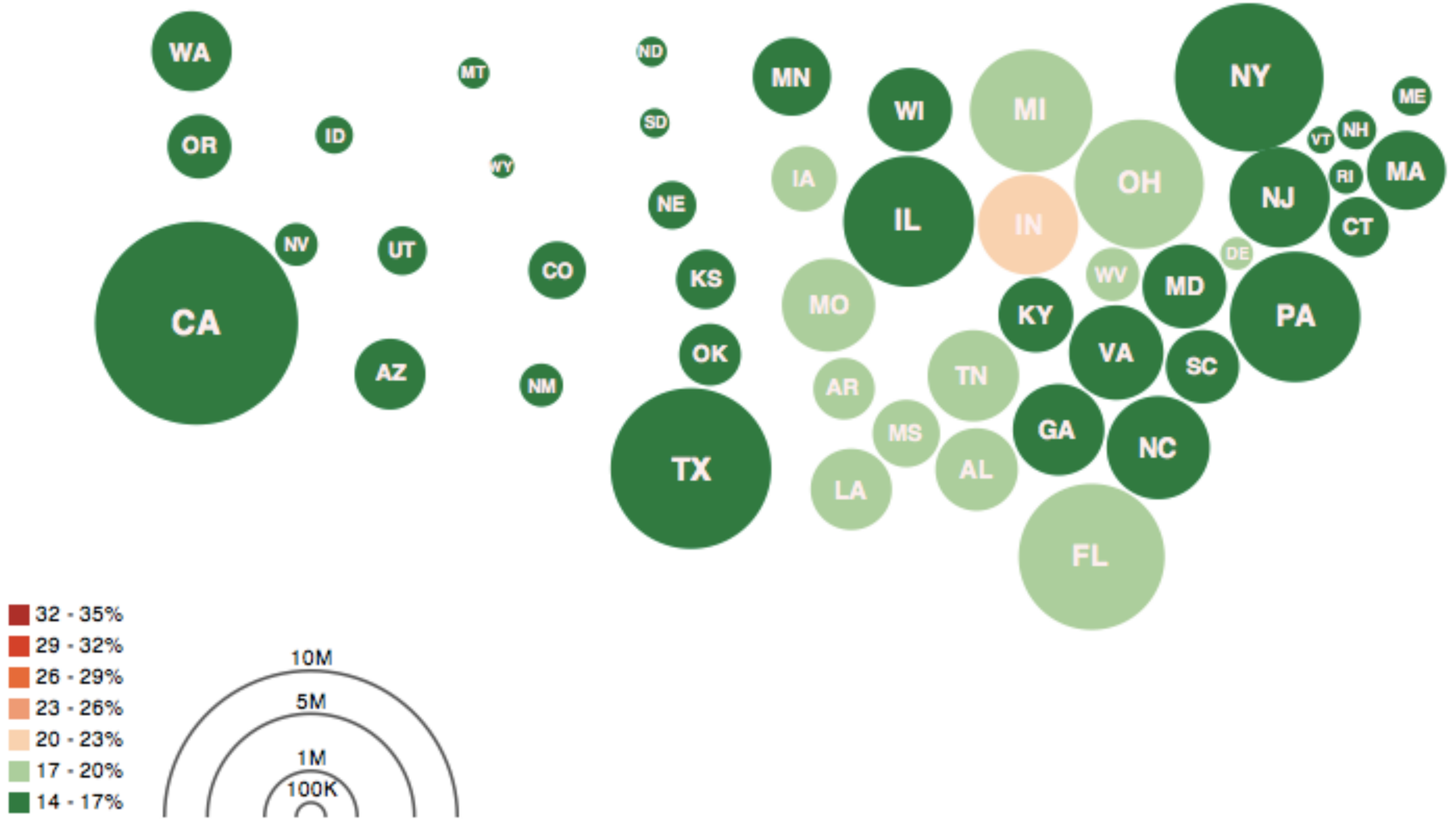
As coronavirus testing has expanded, it is not surprising that more cases have been found. But they have risen much more than would be expected solely from additional testing.

Article and charts by state, Page A7.

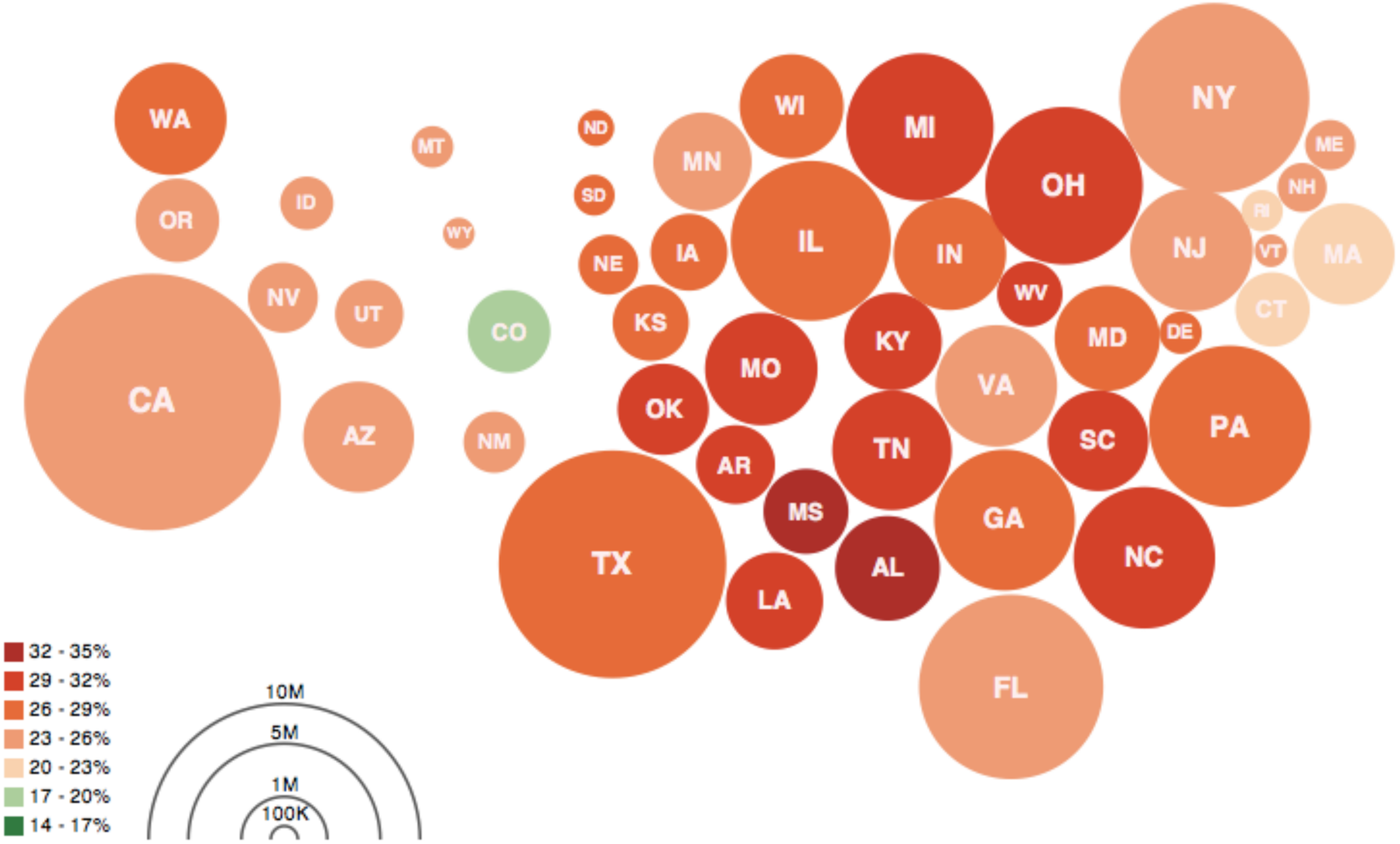


Source: The COVID Tracking Project

MATTHEW CONLEN/THE NEW YORK TIMES



Obesity Map Vadim Ogievetsky



Obesity Map Vadim Ogievetsky

Instagram

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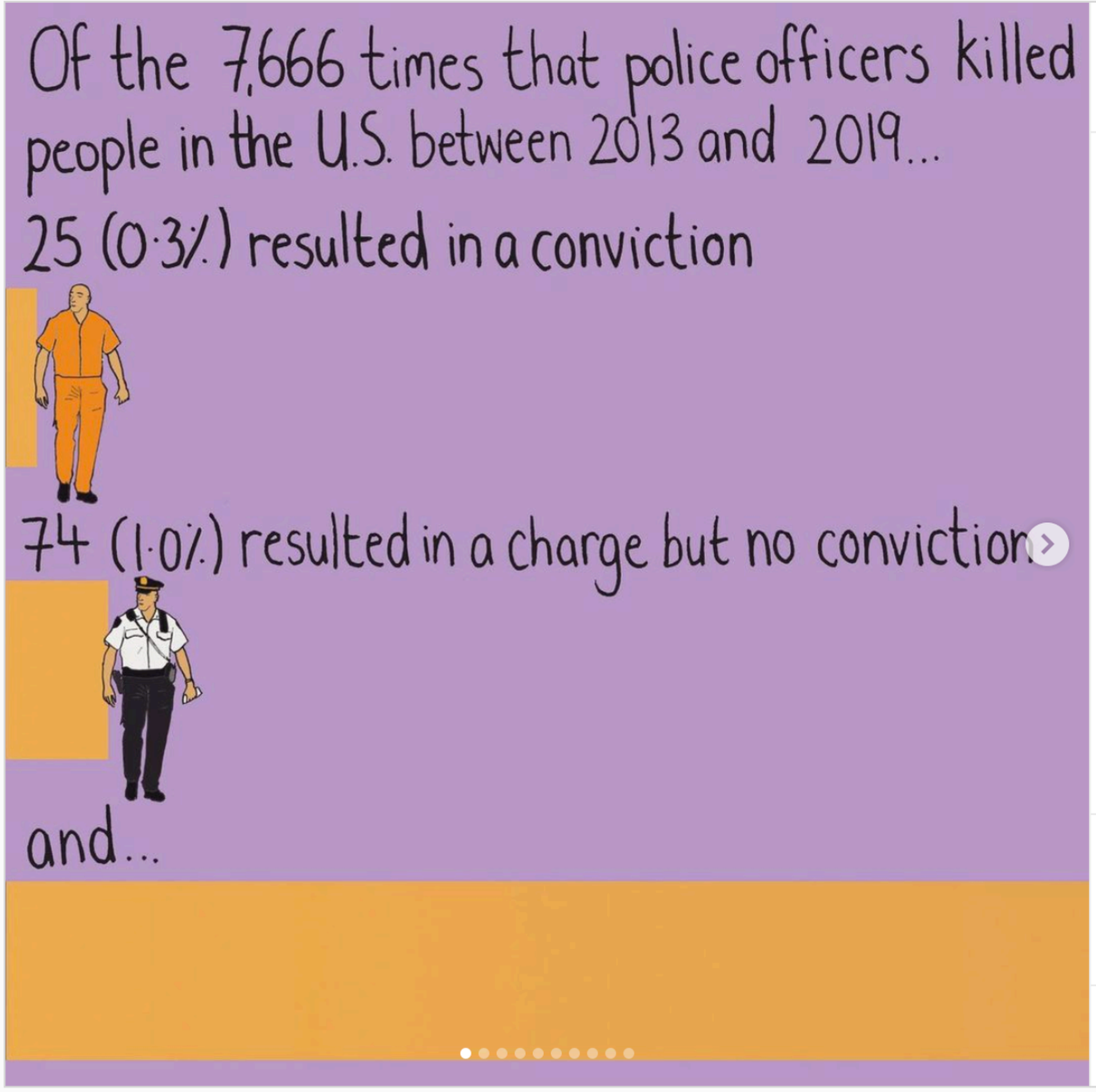


monachalabi • Follow
United States

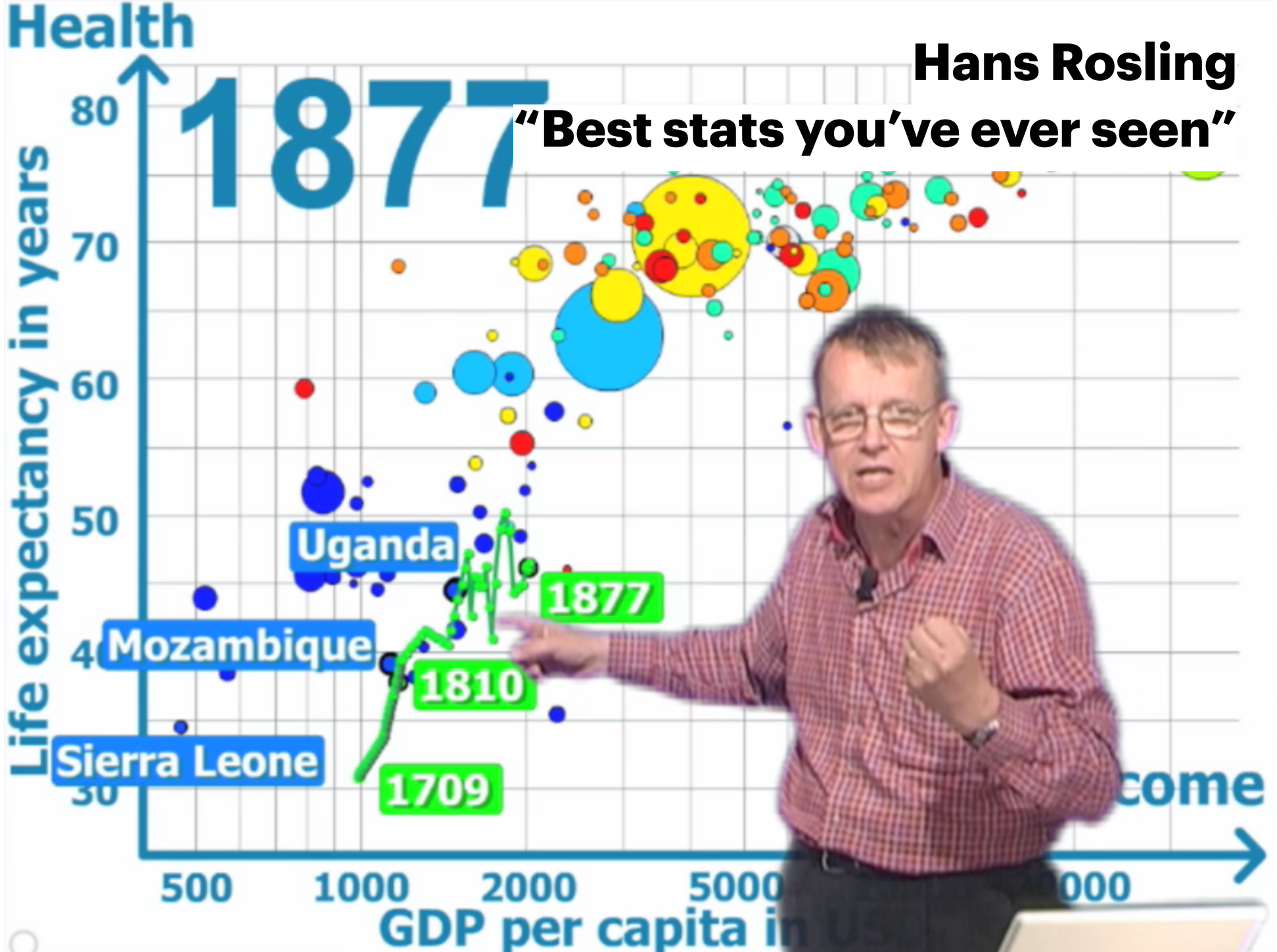
monachalabi Total disbelief about the system doing the bare minimum. George Floyd deserved so much more than this, he deserved to live.

Some detail about those 25 sentences:
Unknown sentence = 4 police killings
Just probation = 3
3 months in jail = 1
1 year in jail, 3 years suspended = 1
1 year in prison = 1
18 months in prison = 1
2.5 years in prison = 1
4 years in prison = 1
5 years in prison = 1
6 years in prison = 1
16 years in prison = 1
20 years in prison = 1
30 years in prison = 2

22,976 likes

3 HOURS AGO

Log in to like or comment.


Health
1877
Hans Rosling
“Best stats you’ve ever seen”
Life expectancy in years
80
70
60
50
40
30
Uganda
Mozambique
Sierra Leone
1877
1810
1709
500
1000
2000
5000
GDP per capita in
come

Narrative Devices

What devices communicates best?

