2025

frank.computer

On Tools, AI, and Disability

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Human-Computer Interaction Institute

hcii.cmu.edu, axle-lab.com, dig.cmu.edu

Credit: Jeff Kubina, Wikimedia

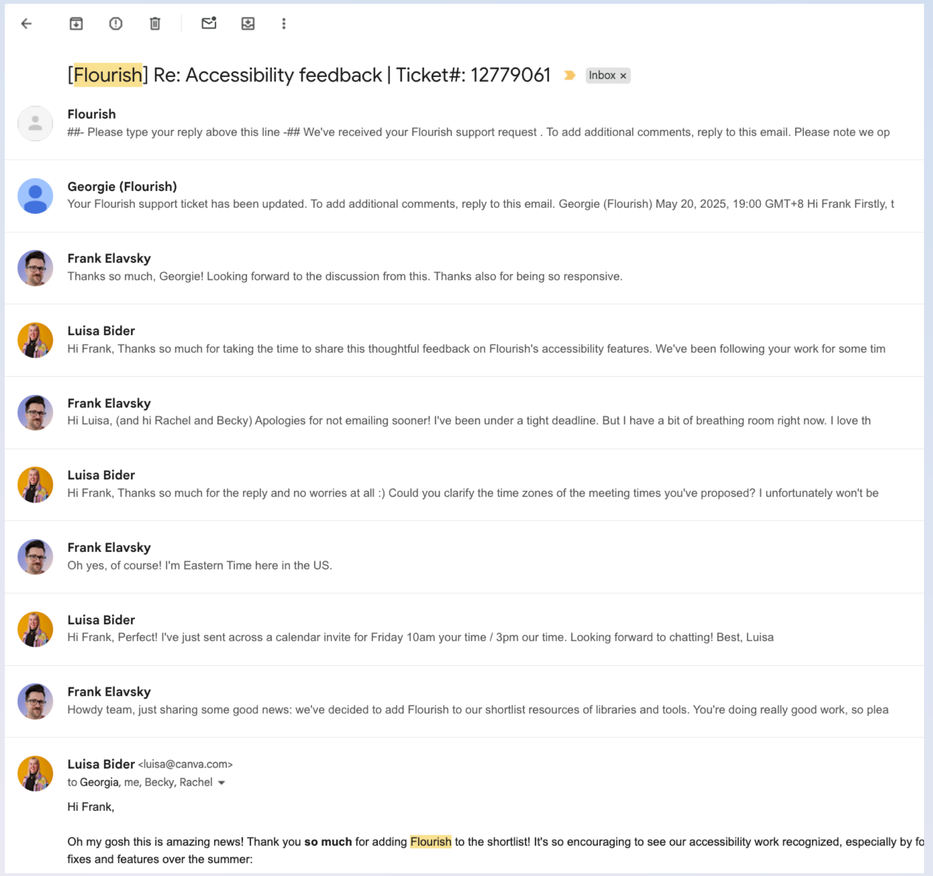
Tools matter

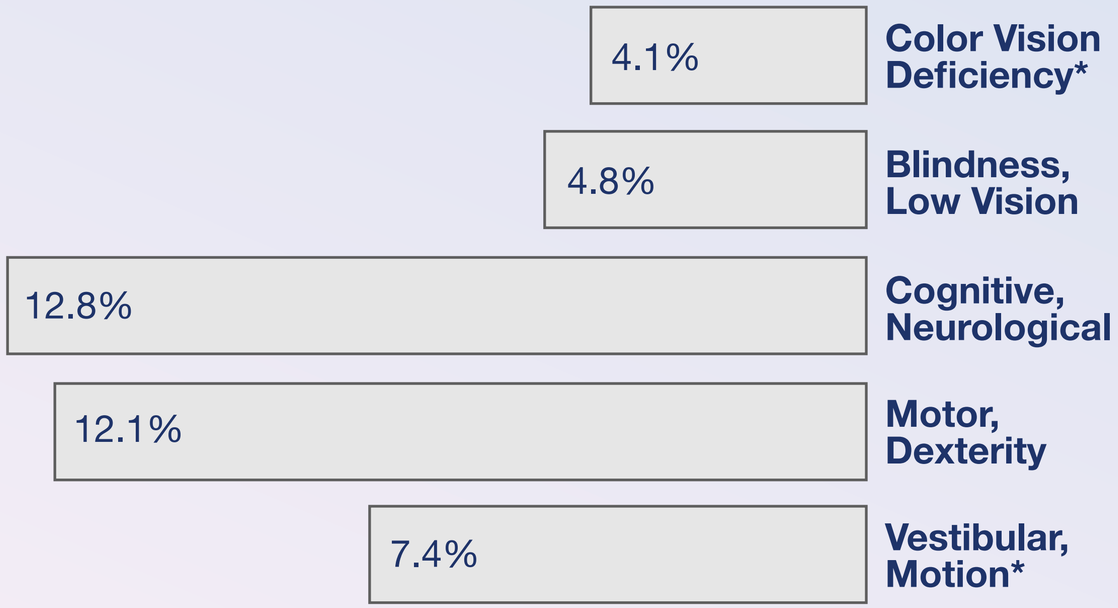
You are currently on a frame. To enter the web area, press Control-Option-Shift-Down Arrow.

ge that

Republican. No need to take that from me: it's a well-evidenced

Some change is easier to make happen than others



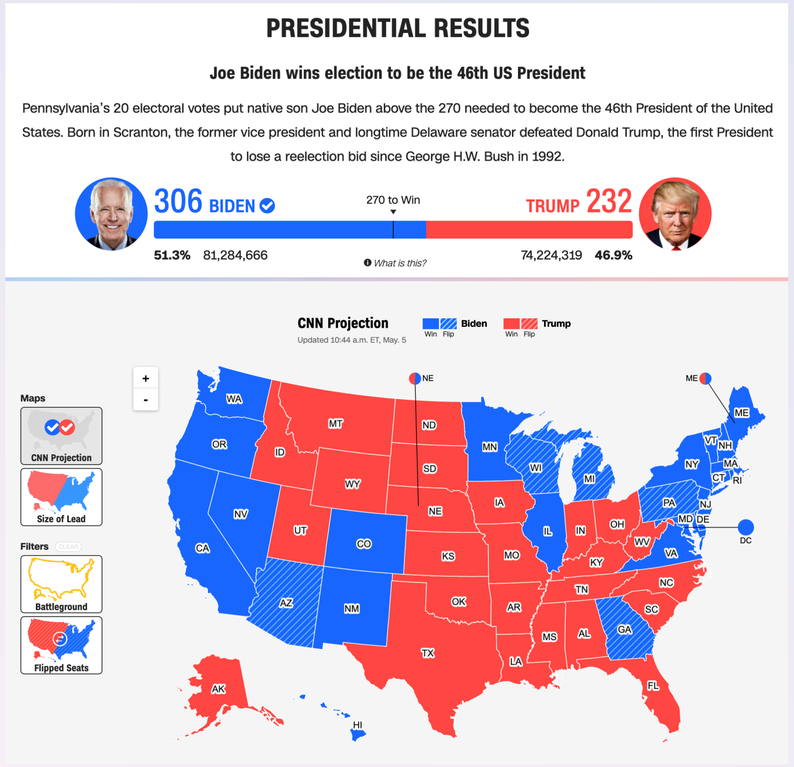


Centers for Disease Control and Prevention. Disability and Health Data System (DHDS). 2023. Available from: http://dhds.cdc.gov
*No new data

~27% of people living in the United States self-report living with a disability that affects their daily life (2023)

People with disabilities deserve to:

Participate in politics



Credit: CNN

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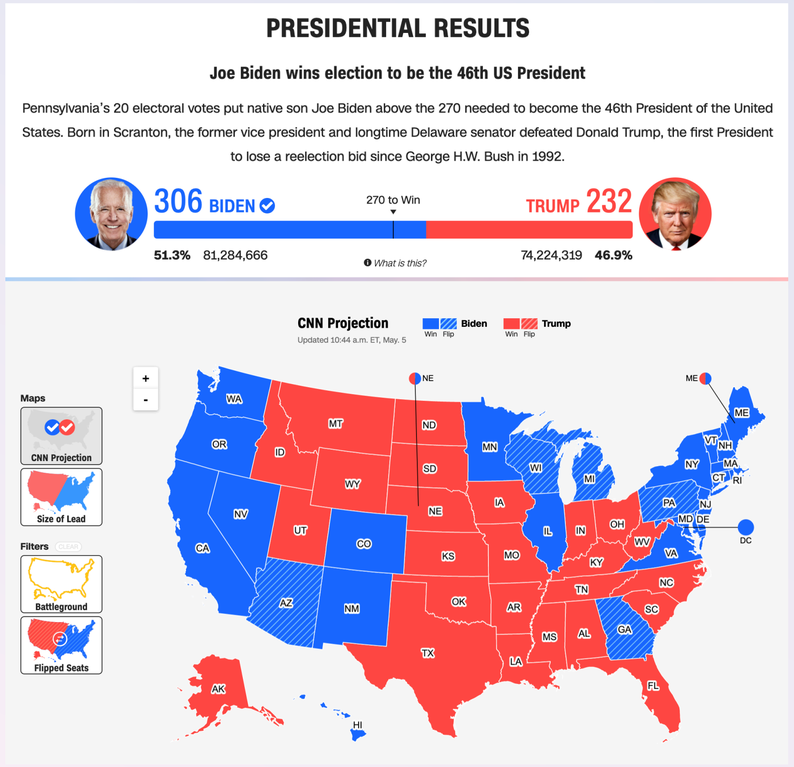
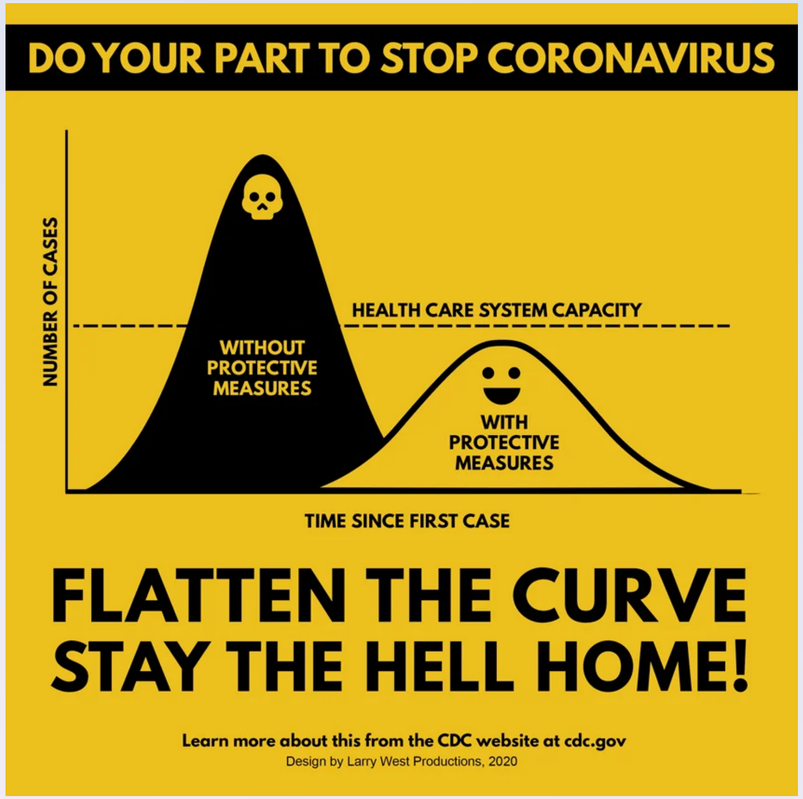
Participate in politics



Credit: CNN

Make informed decisions



Credit: Reddit

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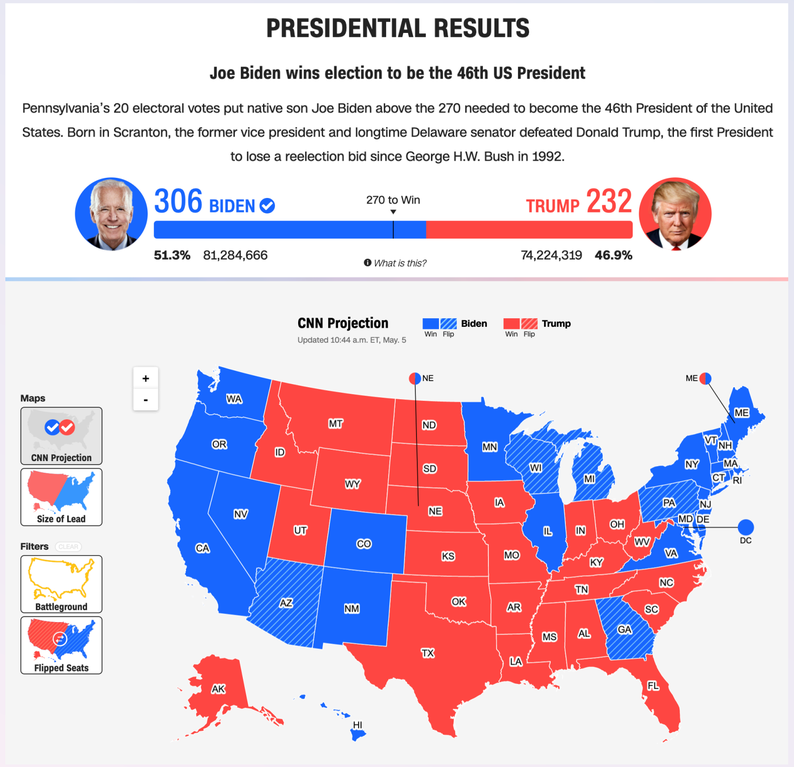
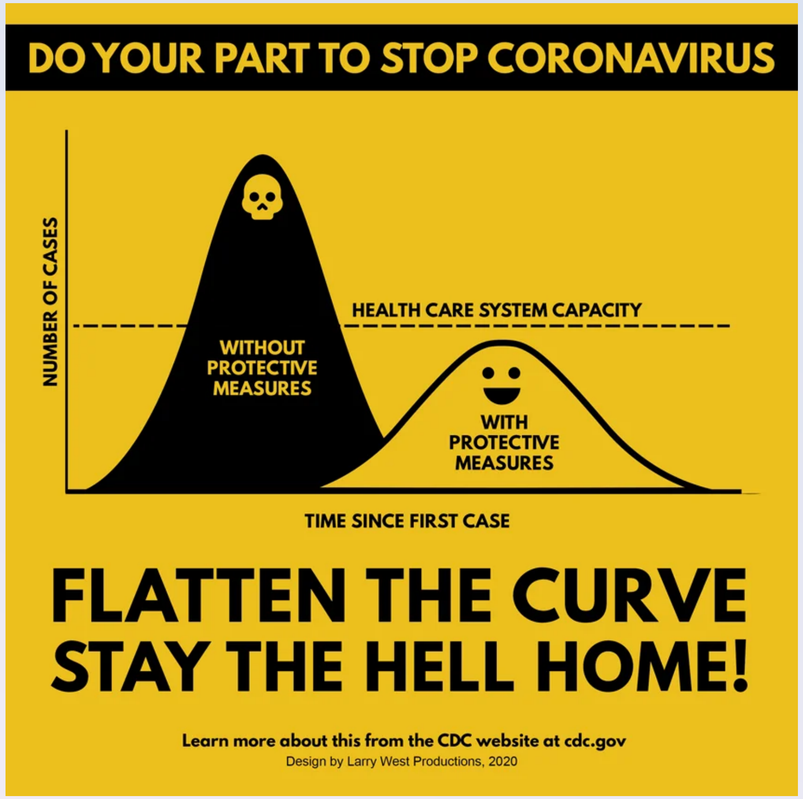


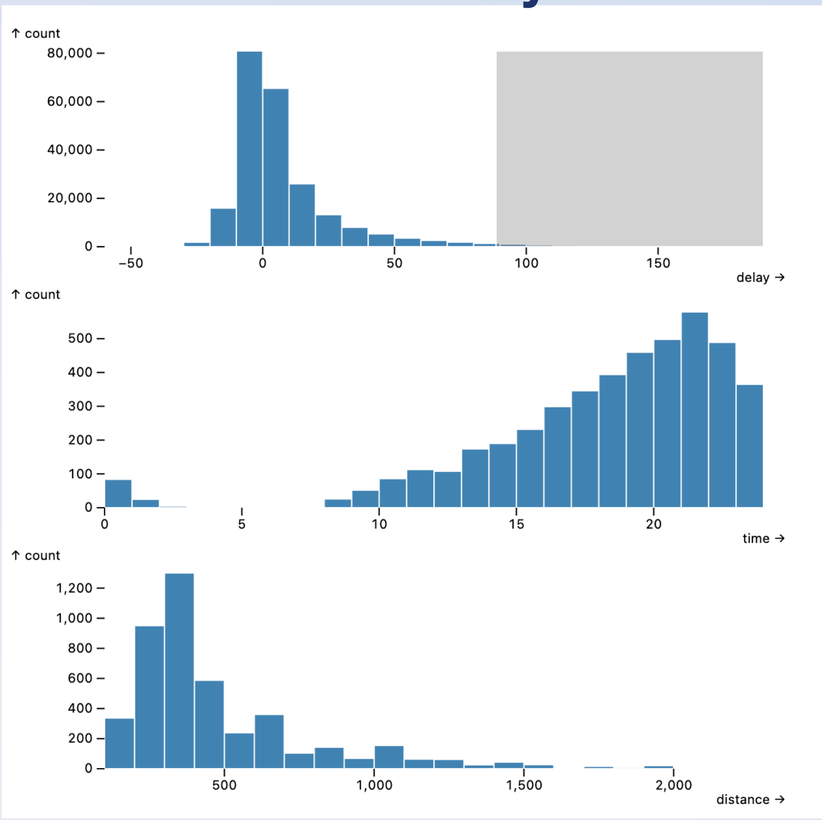
Credit: CNN

Make informed decisions

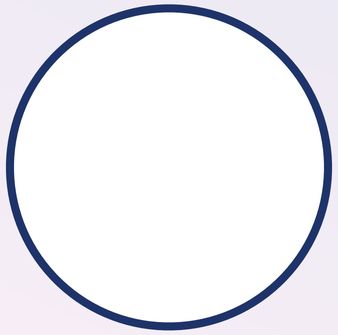


Credit: Reddit

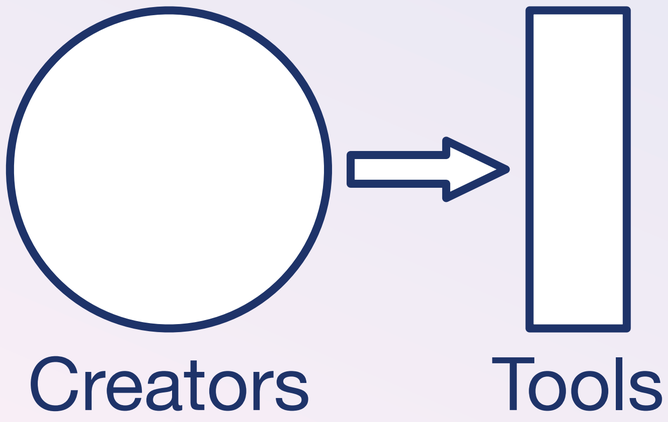
Analyze data quickly and efficiently

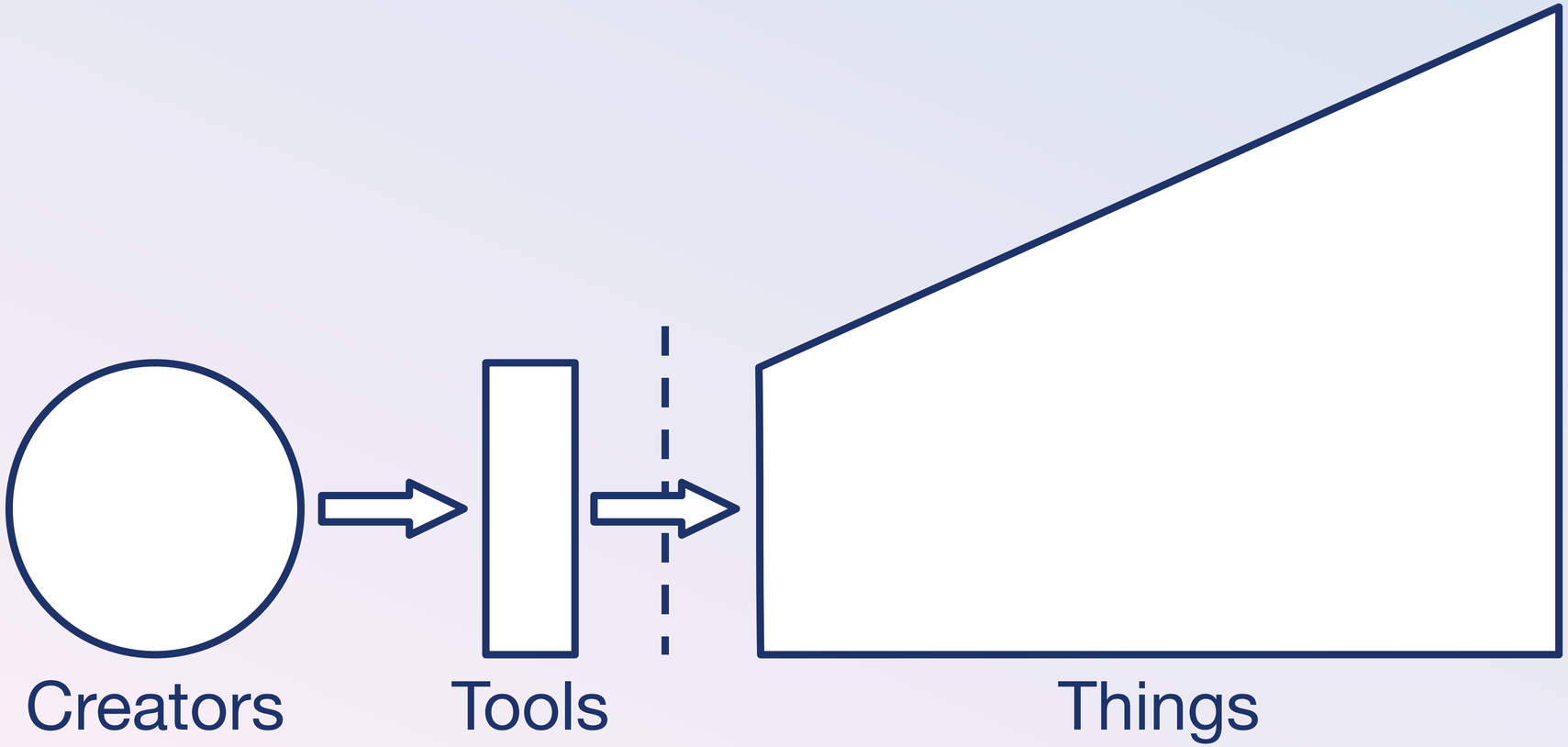


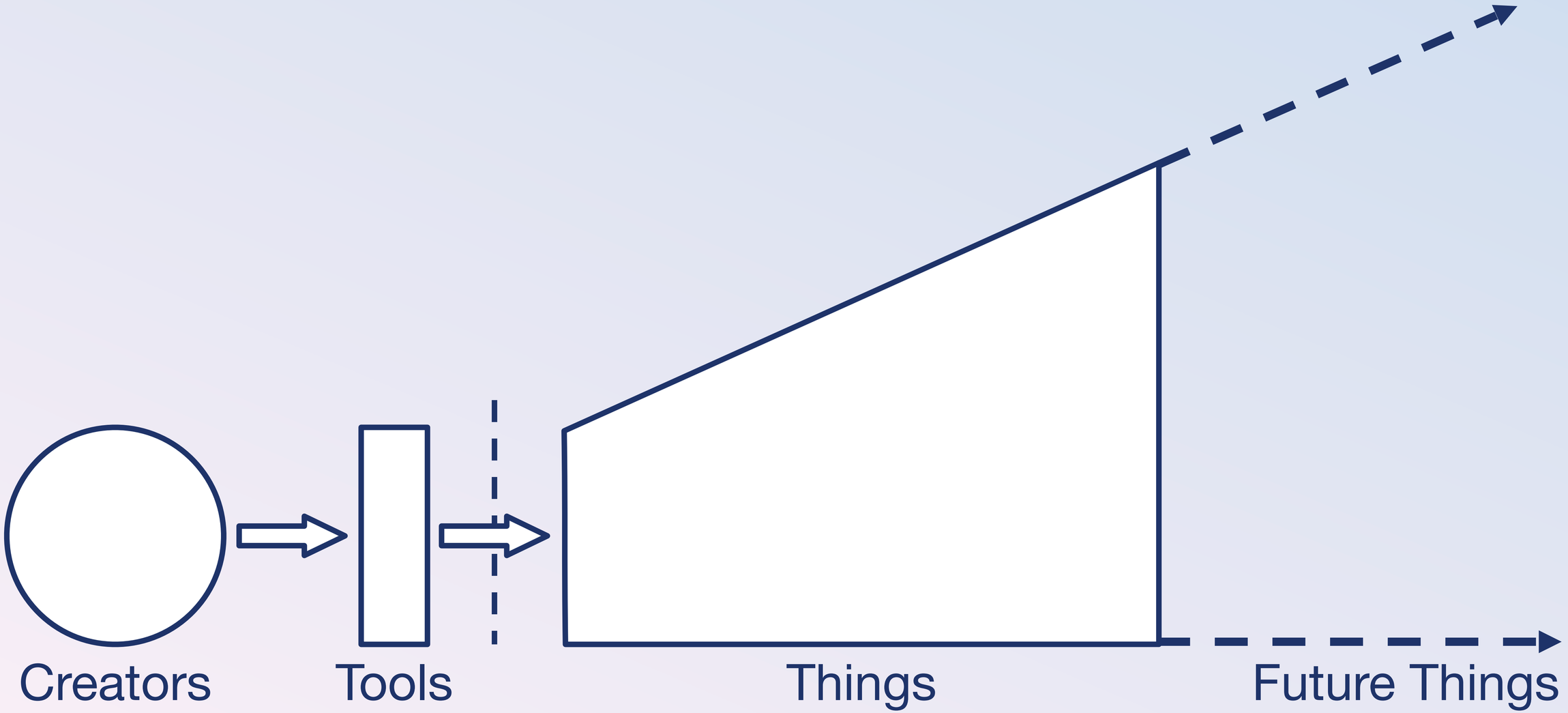
Credit: Our research



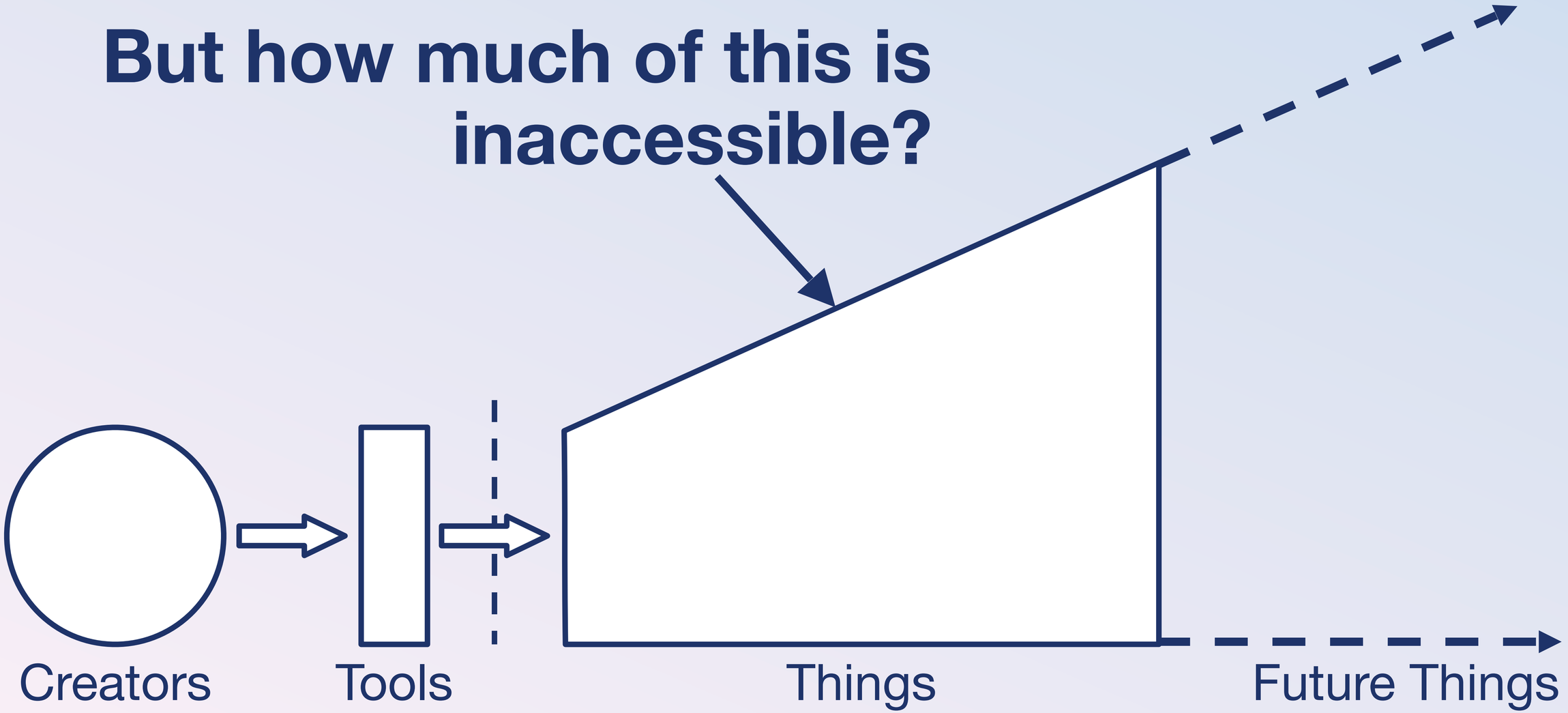
Creators


Creators
Tools


Creators
Tools
Things

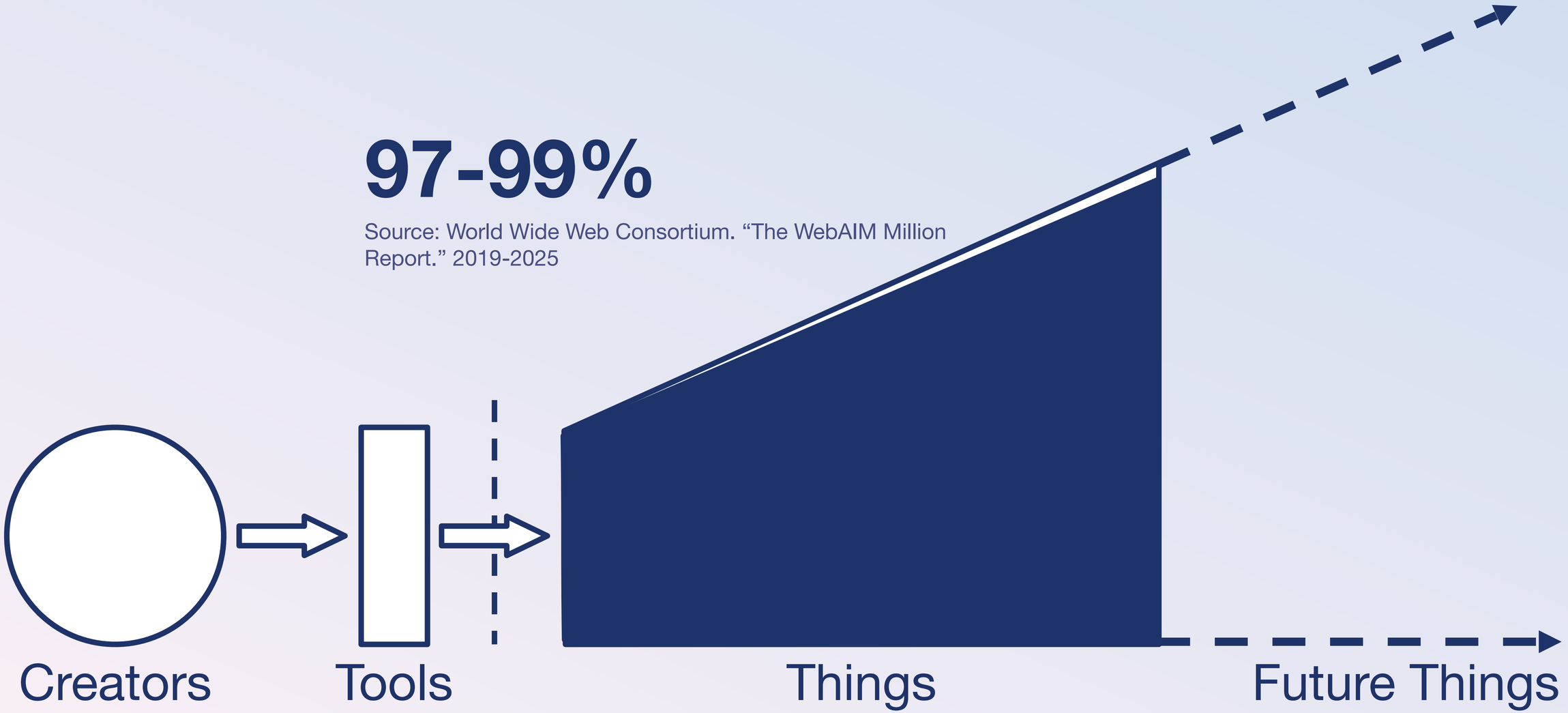

Creators
Tools
Things
Future Things

But how much of this is inaccessible?