Highly dependent on: audience, context, format

Format

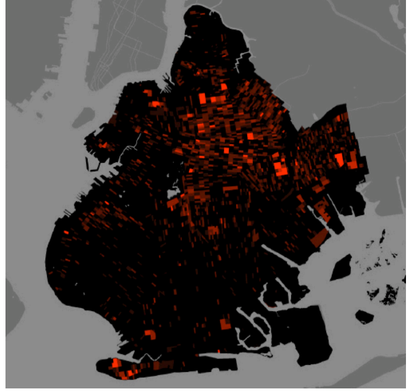
Interactive Article

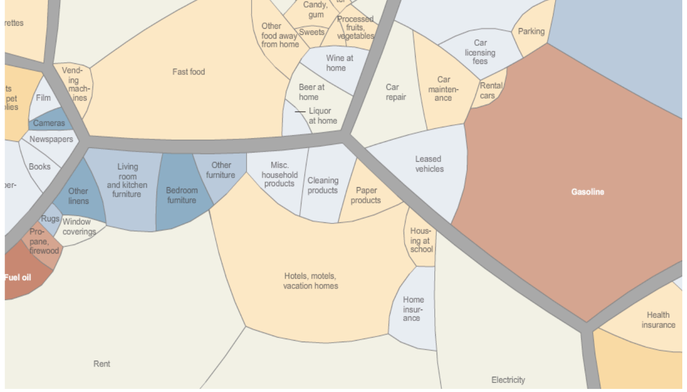
Animation

Lecture

Still Image

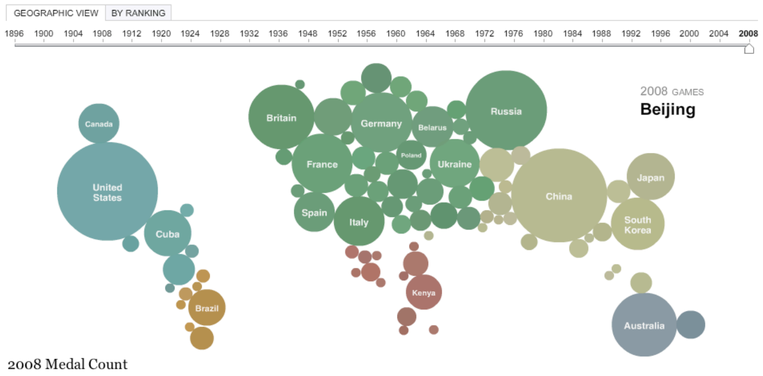
Video



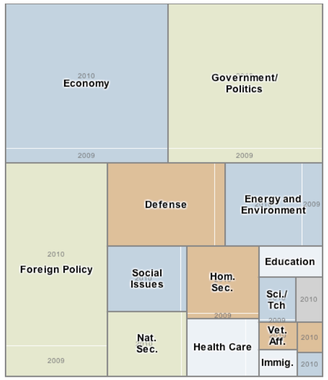


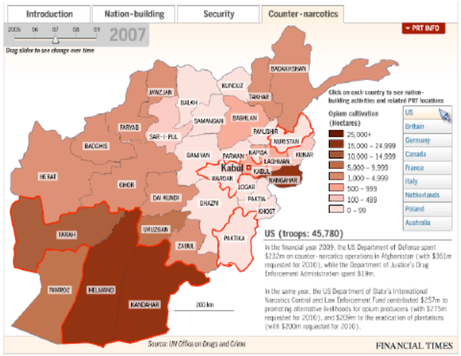
58
CASE STUDIES

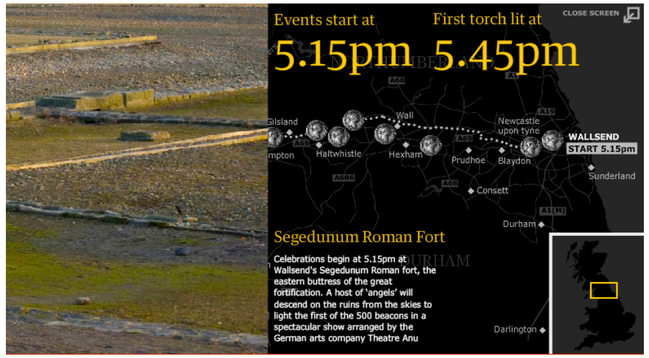
70% Journalism
20% Business
10% Research

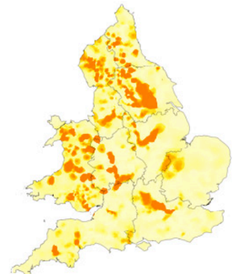


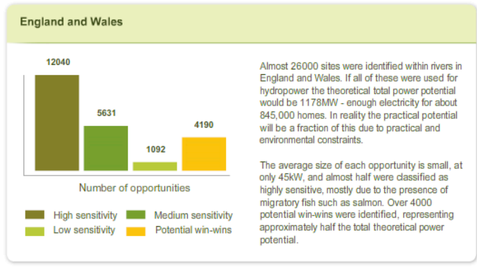
2008 Medal Count











Segel & Heer, 2010

755

Steroids or Not, the Pursuit Is On

Barry Bonds is taking aim at the career home run record. He needs only six more to tie Babe Ruth and 47 to equal Hank Aaron.

Lines are cumulative home runs.

Hank Aaron
755 homers
23 seasons

Babe Ruth
714 homers
22 seasons

Barry Bonds
708 homers
20 seasons

Bonds takes lead
Home runs after 16 seasons

Bonds	567
Aaron	554
Ruth	516

755
714
23 seasons
22 seasons
20 seasons

Bonds was injured last season. He played 14 games and hit 5 homers.

600
400
200
0
14th season
5 seasons
10
15

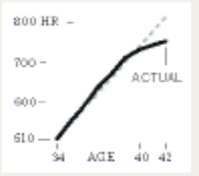
According to allegations in a book about Bonds, he began taking steroids before the 1999 season, his 14th in the league. Two seasons later, he hit 73 home runs, surpassing Aaron's career pace.

Homer Pace After Age 34

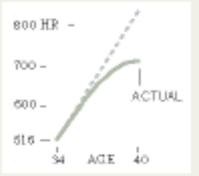
If the accusations are correct, Bonds was 34 in his first season on steroids. Here are projected home run paces for each player after age 34.

PROJECTED PACE BASED ON AVERAGE OF PREVIOUS FIVE SEASONS

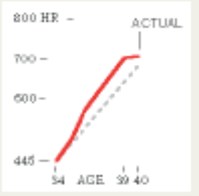
Aaron
Actual homers slightly outpace projected homers for five seasons.



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



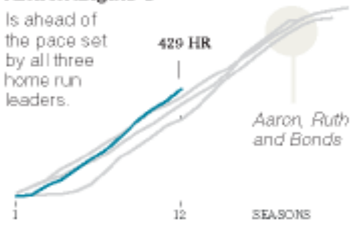
Bonds
From age 35 to 39, he averaged 14 more homers a season than projected.



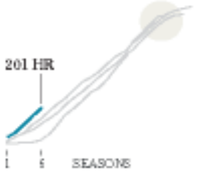
Note: Ages as of July 1 of each season.

Others Taking Aim

Alex Rodriguez ▲
Is ahead of the pace set by all three home run leaders.



Albert Pujols
Averaging 40 homers a season, he has started stronger than the three leaders did.

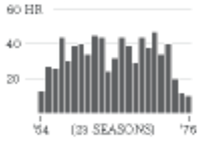


Ken Griffey Jr.
Many thought he would be the first to catch Ruth and Aaron until injuries limited his output.

Differing Paths to the Top of the Charts

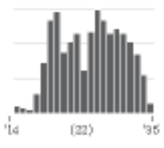
The top seven players on the career home run list, along with a look at Griffey (12th), Rodriguez (37th) and Pujols (tied 257th).

Hank Aaron
755



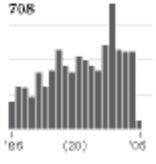
15 times hit 30 or more (M.L. most).

Babe Ruth
714



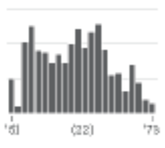
Hit only 20 over first five seasons.

Barry Bonds
708



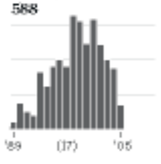
Averaged 52 from 2000 to 2004.

Willie Mays
660



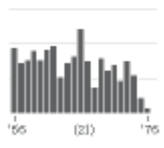
No one hit more from 1950-69.

Sammy Sosa
588



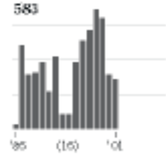
Three 60-homer seasons is record.

Frank Robinson
586



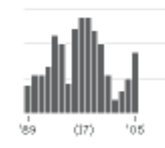
Triple Crown in '66 (49, 122, .316).

Mark McGwire
583



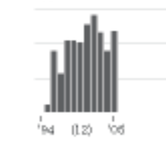
First to hit 70 in a season.

Ken Griffey Jr.
536



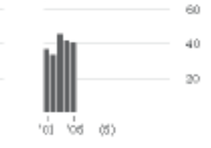
Only McGwire had more in the 90's.

Alex Rodriguez
429



Youngest to reach 400 homers.

Albert Pujols
201



Second most ever in first five seasons.

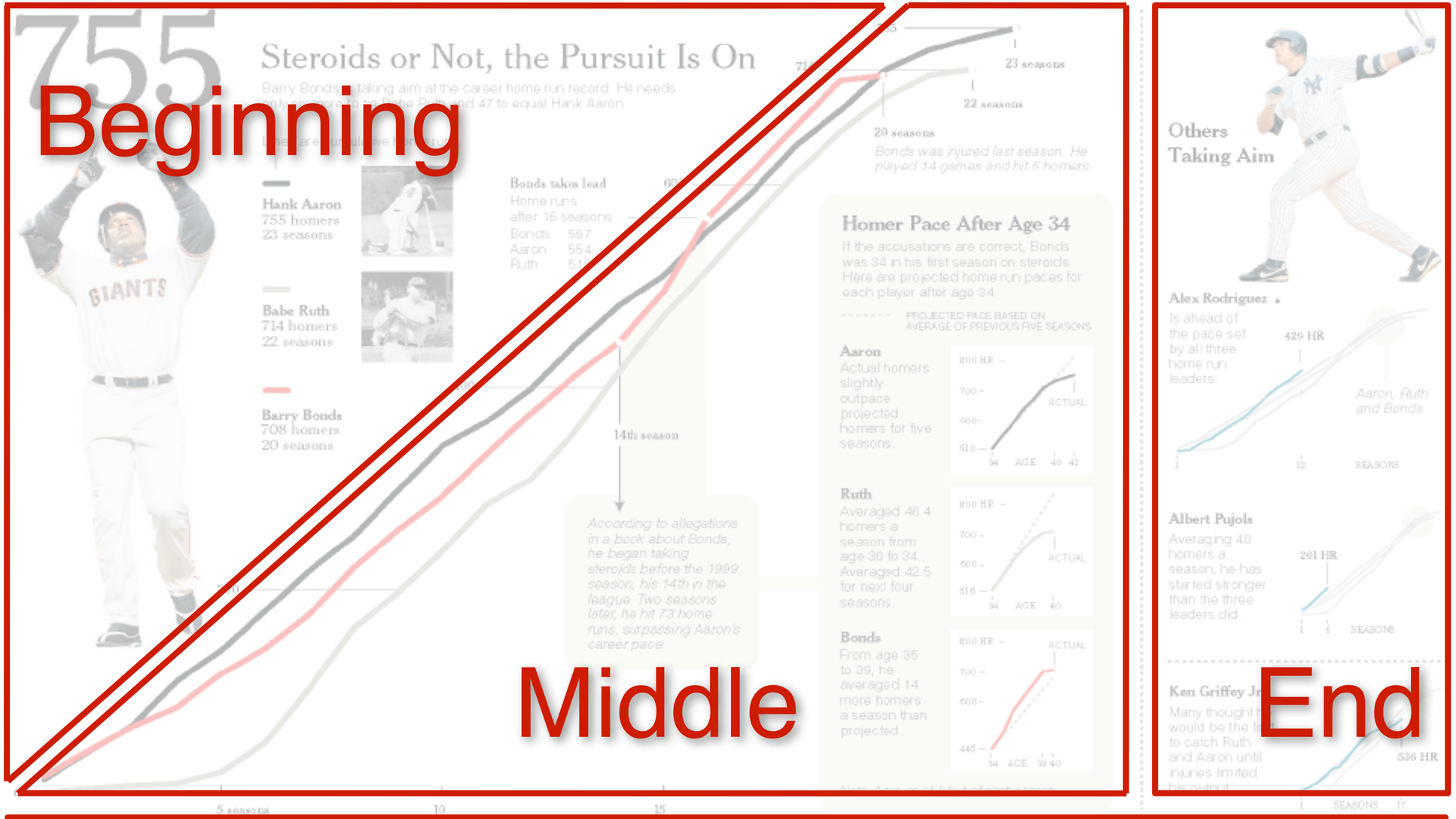
Amanda Cox and Joe Ward/The New York Times

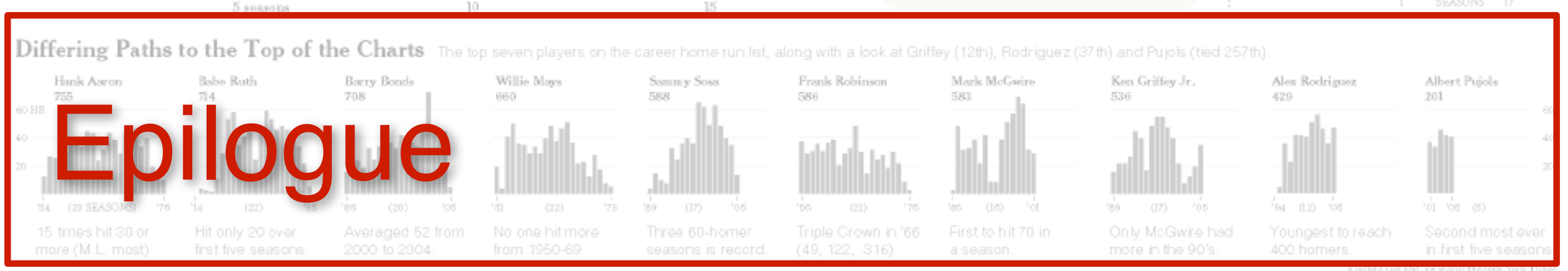
Beginning

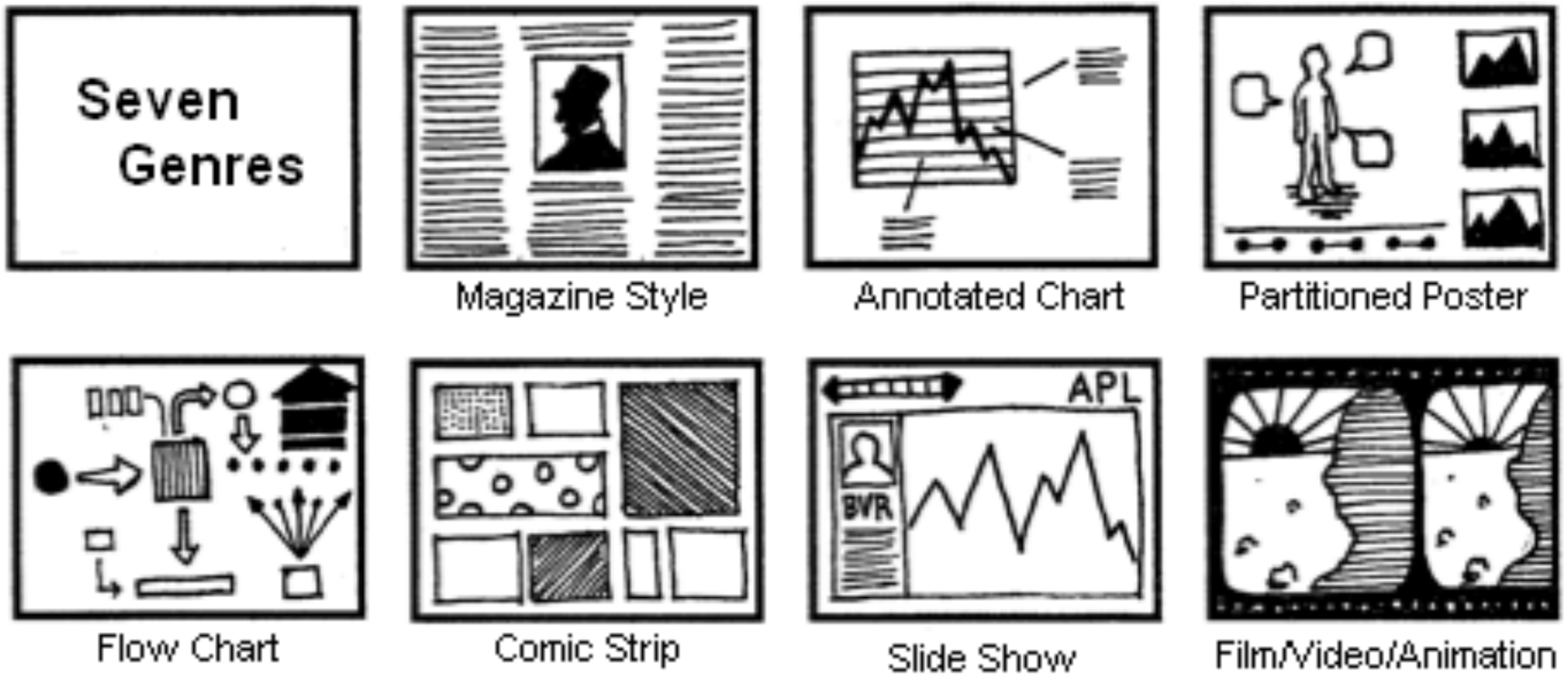
Middle

End

Epilogue





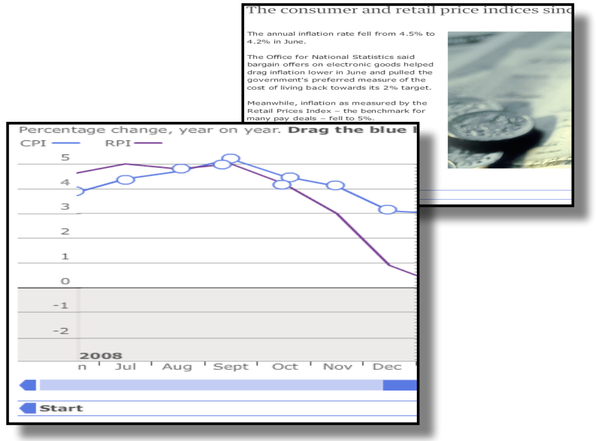


Genres for Narrative Visualization (2010)