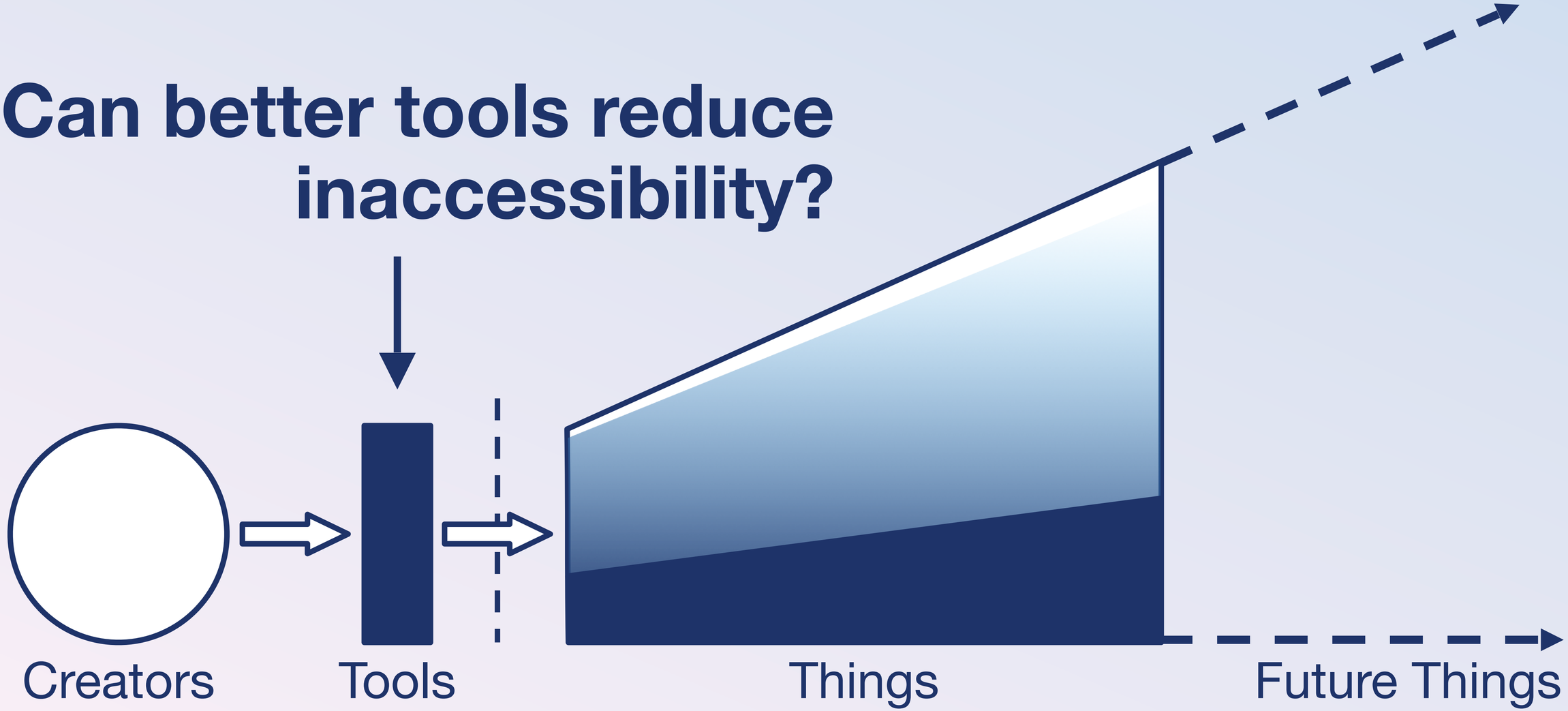
97-99%

Source: World Wide Web Consortium. “The WebAIM Million Report.” 2019-2025

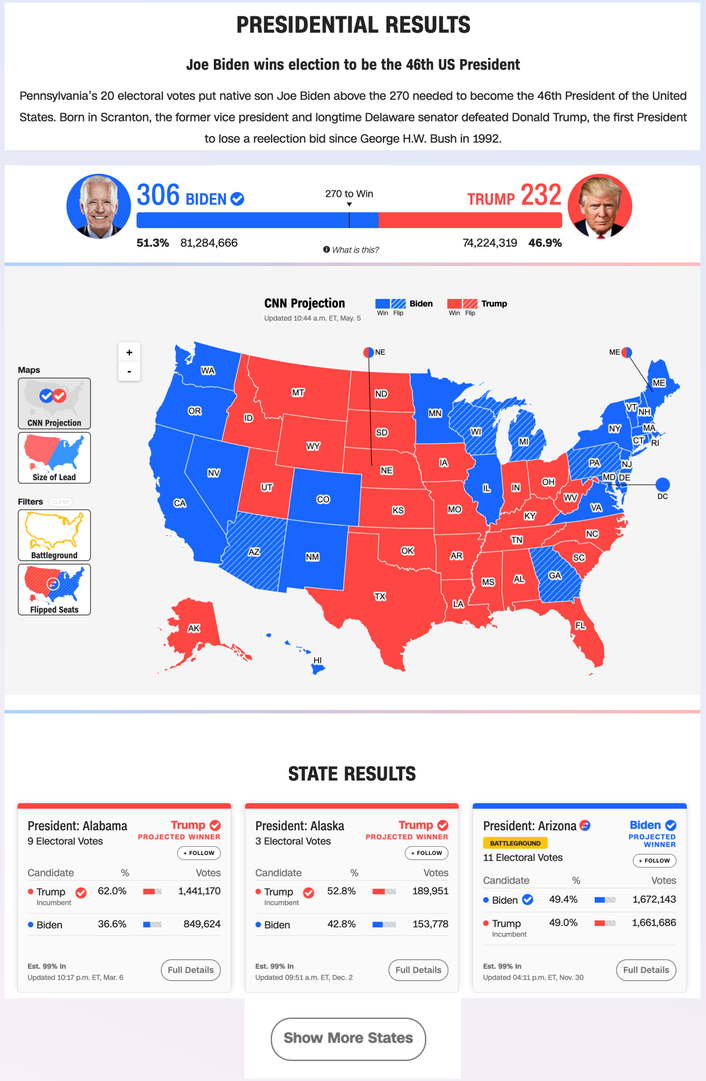


The builders and the makers (*that's us*) are responsible for access.

Can better tools reduce inaccessibility?

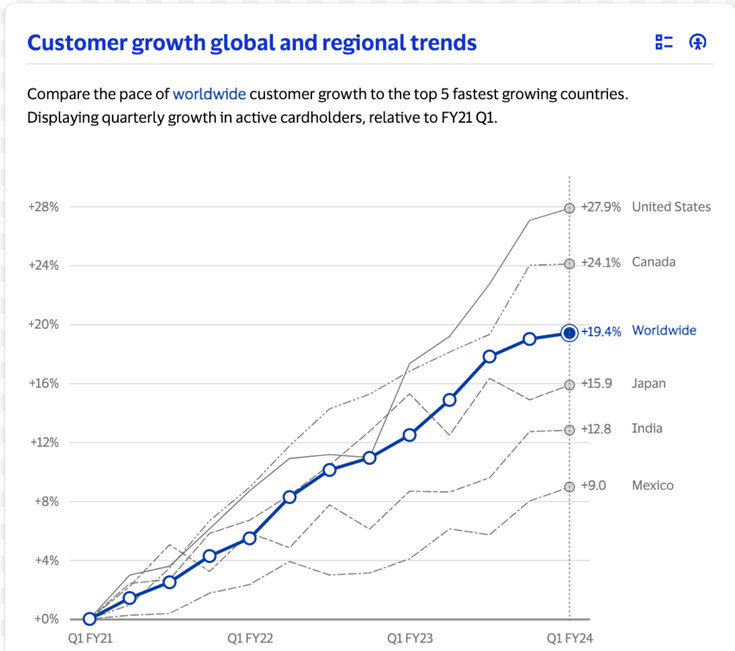


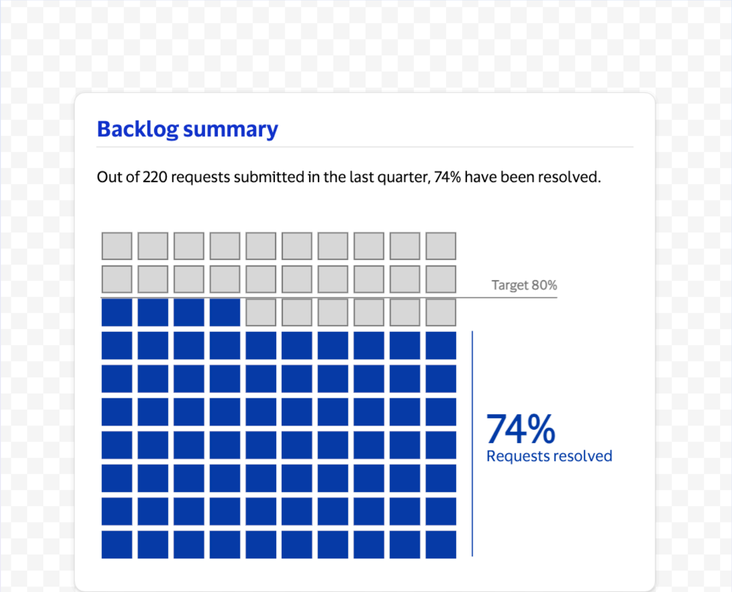
Helping practitioners consider accessibility

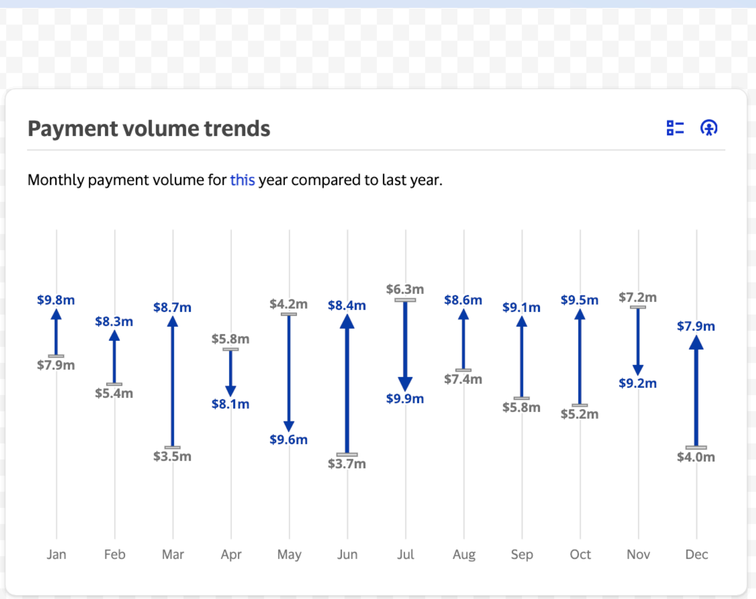


How do you find and evaluate access barriers in interactive visualizations?

Prior work: Staff-level engineer making a visualization library







Chartability is a workbook of tests, tools, and principles

How do you use Chartability?

There are a lot of different ways to perform an audit, and so there are also many different ways to use Chartability. Sometimes an audit is as casual as checking your work while you do it. And other times it is a big affair that involves teams of specialists and lawyers.

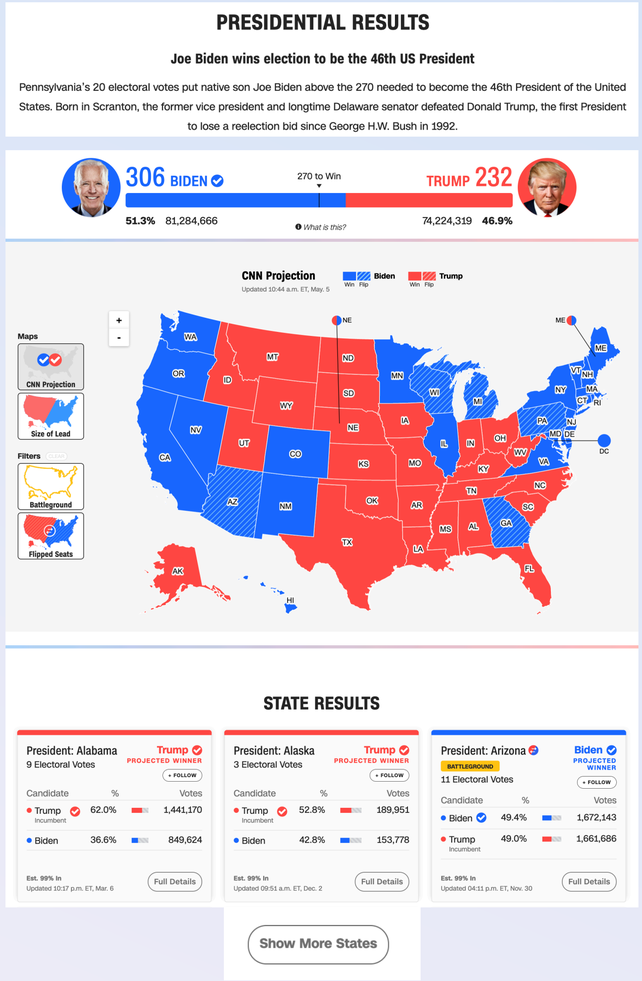
Realistically, while a highly trained auditor may be able to casually evaluate an artifact in as little as 30 minutes or even hold heuristics in mind as they are doing their own creative work, those new to auditing may take anywhere between 2 and 8 hours to complete a full pass of Chartability. Professional audits, which can take weeks or months, often include multiple auditors and provide rigorous documentation and detailed recommendations for remediation, typically in the form of a report. Chartability is meant to serve both quick pass and deep dive styles of audits, so users are expected to leverage it as they see fit.

Below we give an example of what might be a fast pass audit, using Chartability, in 5 steps. This isn't super thorough, but a good way to quickly check a handful of access barriers quickly.

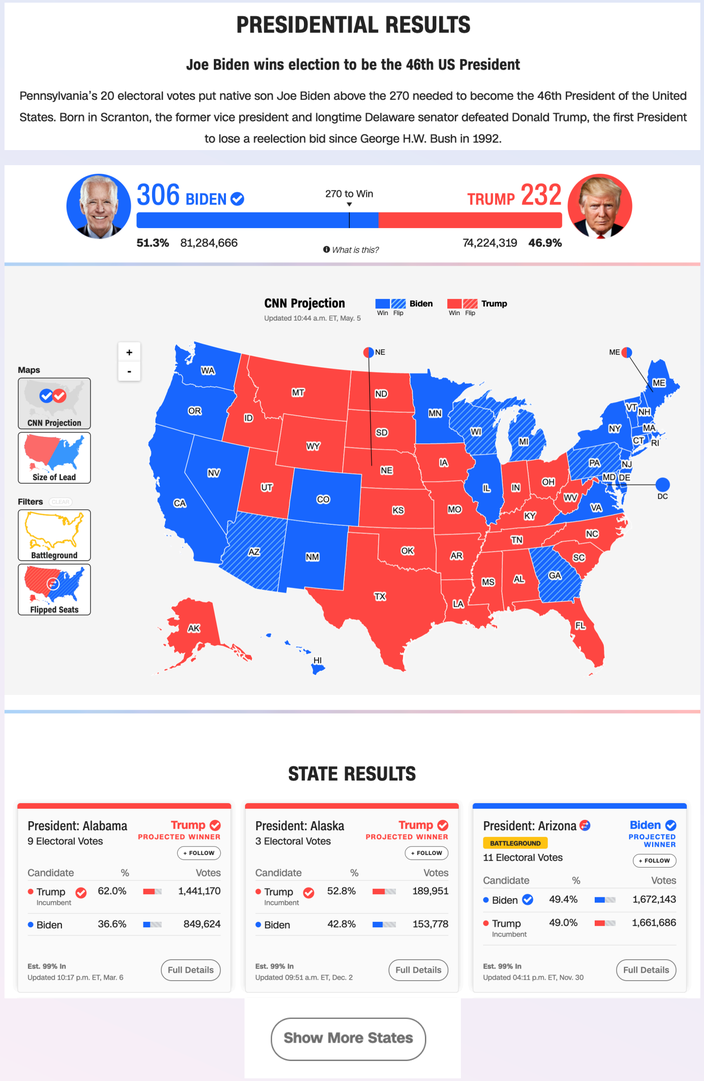
1. Visual Testing

Figure 1: A low contrast chart (left) compared to a higher contrast version (right). A dropper tool is extracting the fill color of the bar and then a contrast ratio has been calculated. Note that the fill color is the same on both bars, but darker borders have been added to ensure the visualization passes contrast tests.

Checking for contrast is the most common critical failure across all of our audits (88% of audits failed this heuristic). In order to evaluate contrast, often a combination of automatic (code-driven) and manual tooling is performed. When manually auditing, practitioners typically use a dropper and a contrast calculator (Figure 1). Contrast is measured by finding adjacent colors that are intended to convey meaning or boundaries, and finding a ratio between them. Standards require a different minimum contrast for text (4.5:1) than geometries like marks in a chart (3:1). Most auditors find this to be one of the easiest tasks to perform, but techniques can be tricky to handle. Testing for contrast accomplishes 3 different heuristics in Chartability: ensuring text/geometries have contrast, interactive states for elements have enough contrast change, and the keyboard focus indicator is easy to distinguish.

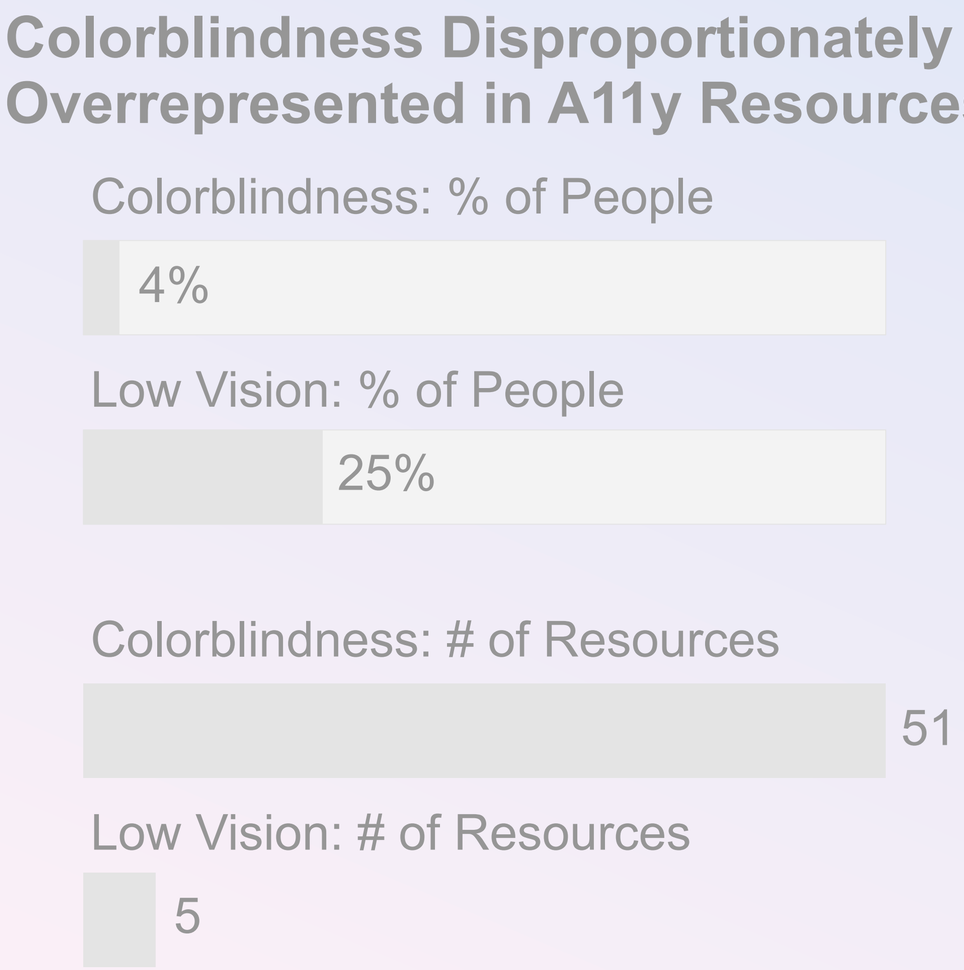


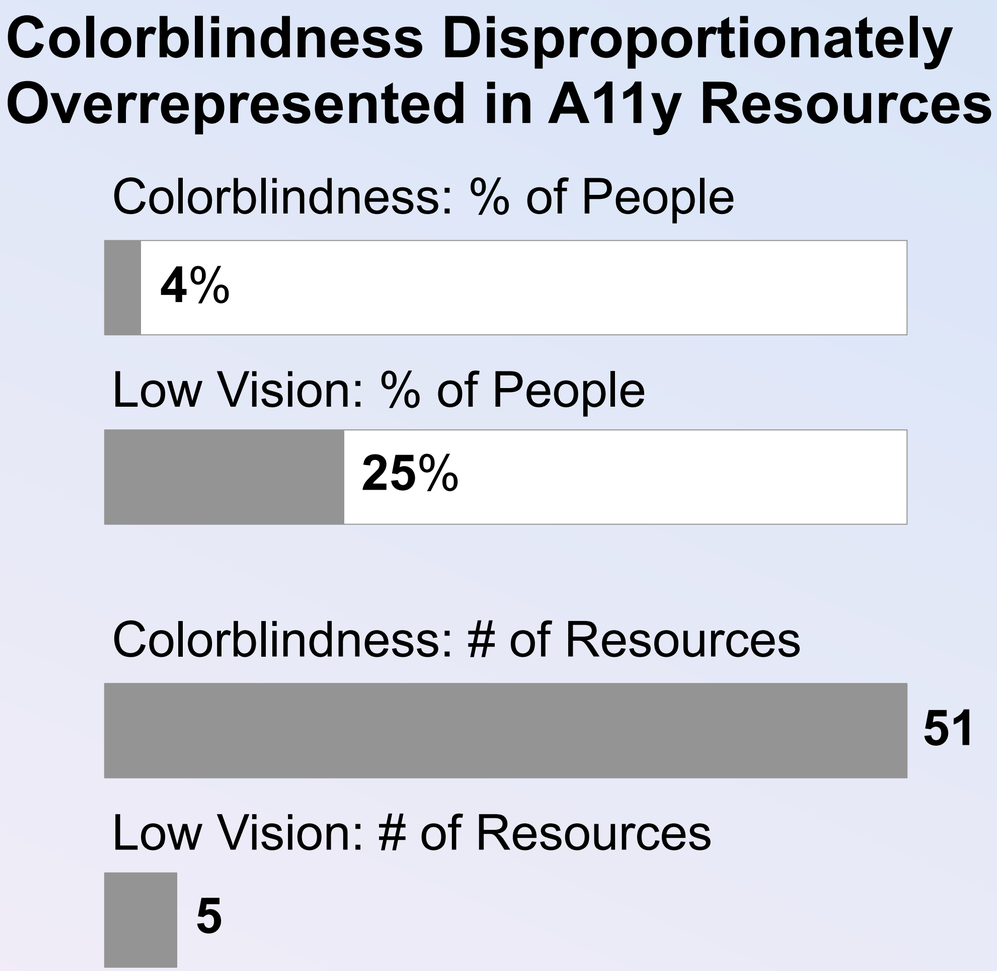
F. Elavsky, C. Bennett, and D. Moritz, "How accessible is my visualization? Evaluating visualization accessibility with *Chartability*," Computer Graphics Forum, 2022.



Let's evaluate this map from CNN with Chartability.

Design with high contrast

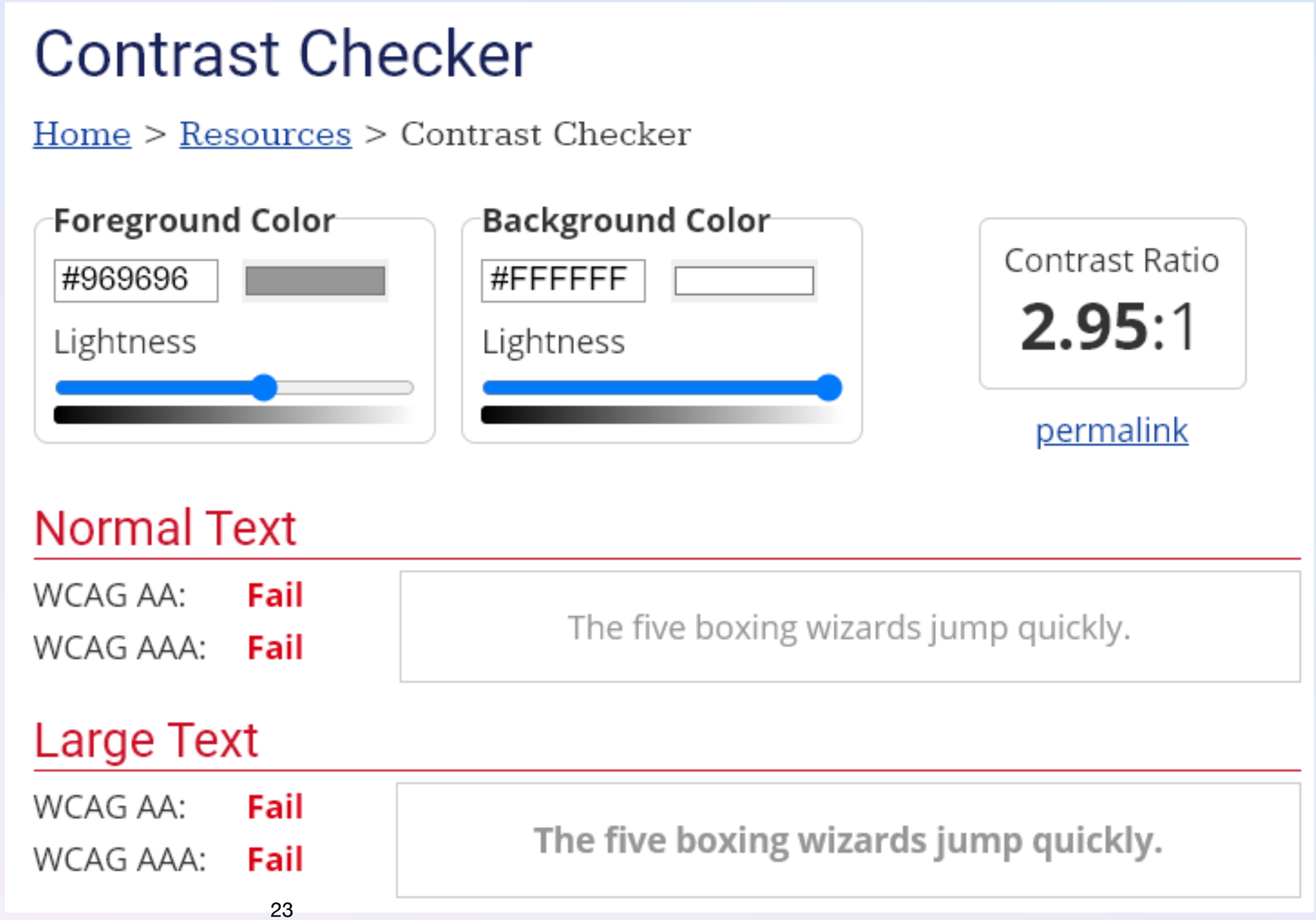




Use High Contrast Text

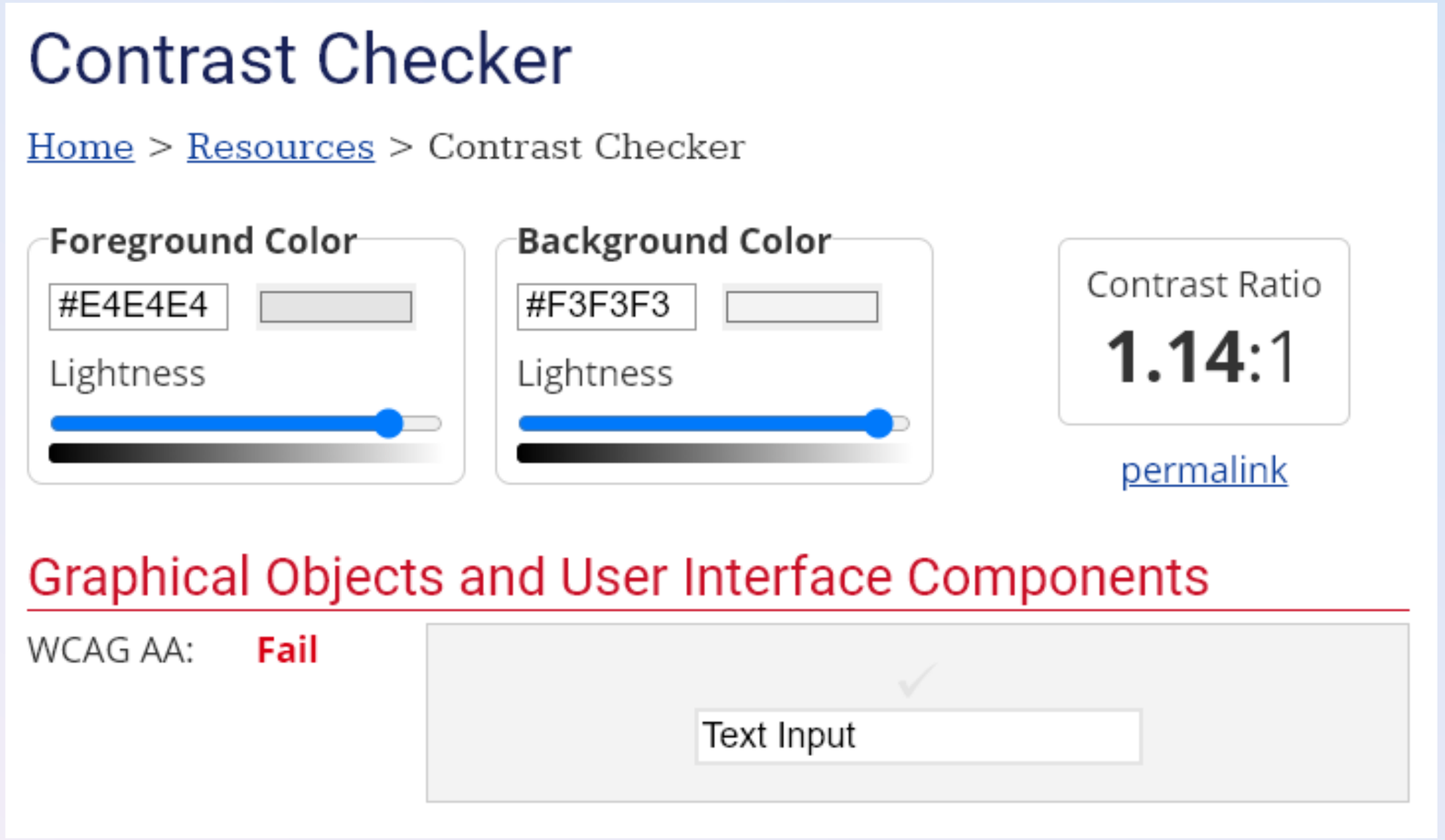
Text needs at least 4.5:1 contrast against its background.

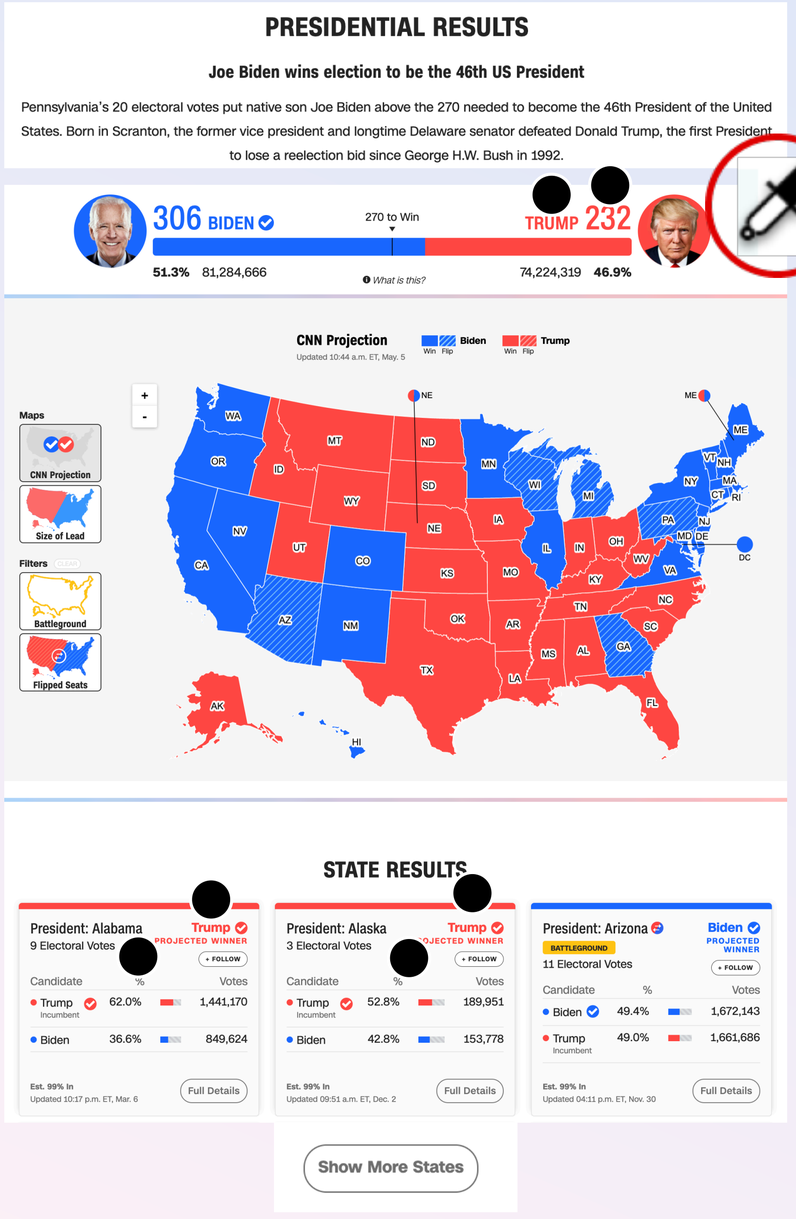
Large text (bold and 16pt or larger) can be 3:1 or higher.

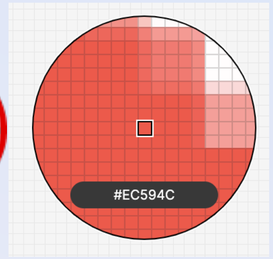


Use High Contrast Geometries

Chart elements need at least 3:1 contrast against their background.