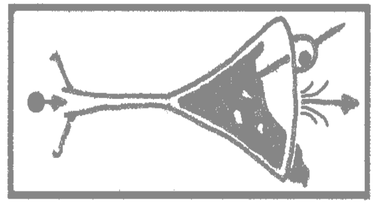
Genres + Interactivity + Messaging =

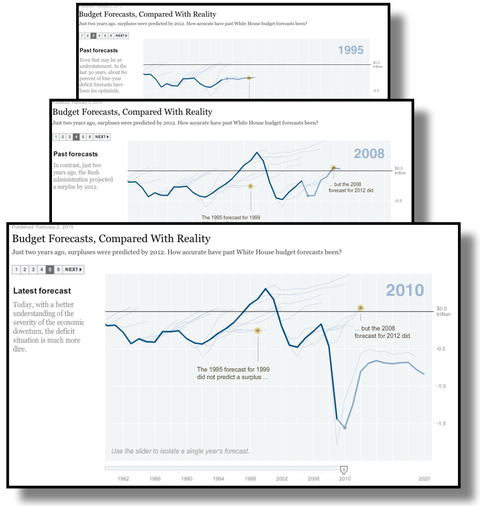
DESIGN SPACE

STORYTELLING	**Author Driven** strong ordering heavy messaging limited interactivity	**Reader Driven** weak ordering light messaging free interactivity	ASK QUESTIONS
CLARITY			EXPLORE
SPEED			FIND

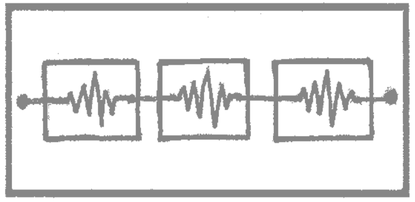


martini glass

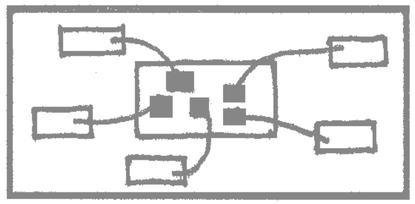




interactive slideshow



drill-down story

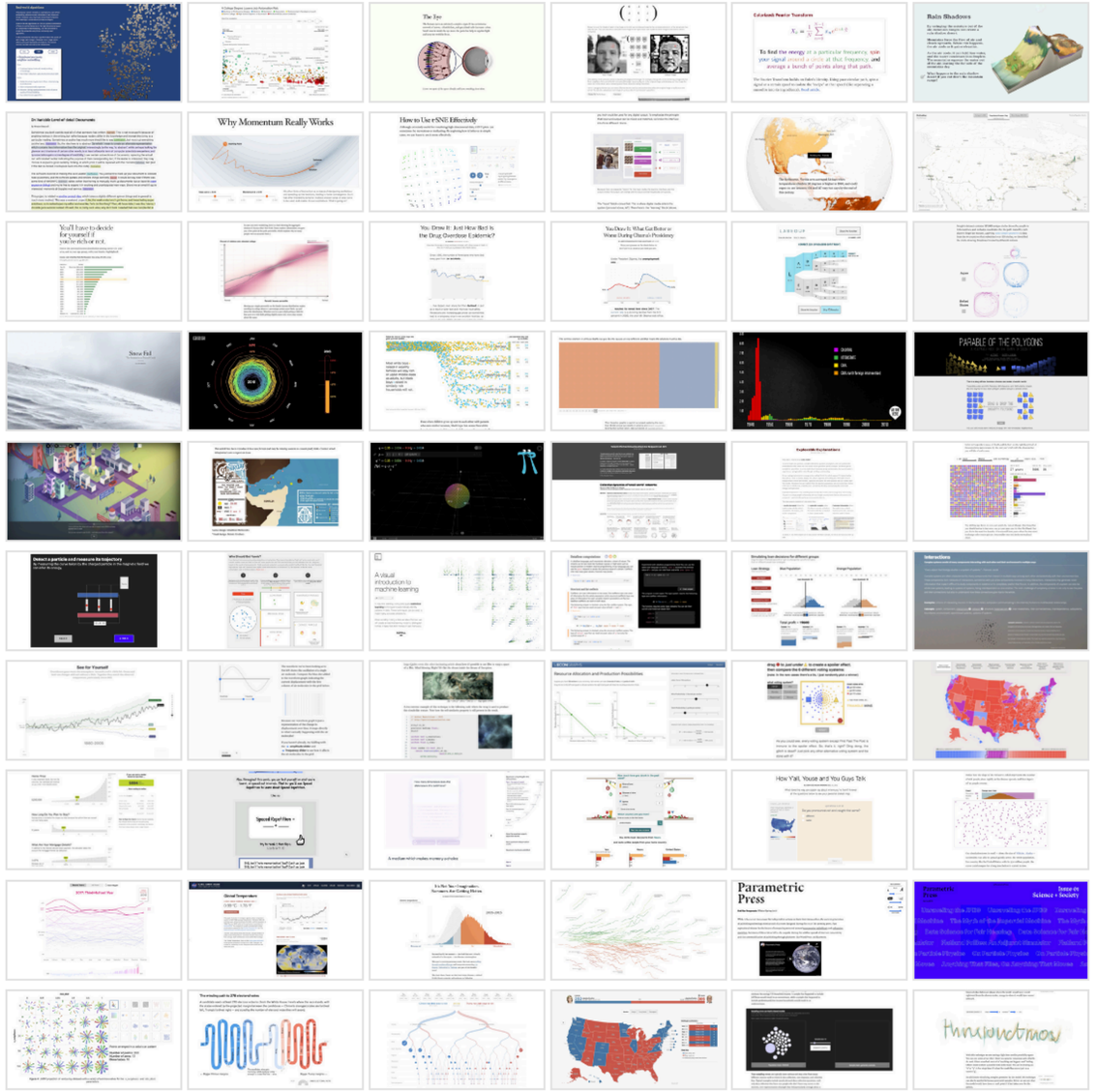


Communicating with Interactive Articles

60 Interactive Articles

NYTimes, WaPo, Distill, VisXAI, ...

Tied together research from
HCI, multimedia learning,
infovis, digital journalism



Hohman, Conlen, Heer, Chau, Distill, 2020

Interactive Articles - Design

Five affordances of the format

Connecting People and Data.
Make data pleasant to work with. Happy readers are engaged readers.

Personalizing Reading.
Let readers choose the content that is relevant to their own experience.

Making Systems Playful.
Run interactive simulations directly in the browser. No setup required.

Prompting Self-Reflection.
Help readers learn by asking them to reflect in a low pressure environment.

Reducing Cognitive Load.
Use effective representations to make complex topics more intuitive.

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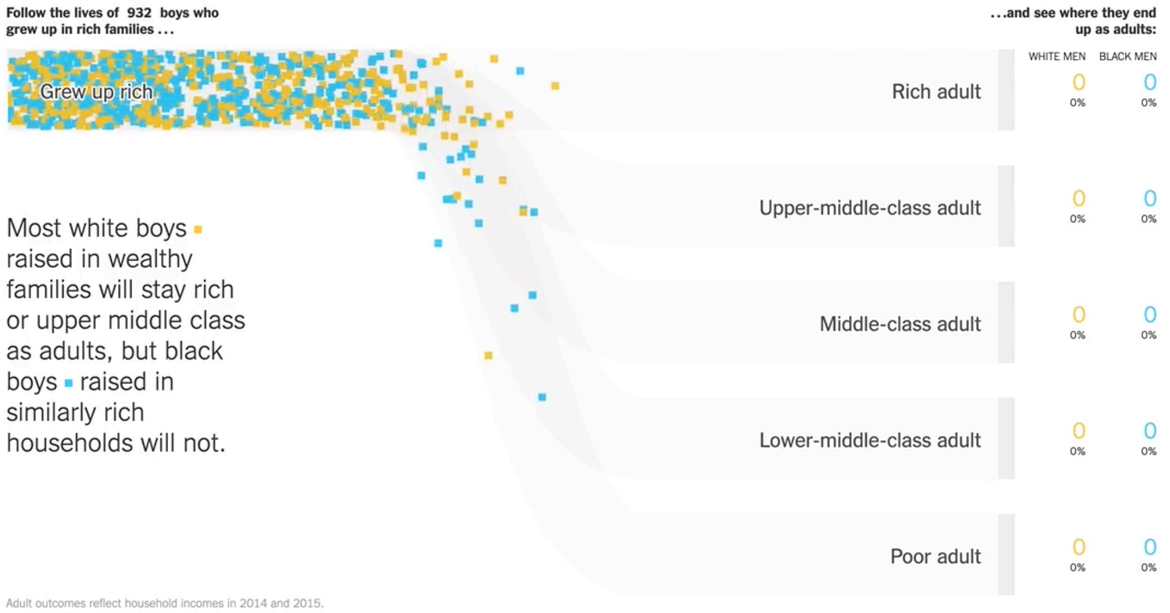

Even when children grow up next to each other with parents who earn similar incomes, black boys fare worse than white

Badger, Miller, Pearce, Quealy, *NYTimes*, 2018

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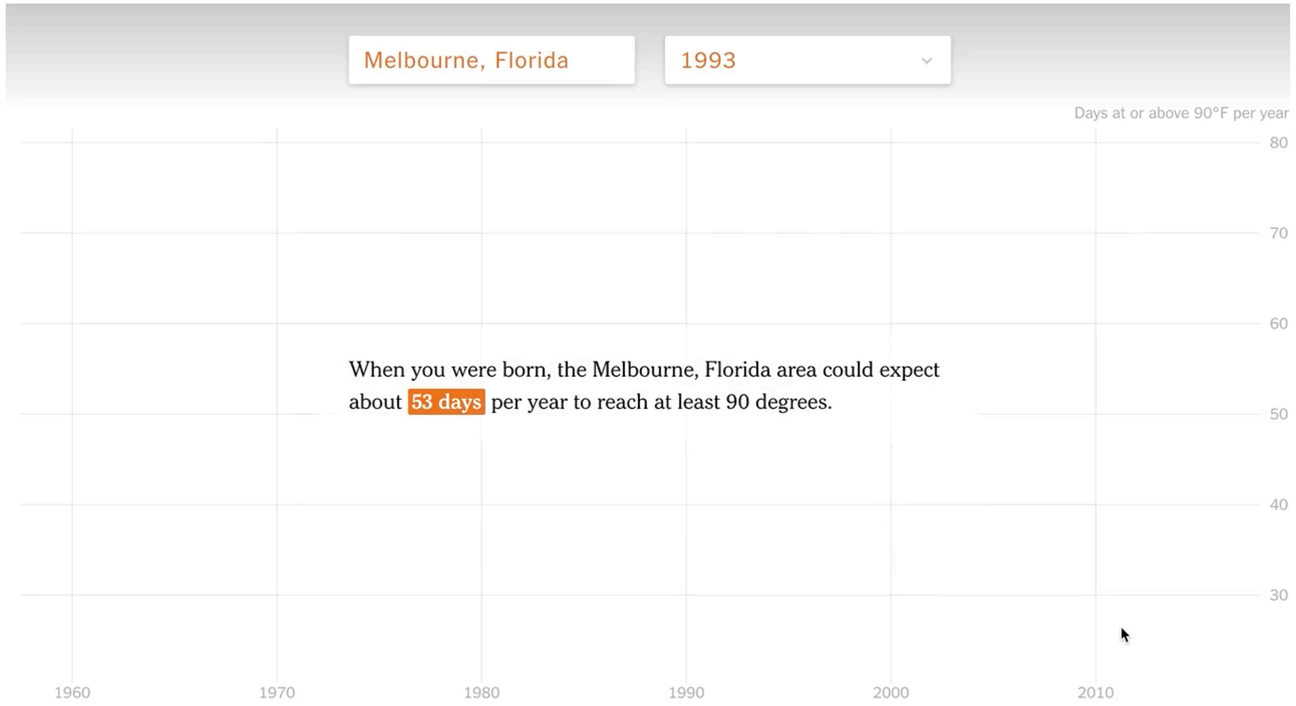

Popovich, Migliozzi, Taylor, Williams, Watkins
NYTimes, 2018

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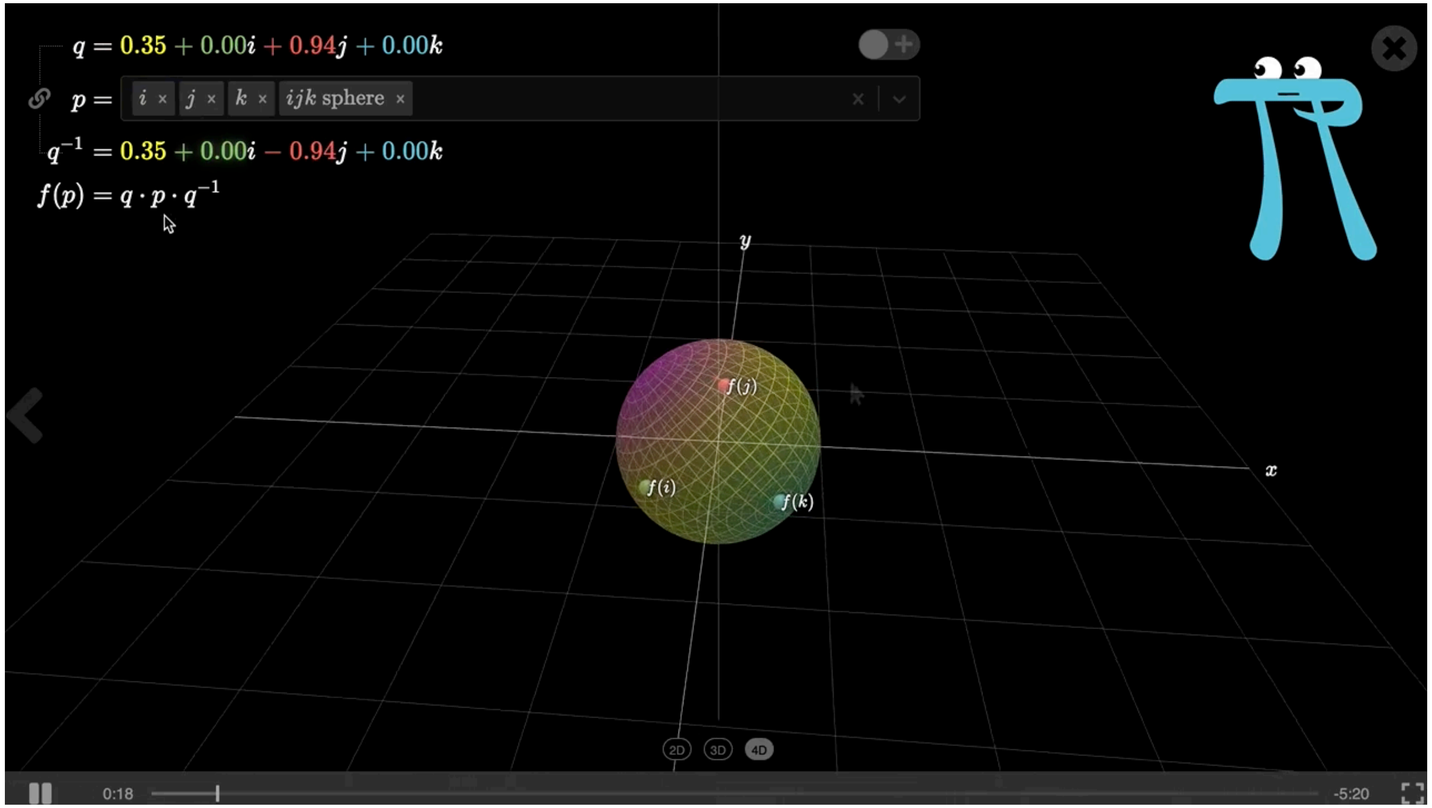

Sanderson and Eater, 2018

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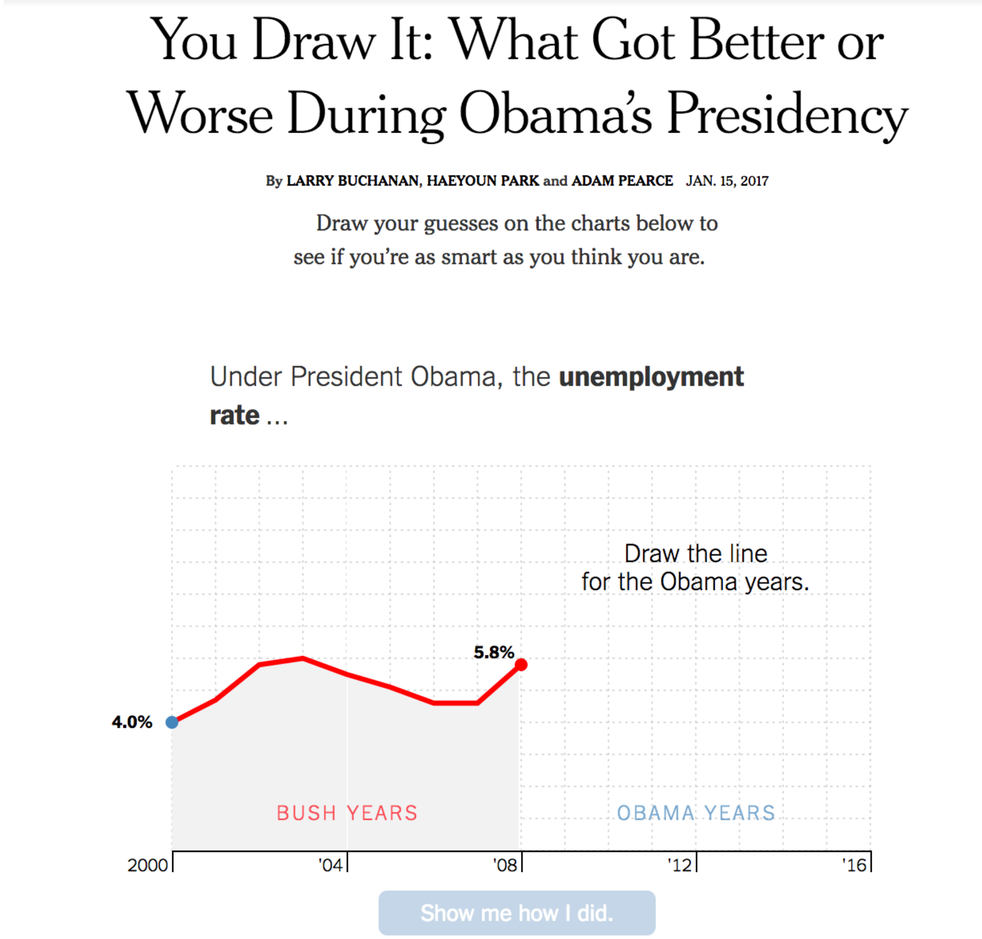