Contrast Checker

Home > Resources > Contrast Checker

Foreground Color

#EC594C

Lightness

↔

Background Color

#FFFFFF

Lightness

Contrast Ratio

3.44:1

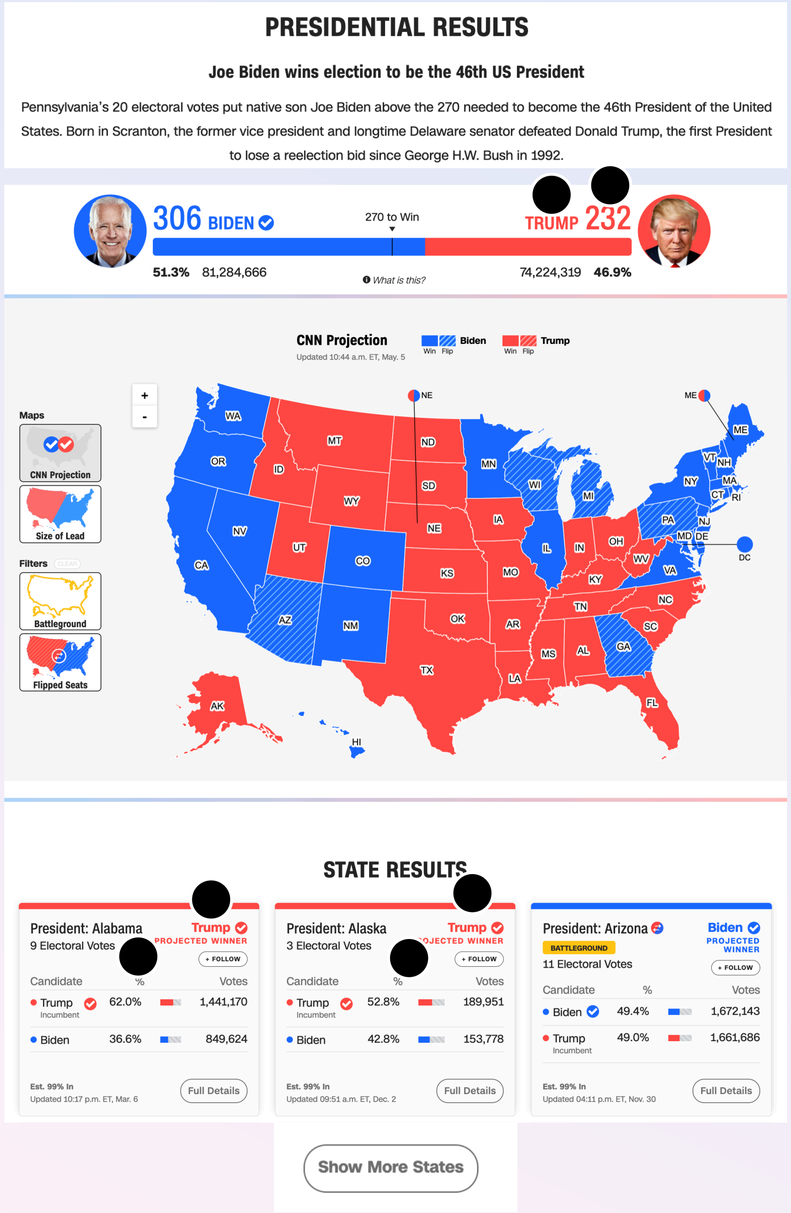
permalink

Normal Text

WCAG AA: **Fail**

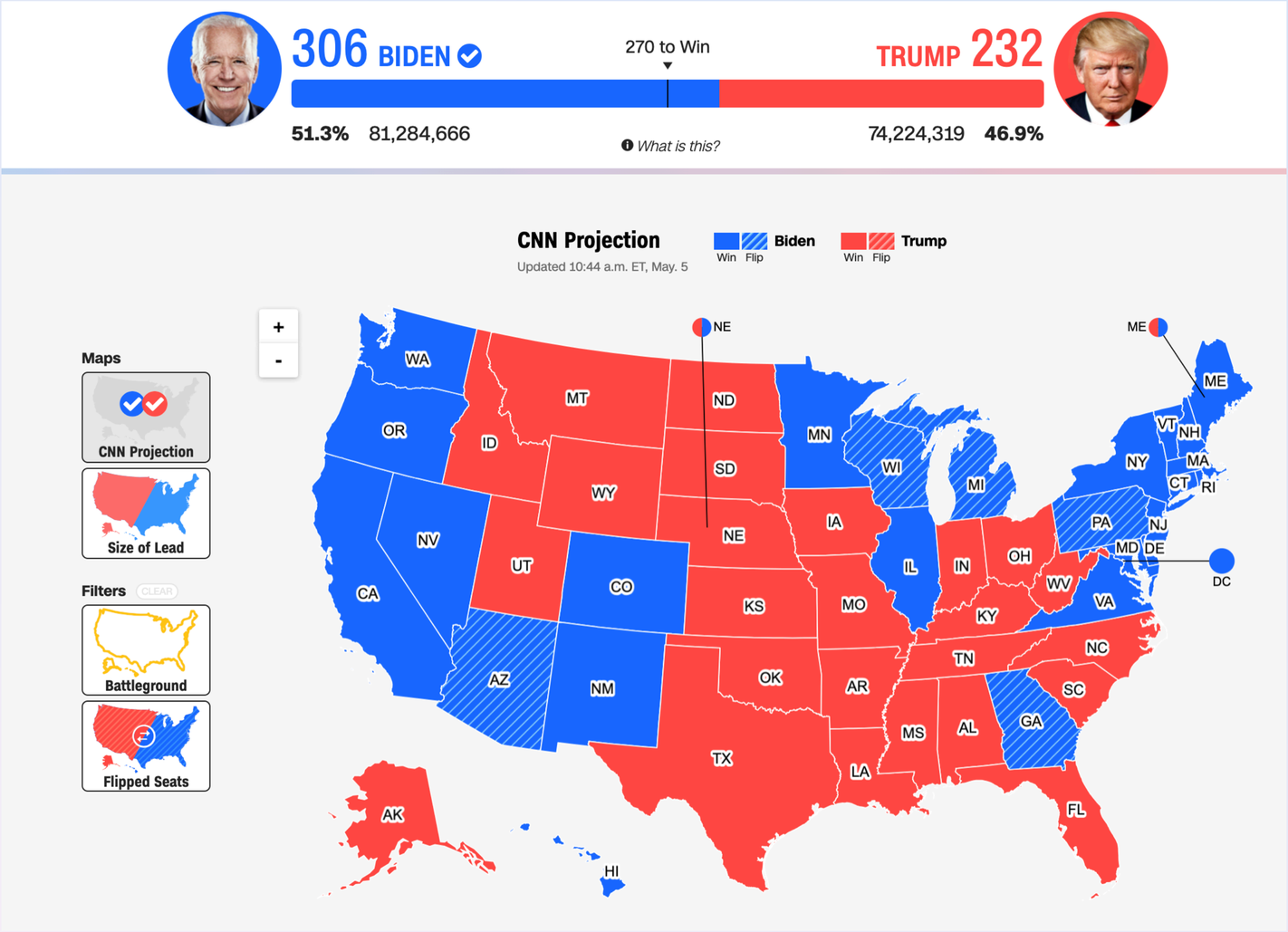
WCAG AAA: **Fail**

The five boxing wizards jump quickly.

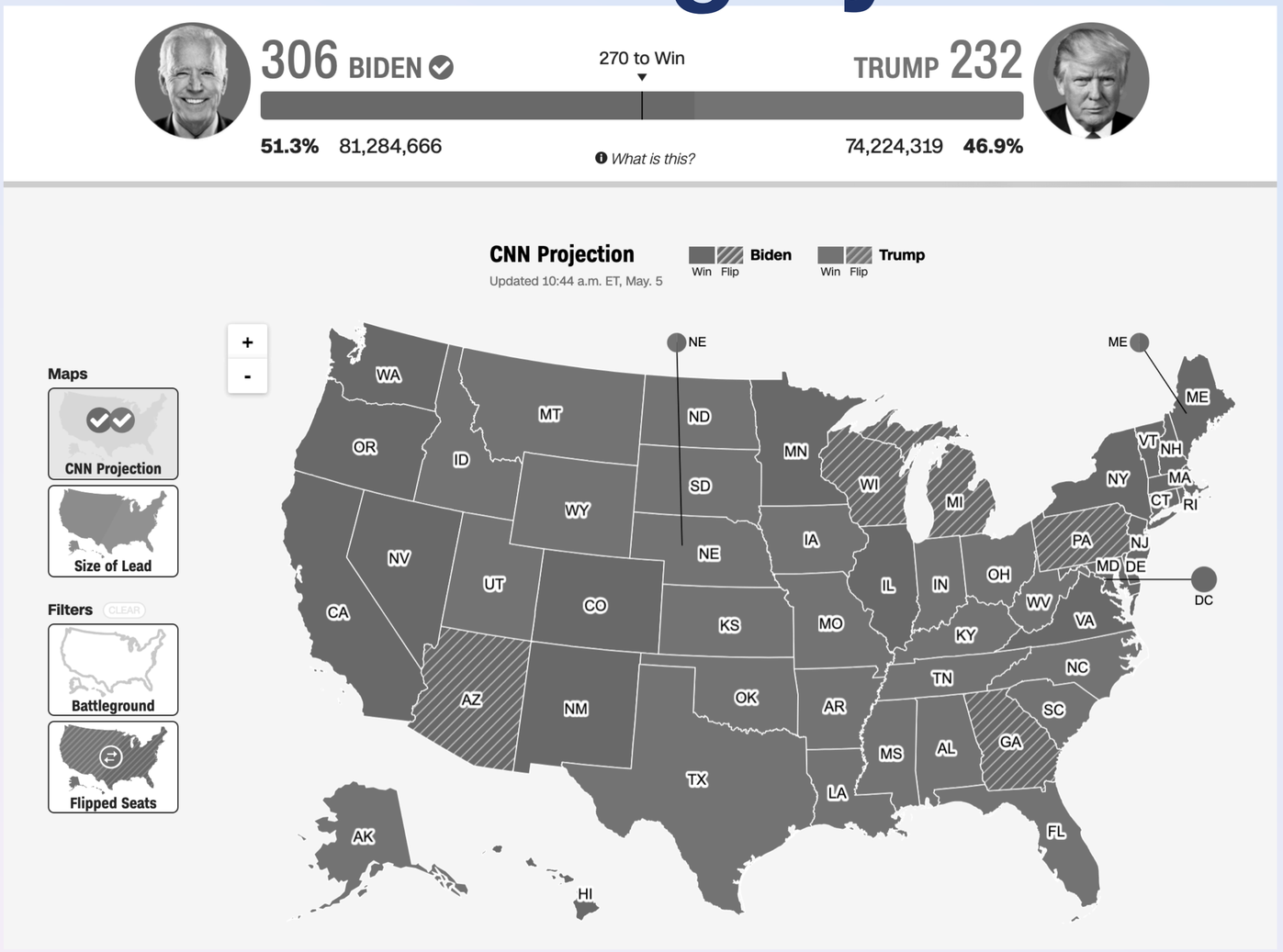


6 instances of low contrast

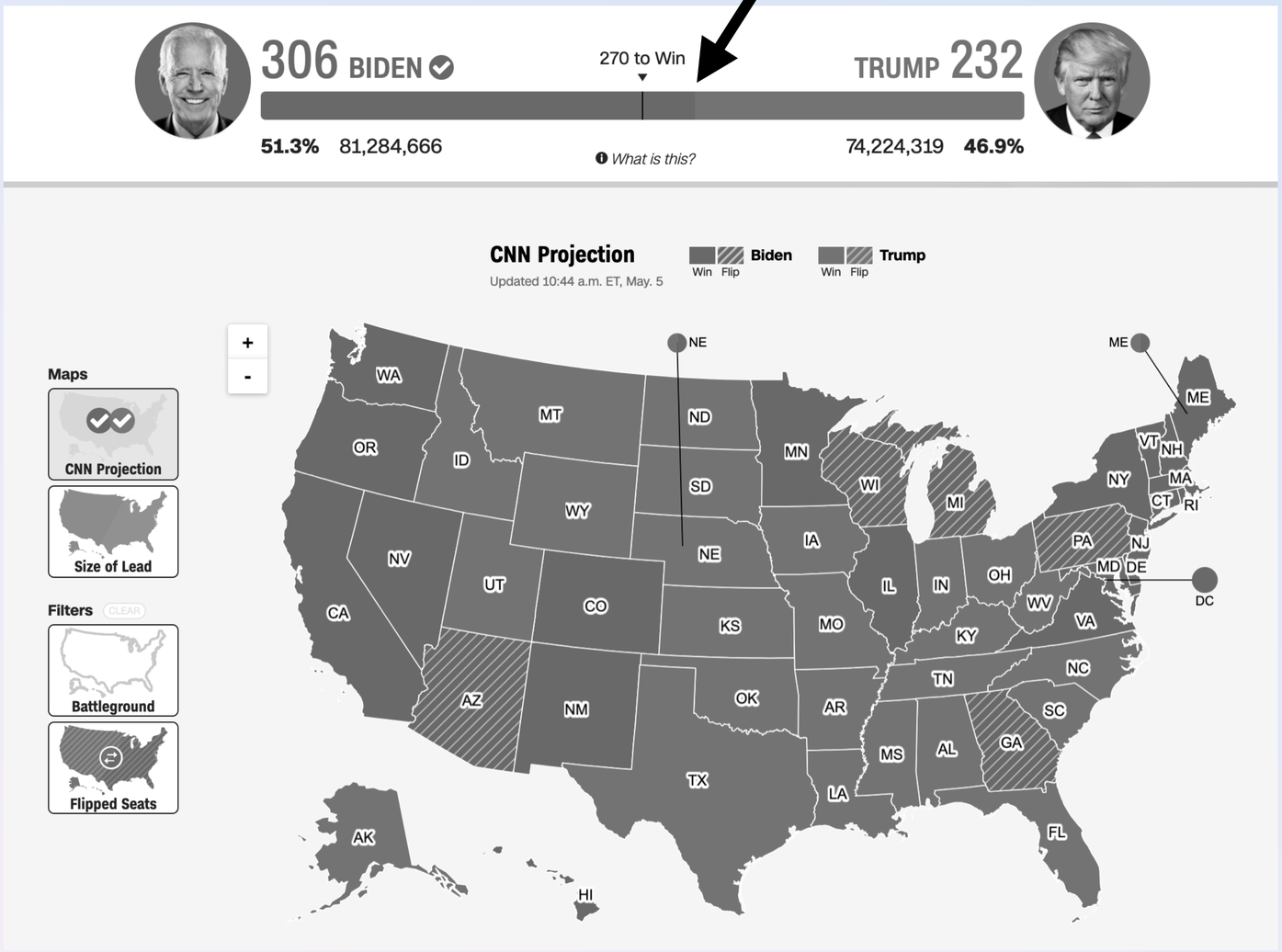
How can we fix this?



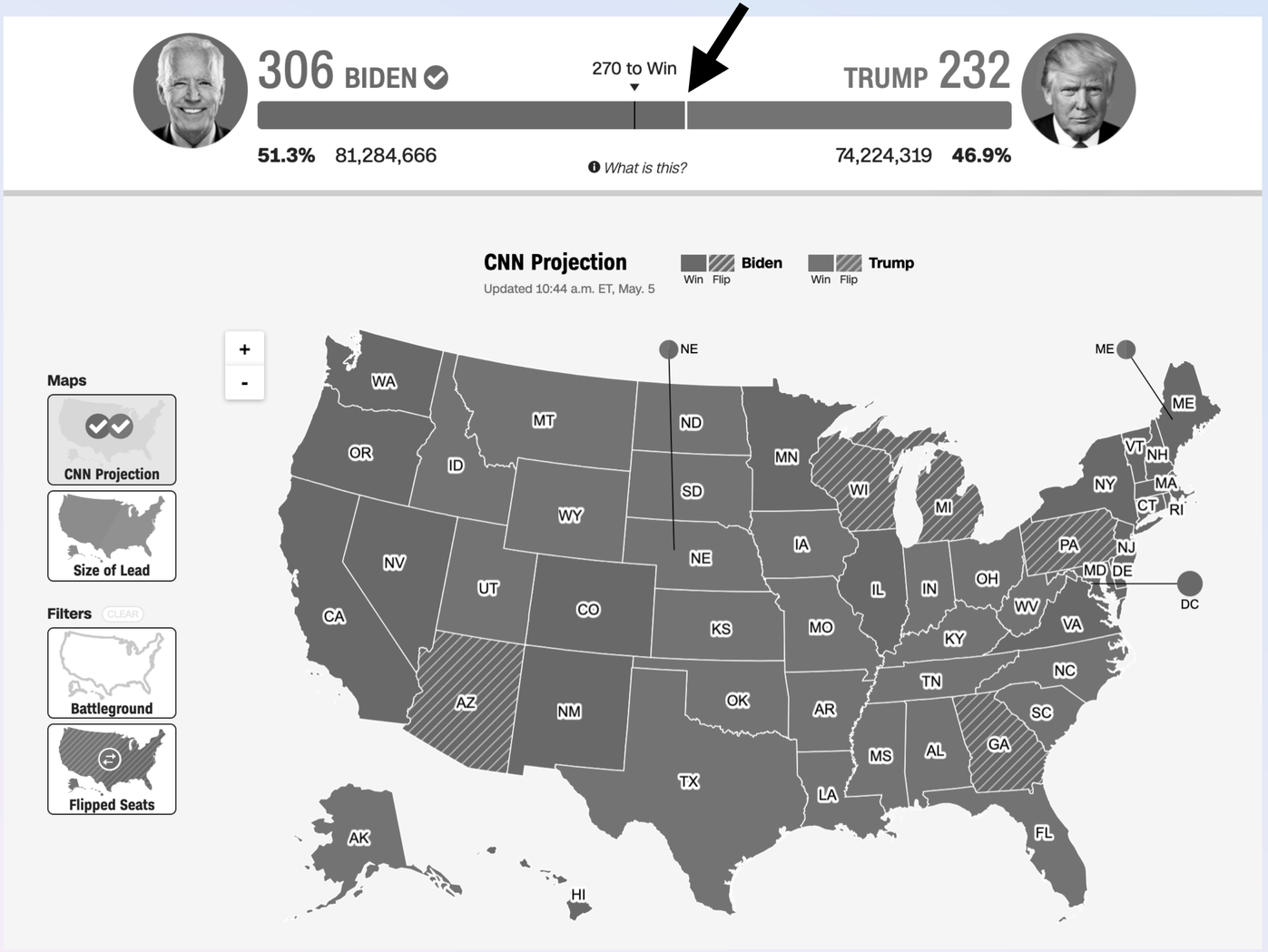
This map is trouble in greyscale



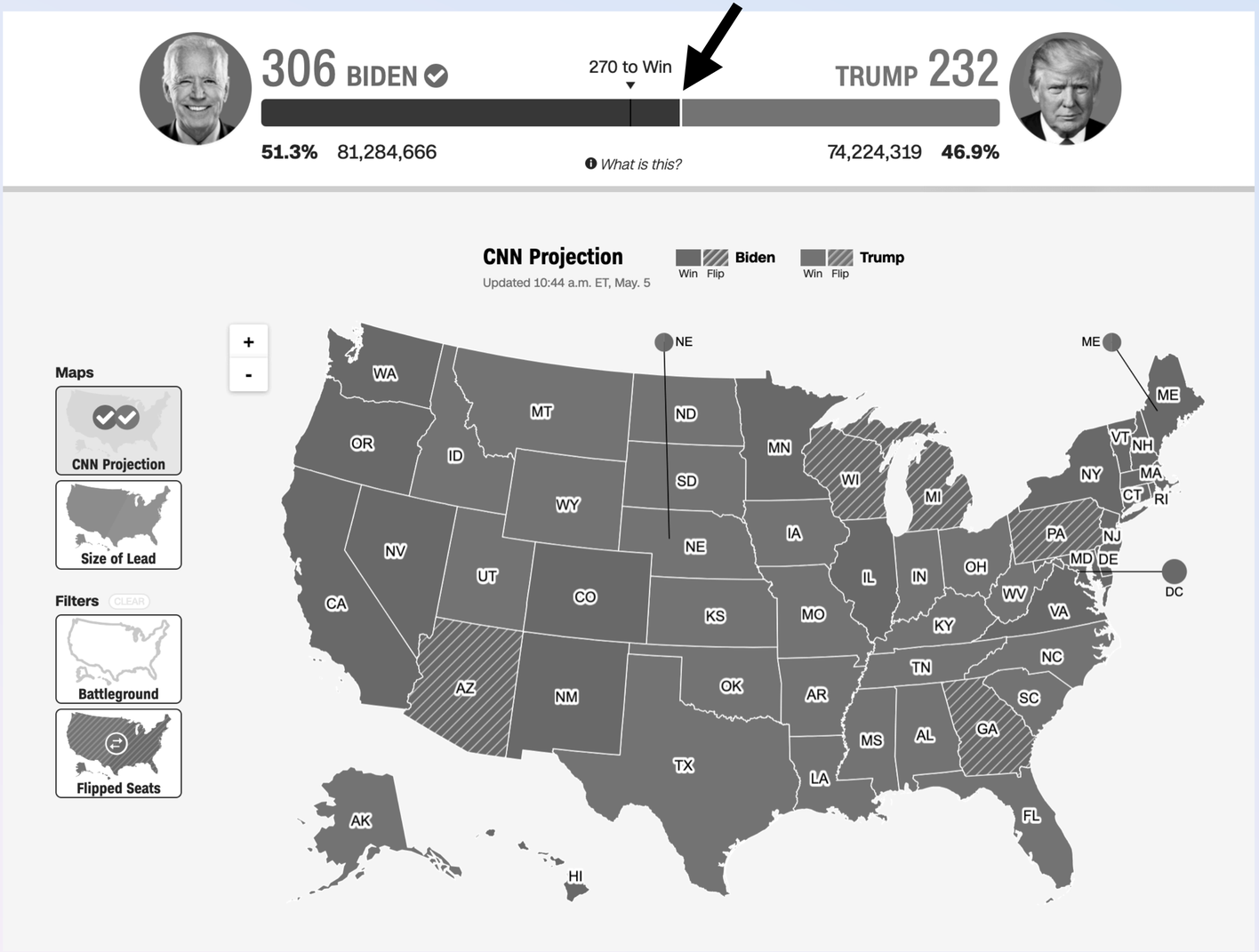
The division here matters!



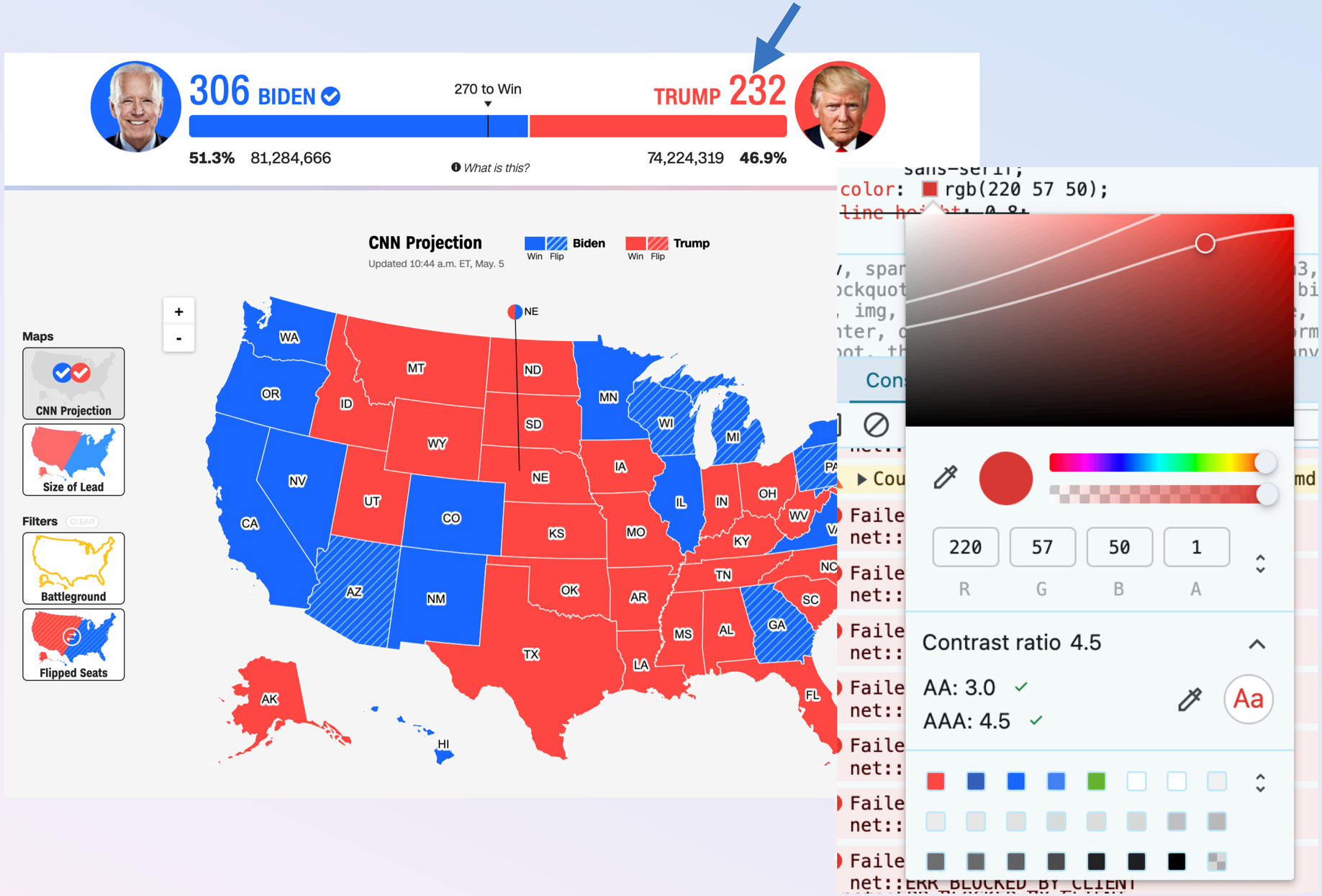
Maybe a small white divider, like the states?



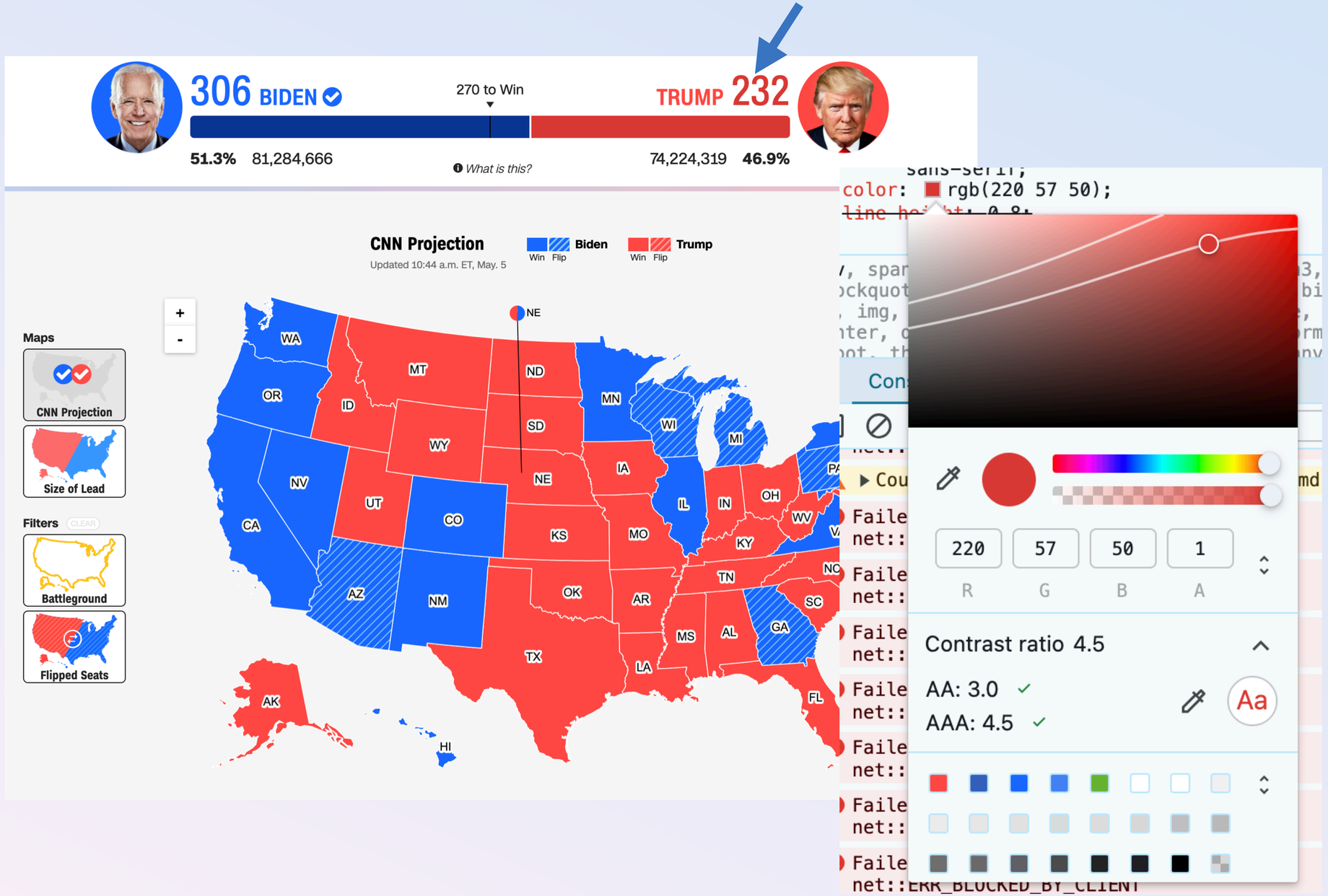
Perhaps test a darker blue too?



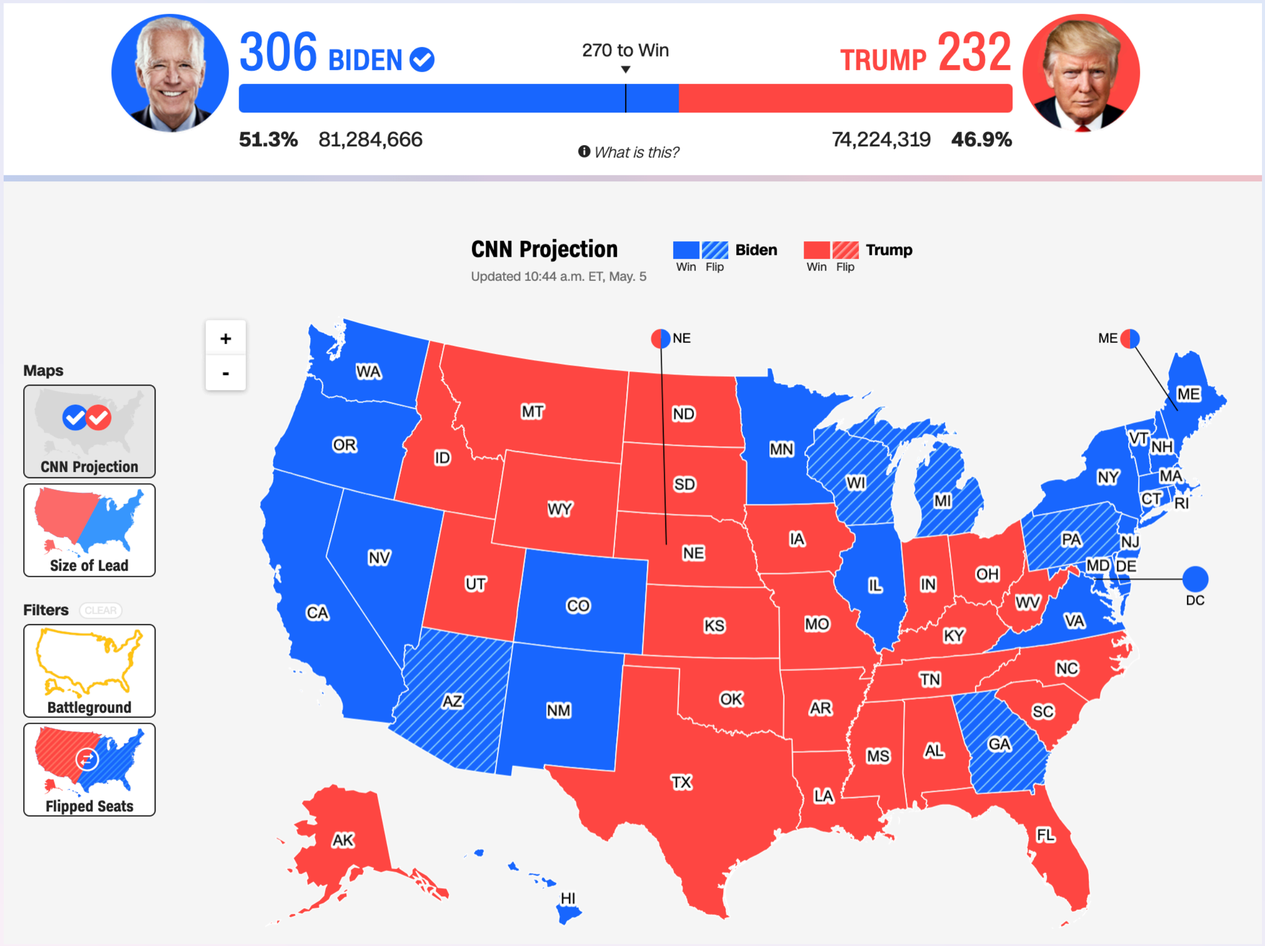
What if we fix the contrast failures at the same time?

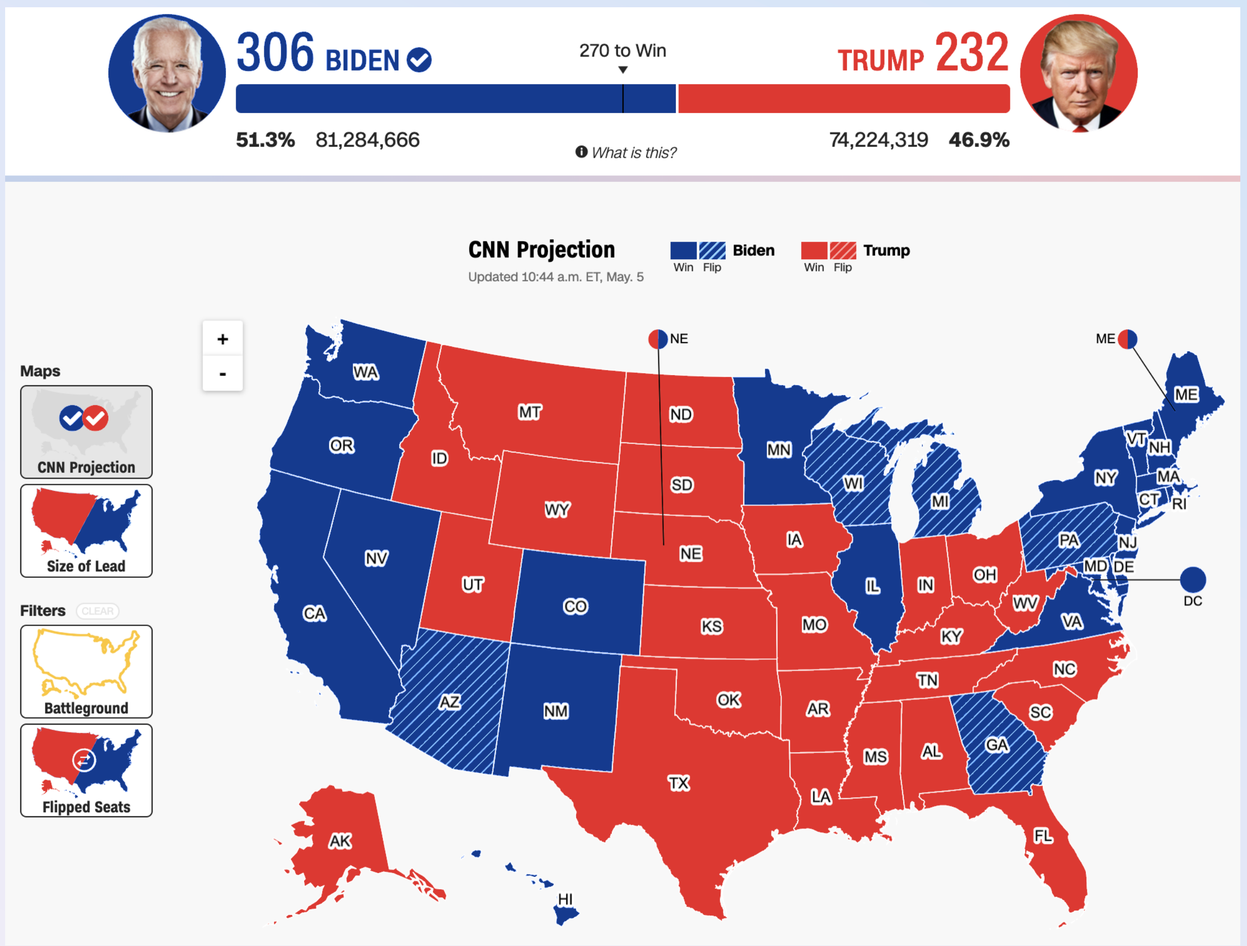


This text now passes!