Buchanan, Park, Pearce, *NYTimes*, 2017

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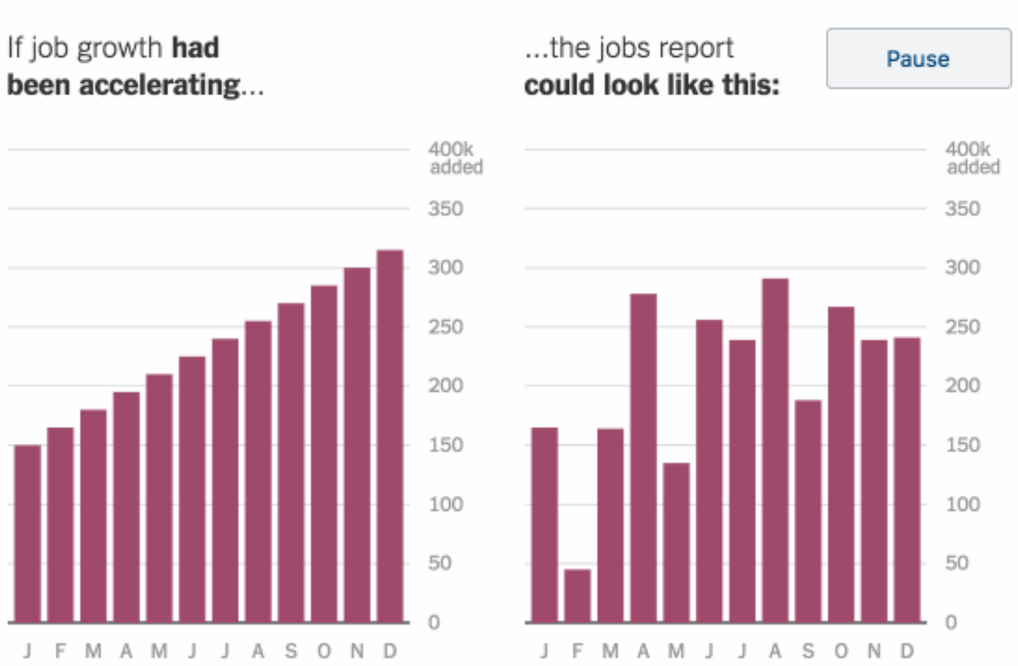


Irwin, Quealy, *NYTimes*, 2014

Interactive Articles - Application

Areas of Application

- Research Dissemination
- Journalism
- Education
- Policy & Decision Making

Interactive Articles - Application

Areas of Application

Research Dissemination
Journalism
Education
Policy & Decision Making

Policy and Decision Making

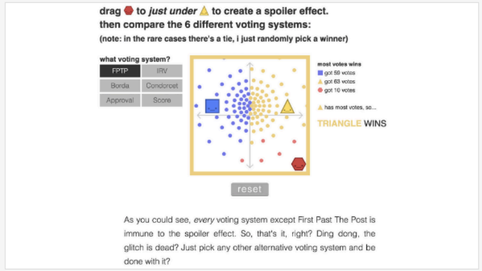
When public officials are tasked with making decisions, they are not doing it in a static, unchanging world. Politicians need to make informed decisions about complex, multifaceted problems, taking into account a variety of competing constraints, and given uncertain and changing information. So why are intelligence briefings printed on dead trees? Interactive articles offer the potential of something better, something fluid which responds to system dynamics and to changing constraints, priorities, and risk tolerance levels.

OPPORTUNITIES

- Concretize complex societal issues using experimental sandboxes
- Inform public of past, present, and future policies and their impact
- Dynamic reports that respond to changing situations and priorities

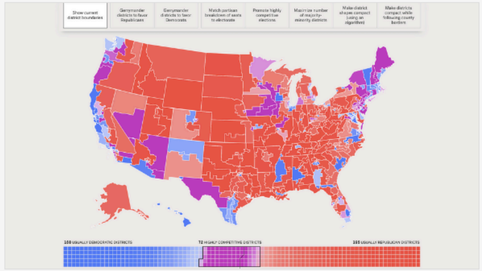
CHALLENGES

- May require greater numeracy and graphicacy in audience
- Few existing examples of effective usage by policy makers
- Danger of information overload with complex societal scenarios



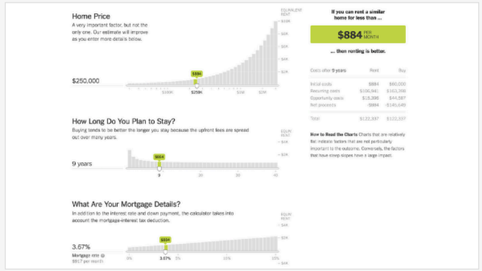
[To Build a Better Ballot](#) [22]

An explorable explanation that uses direct manipulation to show election outcomes under different voting methods to provide concrete tools for voting reform.



[The Atlas Of Redistricting](#) [23]

Visualizations of the United States and its breakdown on governmental representation and gerrymandering. Interactive toggles that redraw district boundaries compare the makeup of the US House of Representatives under different goals, both partisan and bipartisan, all without a single voter relocating.



[Is It Better to Rent or Buy?](#) [24]

Built into this article is an interactive calculator that suggests if a reader should buy or rent a property based on a collection of user-selected costs.

Challenges

Few authoring tools available
Those that do exist are too low level or lack expressivity
Not suitable for production usage

Requires general purpose programming
In practice need to be a web developer

Difficult to evaluate
Limited empirical evidence; hard to analyze usage data; lack of metrics

Lack of design guidance
Integration between text and media
Multiple output targets
How to make content accessible?

Breadth of skills required (design, programming, narrative)

Narrative Implementation

Do-It-Yourself

Monitor scroll position & element positions

Guidance: M. Bostock, J. Vallandingham

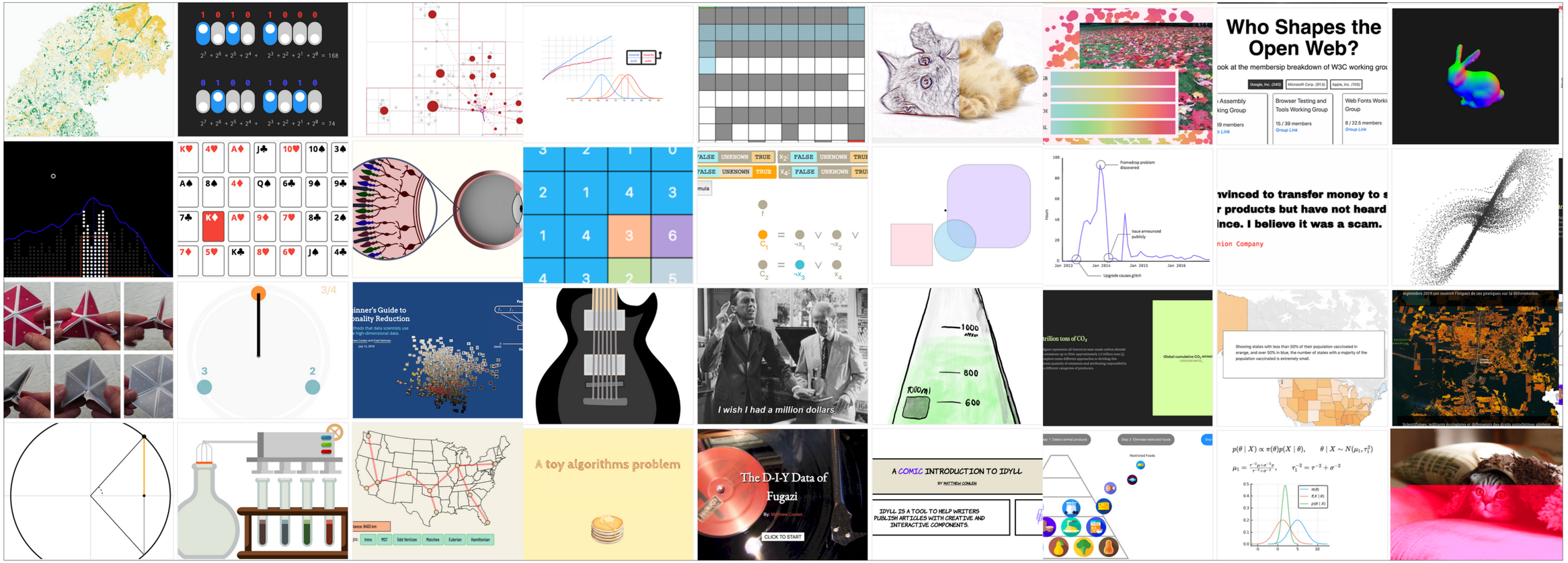
Third-Party Support

Helper Libraries

Interactive Document Formats: Idyll

Idyll

A Markup Language for Authoring and Publishing Interactive Articles on the Web



Conlen & Heer, *UIST, 2018*

DSL for Interactive Articles

Idyll Markup

```
[Header
 title:“Hi Idyll!” /]

This is the text
of my article.

 [Graphic
   value:x /]

And that was a
custom graphic.
```

Input:

extended markdown

domain-specific graphics

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Live Web Page

Input:

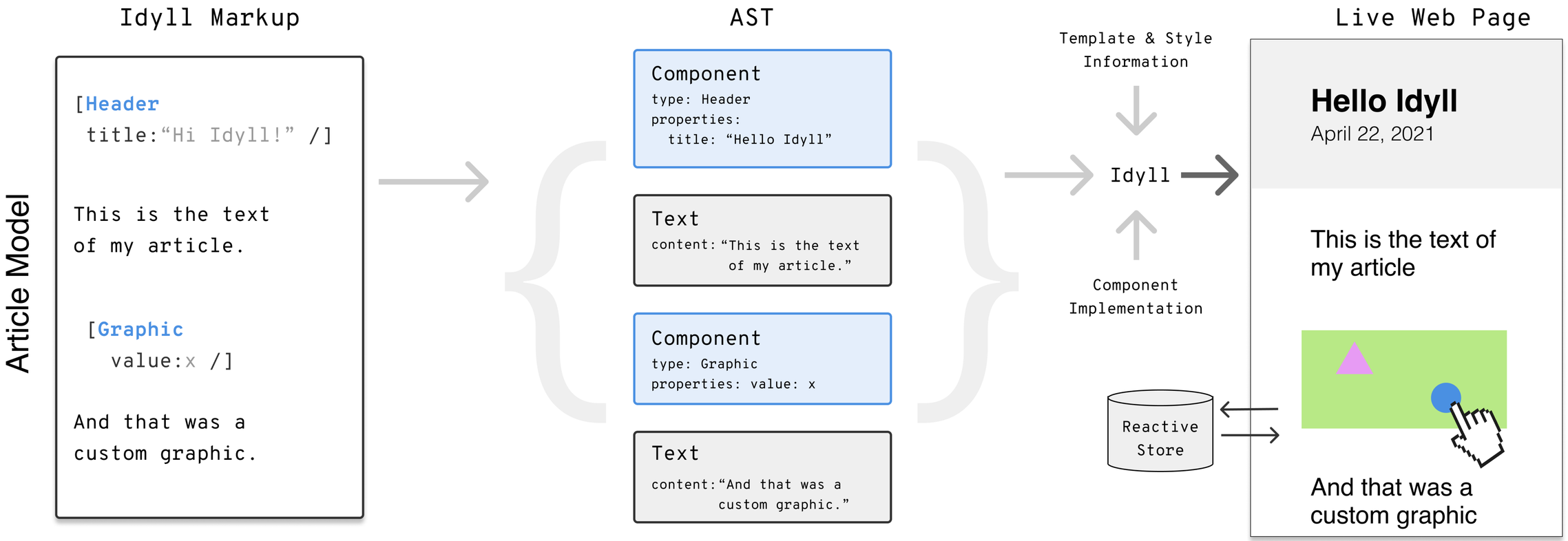
extended markdown

domain-specific graphics

Output:

javascript,html,css

DSL for Interactive Articles



interactive document schema

(Interactions, linked text+graphics, events)

Input:

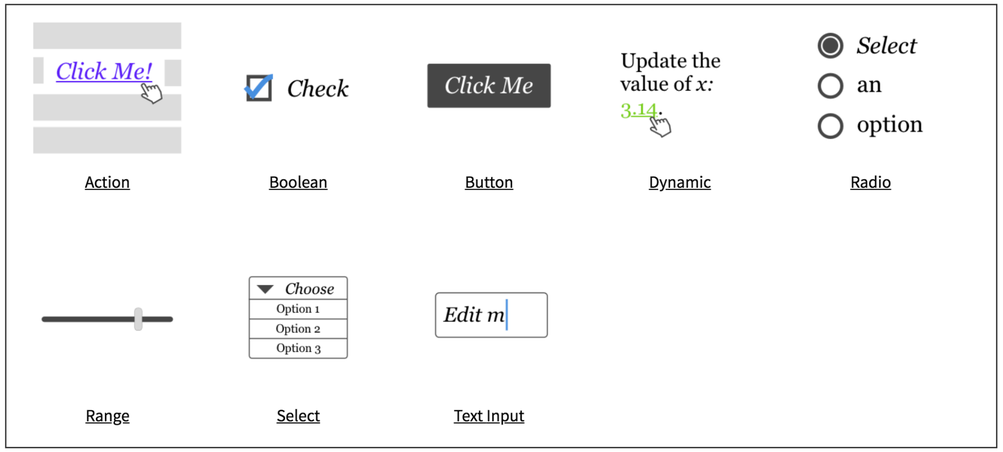
extended markdown

domain-specific graphics

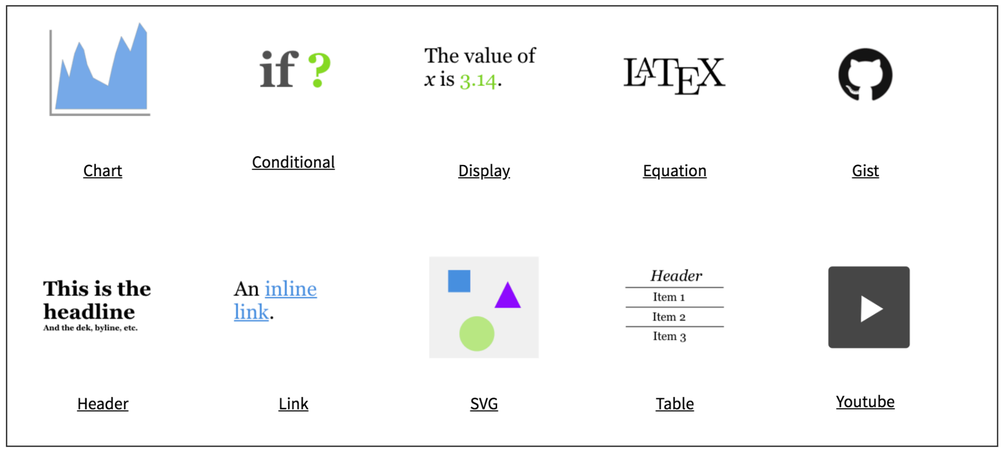
Output:

javascript,html,css

Component Library

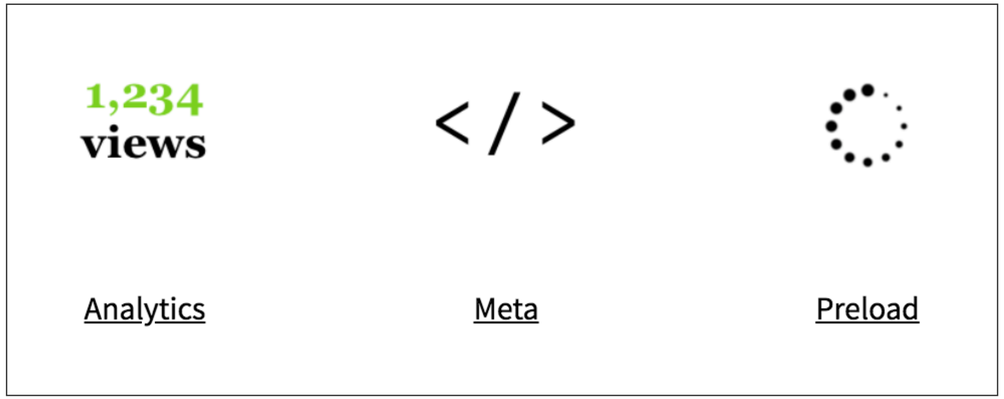


Input



Presentation

Layout



Helpers

Text + Parameterized Graphics

Write articles in *markdown*.

Embed *parameterized graphics*.

Connect *reactive variables* to user input widgets to add interactivity.

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INPUT (EDITABLE)

```
# Hello World

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

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

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

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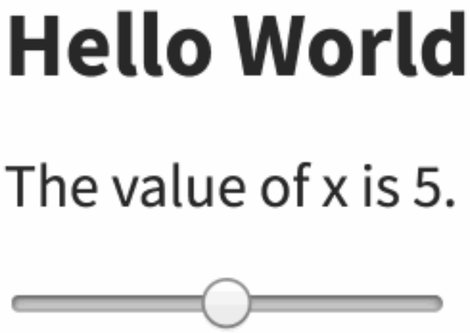


Bring your own graphics

A JavaScript component API is exposed to end users.

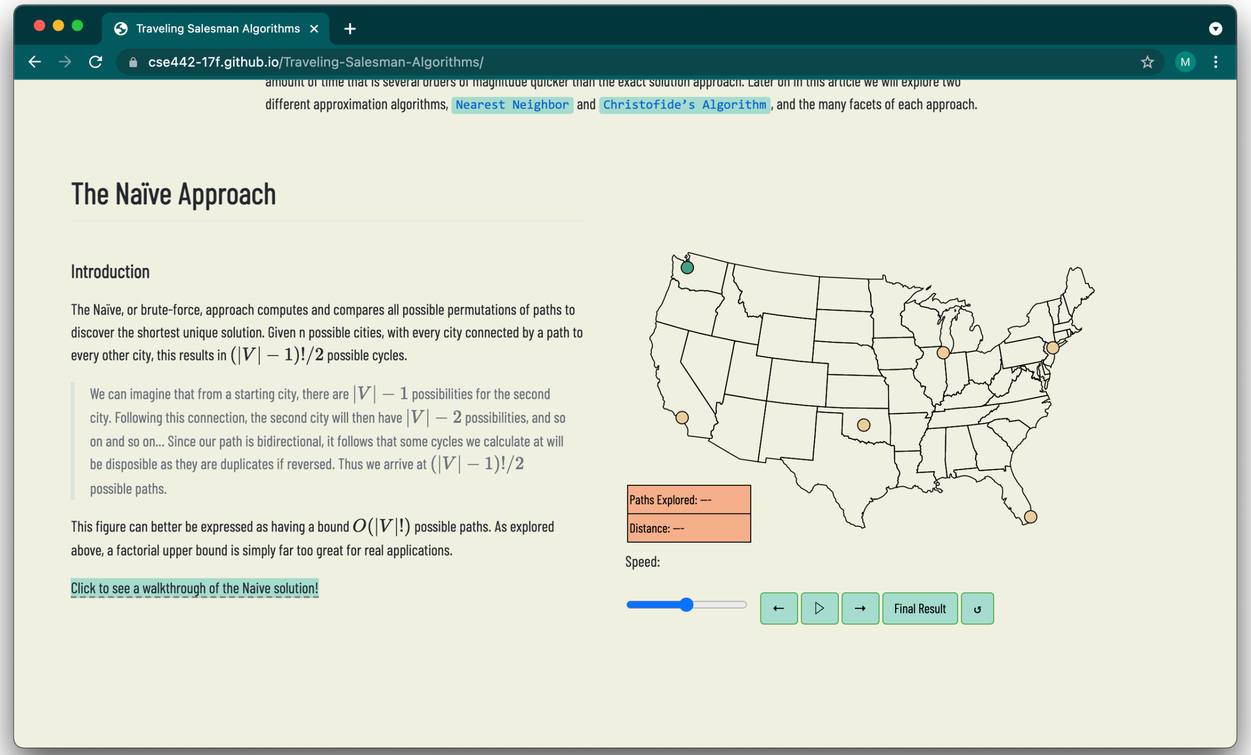
Use with libraries like D3, Vega-Lite, Mapbox, Processing (P5), React, ...

Usage

Refined design through expert interviews.

Deployed with undergrad CS students at UW.

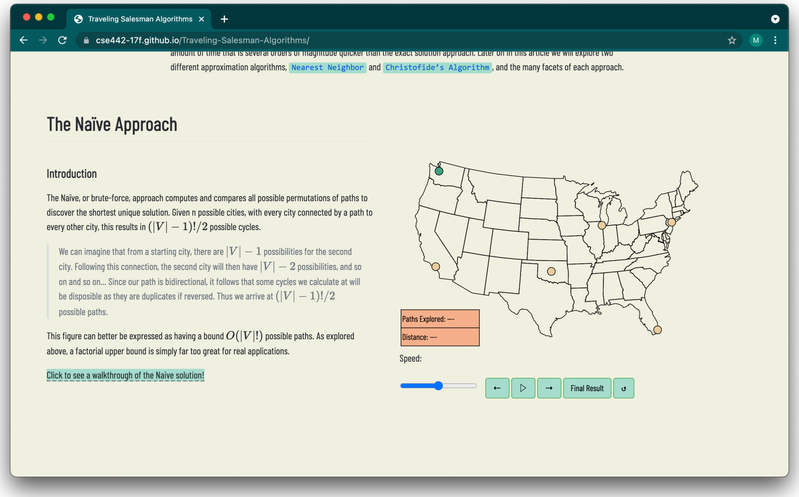
Students successfully in creating highly customized explorable explanations of algorithms.



Mathew, Cherukupalli, Pusich, Zhao, *Traveling Salesman Algorithms, CS442 '17*

Usage

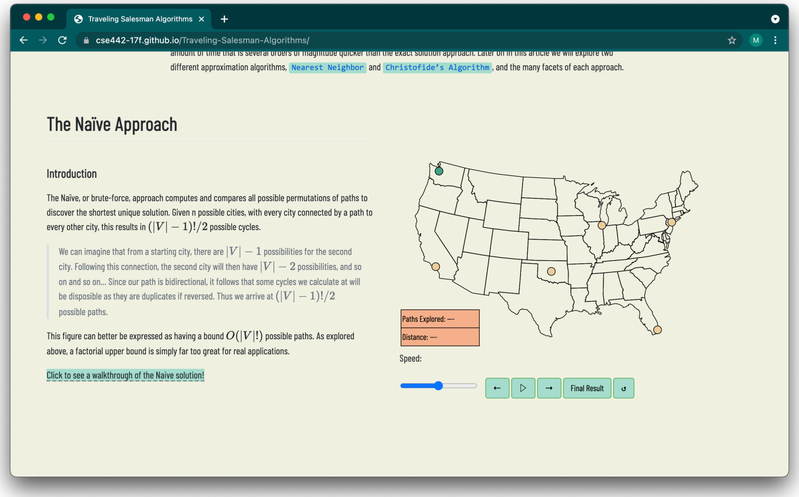
Analyzed usage of language features

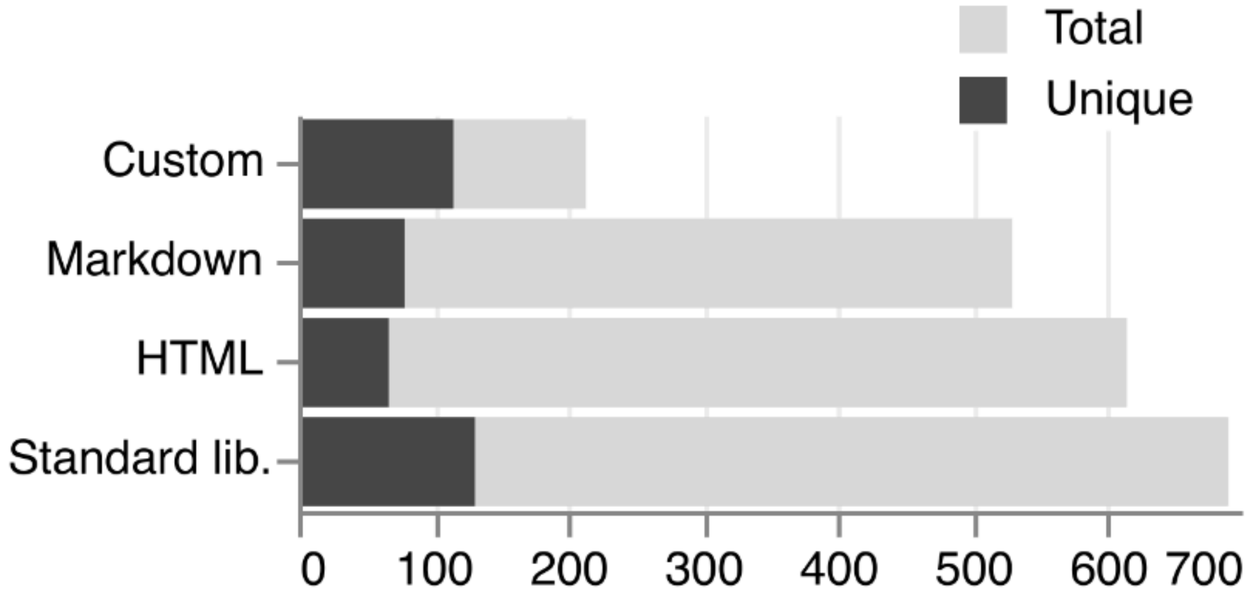


Usage

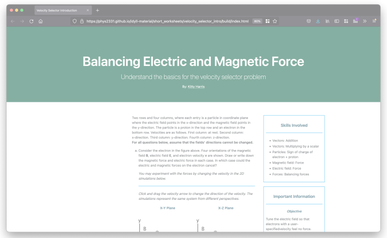
Analyzed usage of language features

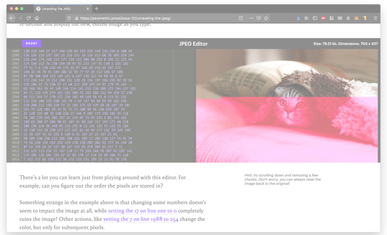
Heavy use of standard components, markdown features. Still used HTML tags

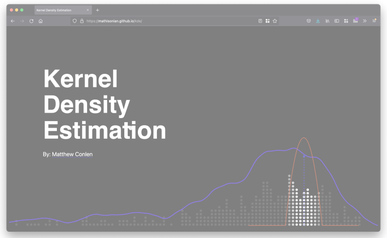




Idyll in the wild







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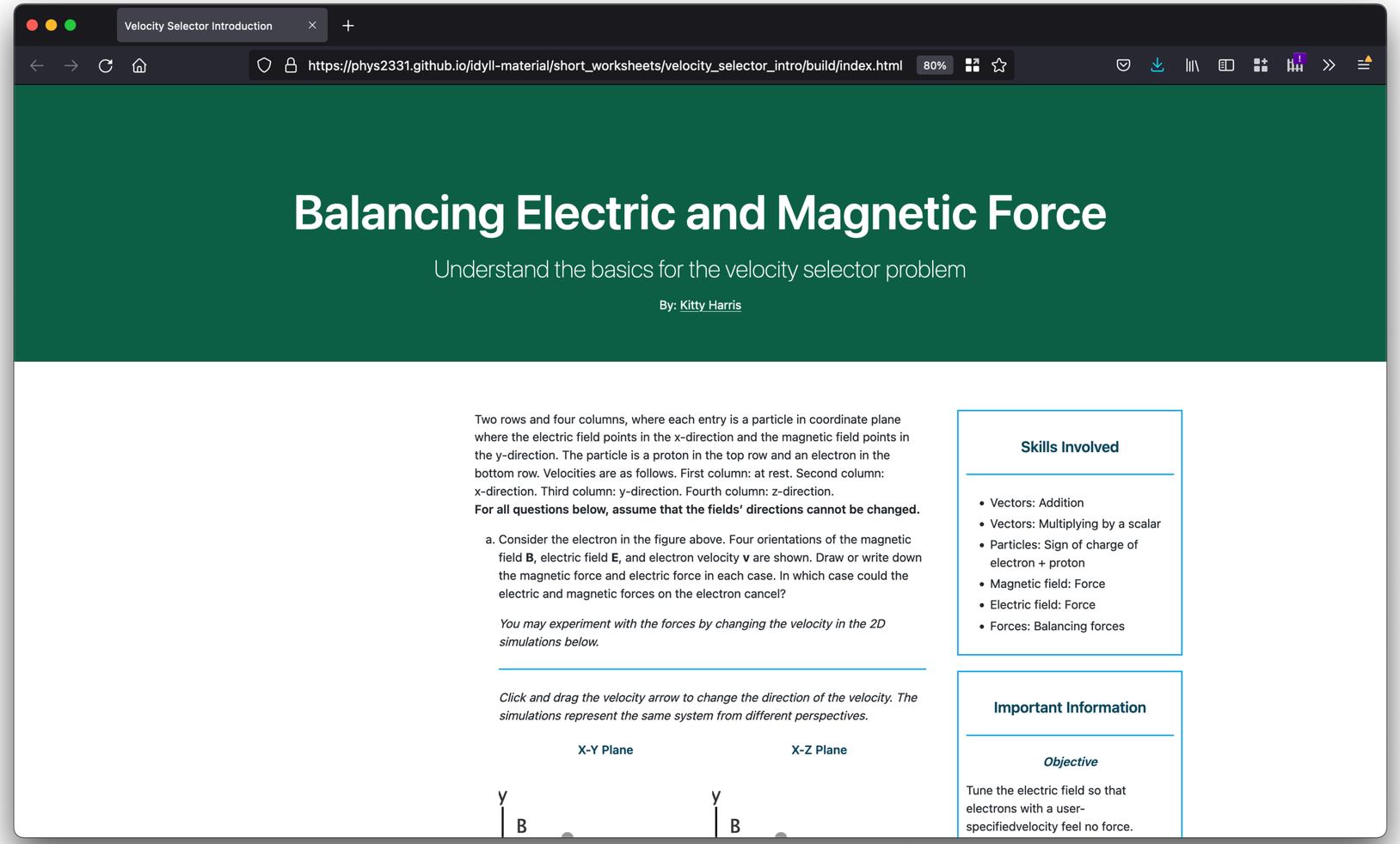
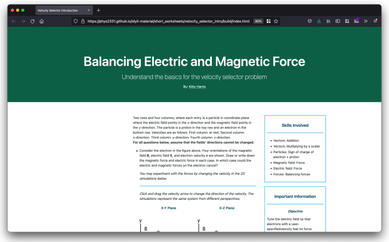
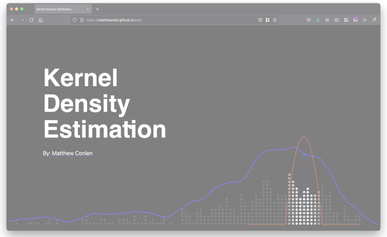
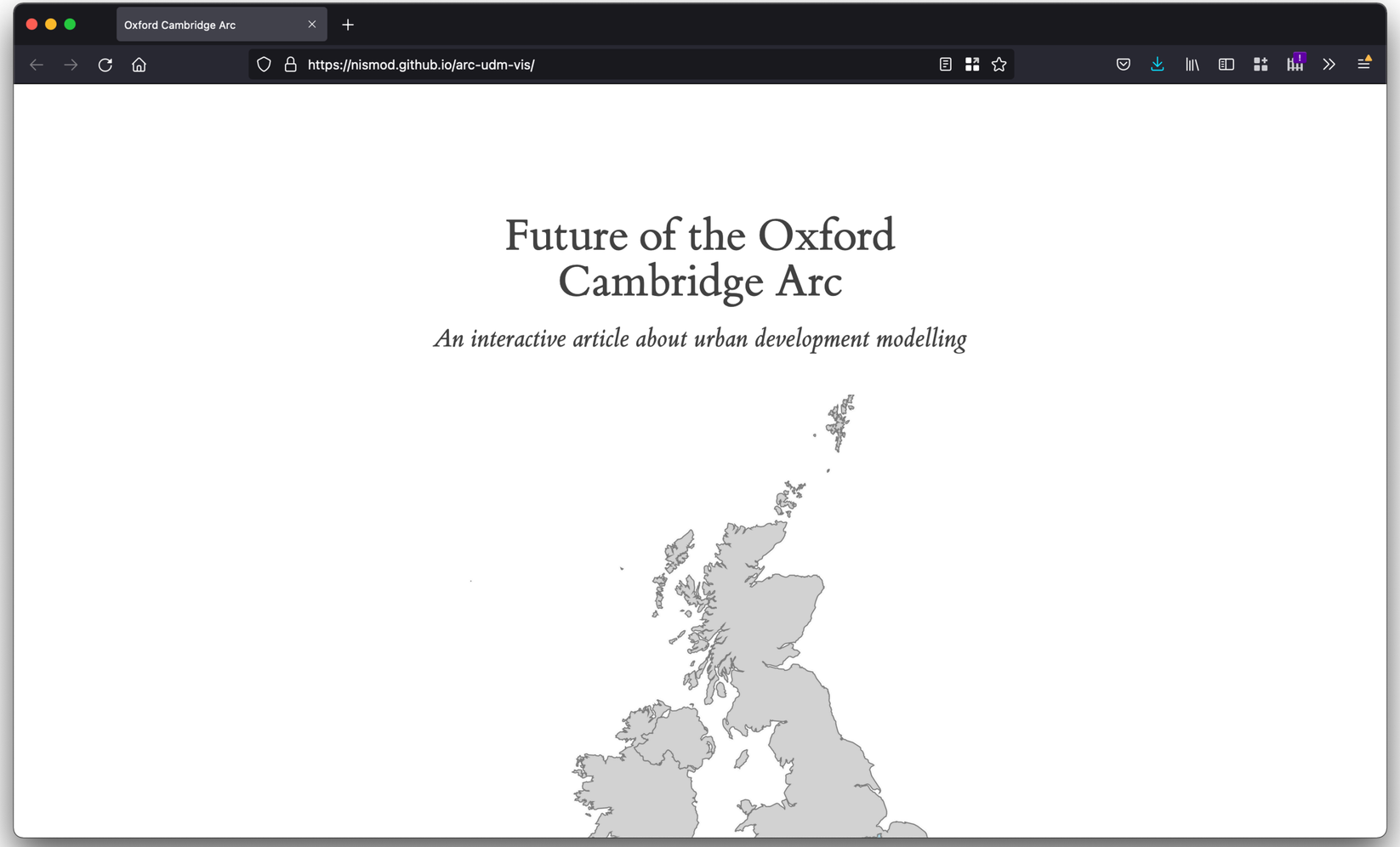


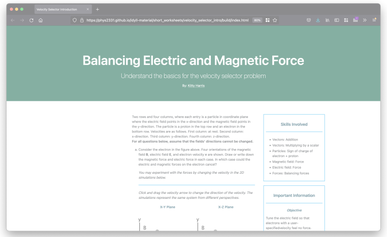


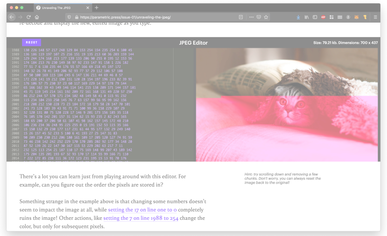


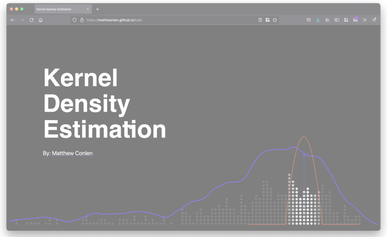
UC Denver
Undergraduate physics material (interactive worksheets)

Idyll in the wild



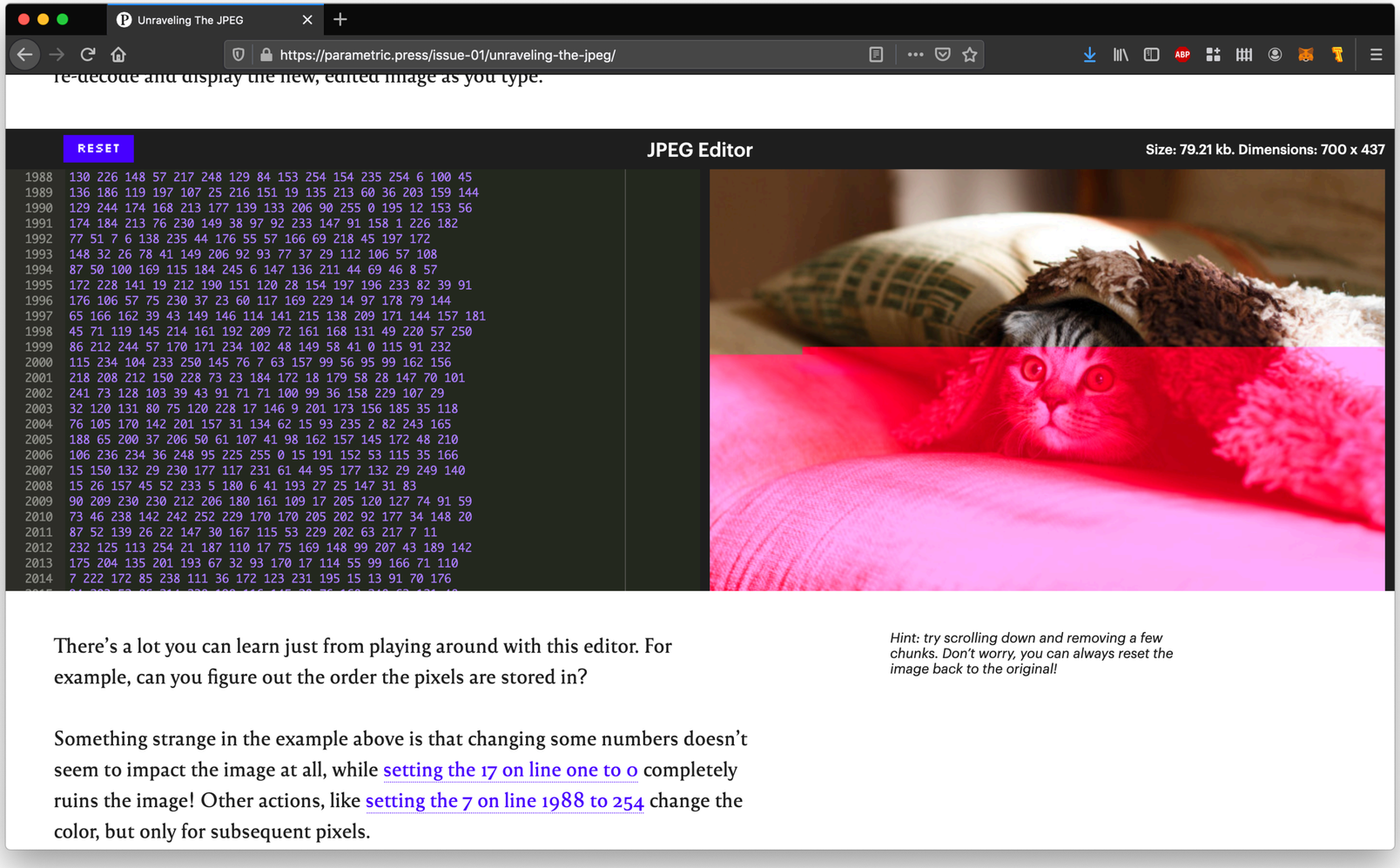




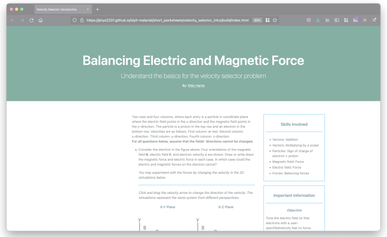


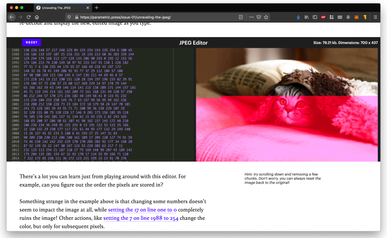
UK Infrastructure Transitions Research Consortium
Interactive presentation of urban development models

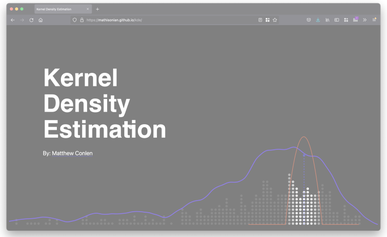
Idyll in the wild



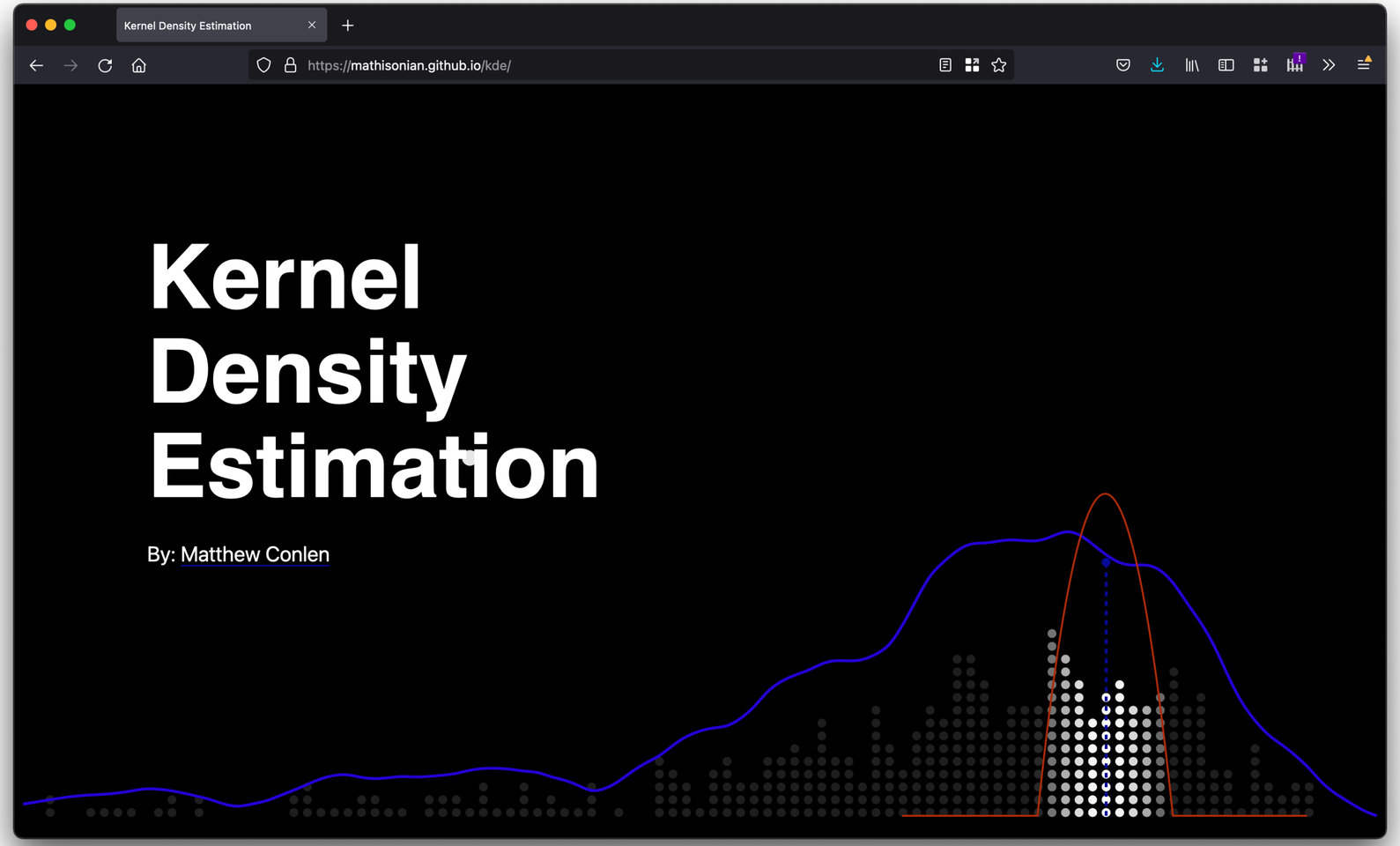