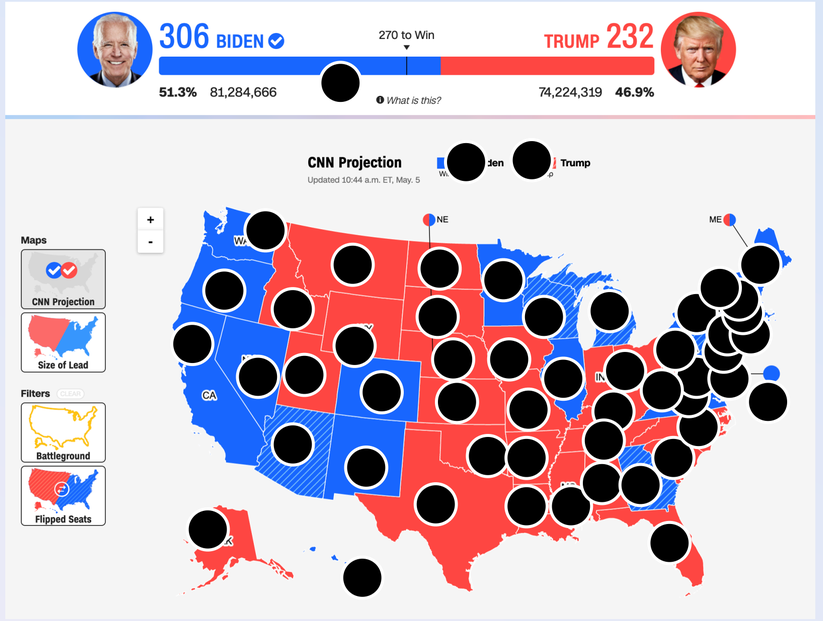


Sufficient contrast can help folks differentiate





(repeat for 49 other heuristics)



Chartability is used in:

15+ Policy orgs and governments worldwide

World Health Organization

European Commission

USWDS

110+ Tech, news, and non-profit companies/orgs

Microsoft

GitHub

Azure

HIGHCHARTS

Adobe

jupyter

The New York Times

REUTERS

BBC

20+ Undergraduate and graduate courses

Carnegie Mellon University

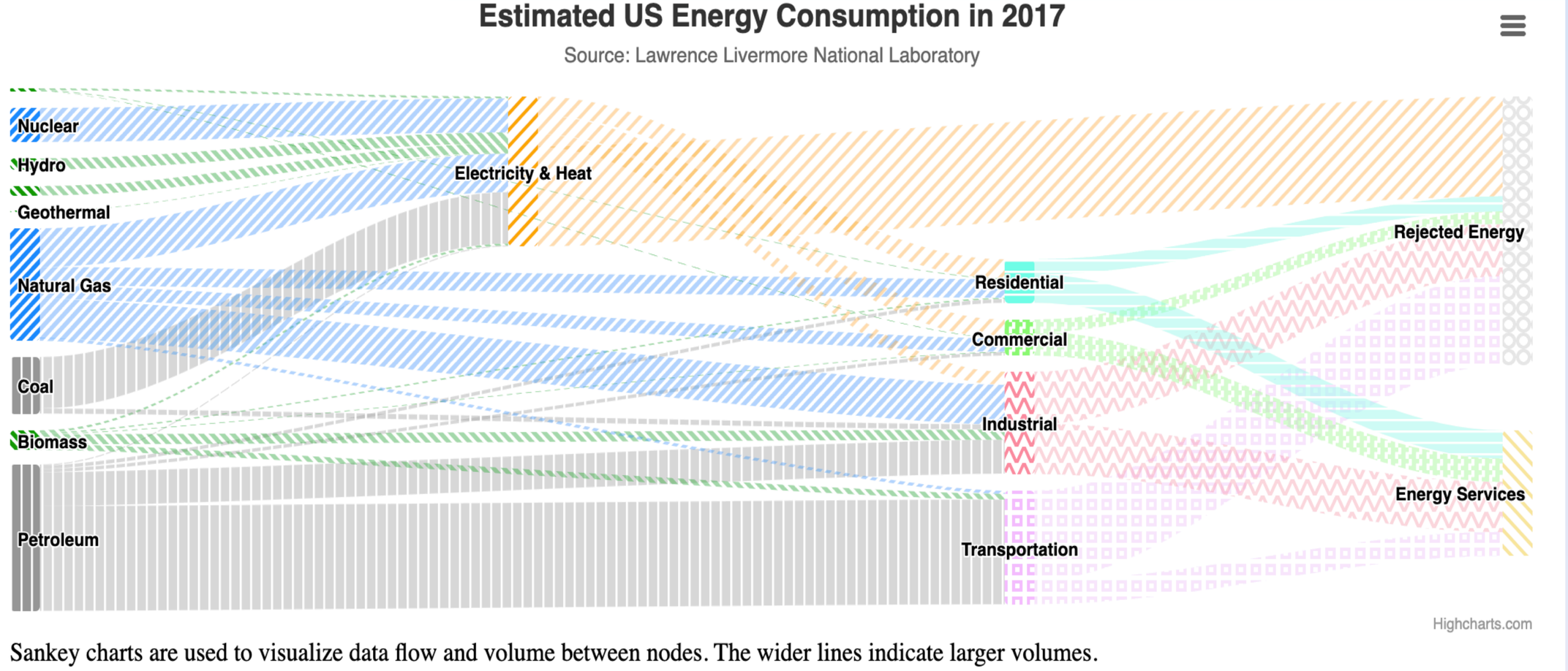
Massachusetts Institute of Technology

UNIVERSITY of WASHINGTON

Northwestern University

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

What about this visualization might be a barrier?



Sankey charts are used to visualize data flow and volume between nodes. The wider lines indicate larger volumes.

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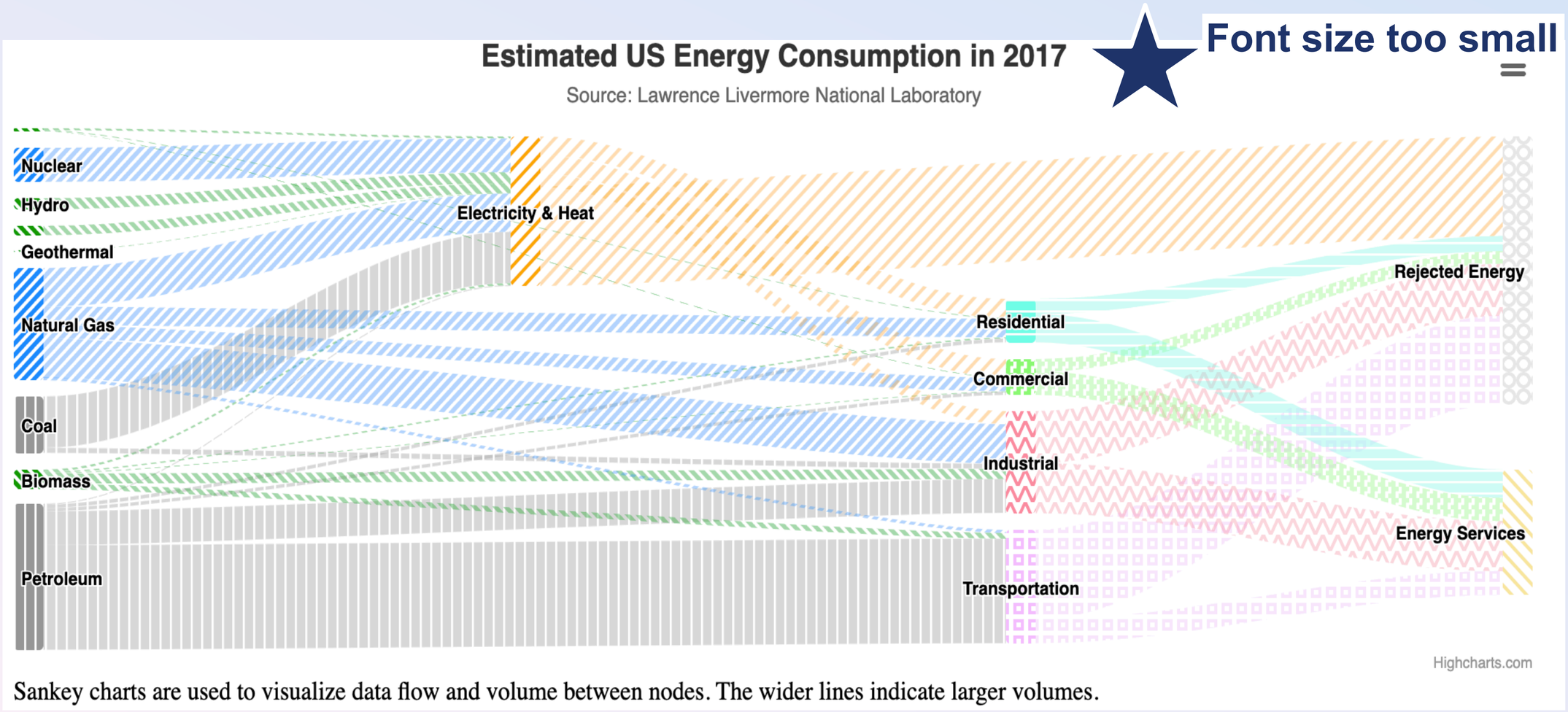

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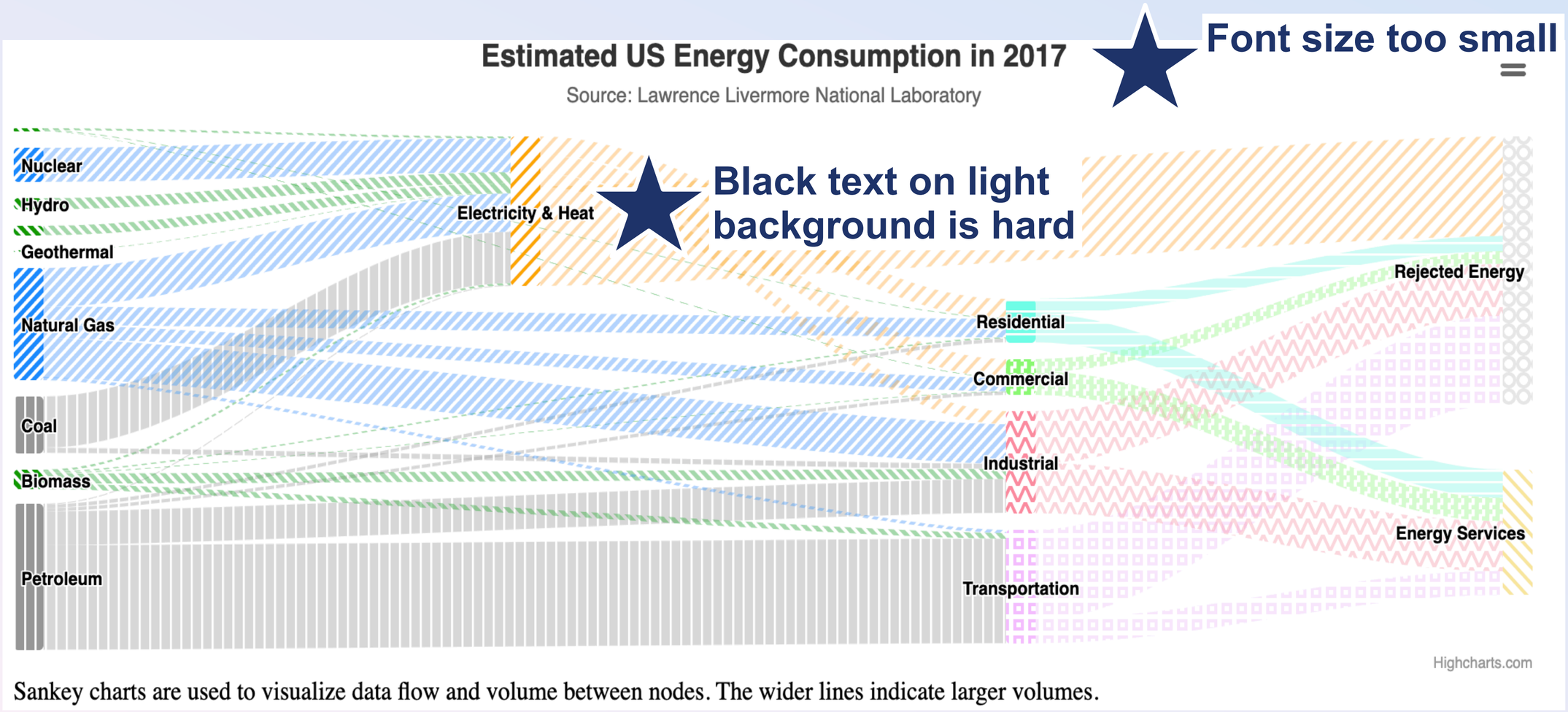

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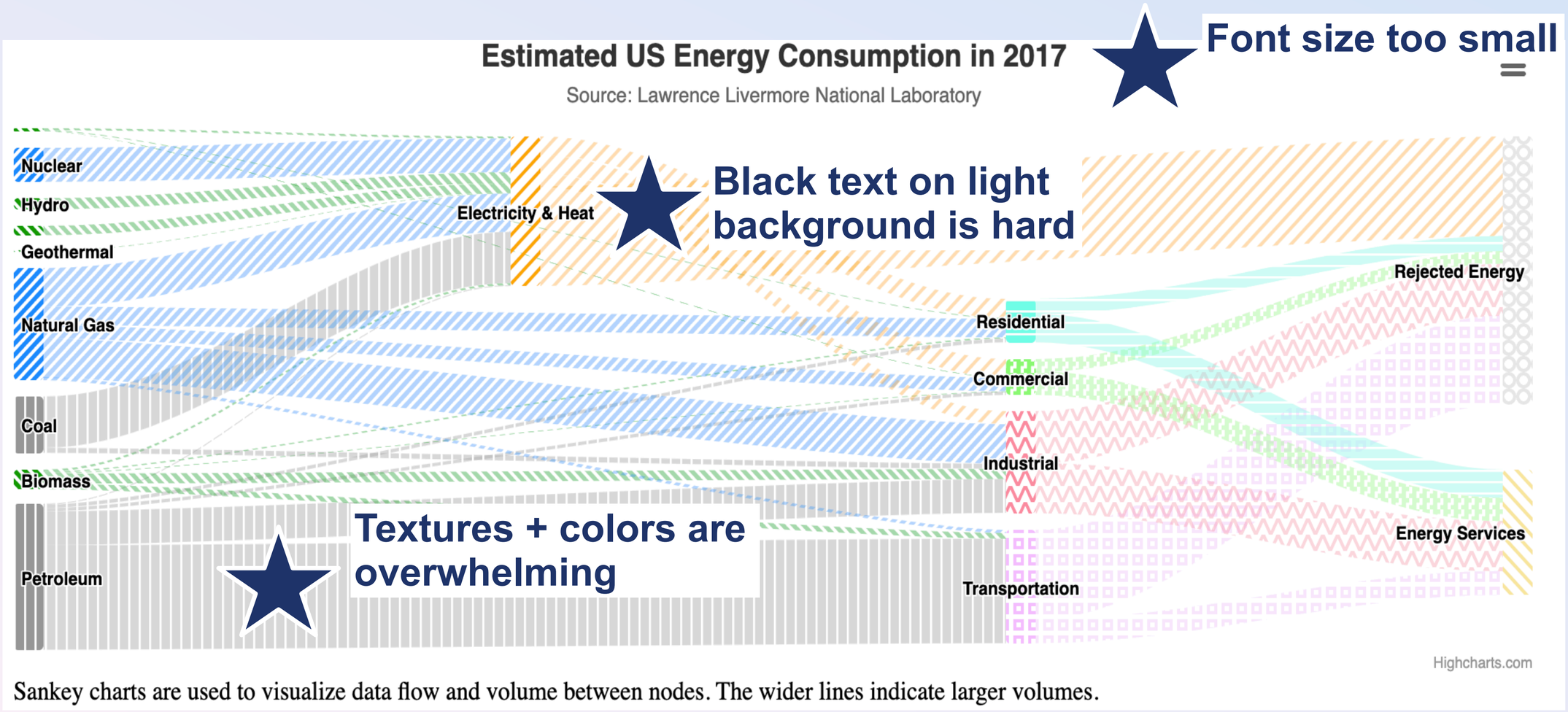

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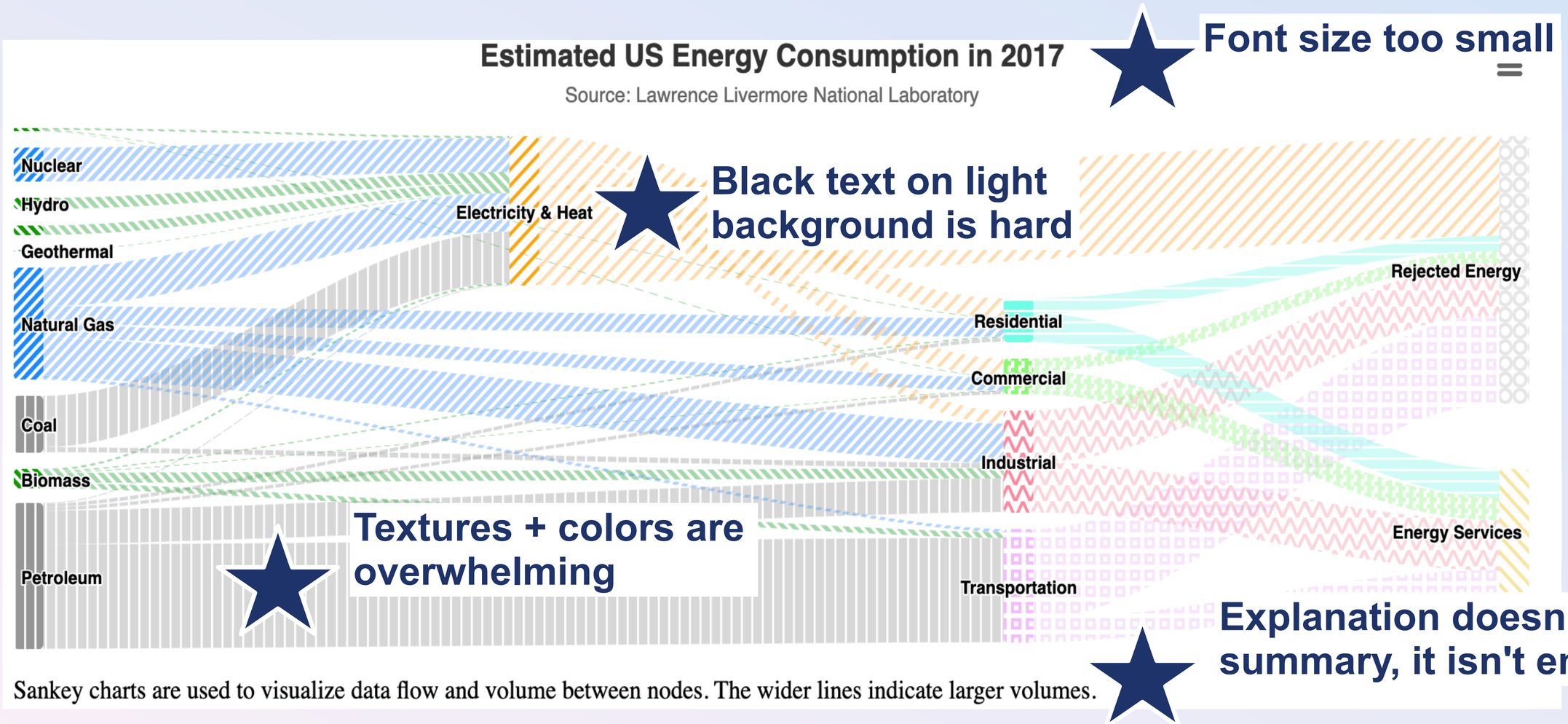
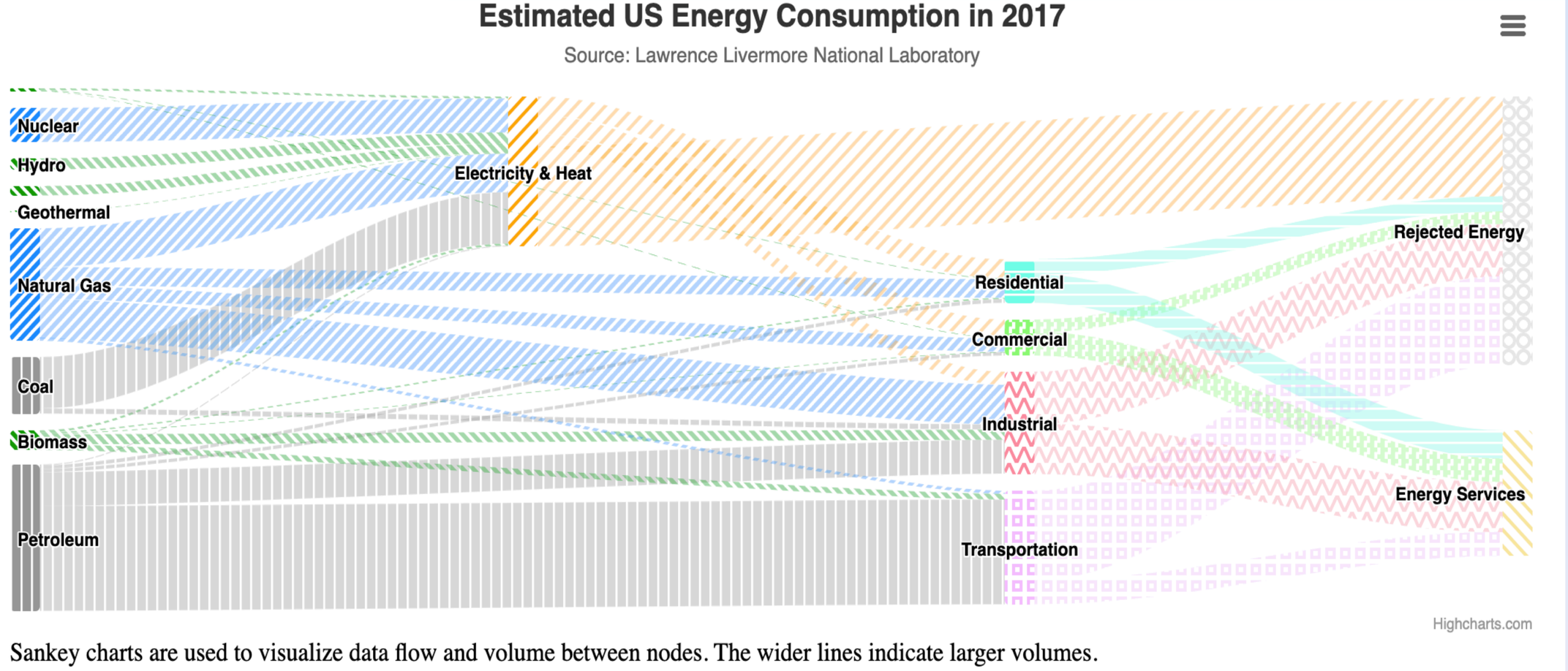
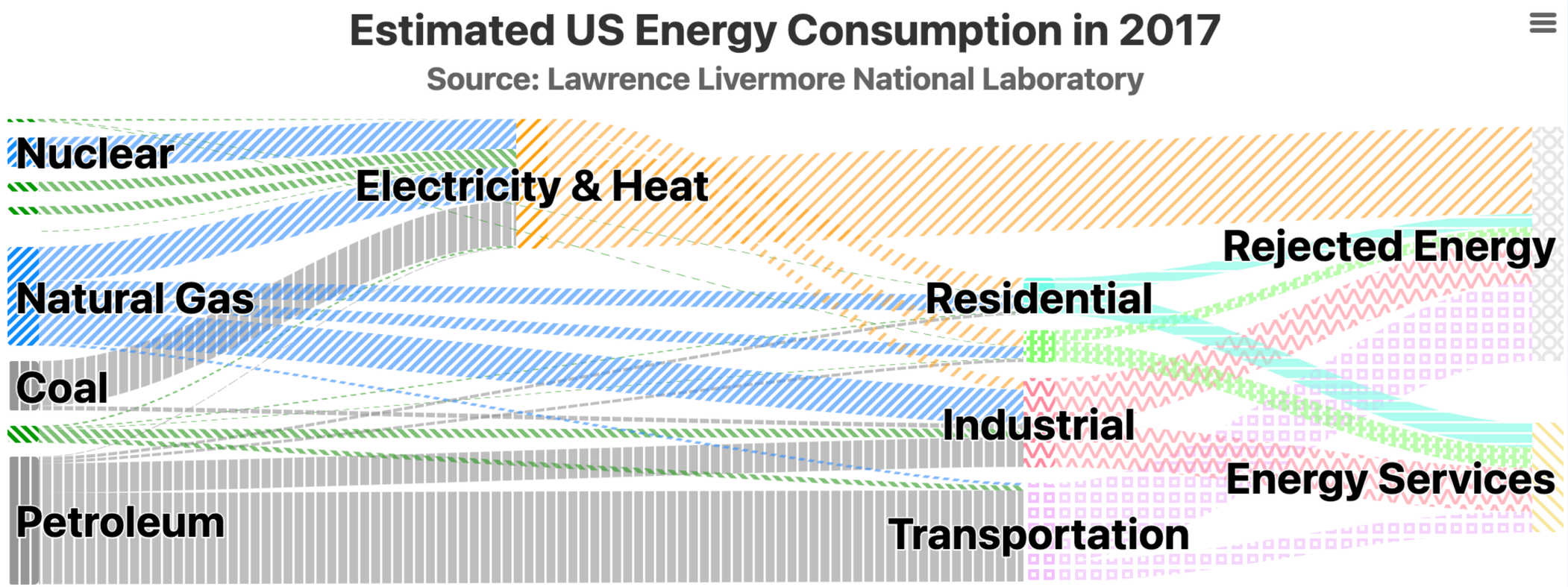


Can we fix this?



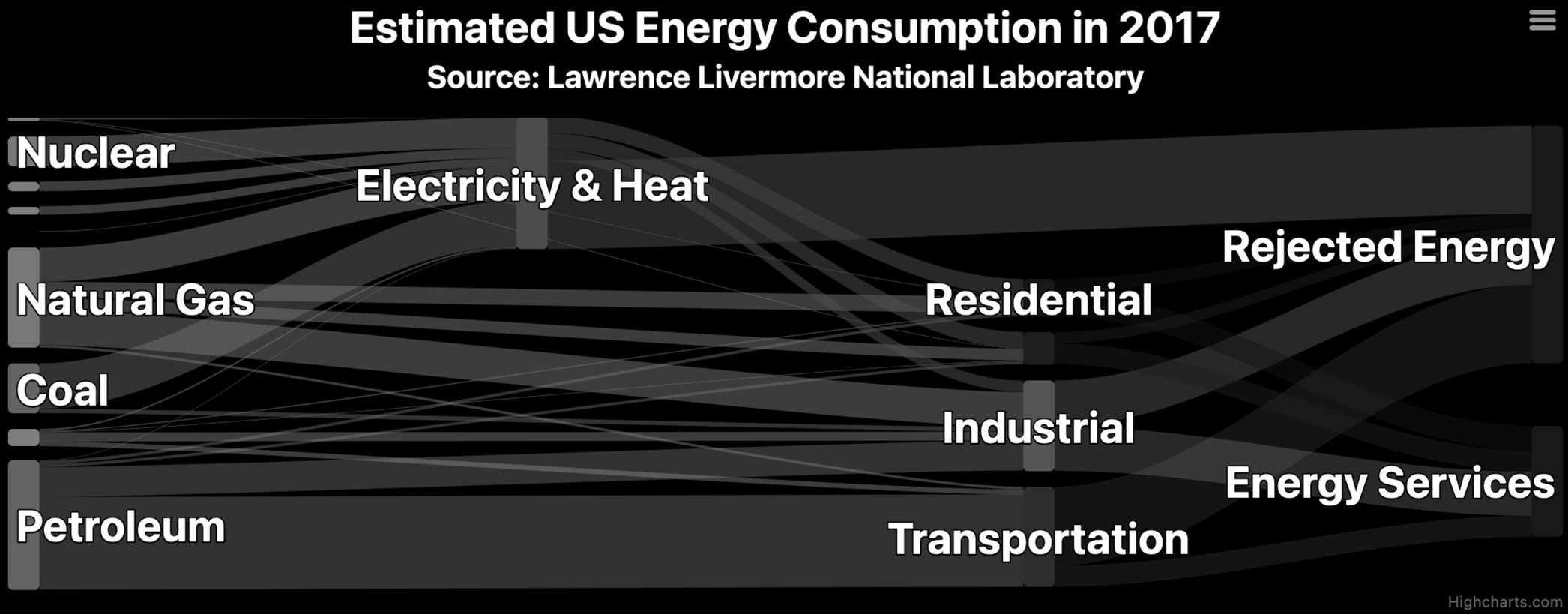
Sankey charts are used to visualize data flow and volume between nodes. The wider lines indicate larger volumes.

Maybe we can bump up the text size



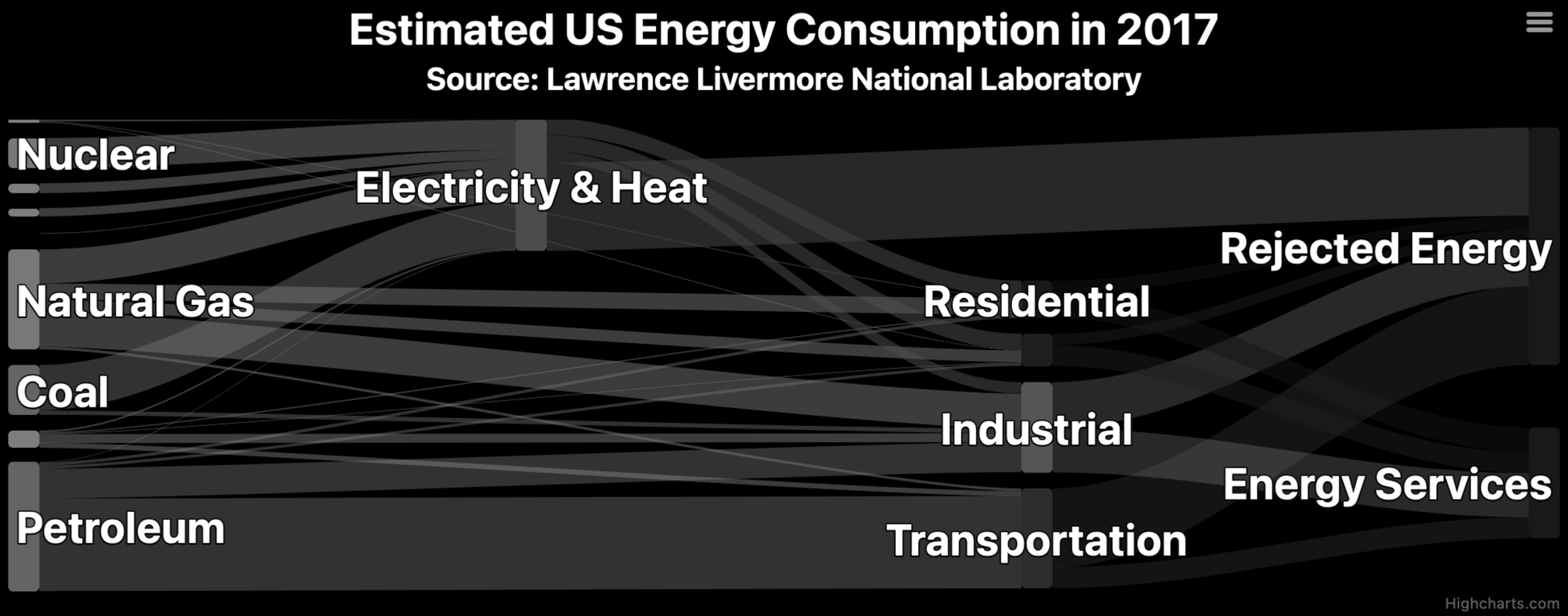
Sankey charts are used to visualize data flow and volume between nodes. The wider lines indicate larger volumes.