Unraveling the JPEG - Omar Shehata
Parametric Press (Conlen & Hohman, *VisComm '19*)

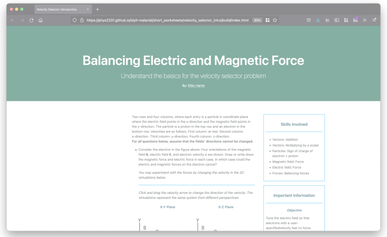


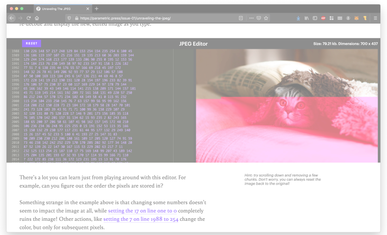


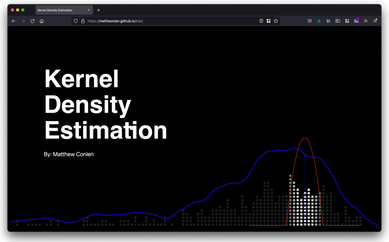


Idyll in the wild









Kernel Density Estimation
Top search result under Wikipedia, many messages saying it helped people understand the topic.

Idyll...

Seems great but...

...still requires learning and writing markup syntax

...requires use of general-purpose programming tools, e.g. to make a new post, run development server

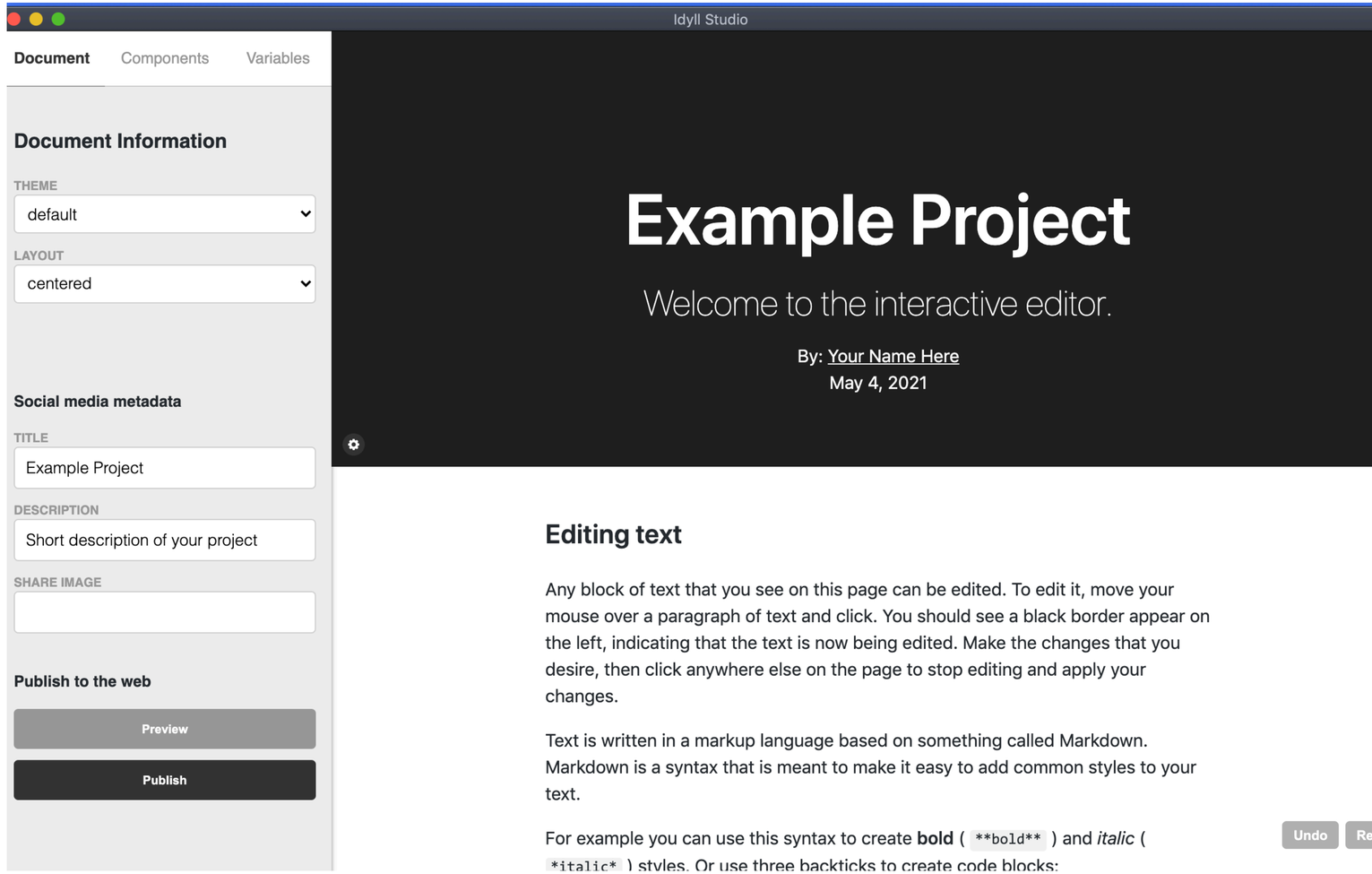
Idyll Studio

Built a **structured editor** for editing and creating Idyll programs

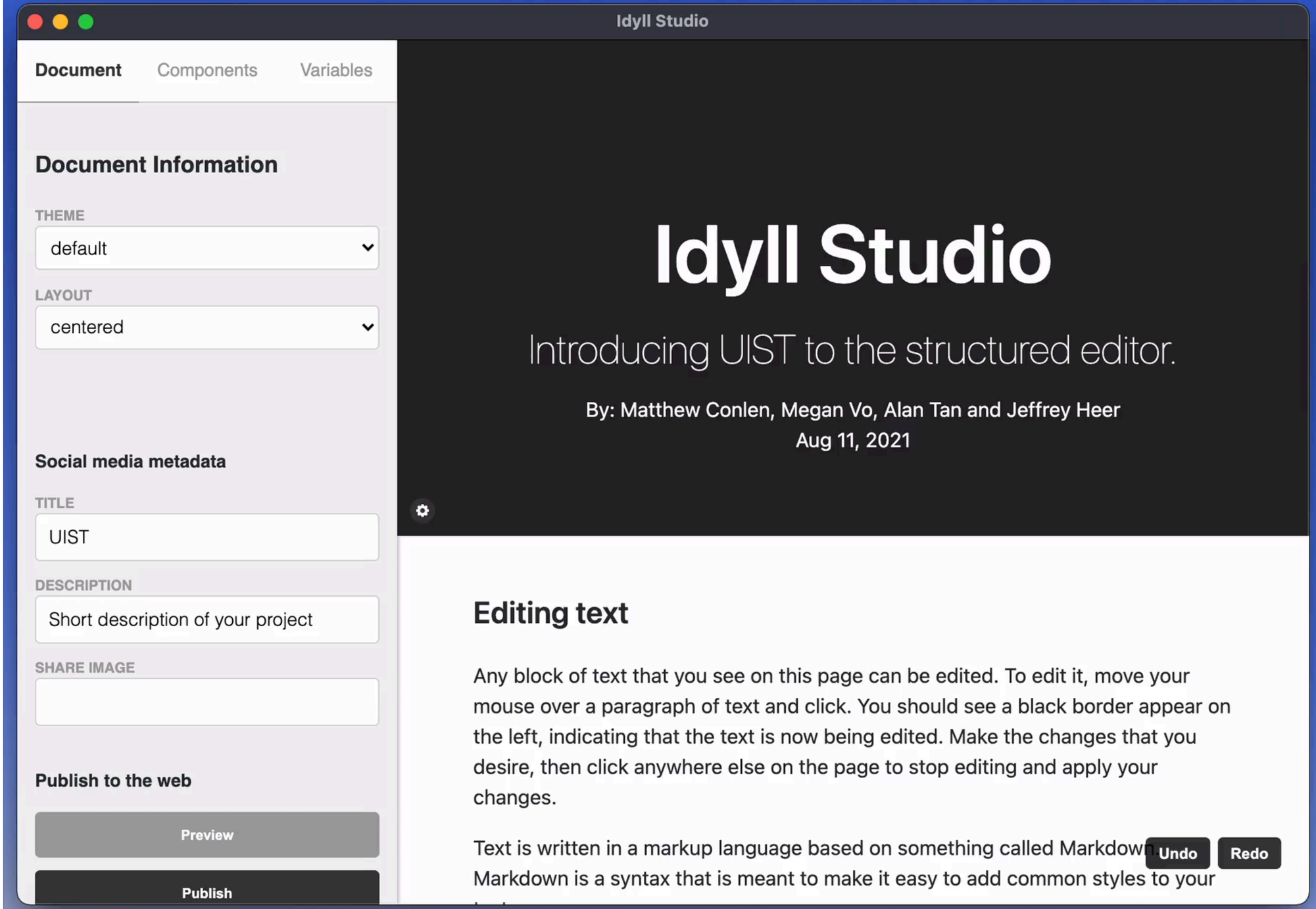
Reduce use of general-purpose programming tools.

Eliminate a class of syntax errors.

Reify Idyll model.



Conlen, Vo, Tan, Heer, *UIST 2021*


Idyll Studio
Document
Components
Variables
Document Information
THEME
default
LAYOUT
centered
Social media metadata
TITLE
UIST
DESCRIPTION
Short description of your project
SHARE IMAGE
Publish to the web
Preview
Publish
Idyll Studio
Introducing UIST to the structured editor.
By: Matthew Conlen, Megan Vo, Alan Tan and Jeffrey Heer
Aug 11, 2021
Editing text
Any block of text that you see on this page can be edited. To edit it, move your mouse over a paragraph of text and click. You should see a black border appear on the left, indicating that the text is now being edited. Make the changes that you desire, then click anywhere else on the page to stop editing and apply your changes.
Text is written in a markup language based on something called Markdown.
Markdown is a syntax that is meant to make it easy to add common styles to your
Undo
Redo

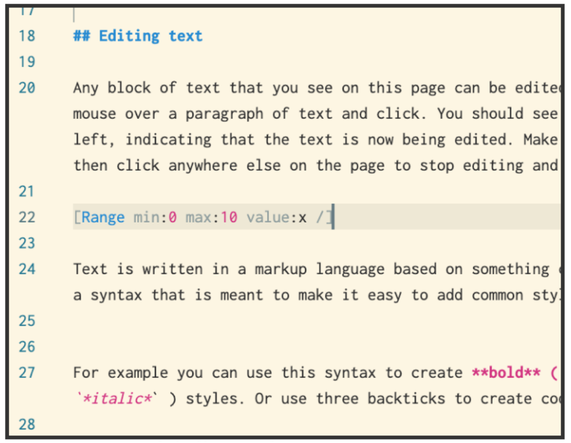
Idyll Studio Architecture

Two extensions to Idyll:

Instrumentation. Take any Idyll program, inject instrumental components (text editors, component editors, insertion points)

Reflection. Allow an Idyll component to modify the Idyll program while it runs.

Architecture Overview



```
17
18  ## Editing text
19
20  Any block of text that you see on this page can be edite
    mouse over a paragraph of text and click. You should see
    left, indicating that the text is now being edited. Make
    then click anywhere else on the page to stop editing and
21
22  [Range min:0 max:10 value:x /]
23
24  Text is written in a markup language based on something
    a syntax that is meant to make it easy to add common sty
25
26
27  For example you can use this syntax to create **bold** (
    `*italic*` ) styles. Or use three backticks to create co
28
```

Idyll markup

Architecture Overview

```
18  ## Editing text
19
20  Any block of text that you see on this page can be edite
    mouse over a paragraph of text and click. You should see
    left, indicating that the text is now being edited. Make
    then click anywhere else on the page to stop editing and
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25
26
27  For example you can use this syntax to create **bold** (
    `*italic*` ) styles. Or use three backticks to create co
28
```
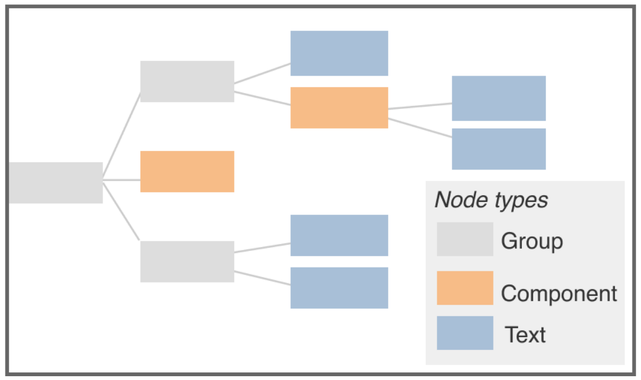
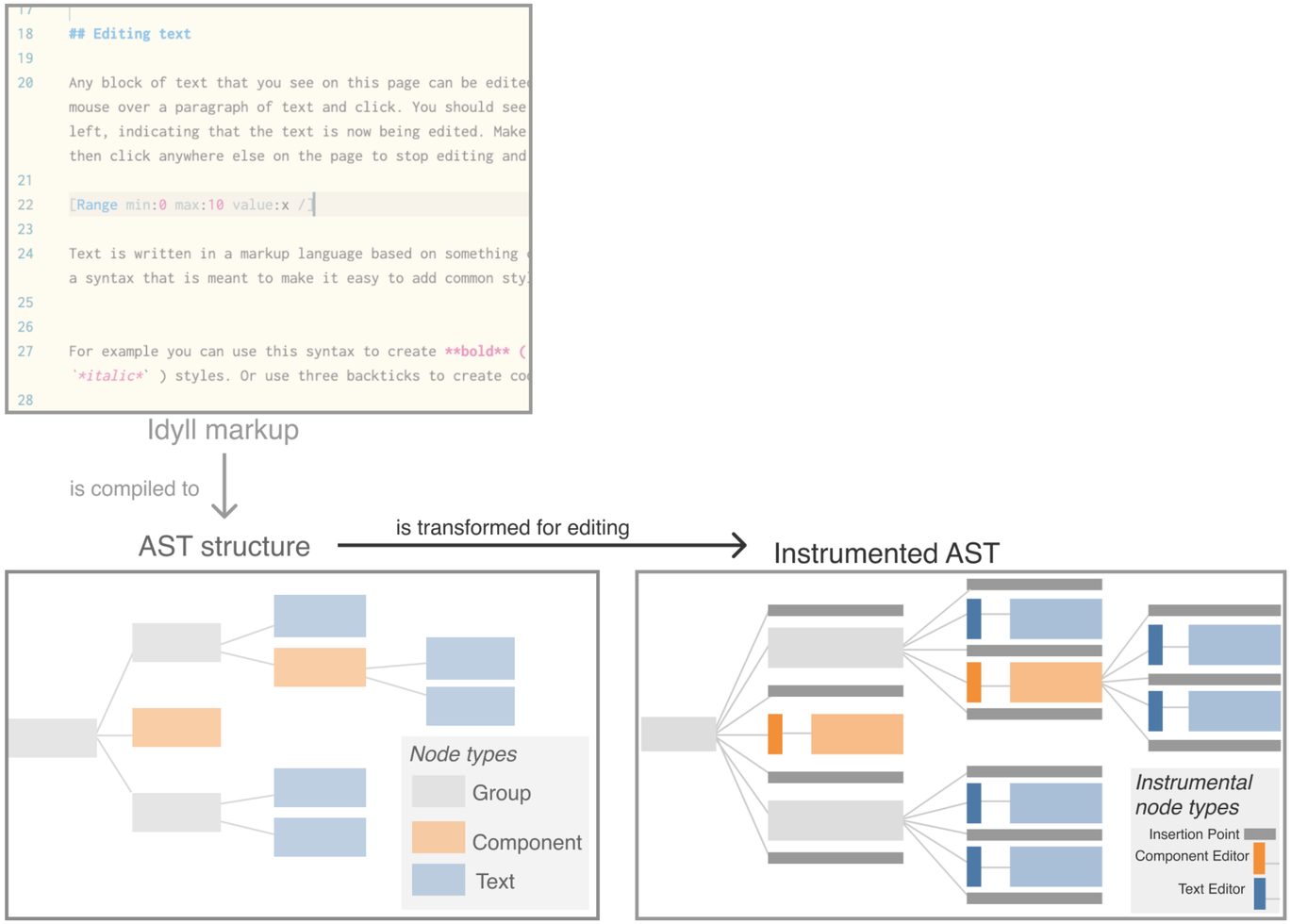

Idyll markup

is compiled to ↓

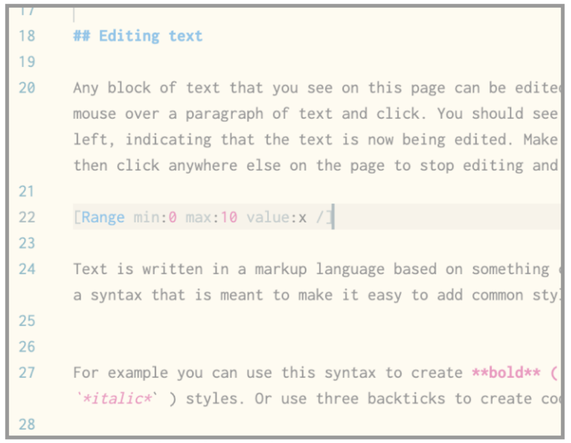
AST structure



Architecture Overview



Architecture Overview



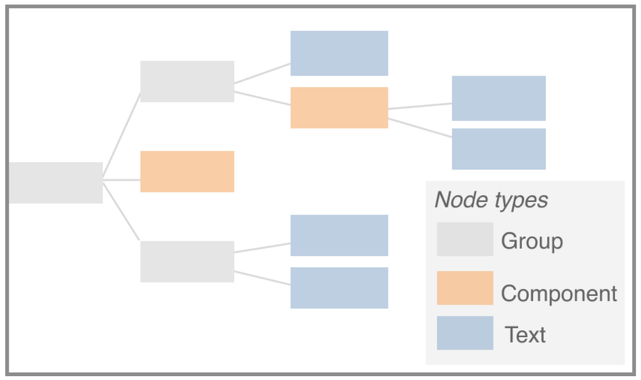
Idyll markup

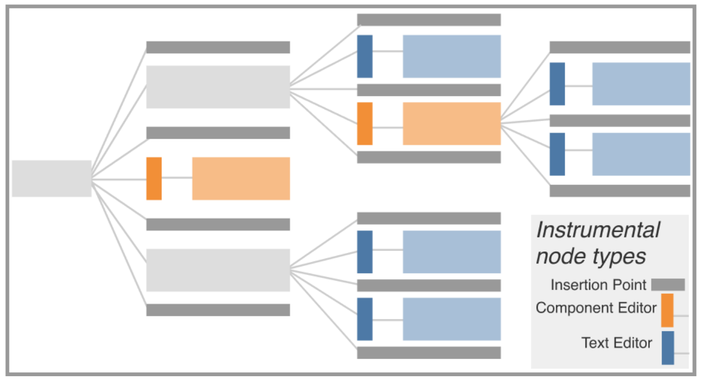
is compiled to

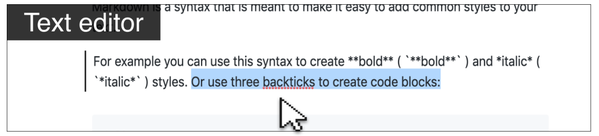
AST structure

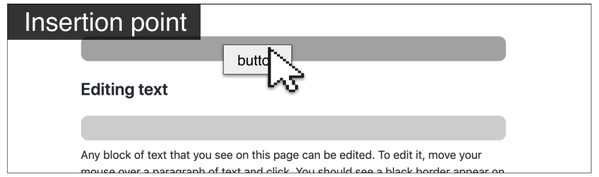
is transformed for editing

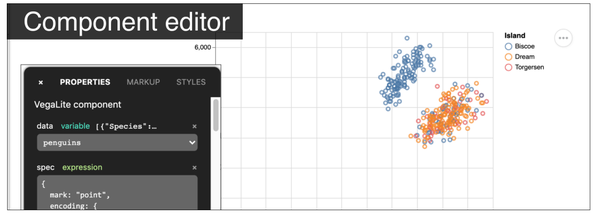
Instrumented AST



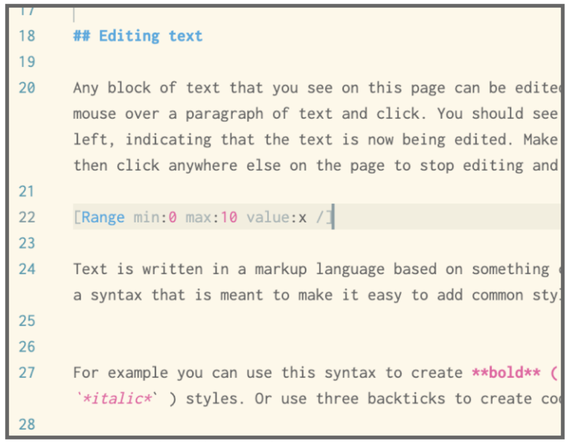


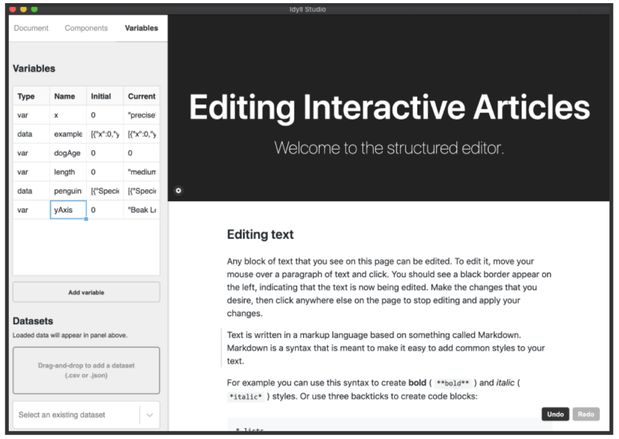


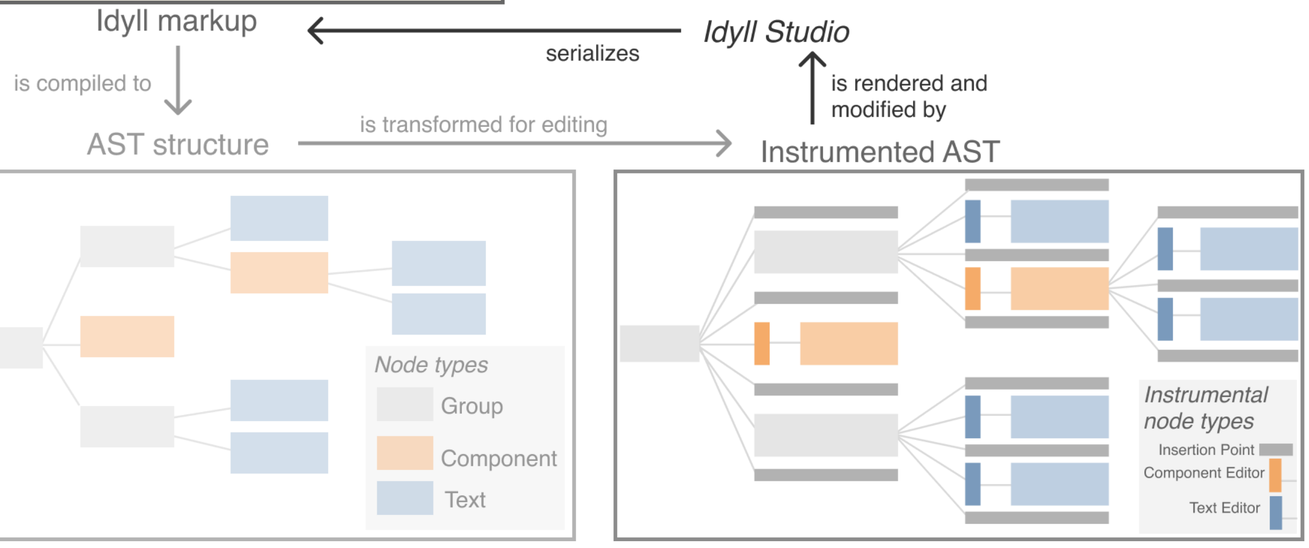


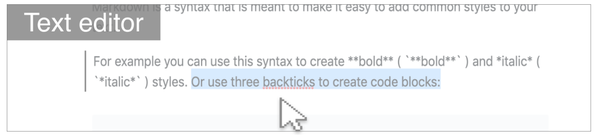


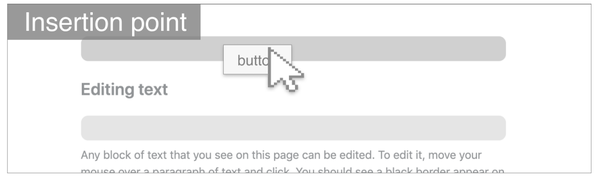
Architecture Overview

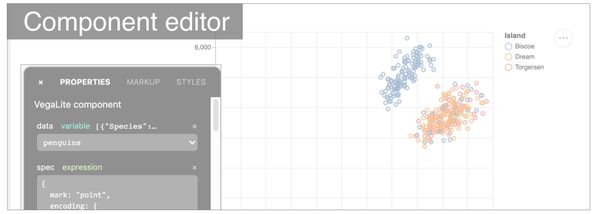




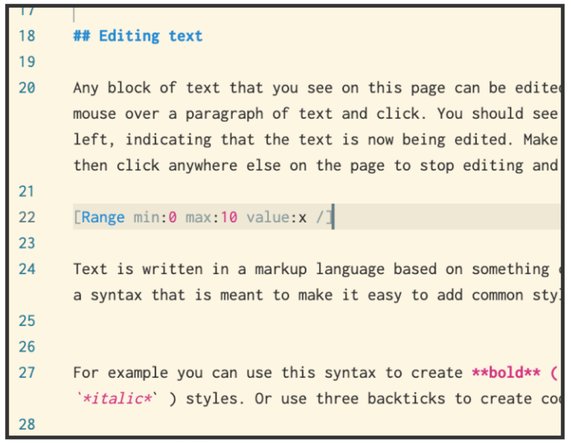


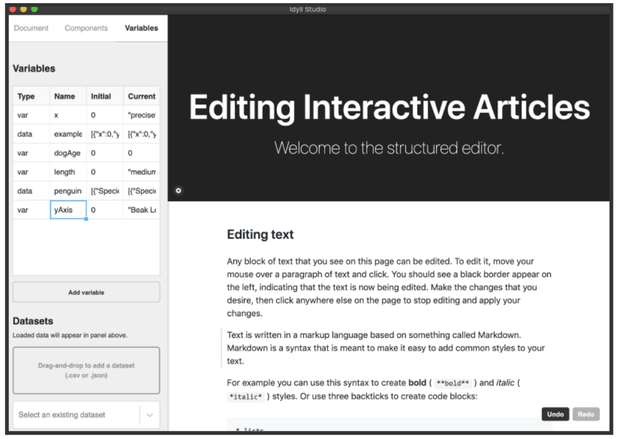


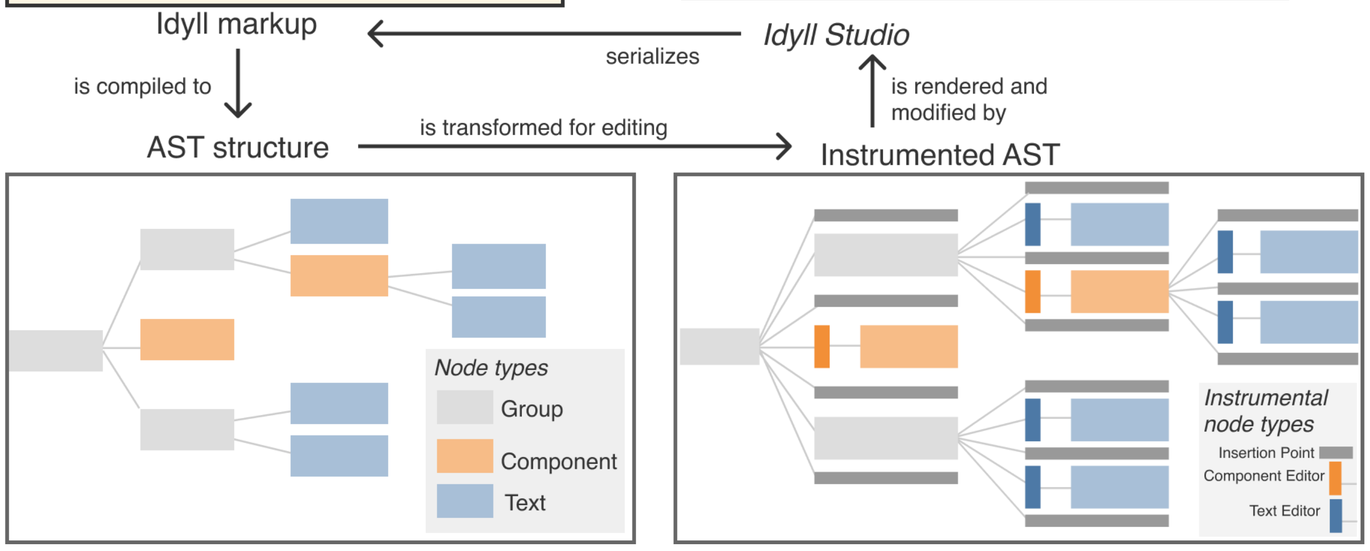


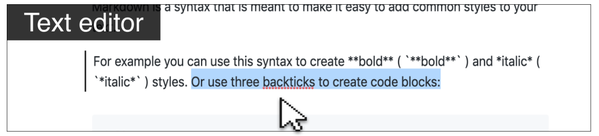


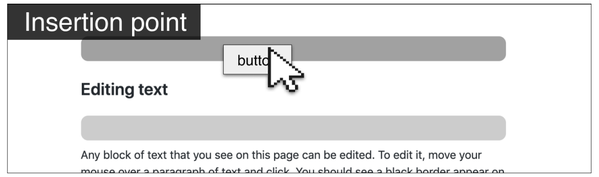
Architecture Overview

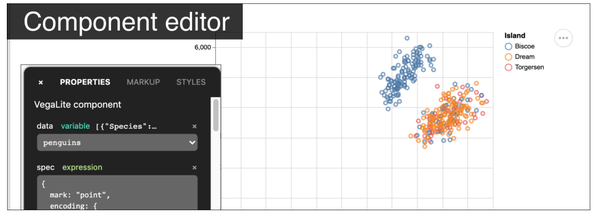












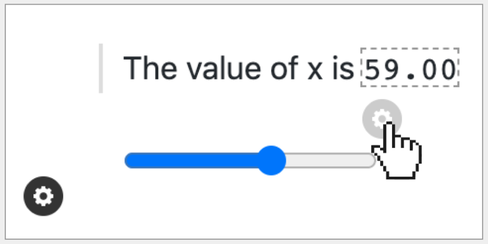
Idyll Studio Evaluation

18 Participants; 10 minute tutorial; 30 minutes to complete 6 tasks

Interaction

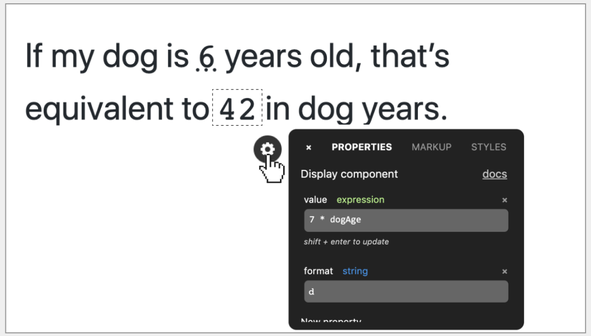
Interactivity with Variables — Basic

Prompt. Create a new variable. Add a *Slider* to the page which modifies the value of that variable; add a component that displays the value of the variable.



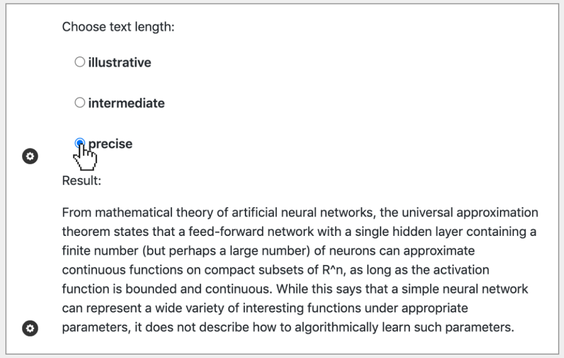
Dog Years Calculator — Intermediate

Prompt. Create an interactive calculator in the article text that calculates a dog's age in *dog years*.



StretchText — Advanced

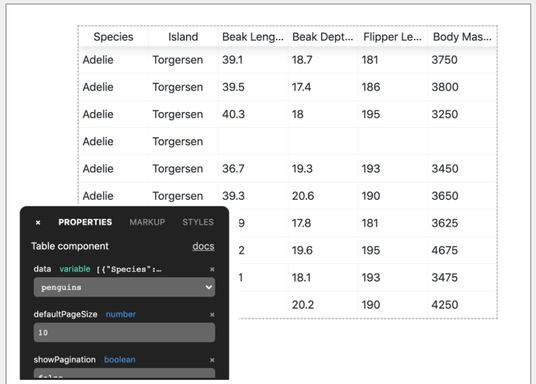
Prompt. Use a *Switch* component to implement dynamic text that expands to different levels-of-detail based on reader input.