We can reduce visual complexity too



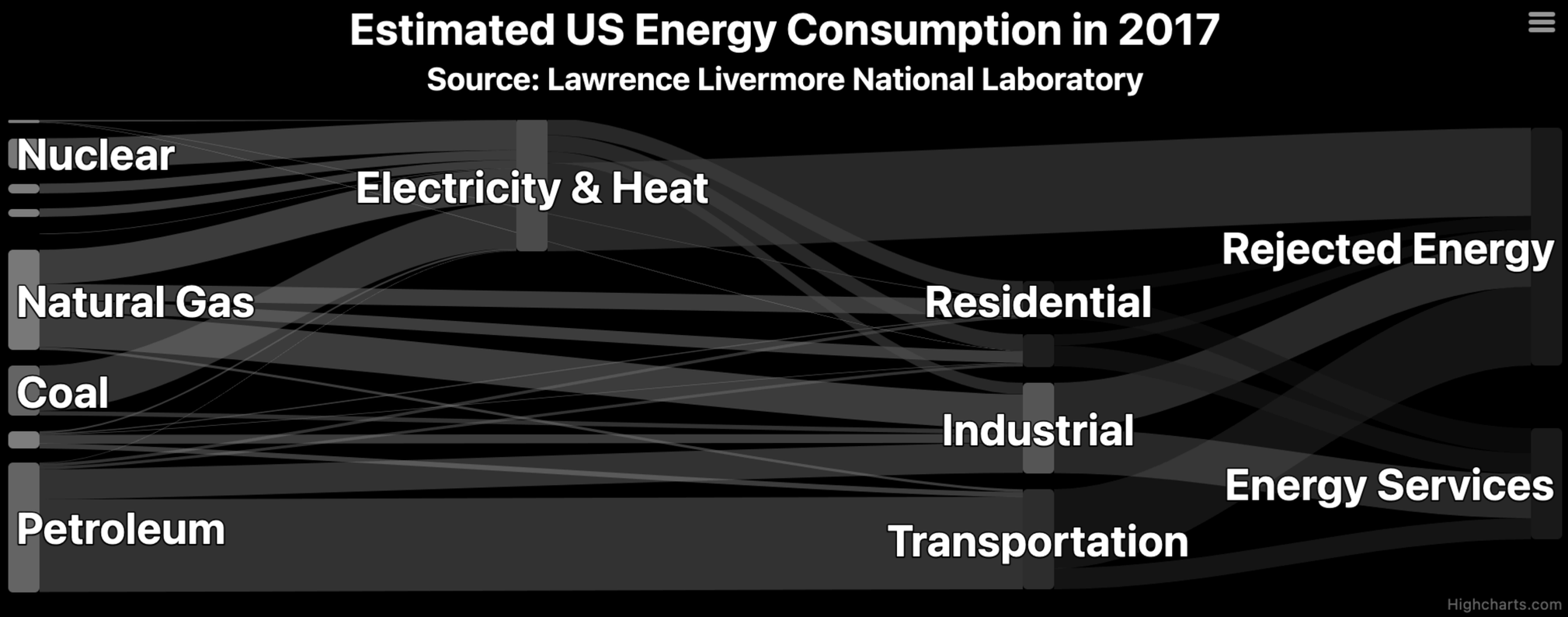
Sankey charts are used to visualize data flow and volume between nodes. The wider lines indicate larger volumes.

We can add a more descriptive explanation



Sankey charts are used to visualize data flow and volume between nodes. Visually wider lines indicate larger volumes. This chart is showing energy consumption and types. Interacting with this chart by selecting a node or flow (such as with a click) will update the stacked bar chart below.

Is this the perfect, most accessible design?



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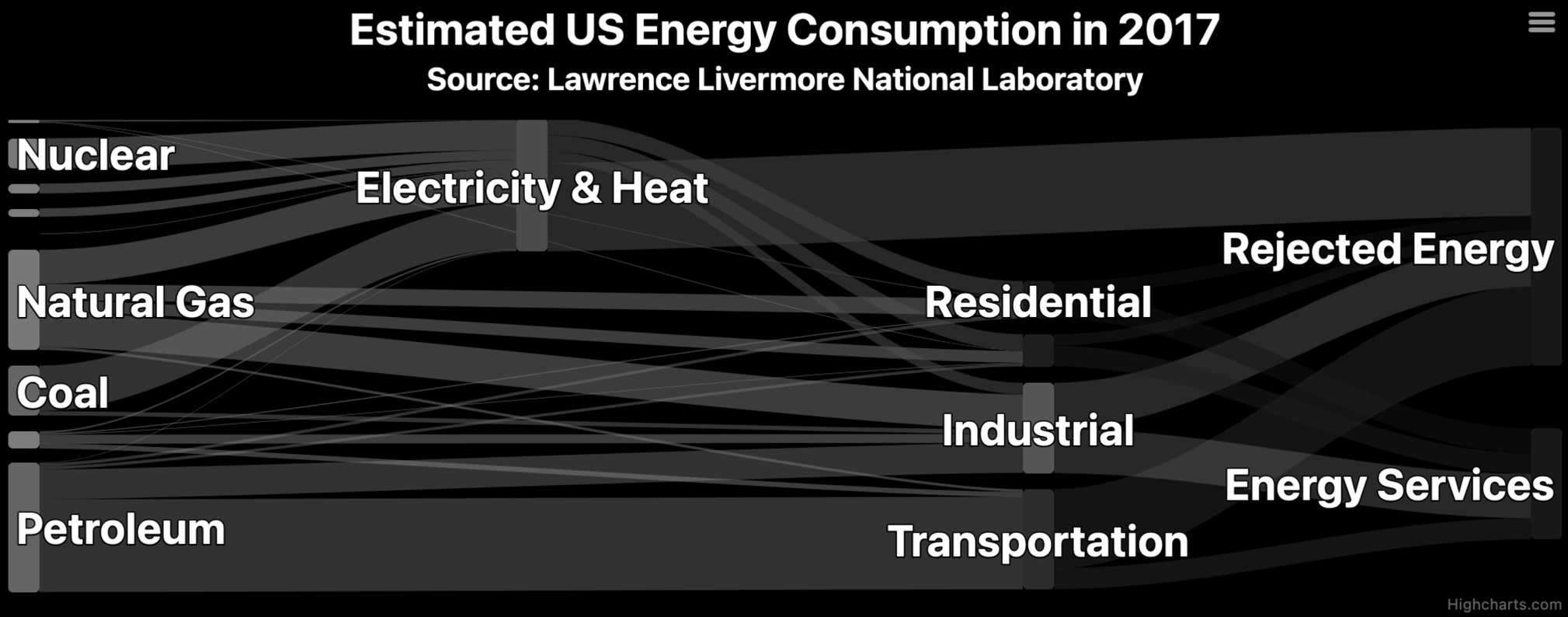
Bad news...



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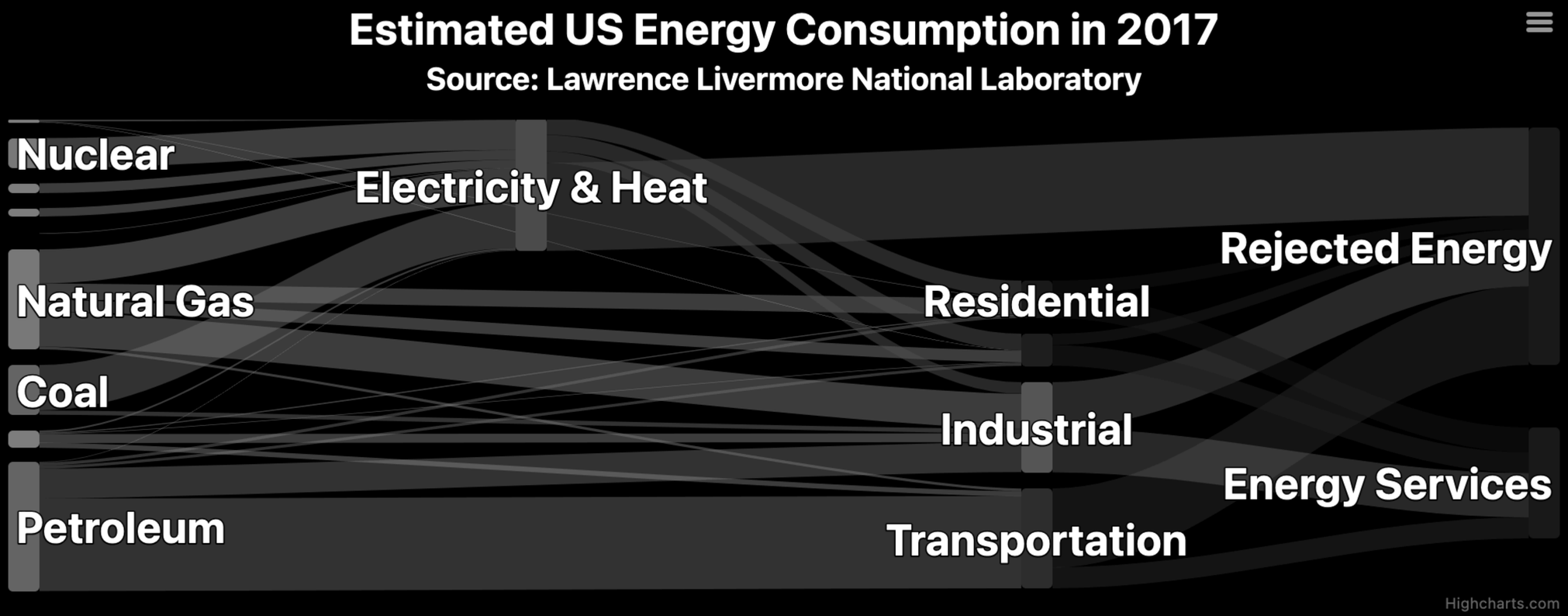
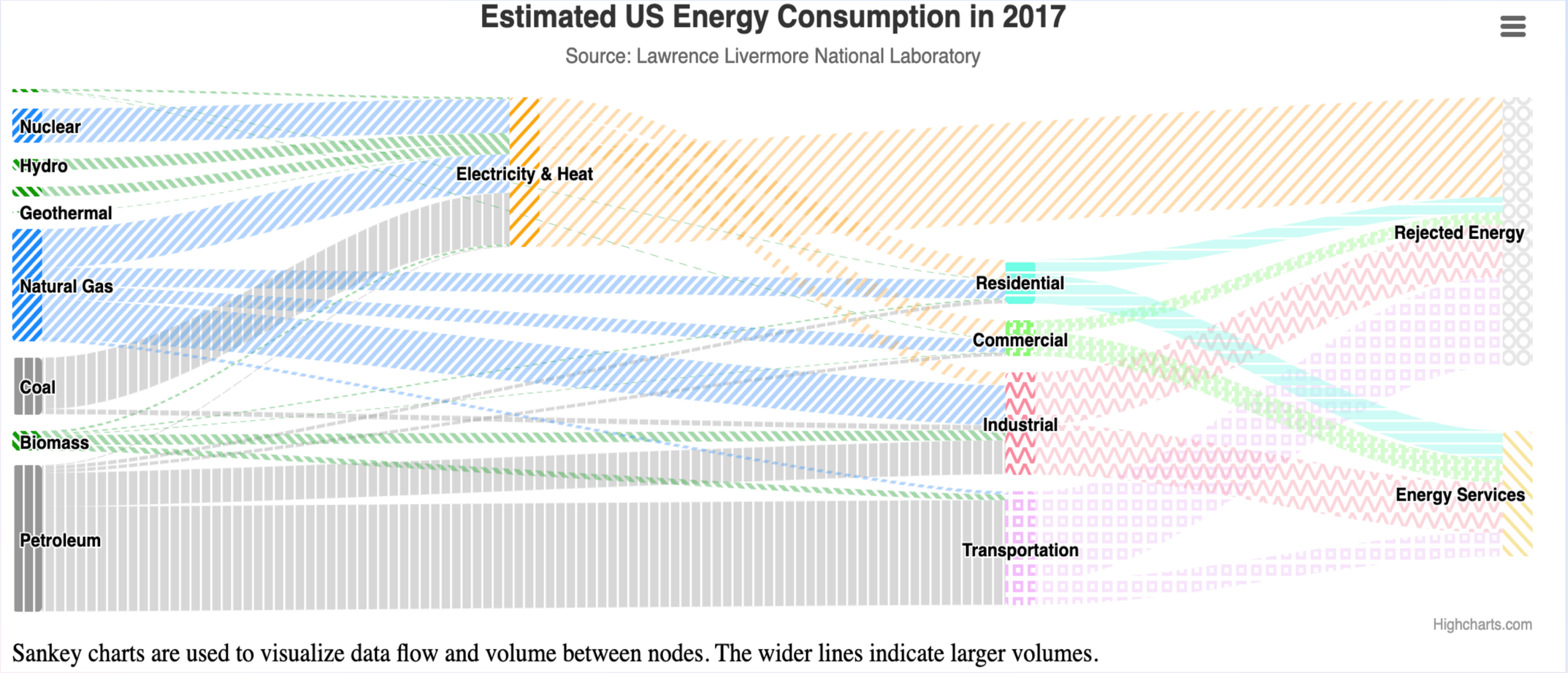
Bad news...

This design has accessibility issues too



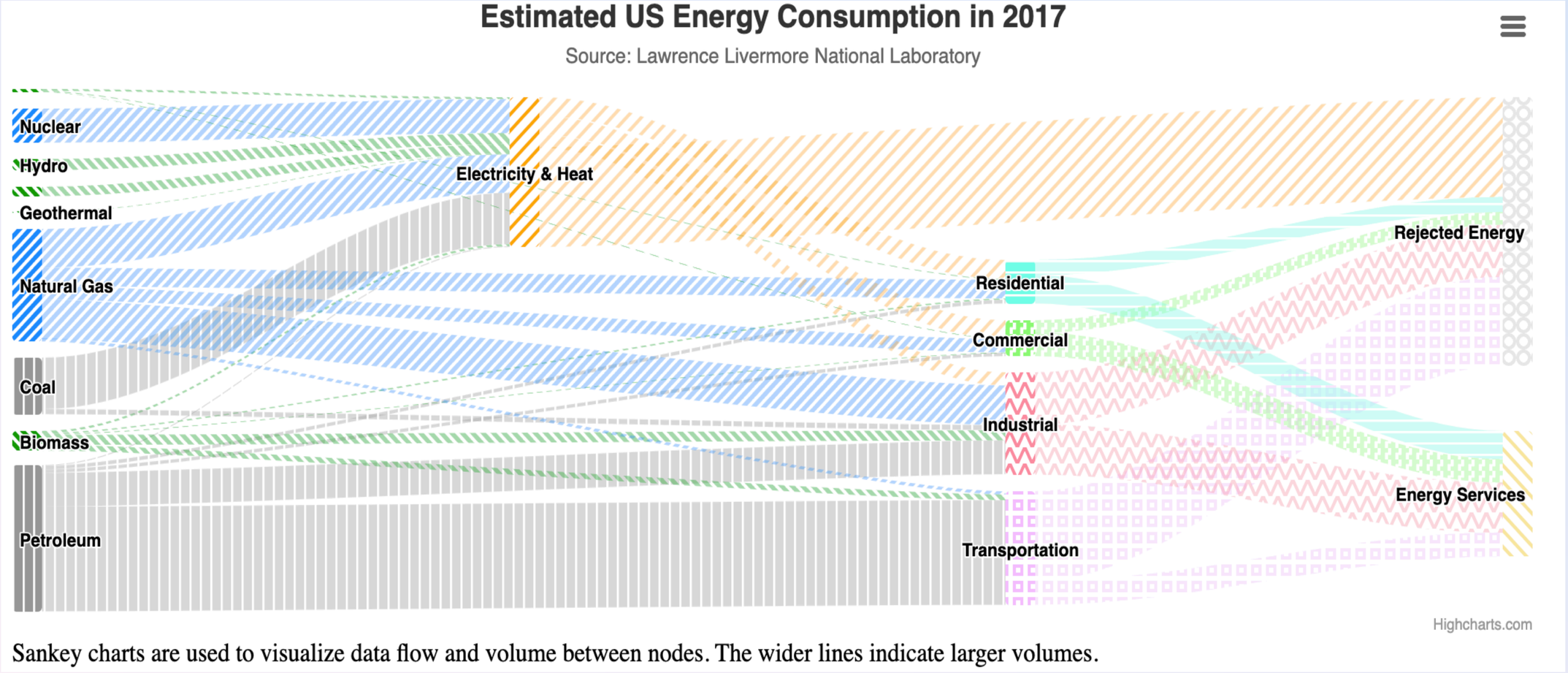
Sankey charts are used to visualize data flow and volume between nodes. Visually wider lines indicate larger volumes. This chart is showing energy consumption and types. Interacting with this chart by selecting a node or flow (such as with a click) will update the stacked bar chart below.

There is no such thing as a single, perfect design



Sankey charts are used to visualize data flow and volume between nodes. The wider lines indicate larger volumes.

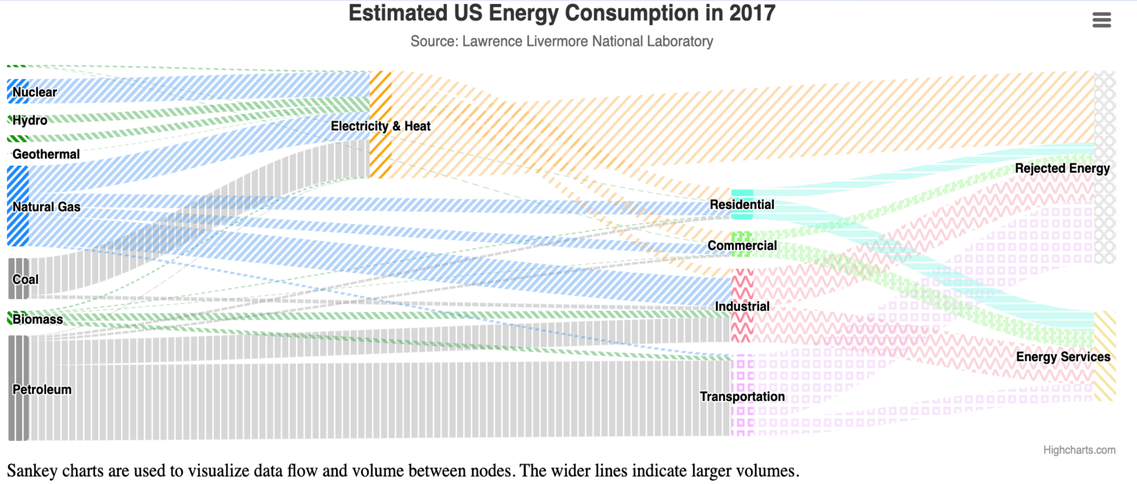
One design *cannot* fit all



Sankey charts are used to visualize data flow and volume between nodes. The wider lines indicate larger volumes.

Why should our designs be one-size-fits-all?

What if we let users personalize?



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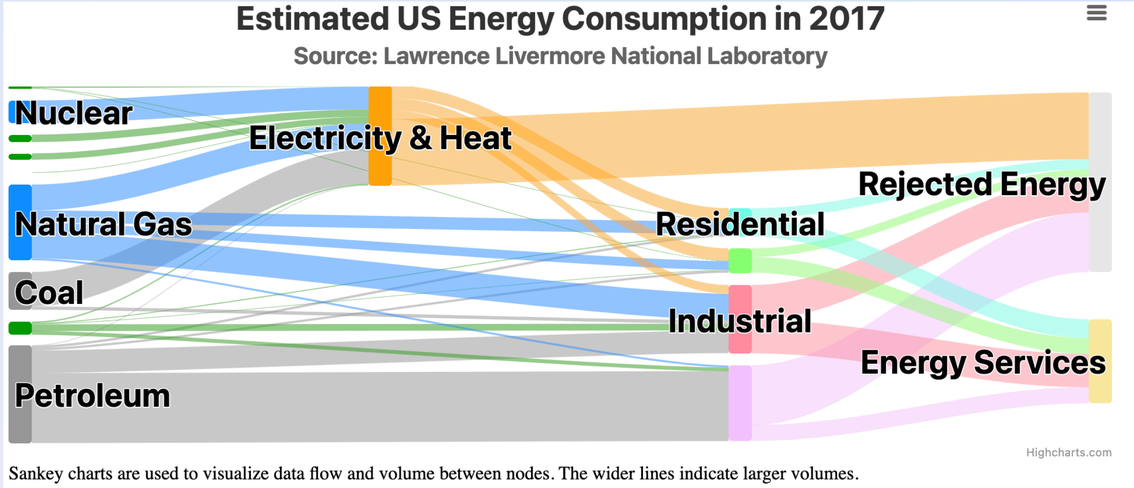

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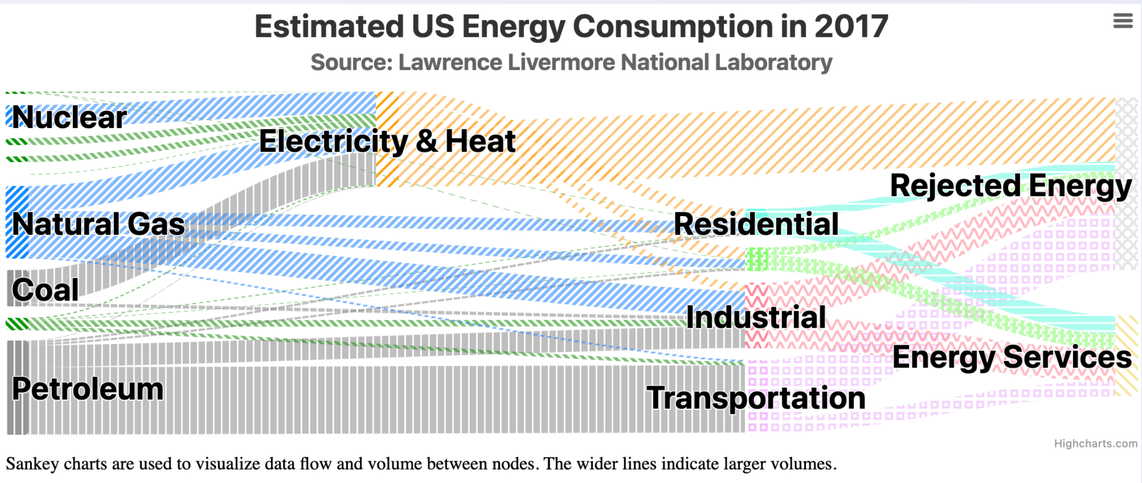

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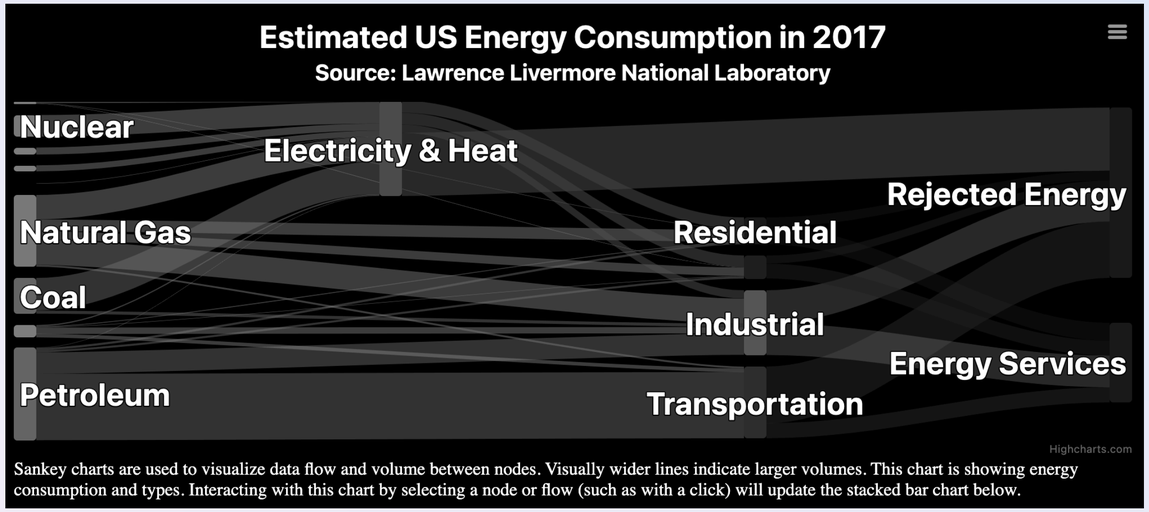


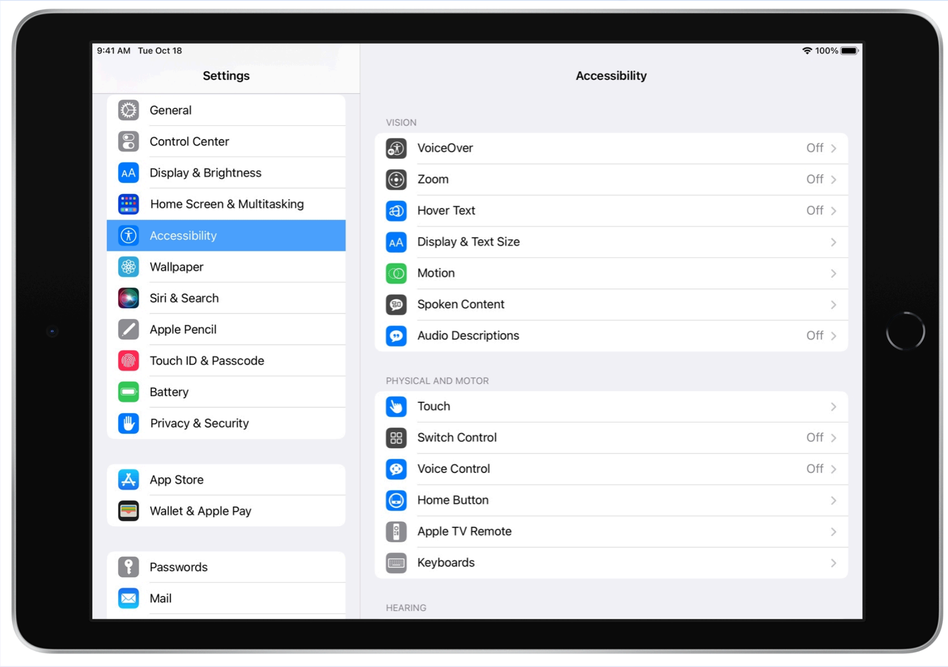
Sankey charts are used to visualize data flow and volume between nodes. Visually wider lines indicate larger volumes. This chart is showing energy consumption and types. Interacting with this chart by selecting a node or flow (such as with a click) will update the stacked bar chart below.

We have been enabling personalization for years

Video games

The Last of Us 2 has more than 60 settings

Devices and operating systems



"Make it yours" is the motto for Apple's accessibility personalization

We built a preferences menu!

Preferences

This menu provides a way to customize charts and graphs. The menu is organized into categories, and adjusting the settings at the category level will adjust all of the settings within that category. Some settings within categories also have sub-settings which will also inherit higher level settings that they belong to. If wording for a category's setting is hard to understand, try changing that setting and then navigating into the menu to see which children settings it affected.

Hide unavailable options ☑

Comprehension

default moderate robust

▶ Show more comprehension options...

Text visuals

default minimalist moderate maximalist

▼Show more text visuals options...

Font Size

default small medium large

▶ Show more font size options...

Font Weight

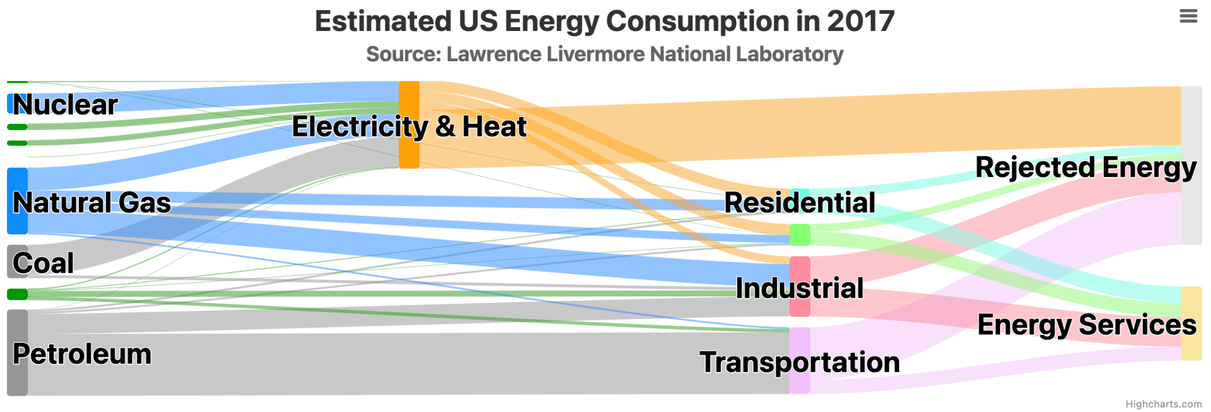
default 100 400 700

▶ Show more font weight options...

Color and contrast

default minimalist maximalist

▼Show more color and contrast options...



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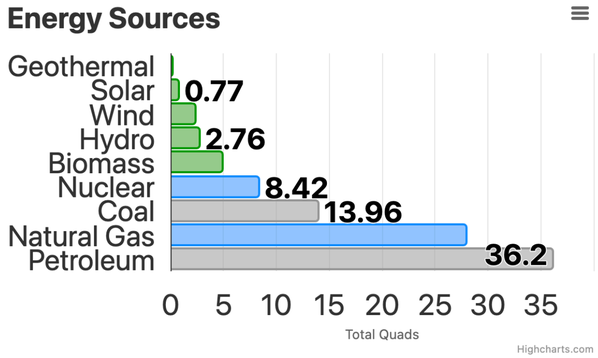
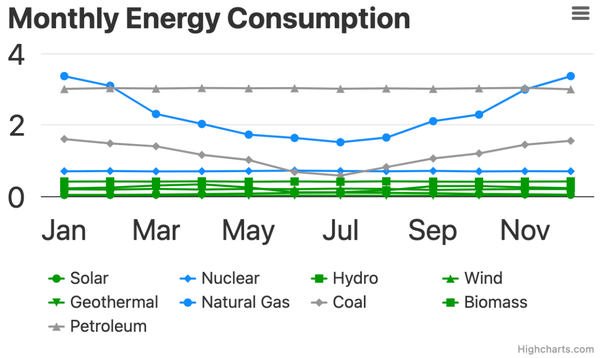


Chart showing stacked columns for comparing quantities. Stacked charts are often used to visualize data that accumulates to a sum.



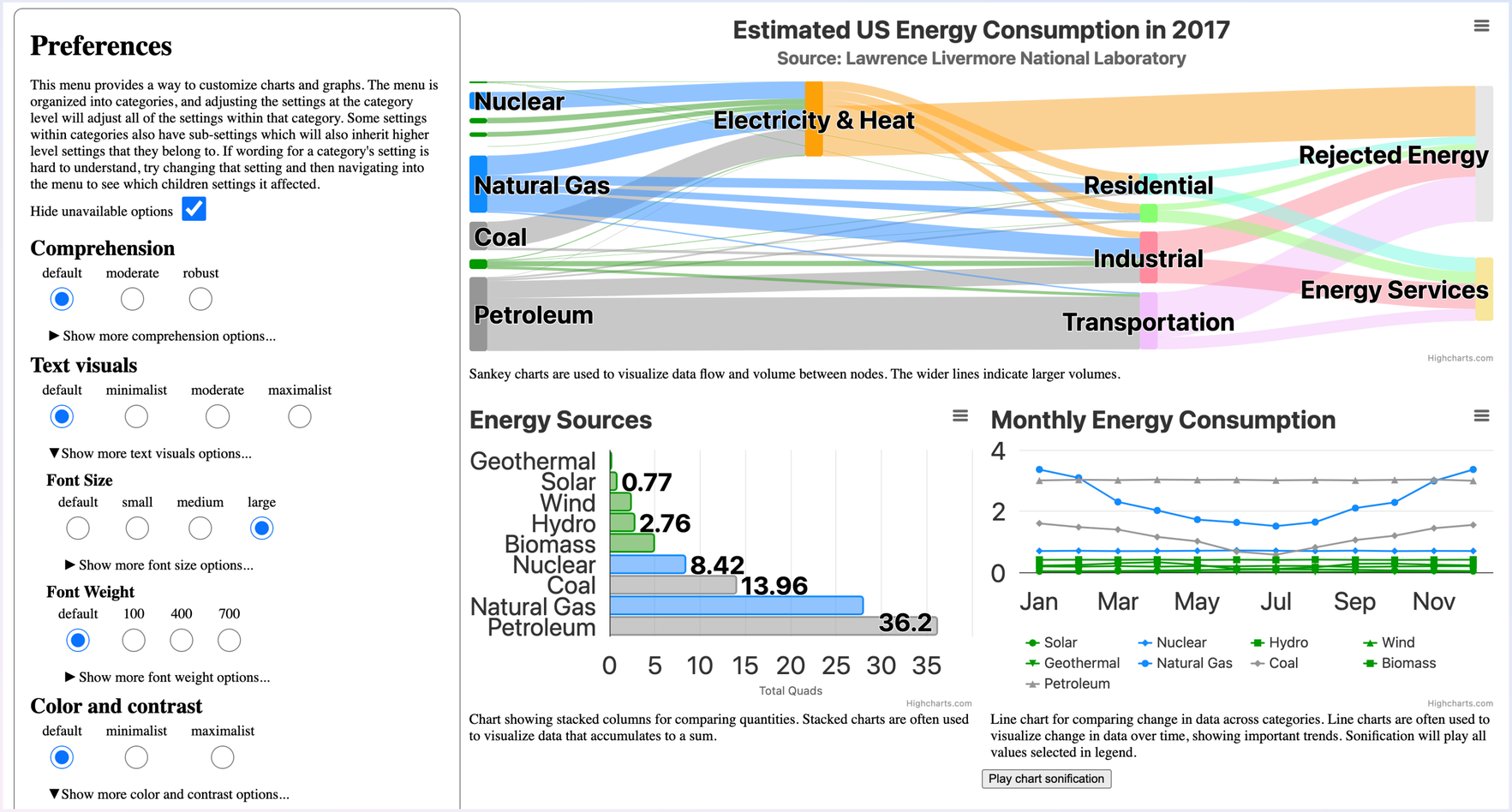
Line chart for comparing change in data across categories. Line charts are often used to visualize change in data over time, showing important trends. Sonification will play all values selected in legend.

Play chart sonification

What do people with disabilities want to personalize with visualizations?

And how does personalization change how we design visualization libraries, systems, and tools?

We gave 9 BLV users and 4 developers some levers to pull



(What is accessible for one...)

“If anything has dark mode? That’s great. I wish everything used dark mode.”

Participant #4

(...might be a barrier for another.)

“Oh, I can’t use dark mode at all. I hate when websites have [dark mode] because it can be virtually impossible to use.”

Participant #7

Results

⚠ Malleable interfaces need guardrails

- It is possible to design harmful visualizations, so system designers should anticipate ways to help users personalize safely.

F. Elavsky, M. Vindedal, T. Gies, P. Carrington, D. Moritz, and Ø. Mousing, “Towards *Softerware*: Enabling personalization of interactive data representations for users with disabilities,” *Computer Graphics and Applications*, 2025.

Results

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🎯 Our ethical responsibility: Accessible defaults first

- Some users won't want to personalize or manipulate interfaces at all, so they will still rely on smart, effective defaults.

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🪪 Persistence, profiles, and "effort-to-usage" ratio

- Everything about malleable interfaces should save users time and energy. Let them save, reuse, and share their personalization.

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Persistence, profiles, and "effort-to-usage" ratio

- Everything about malleable interfaces should save users time and energy. Let them save, reuse, and share their personalization.

Interoperability: *everyone*'s job

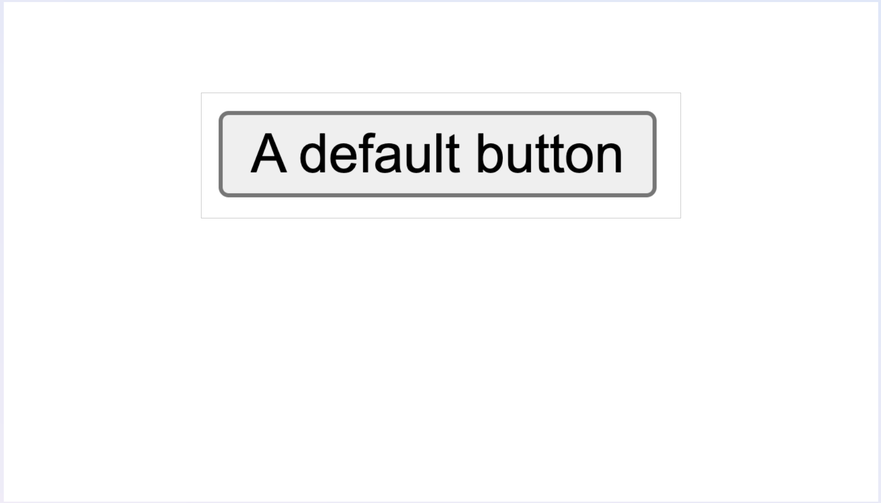
- One visualization library isn't enough: the way users personalize a chart in one place should carry over to other platforms and tools.

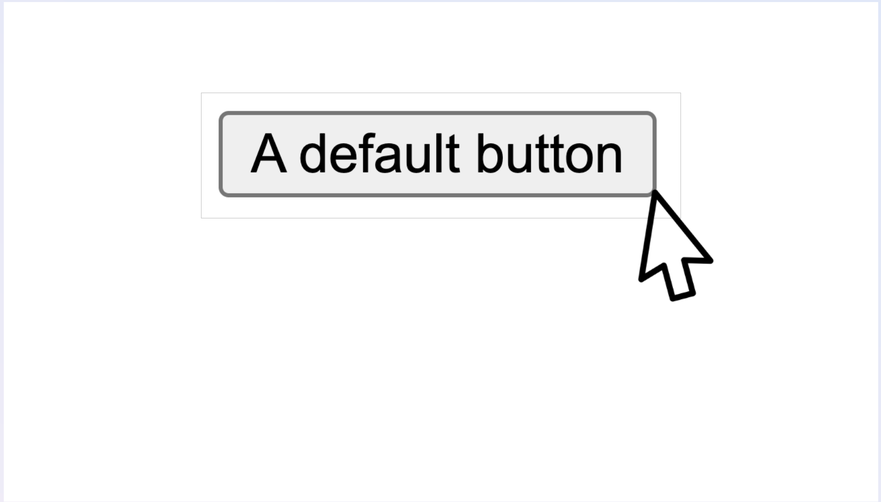
F. Elavsky, M. Vindedal, T. Gies, P. Carrington, D. Moritz, and Ø. Mousing, “Towards *Softerware*: Enabling personalization of interactive data representations for users with disabilities,” *Computer Graphics and Applications*, 2025.

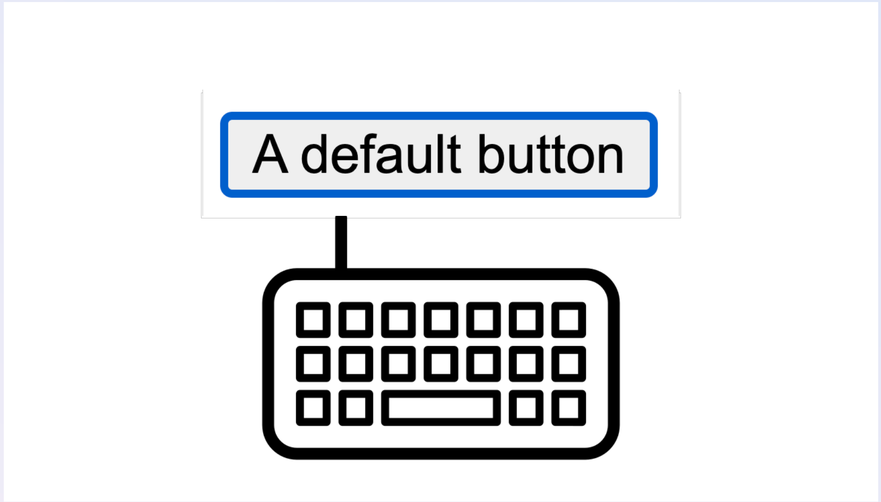
Low-level building blocks

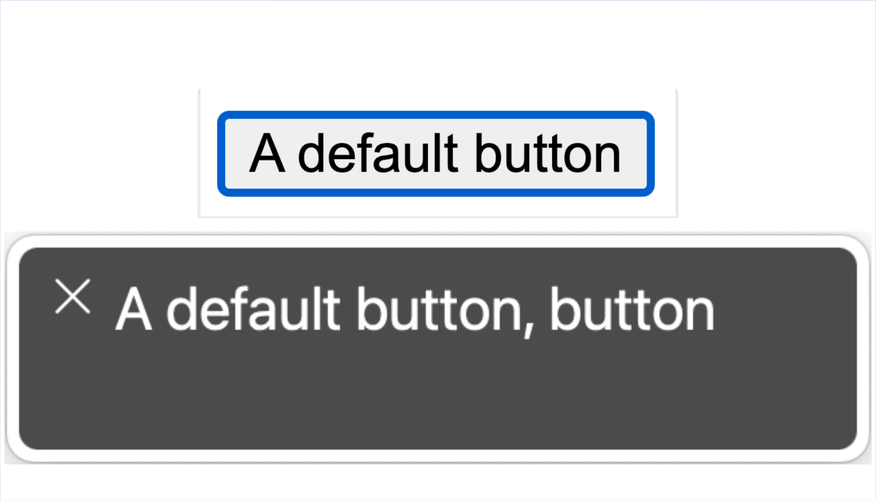
Interactive visualization has yet to reckon with barriers for people with motor and dexterity disabilities.

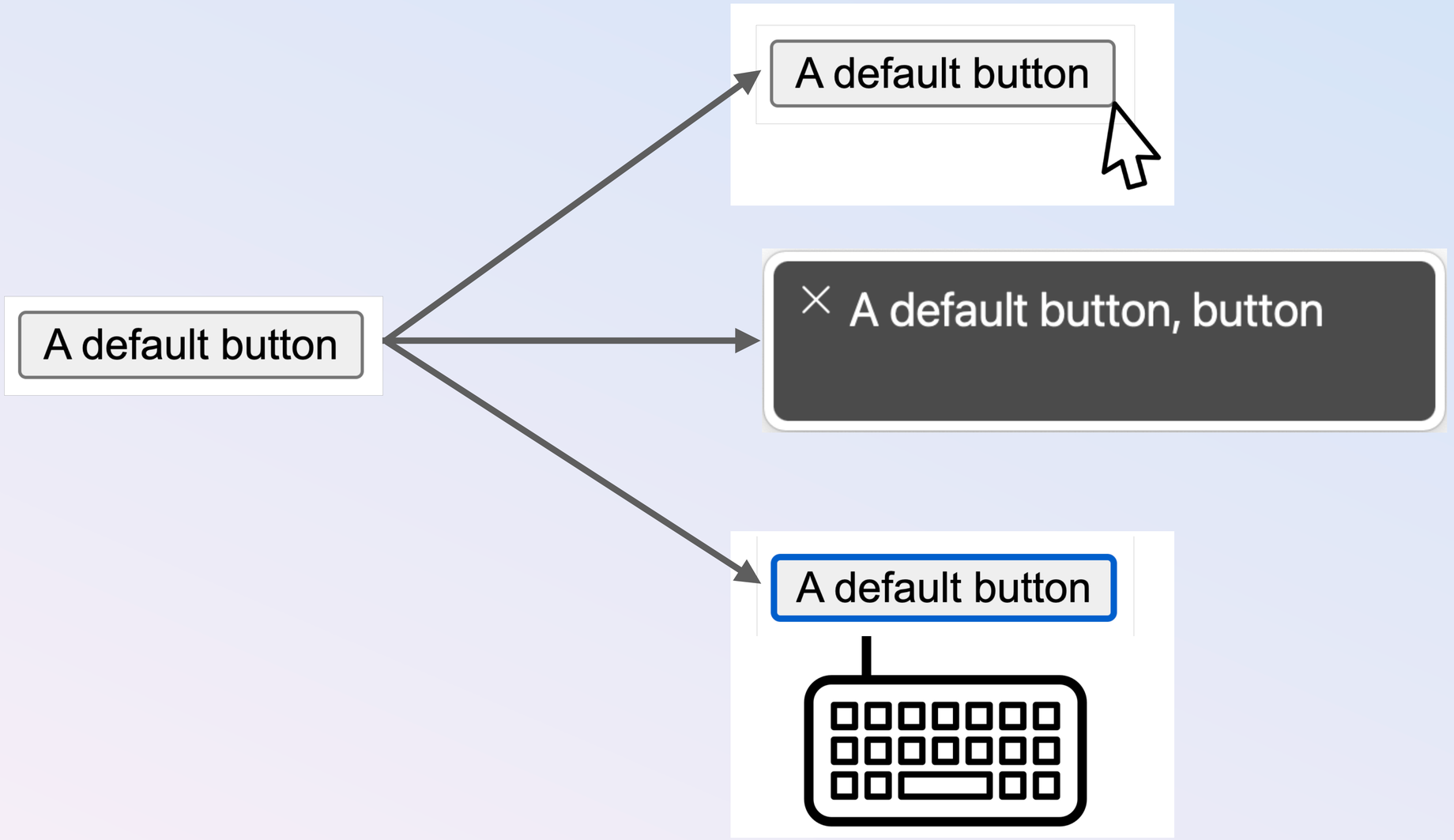
Visualization has not engaged motor disability:
Wimer et al. “Beyond vision impairments: Redefining the scope of accessible data representations.” *IEEE VIS*, 2024.
Marriott et al. “Inclusive data visualization for people with disabilities.” *Interactions,* 2021.

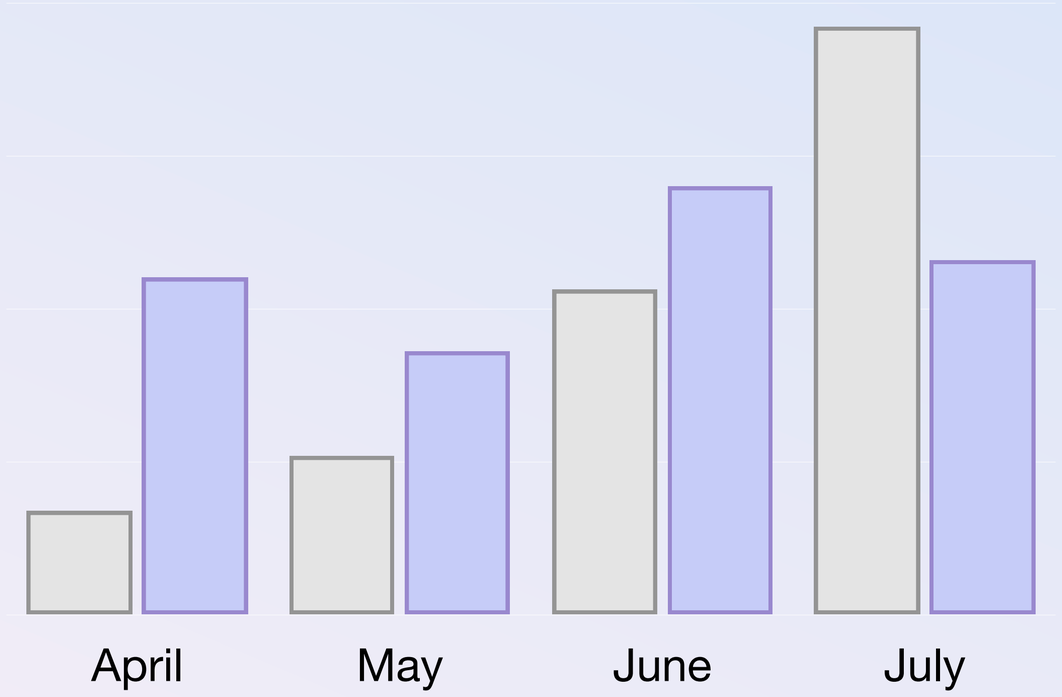

A default button


A default button


A default button

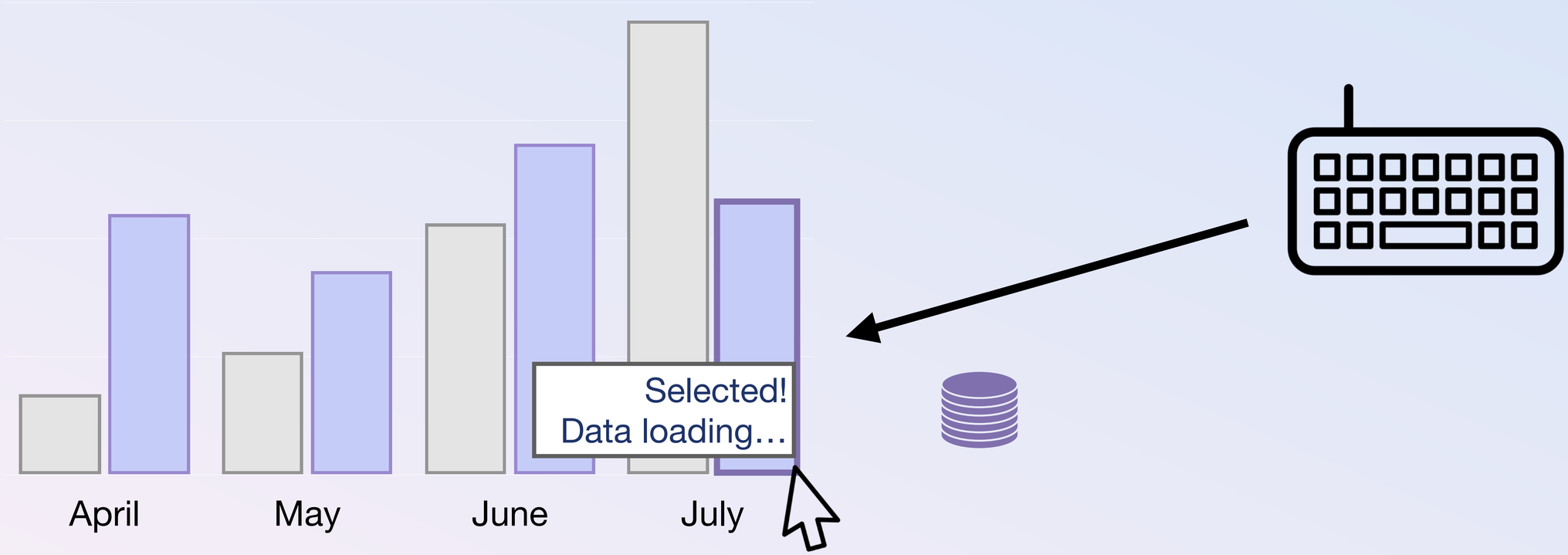

A default button
A default button, button


A default button
A default button
A default button, button
A default button


April
May
June
July

The mouse rules all

A keyboard should be able to do everything a mouse can



WAI. “Understanding success criterion 2.1.1: keyboard.” *WCAG standard*, W3C, 2017.

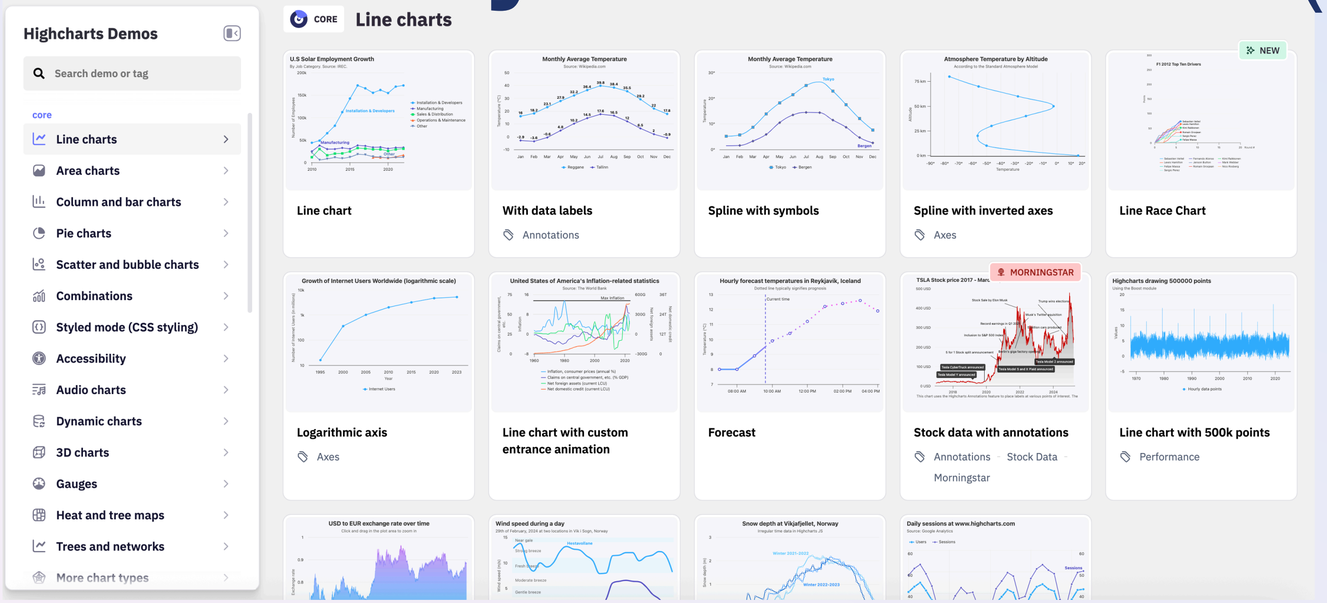
Discrete and direct navigation face more barriers

A person in a wheelchair operating an old computer using a desk-mounted sip and puff device called the POSSUM.

Image credit: Wikipedia, Public Domain, 1960. Photographer: Possum Ltd.

Rich navigation (a short history)

2015: “beyond the table” (highcharts)



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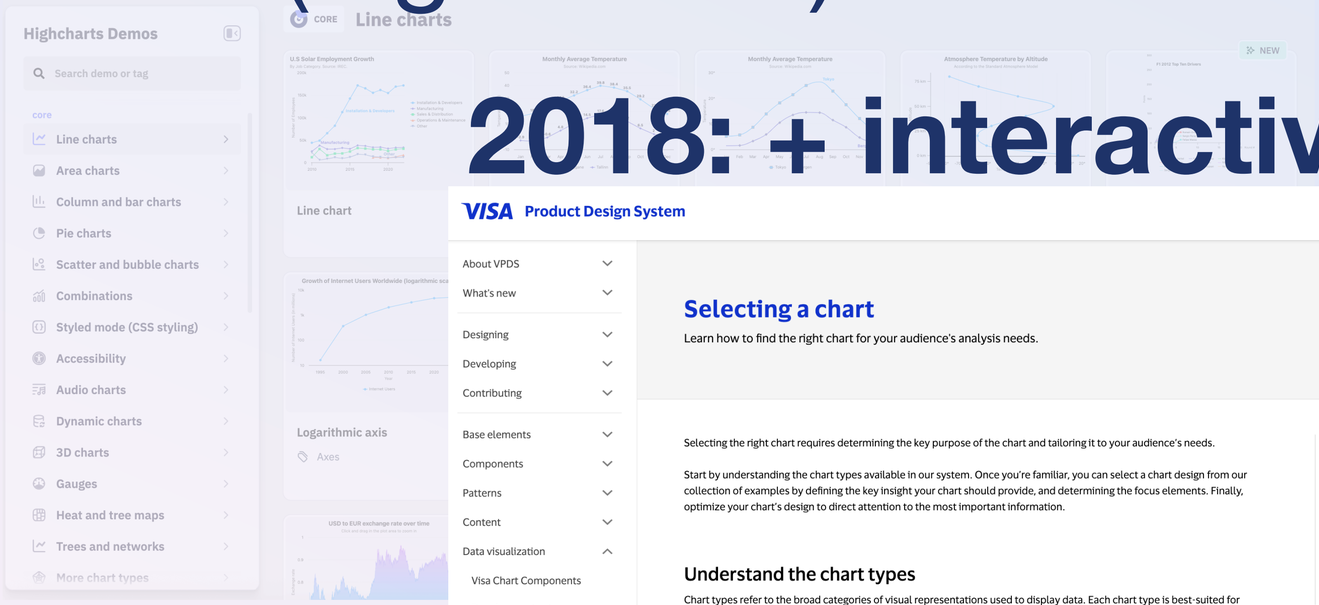
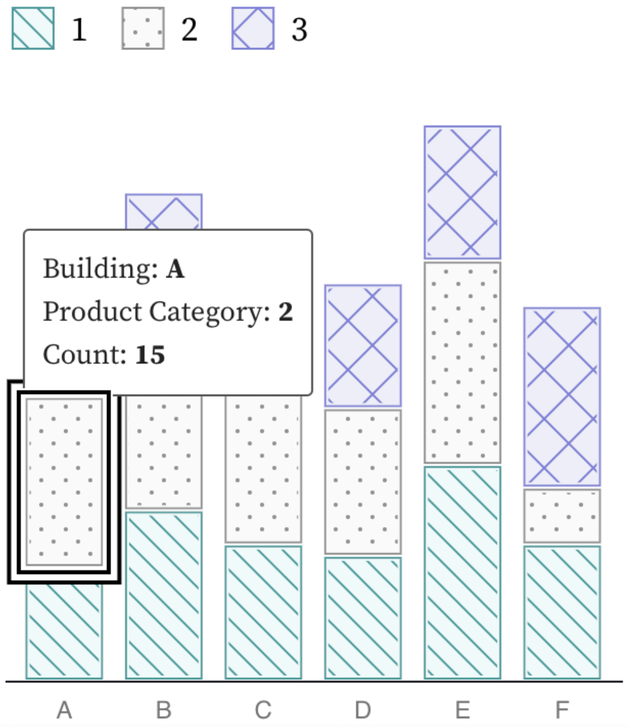


2018: + interactivity (visa charts)

Alt text should communicate operability

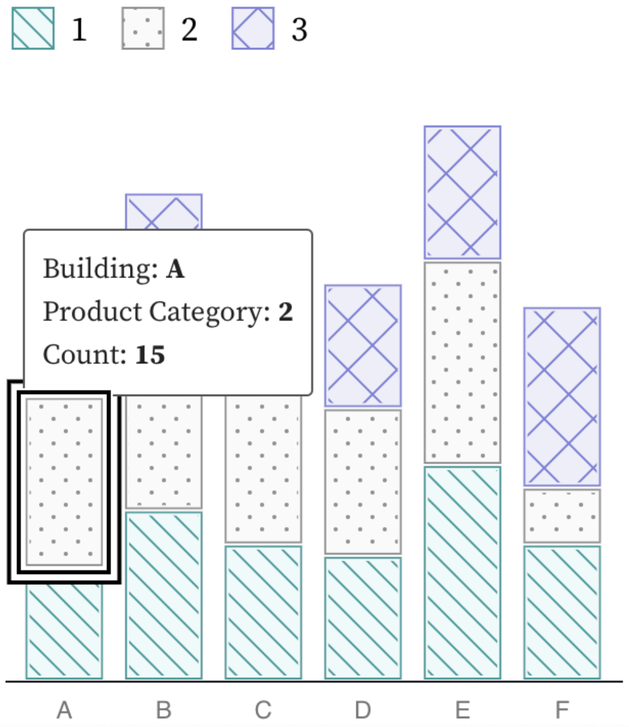
Source: Visa Chart Components, Frank Elavsky (2017-2019)



Building A. Product Category 2. Count 15. Bar 2 of 3. Image.

Semantics matter

Source: Visa Chart Components, Frank Elavsky (2017-2019)

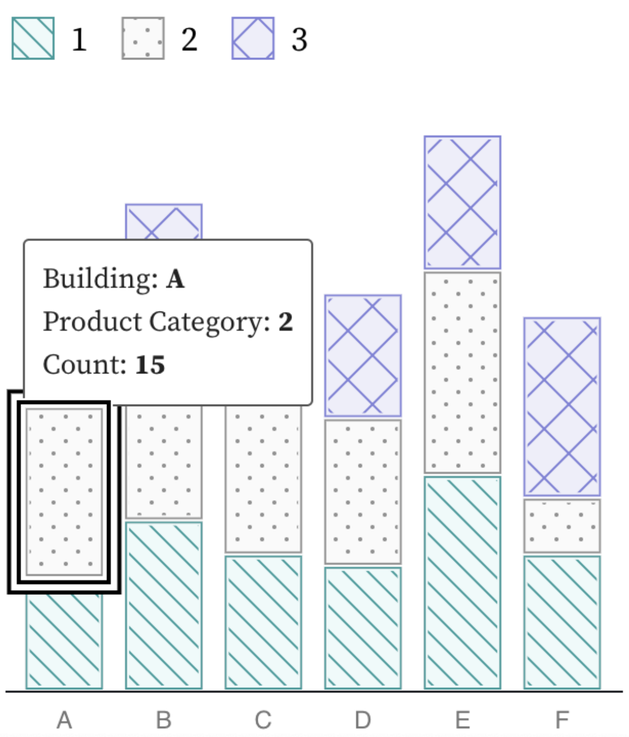


Building A. Product Category 2. Count 15. Bar 2 of 3. Image.

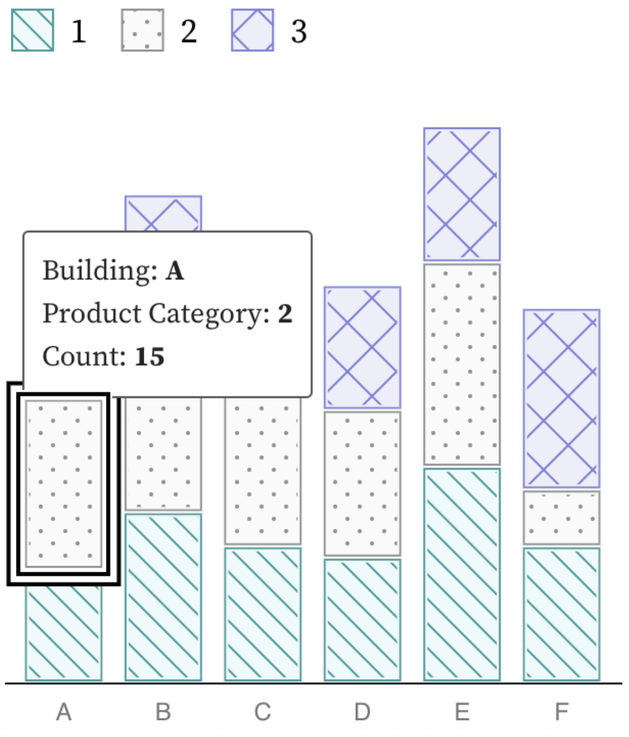
“Image” doesn’t signal interactivity!

ARIA semantics are standardized

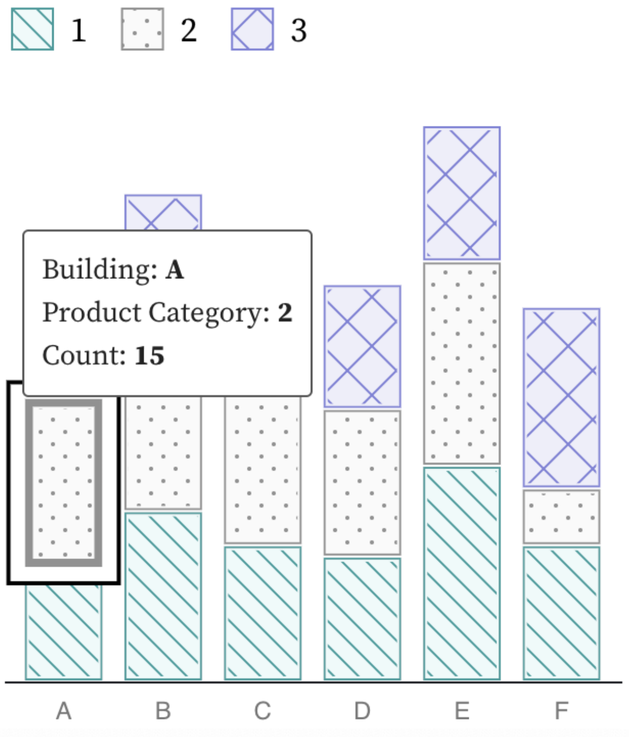
Source: Visa Chart Components, Frank Elavsky (2017-2019)



× Building A. Product Category 2. Count 15. Bar 2 of 3. Image.



× Building A. Product Category 2. Count 15. Bar 2 of 3., toggle button



× selected, Building A. Product Category 2. Count 15. Bar 2 of 3., toggle button

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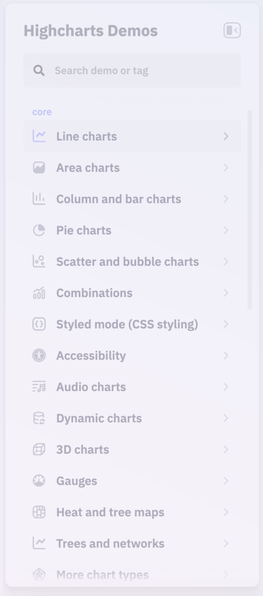
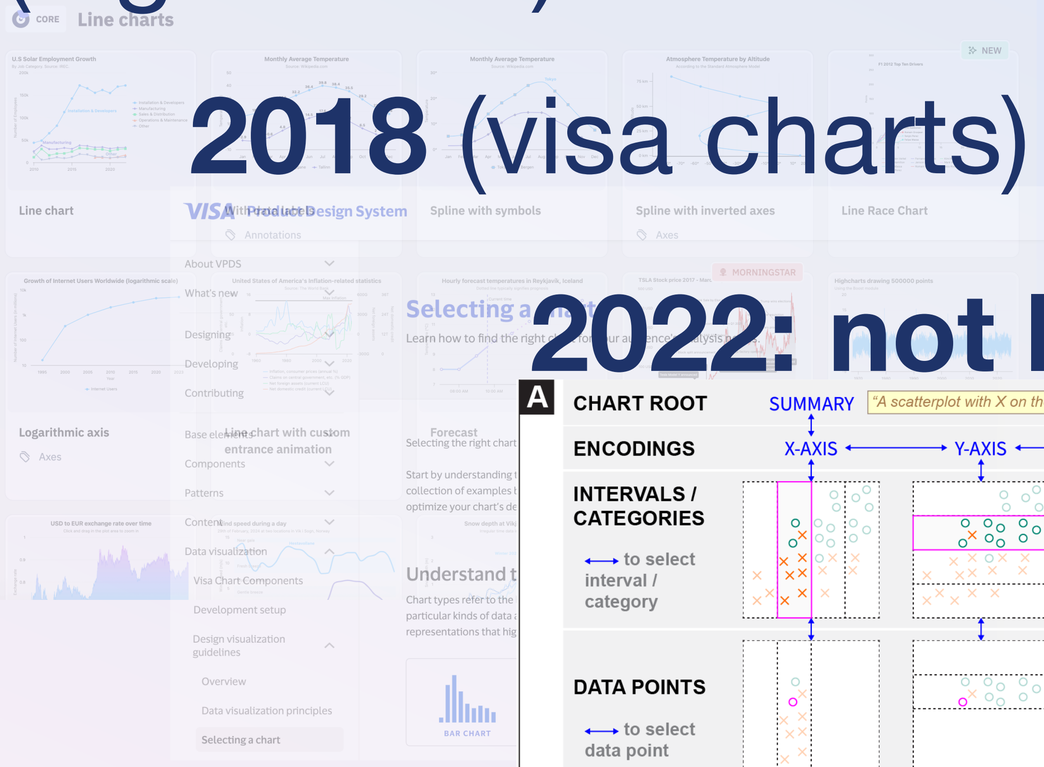
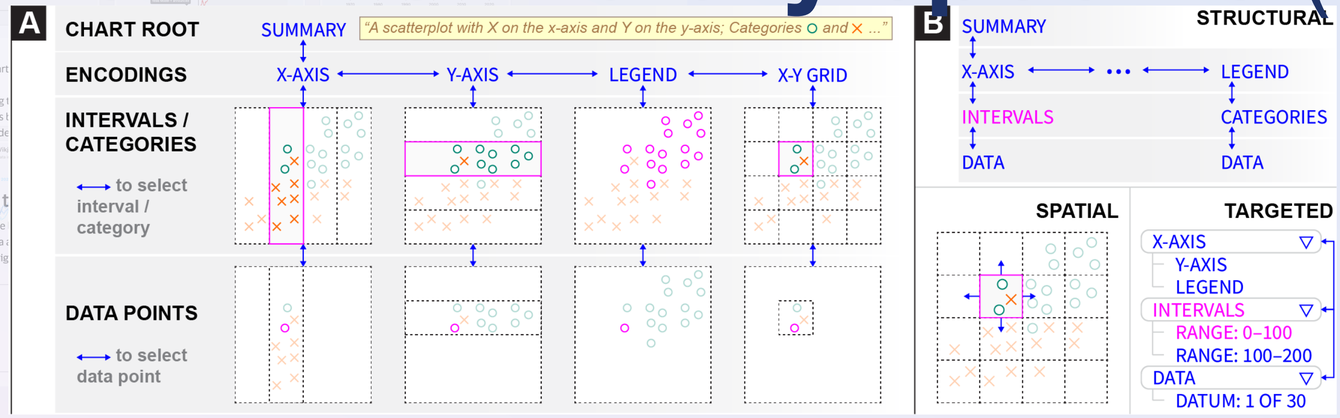




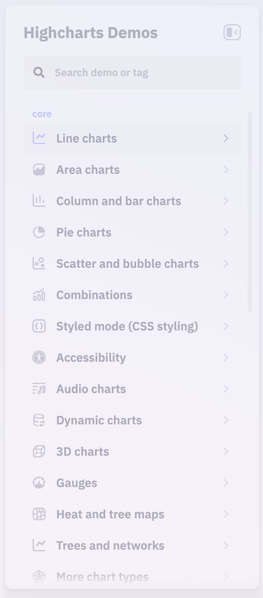
2018 (visa charts)

2022: not library specific (olli)



Rich navigation (a short history)

2015 (highcharts)



2018 (visa charts)

2022 (olli)

2023 (data navigator)

F. Elavsky, L. Nadolskis, and D. Moritz, "*Data Navigator*: An Accessibility-Centered Data Navigation Toolkit," *IEEE Transactions on Visualization and Computer Graphics*, 2023.