Data-driven

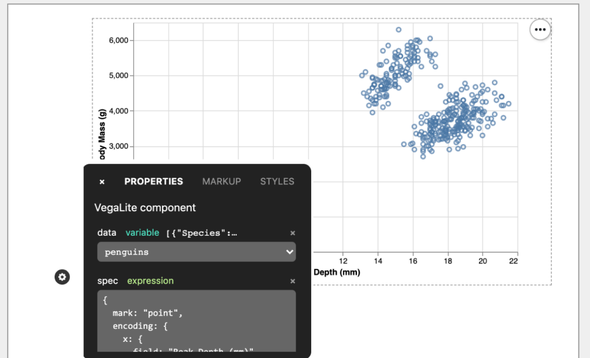
Importing & Displaying Data — Basic

Prompt. Import a provided tabular data file (penguins.json), import it into *Idyll Studio*. Add a *Table* to the article and have it display the data.



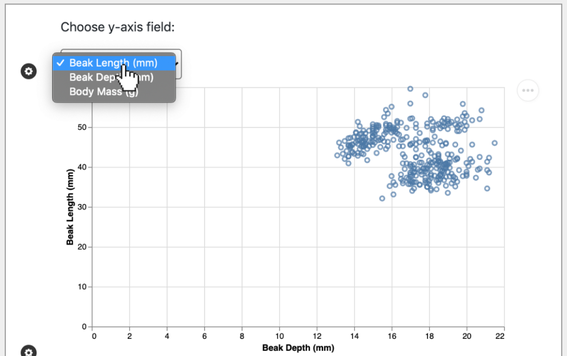
Data Visualization — Intermediate

Prompt. Create a static scatter plot that displays any two quantitative fields from the *penguins.json* dataset.



Interactive Visualization — Advanced

Prompt. Add a dropdown element above the scatter plot that lets a reader select which field to show on the chart's y-axis.



Idyll Studio Findings

1. The interface enabled users to ***rapidly create designs with less stress****.*

2. But some users struggled to synthesize multiple concepts. Others ***needed time to understand the reactive model****.*

3. The interface ***should provide more visual feedback****, promote experimentation, provide documentation on demand, and have* ***guardrails to prevent likely mistakes****.*

4. The interface empowered users and ***provided better support to less technical users compared to existing tools****.*

	Role	Tech.	I1	D1	I2	D2	I3	D3
P1	comp. biologist	4.2	y	y	y	y	y	y
P2	programmer	4.2	y	y	y	y	y	y
P3	hci researcher	3.8	y	y	y	y	y	y
P4	vis. practitioner	3.7	y	y	y	y	y	y
P5	hci researcher	3.5	y	y	y	y	y	y
P6	journalist	3.4	y	y	y	y	y	y
P7	hci researcher	3.4	y	y	y	y	y	y
P8	lab manager	3.4	y	y	y	y	y	y
P9	programmer	3.2	y	y	y	y	y	y
P10	vis. practitioner	2.9	y	y	y	y	y	y
P11	editor	2.9	y	y	y	y	y	y
P12	cs/journ. student	2.5	y	y	y	y	y	y
P13	data scientist	2.5	y	y	y	y	n	n
P14	analyst	2.3	y	y	y	y	n	n
P15	designer	2.3	y	y	y	y	n	n
P16	writer	1.8	y	y	y	n	n	n
P17	ux researcher	1.8	y	y	y	y	y	y
P18	designer	1.3	y	y	y	y	n	n

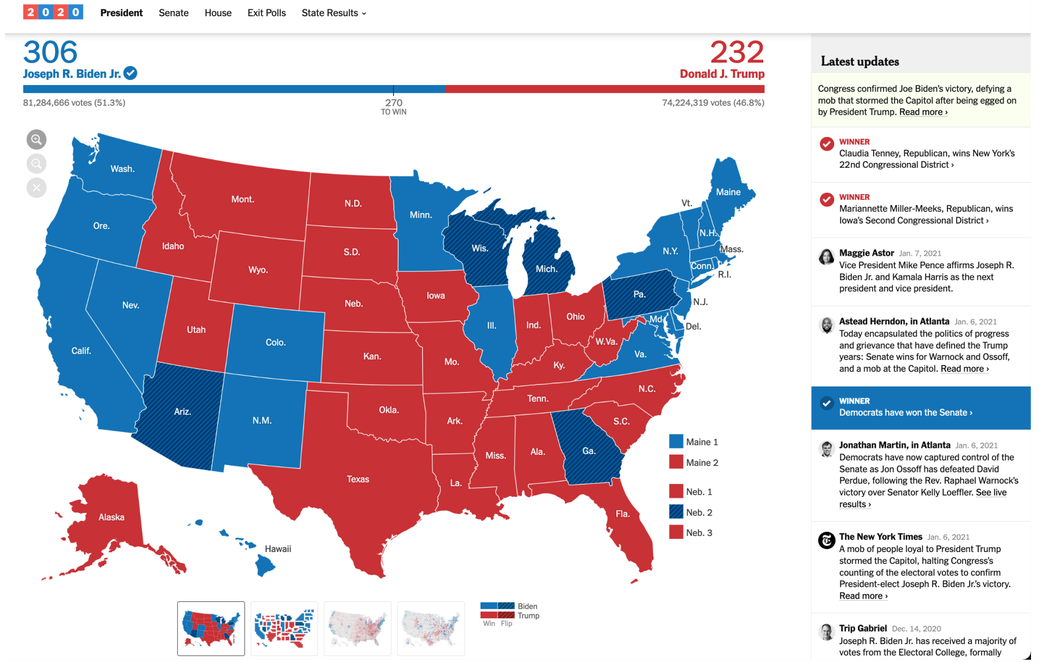
Design Prompt

Design Prompt ELECTION NIGHT

You want to keep the public as informed as possible of the status of the 2024 presidential election as it happens.

May want to convey:

- Current snapshot
- Likely outcomes
- Awareness of uncertainty
- Historical context
- Any unusual circumstances (e.g. delayed returns)



Design Prompt ELECTION NIGHT

Input Data

Vote counts

candidate, state, method, timestamp, # votes

Race calls

candidate, state, timestamp

Constrains

Near real time

Never seen the data before

Data may contain errors

Should not erode public trust

Design Prompt ELECTION NIGHT

How would you visualize this?

What data would you use?

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How would you visualize this?

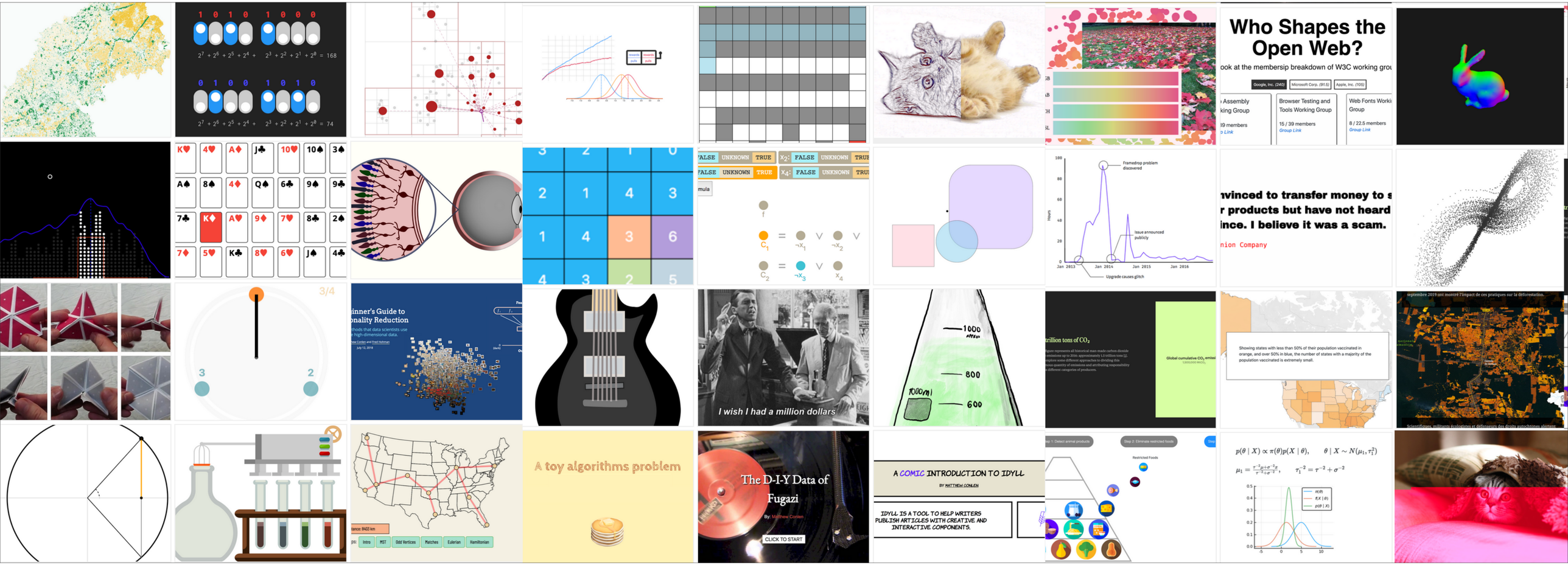
What data would you use?

You want to keep the public as informed as possible of the status of the 2024 presidential election as it happens.

May want to convey:

- Current snapshot
- Likely outcomes
- Awareness of uncertainty
- Historical context
- Any unusual circumstances

Thank you! Questions?



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