Rich navigation (a short history)

2015 (highcharts)

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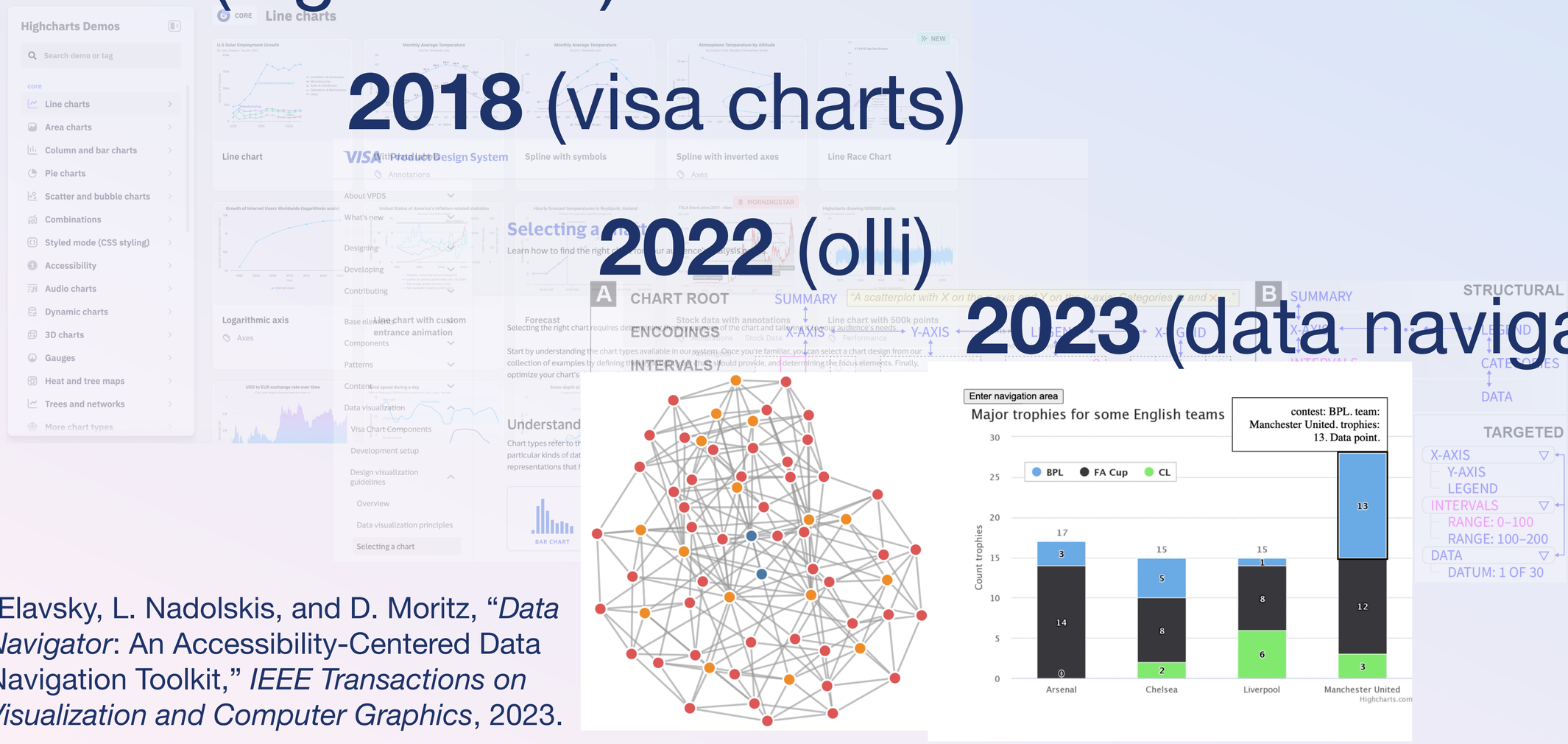

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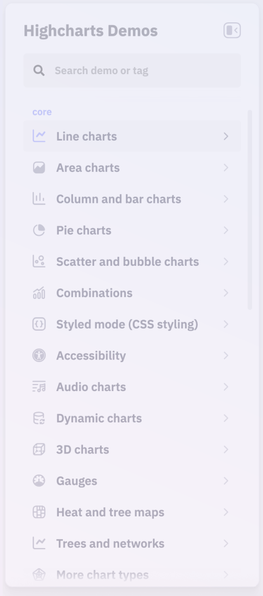
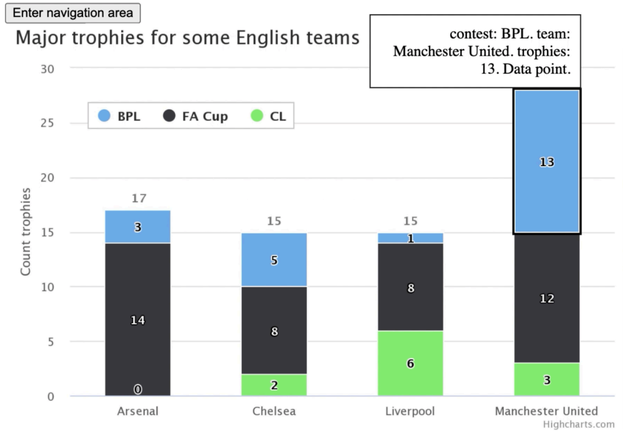
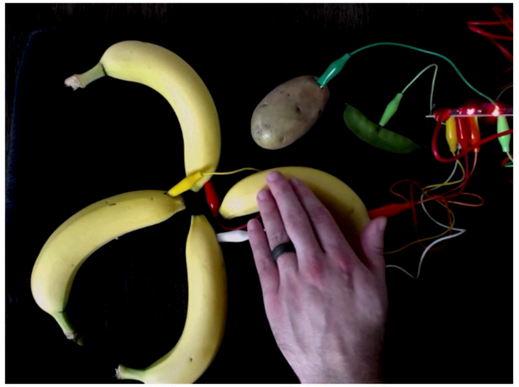


2018 (visa charts)

2022 (olli)

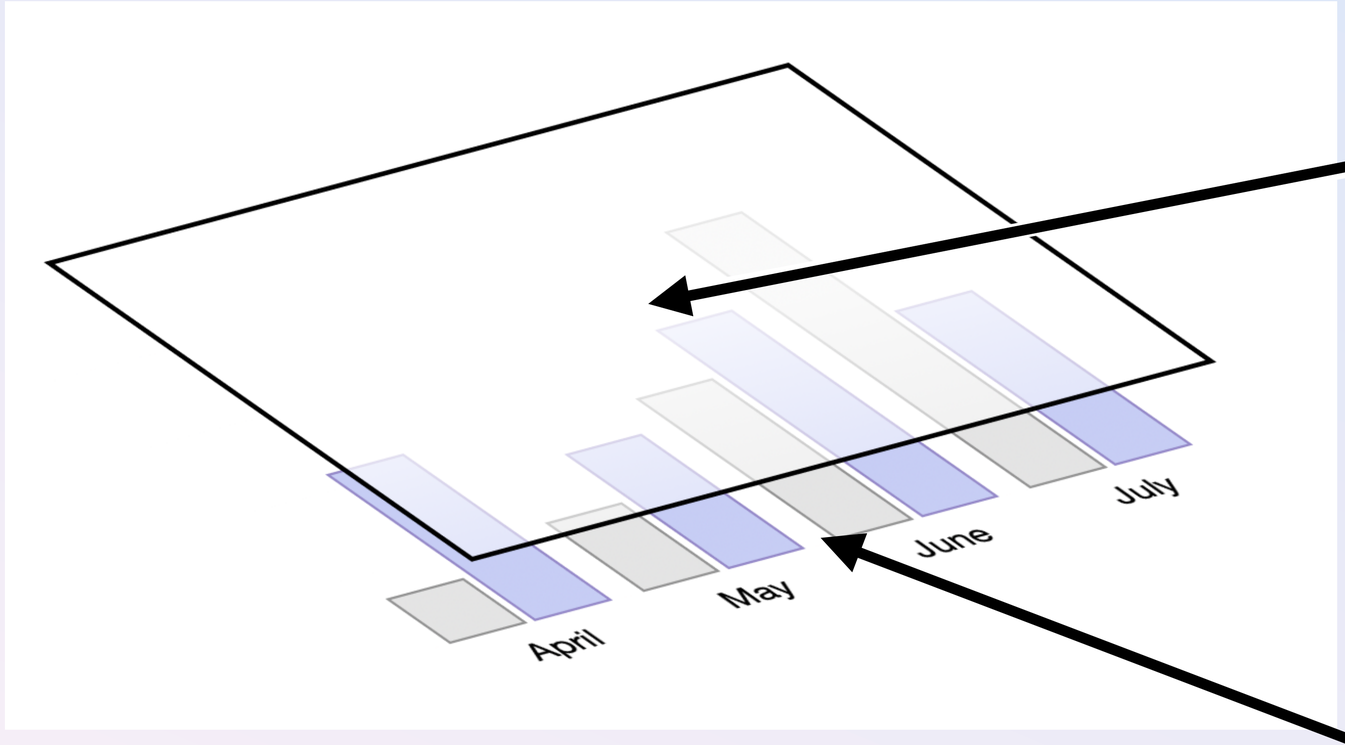
2023 (data navigator)





F. Elavsky, L. Nadolskis, and D. Moritz, "*Data Navigator*: An Accessibility-Centered Data Navigation Toolkit," *IEEE Transactions on Visualization and Computer Graphics*, 2023.

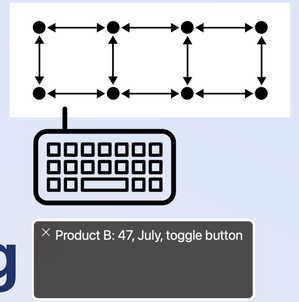
How does data navigator work?



Structure

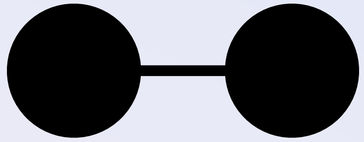
Input

Rendering



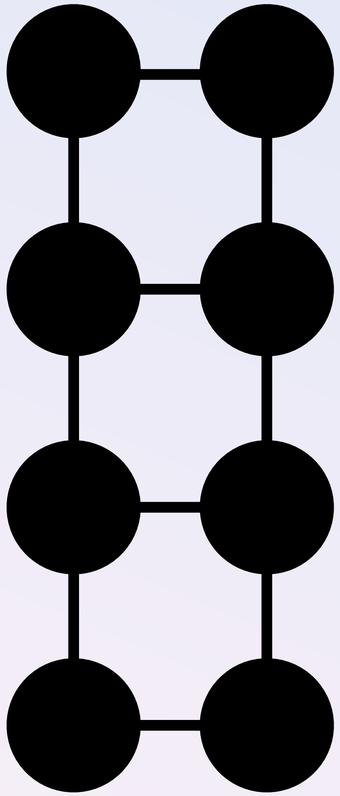
To visualization toolkits

Structure is a *graph*: nodes and edges

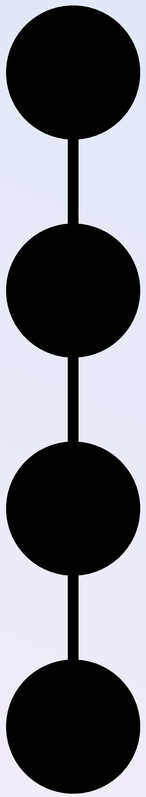


Graphs can create nearly all *other* structures

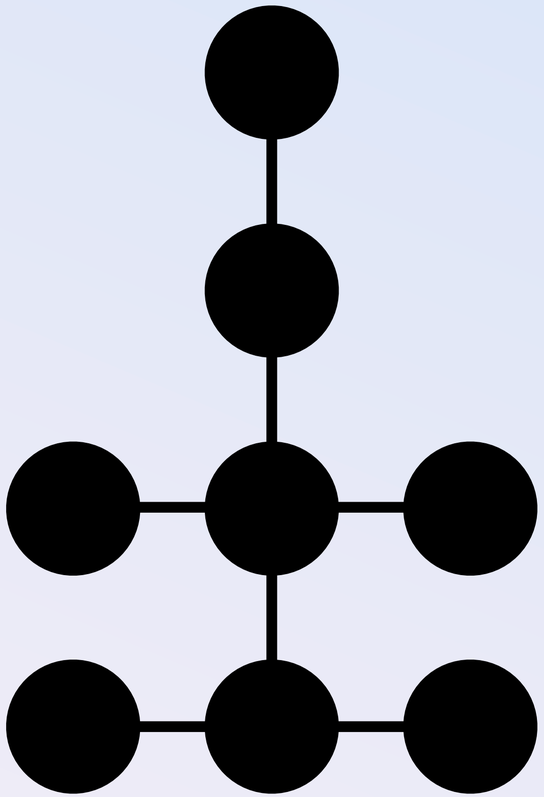
Tables



Lists

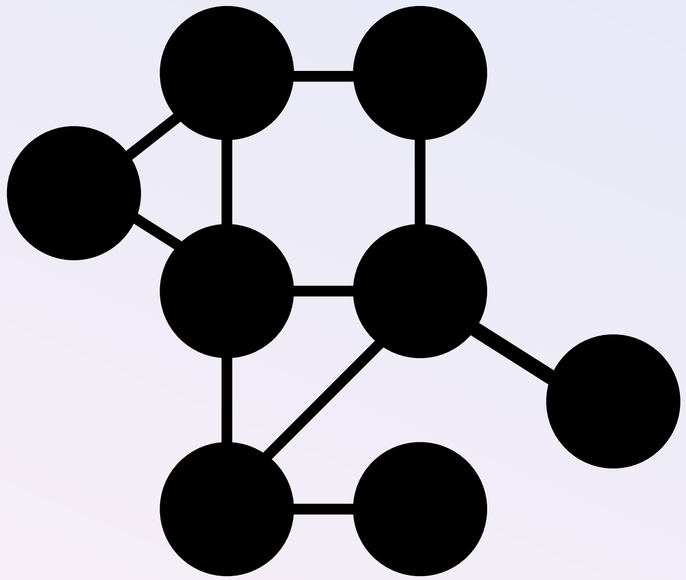


Hierarchies

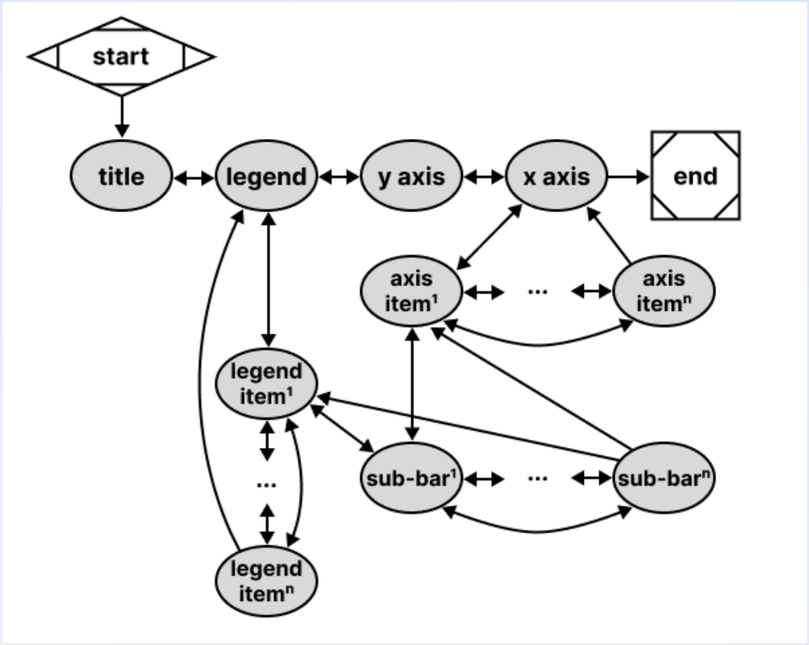


Nodes can become virtually anything

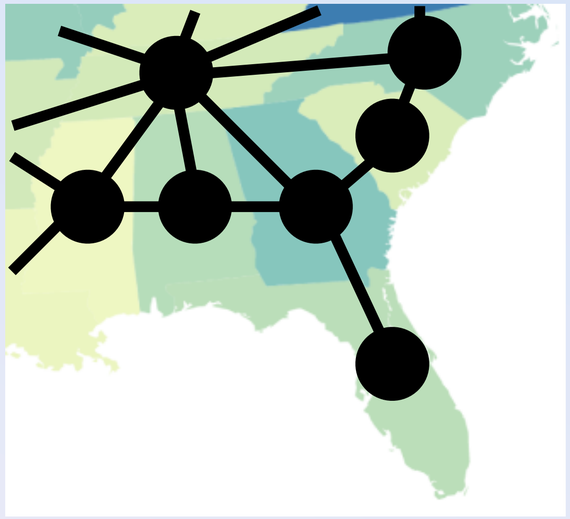
Network graphs



Diagrams



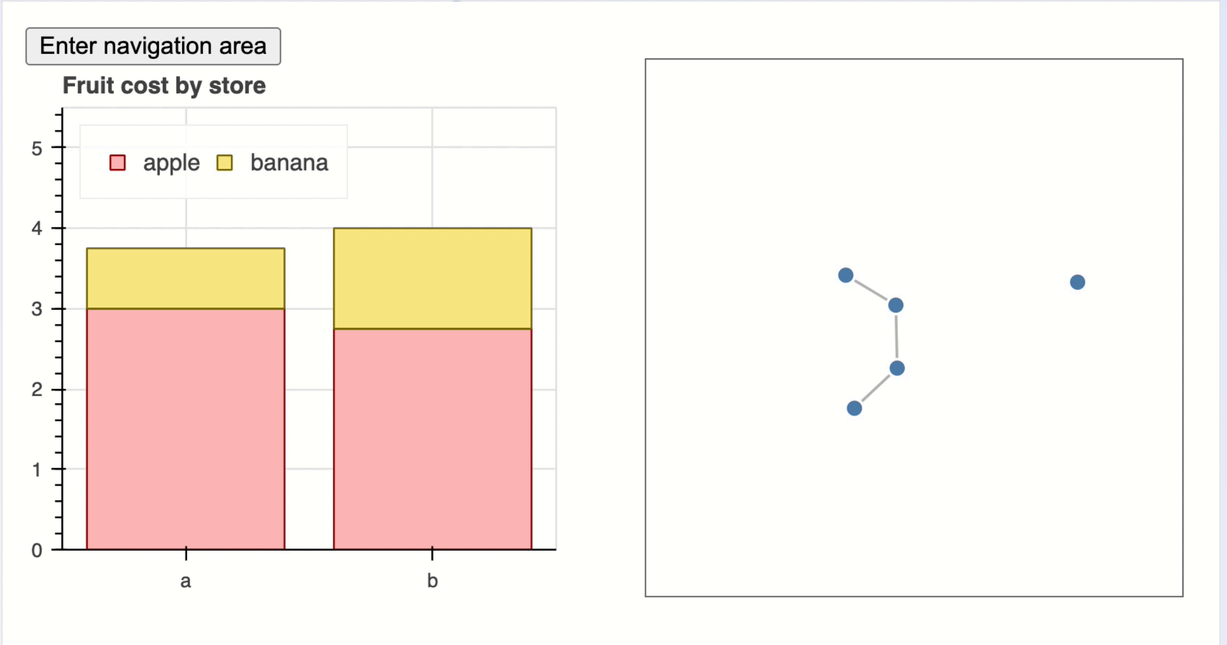
Maps



Data Navigator: Empowering practitioners

Bokeh, a python visualization library,

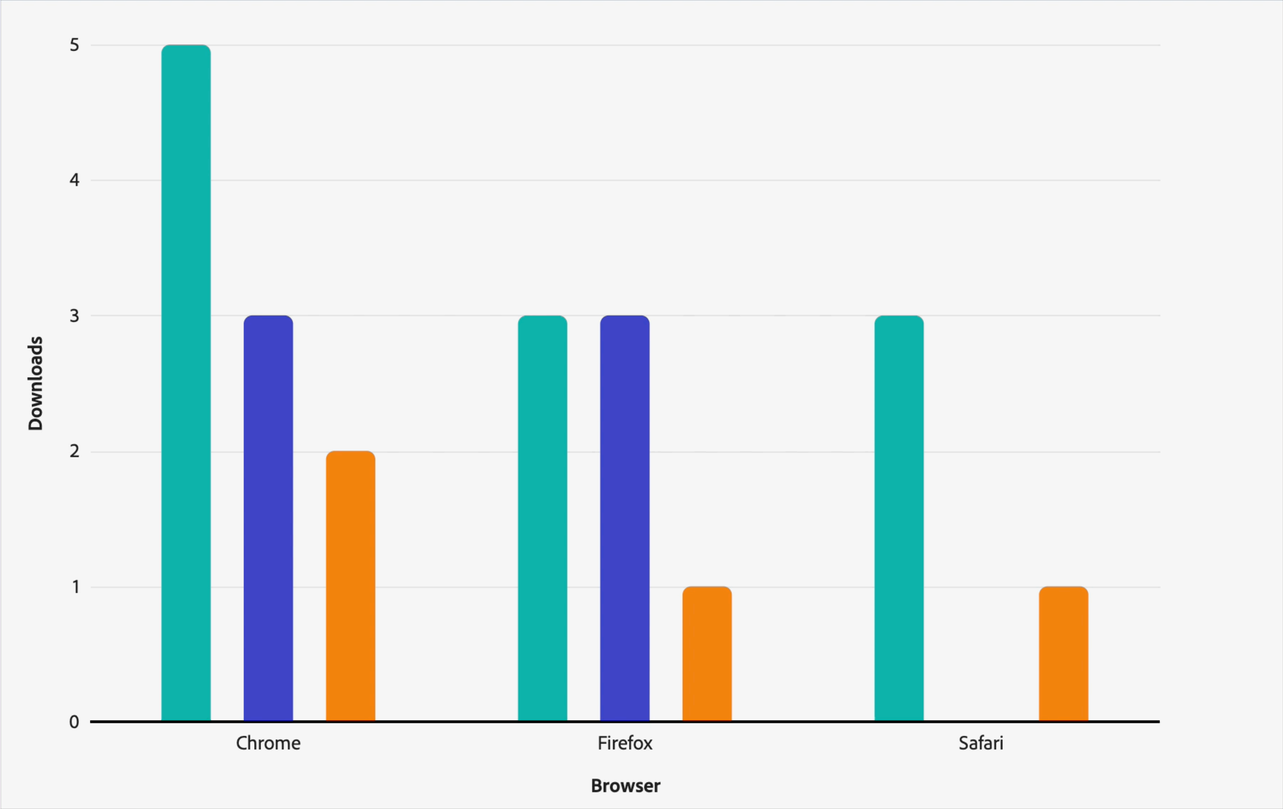
Work enabled thanks to a CZI EOSS Cycle 6 Grant



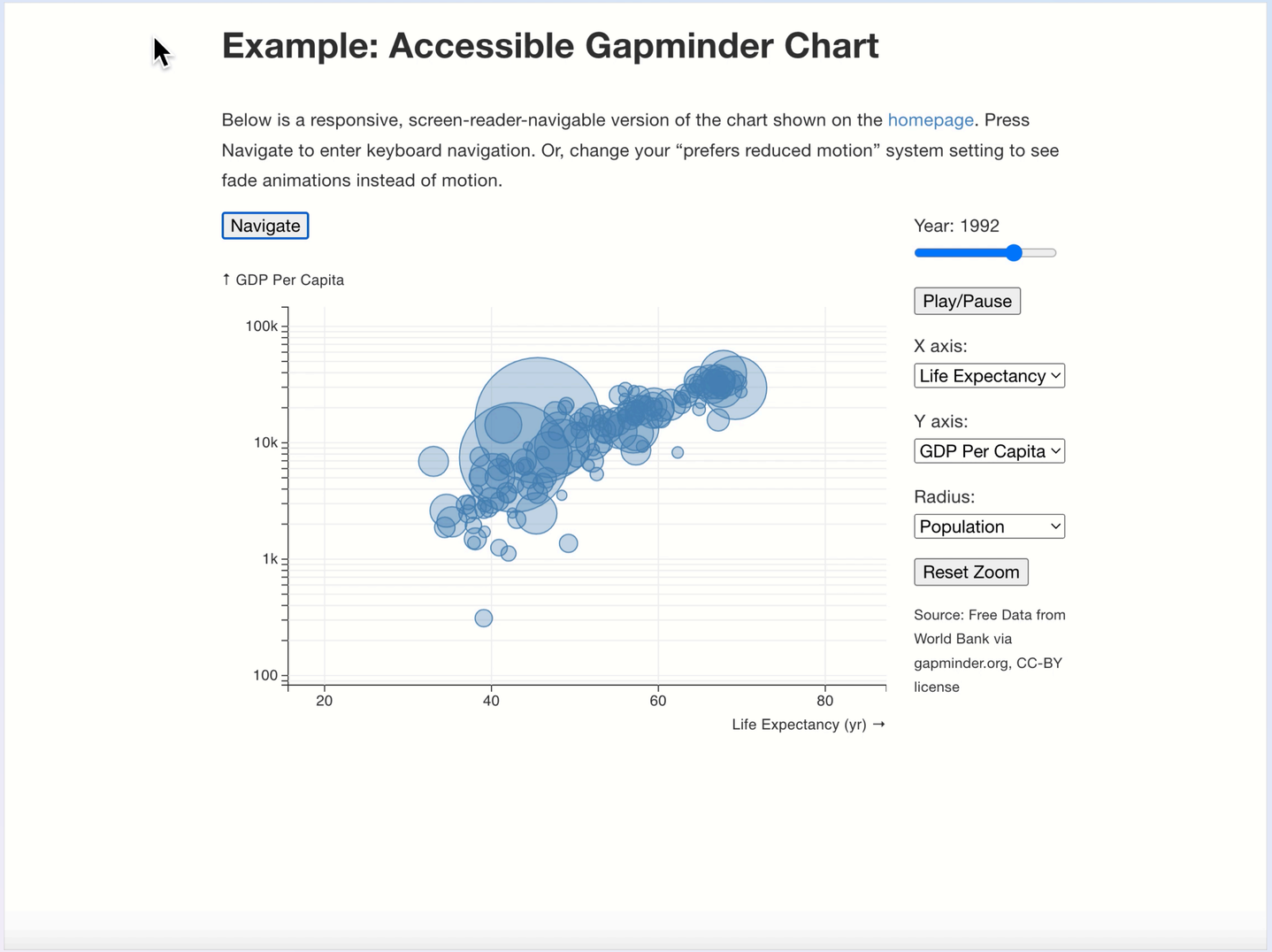
Data Navigator: Empowering practitioners

React Spectrum Charts, Adobe's visualization design system

Work enabled thanks to 2x funding from Adobe



Navigation + Animation



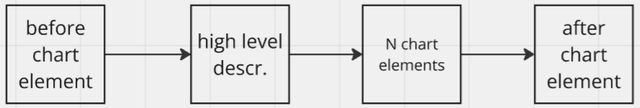
V. Sivaraman, **F. Elavsky**, D. Moritz, and A. Perer. “Counterpoint: Orchestrating large- scale custom animated visualizations.” *IEEE Visualization and Visual Analytics,* 2024.

Current work

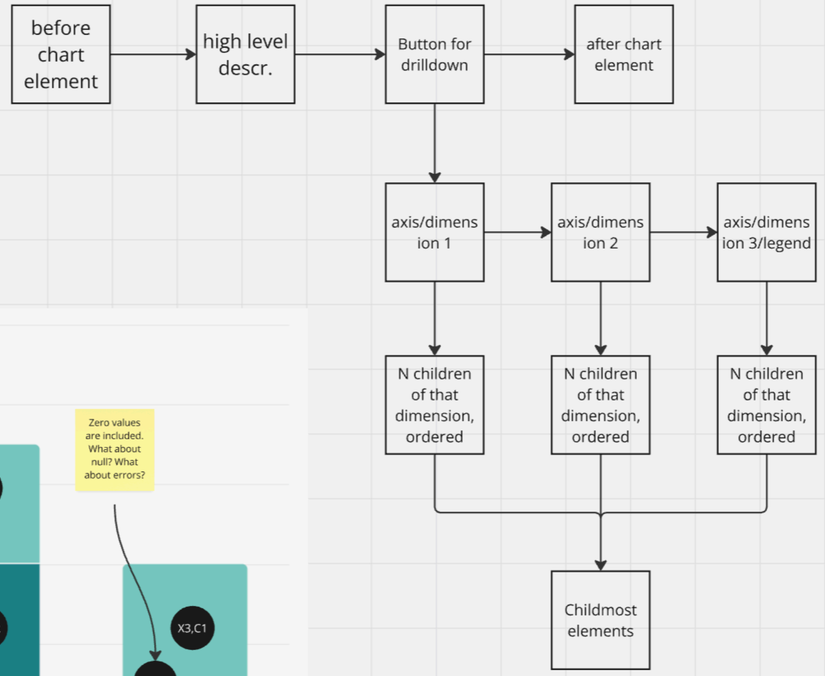
Skeleton: a graphical user interface that visualizes non-visual data experiences

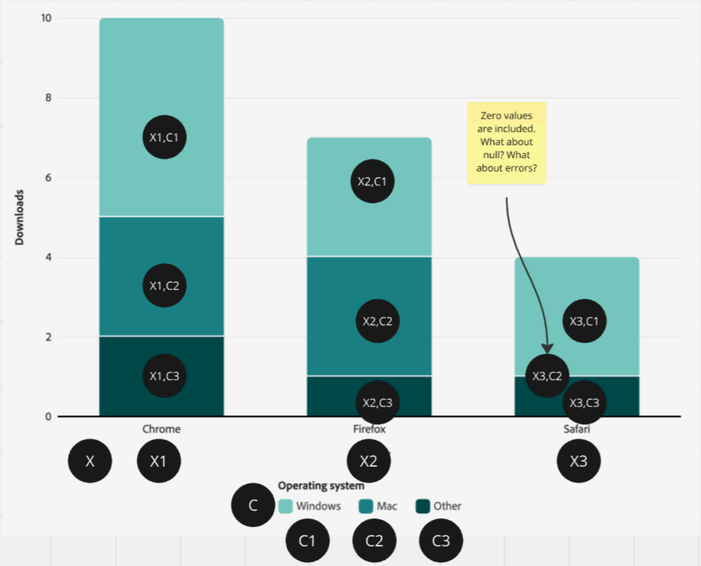
Designing navigation schema is hard

Currently how SVG + ARIA works (n elements must be navigated)



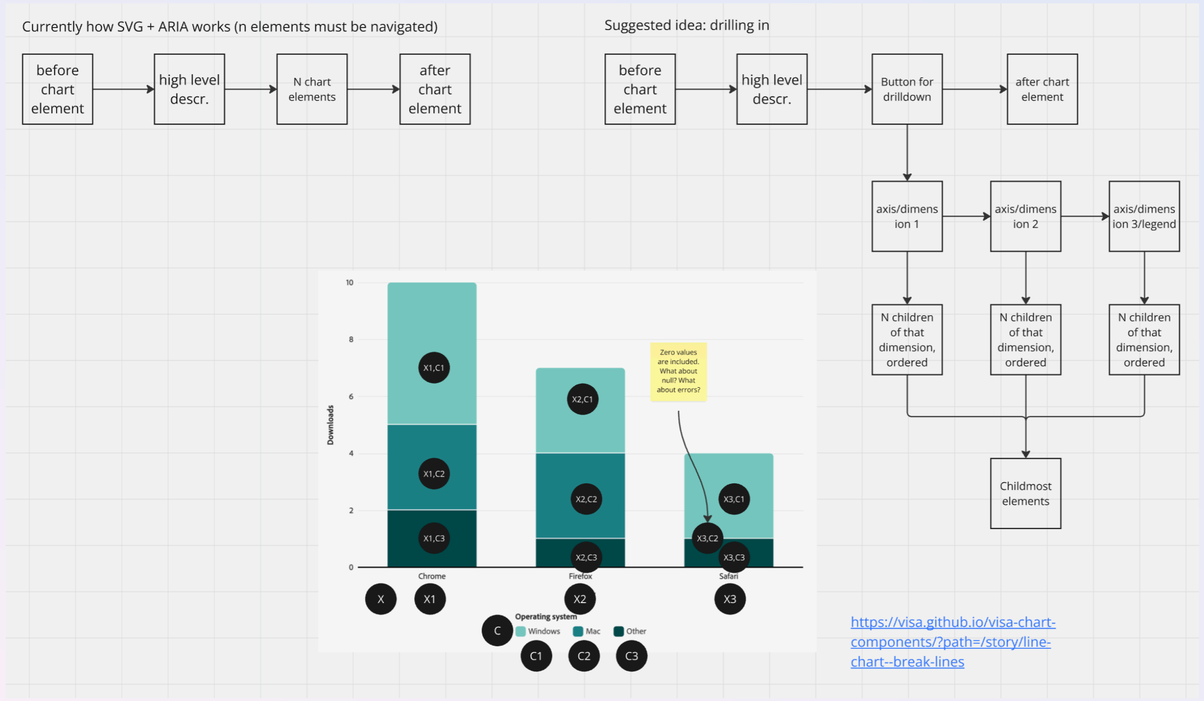
Suggested idea: drilling in





https://visa.github.io/visa-chart-components/?path=/story/line-chart--break-lines

Design and dev iteration becomes error-prone and slow



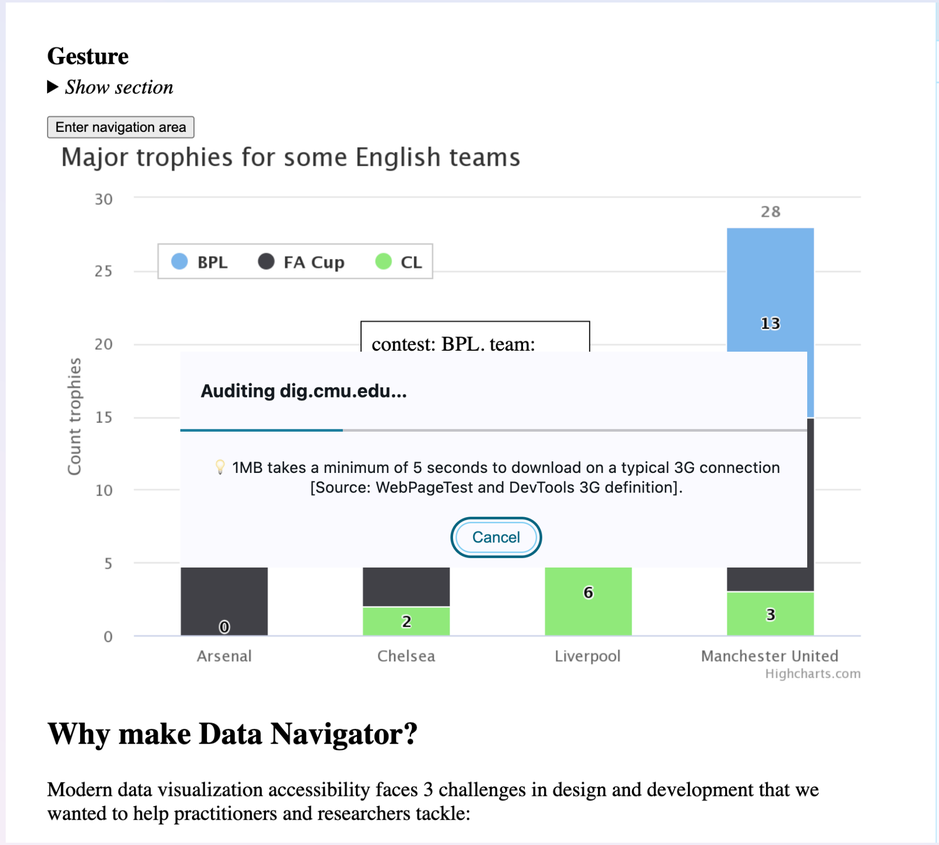
https://visa.github.io/visa-chart-components/?path=/story/line-chart--break-lines

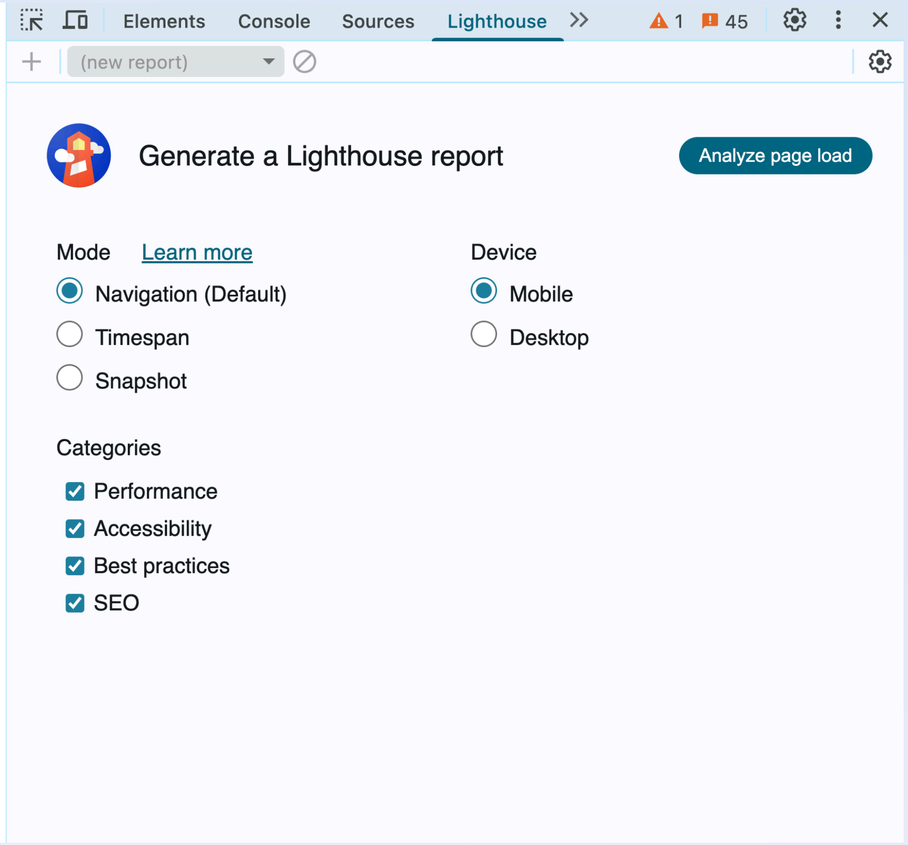
```
let simpleStructure = dataNavigator.structure({
    data: simpleDataTest,
    idKey: 'id',
    dimensions: {
        values: [
            {
                dimensionKey: 'cat',
                type: 'categorical',
                behavior: {
                    extents: 'circular'
                }
            },
            {
                dimensionKey: 'num',
                type: 'numerical',
                behavior: {
                    extents: 'terminal'
                }
            }
        ]
    },
    genericEdges: [
        {
            edgeId: 'any-exit',
            edge: {
                source: (_d, c) => c,
                target: () => {
                    exit['simple']();
                    return '';
                },
                navigationRules: ['exit']
            }
        }
    ]
});
```

Skeleton: non-visual experiences are an accessibility barrier for sighted people

We plan to make an interface for authoring and debugging

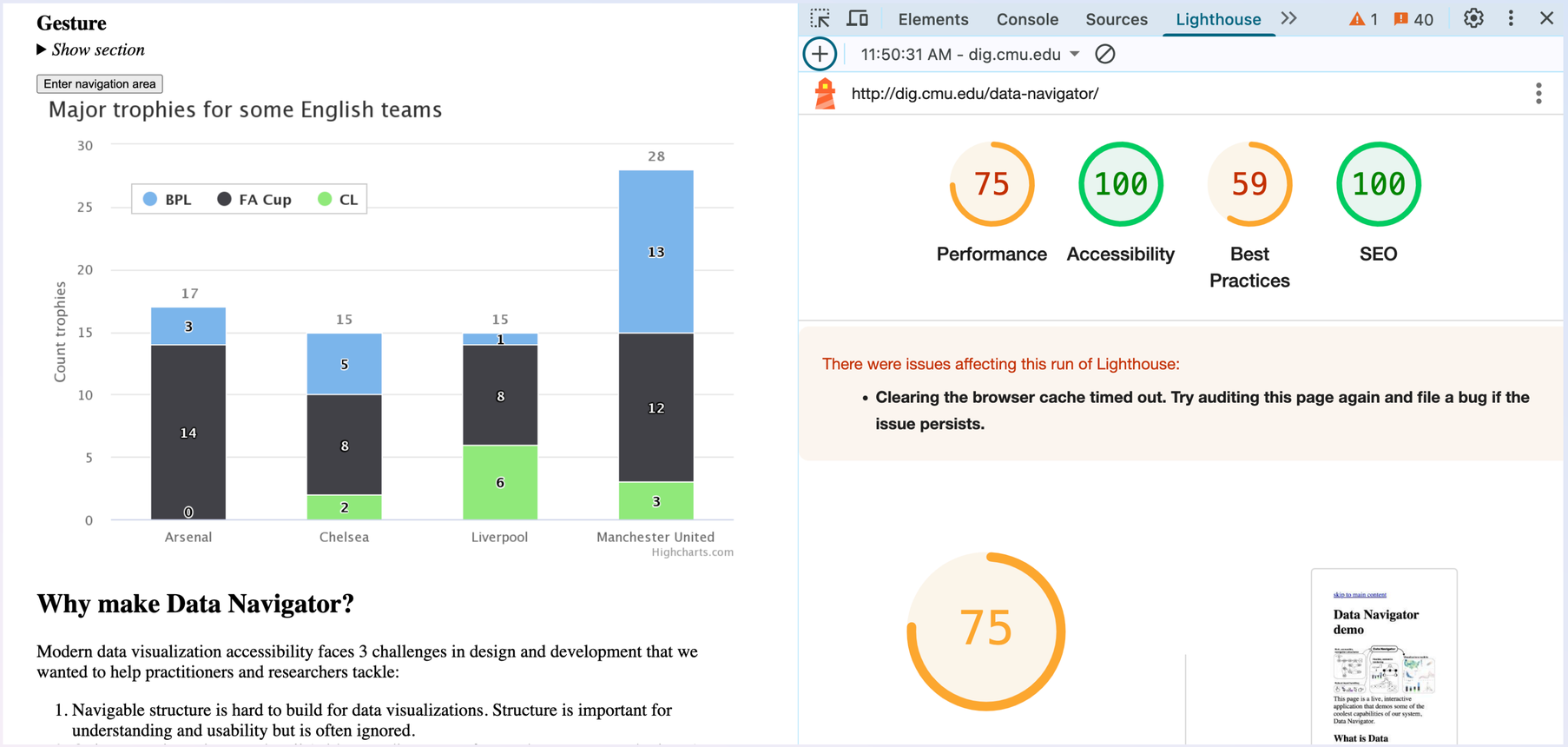
Web development accessibility tooling





Skeleton

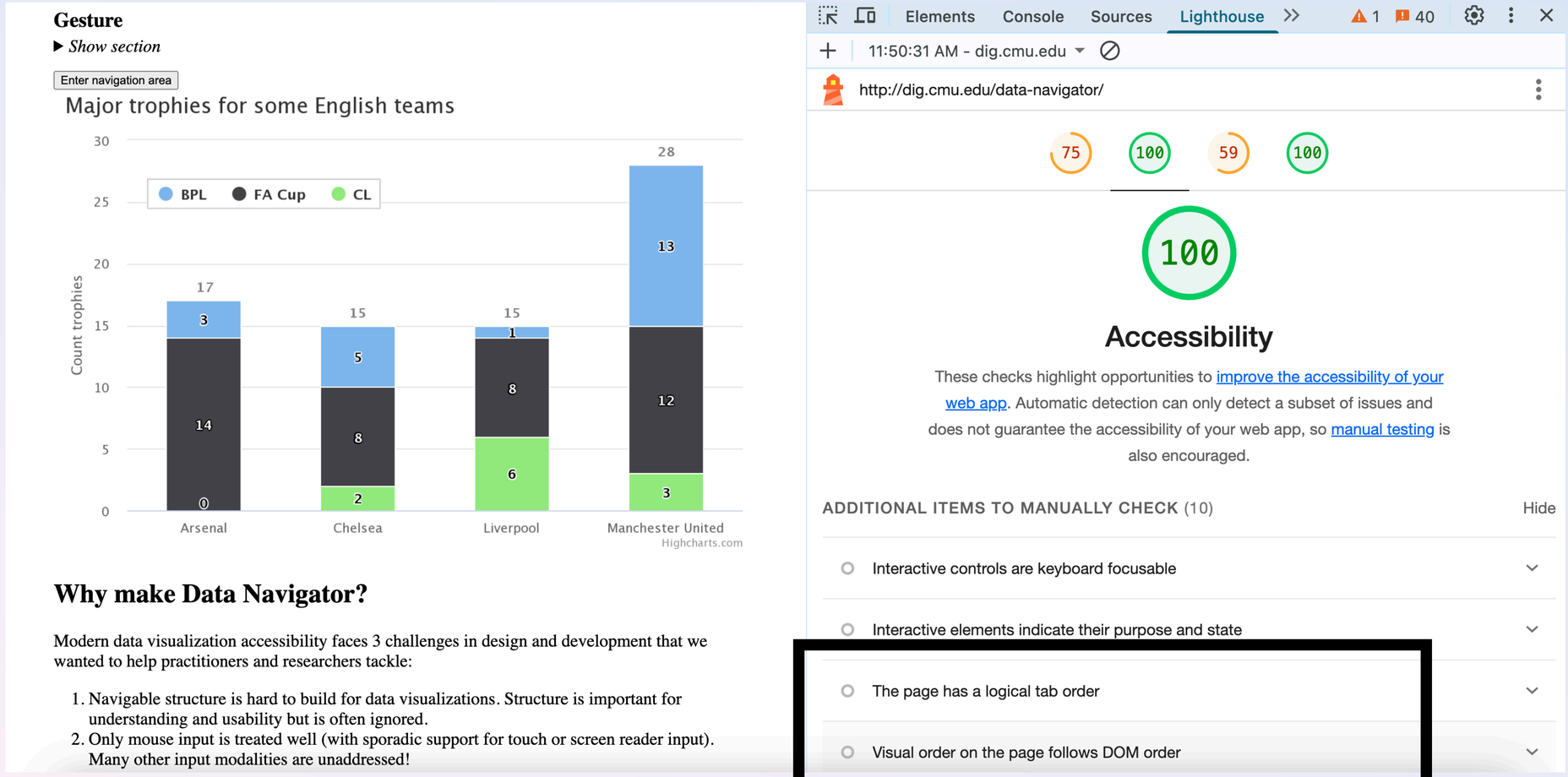
Web development accessibility tooling



Skeleton

What if you could see AT navigation?

Currently navigation is still manually verified!



Skeleton

What if you could see AT navigation?

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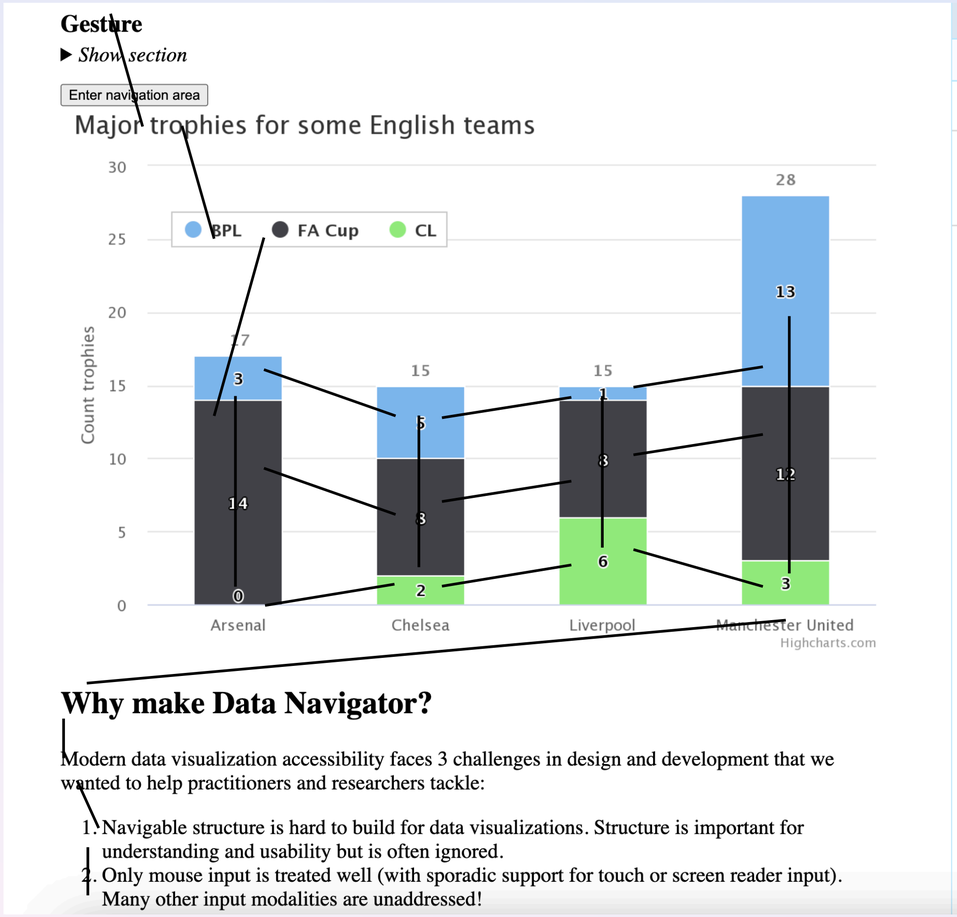
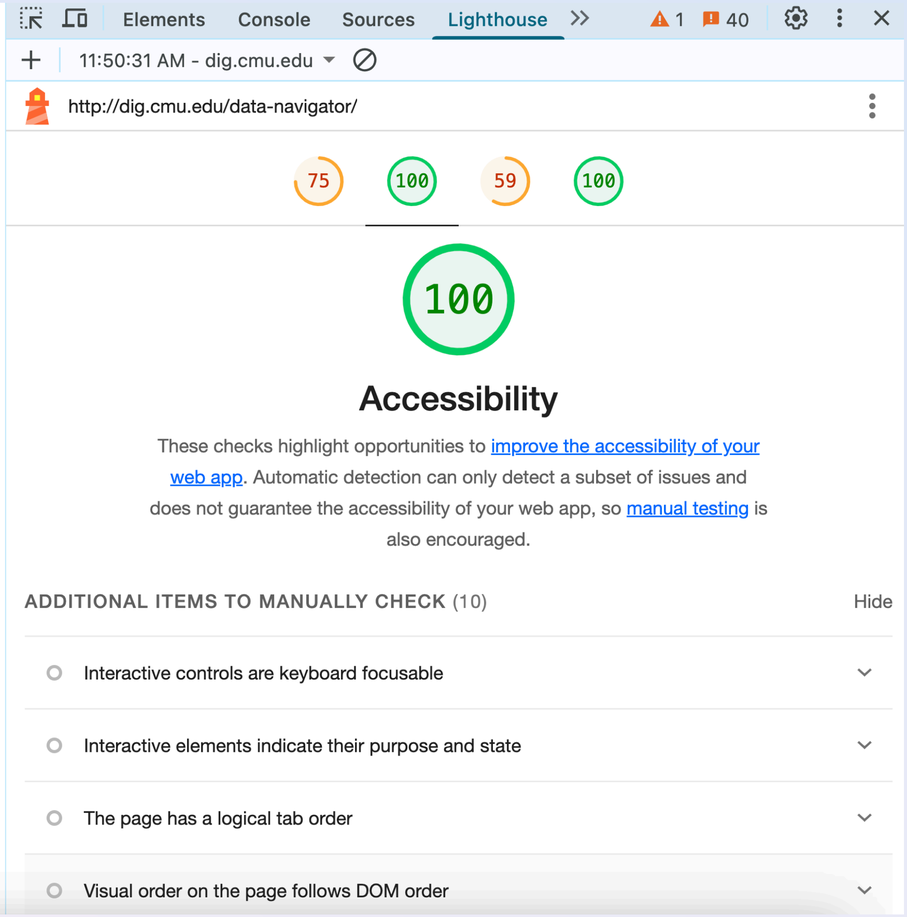


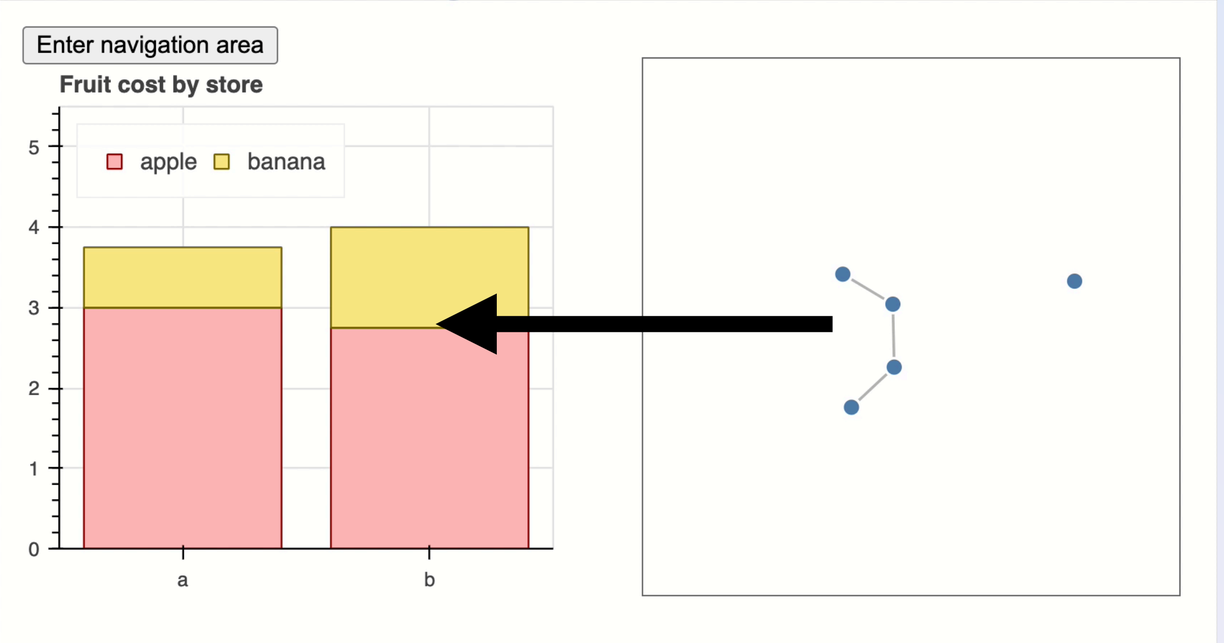


Skeleton

Data Navigator: Empowering practitioners

Bokeh, a python visualization library,

Work enabled thanks to a CZI EOSS Cycle 6 Grant



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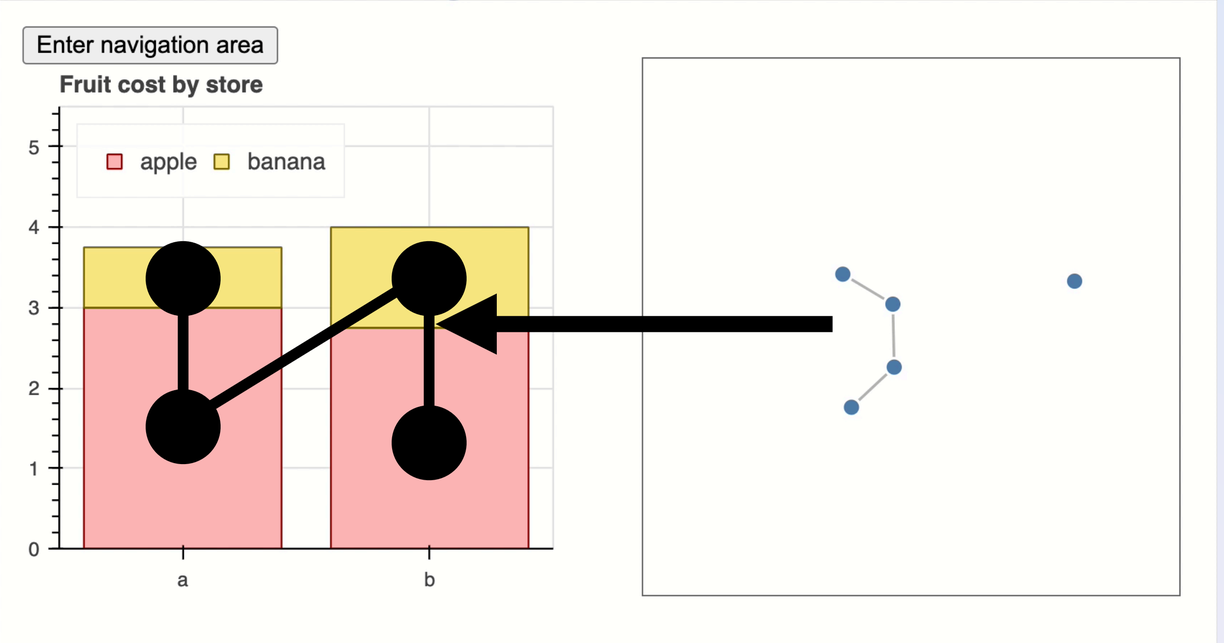

Data Navigator: Empowering practitioners

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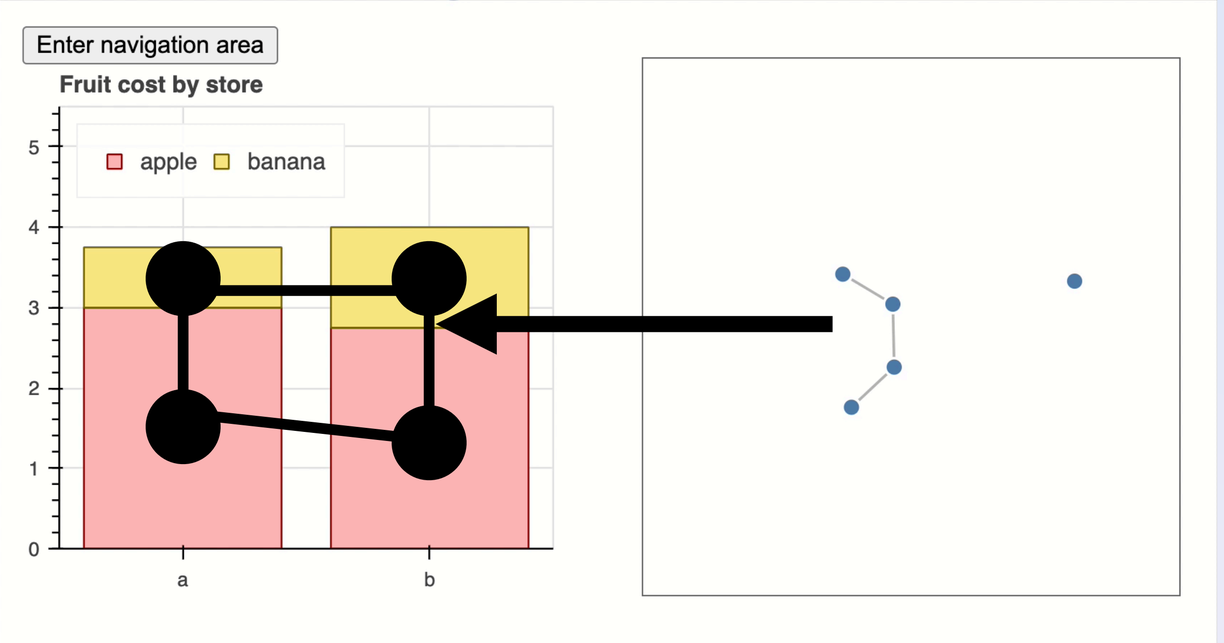


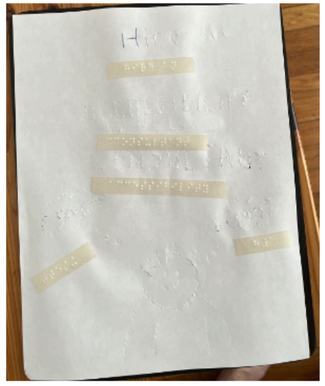
My latest community and critical work

Blind-led innovation and using community response to build a *how-not-to* guide

(a) Tactile maps of grocery store with standardized symbols, by P2

(b) Smart glasses with AI capabilities, by P9

(c) A photo of craft suppliess in a shopping app, by P10



(d) Example of semantically correct HTML headings structure, by P4

(e) Phone interface with navigation consistency, by P6

(f) A device to aid with touch screen interaction, by P11

Fig. 2. Participant's prototypes in response to the Grocery shopping prompt.

How *Not* To Make Bad Assistive Tech: A Guide

Created by Iman Ouzzani, Advised by Frank Elavsky

Some technologies that are created with "good" intentions can end up effectively useless, sometimes even harmful. This can especially be true when technology is made for people with disabilities. So how do you avoid making bad assistive technologies? We created this guide and framework to help you ask questions about your own work and suggest directions for how you can rethink, reframe, and adjust your approach.

Motivation: Avoiding Disability Dongles

Consider the following examples of bad assistive technology:

Sign-Language Glove

SignAloud - The Index Project

Why is it *bad*? The people who make these projects rarely consult with deaf people when they create it, which results in gloves that make an assumption that sign language only occurs in the movement of the hands, rather than with facial expressions and body language as well.

Stair-Climbing Wheelchair

Future agenda

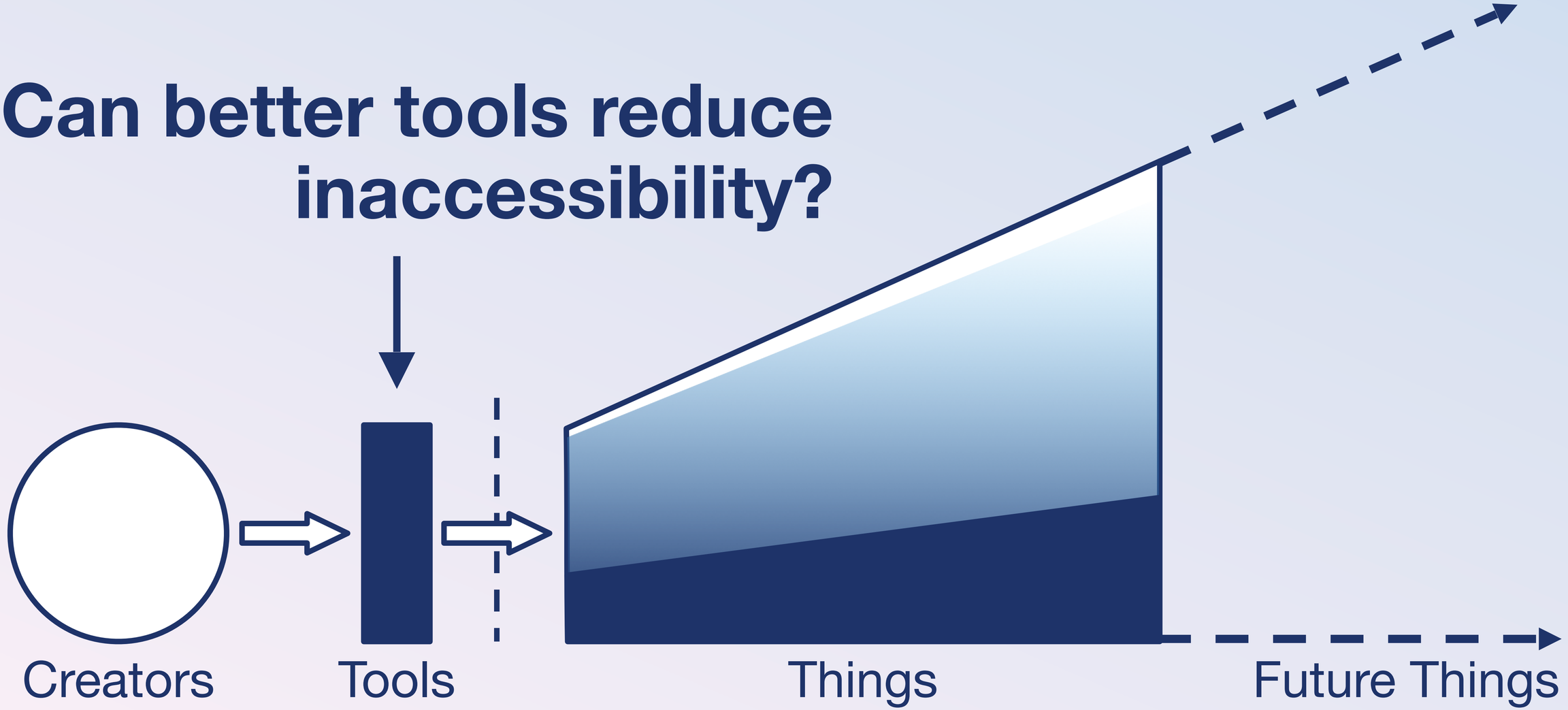
Tools reify and functionalize our values

The chair: “Sit still. Face forward. Behave.” - Anna Gyllenklev

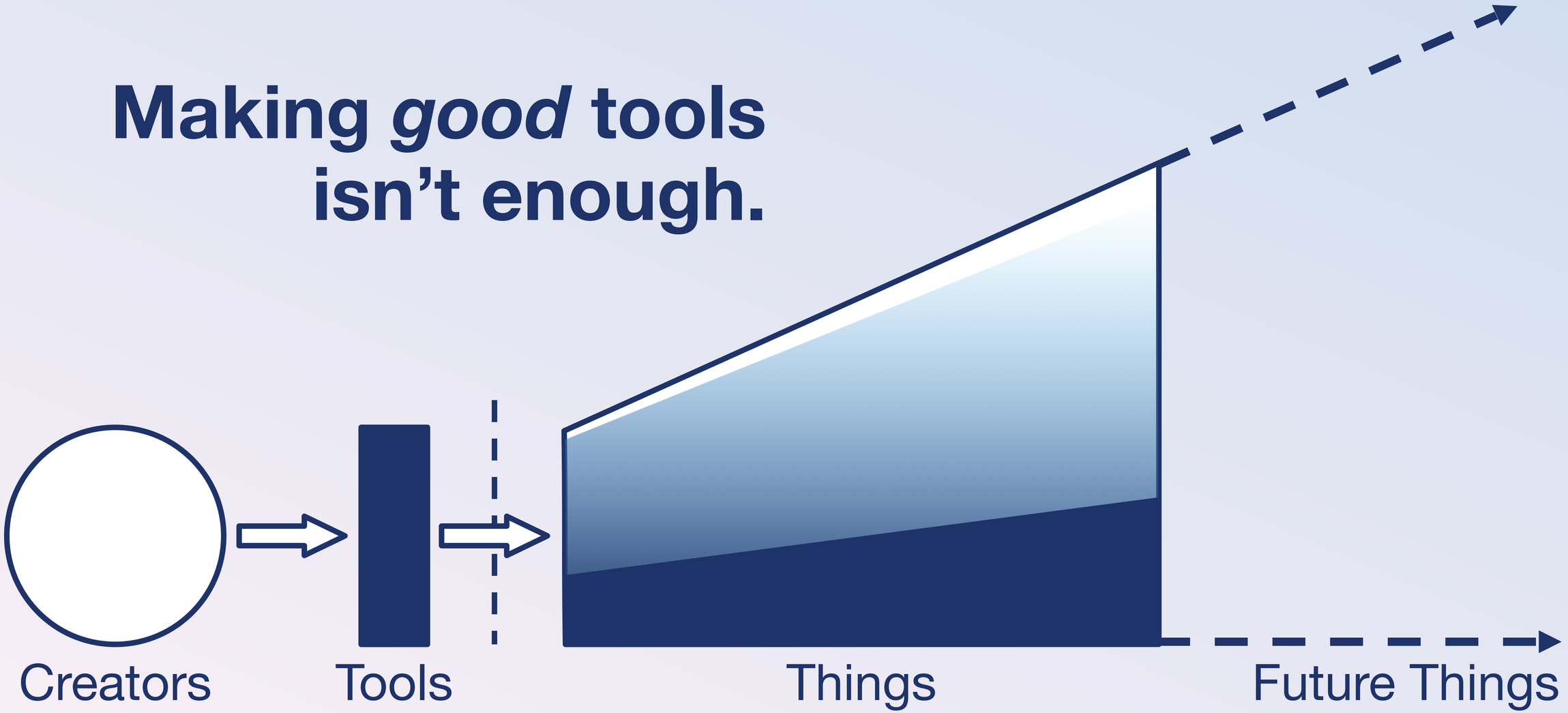
Tools reify and functionalize [the toolmaker's] values

The chair: "Sit still. Face forward. Behave." - Anna Gyllenklev

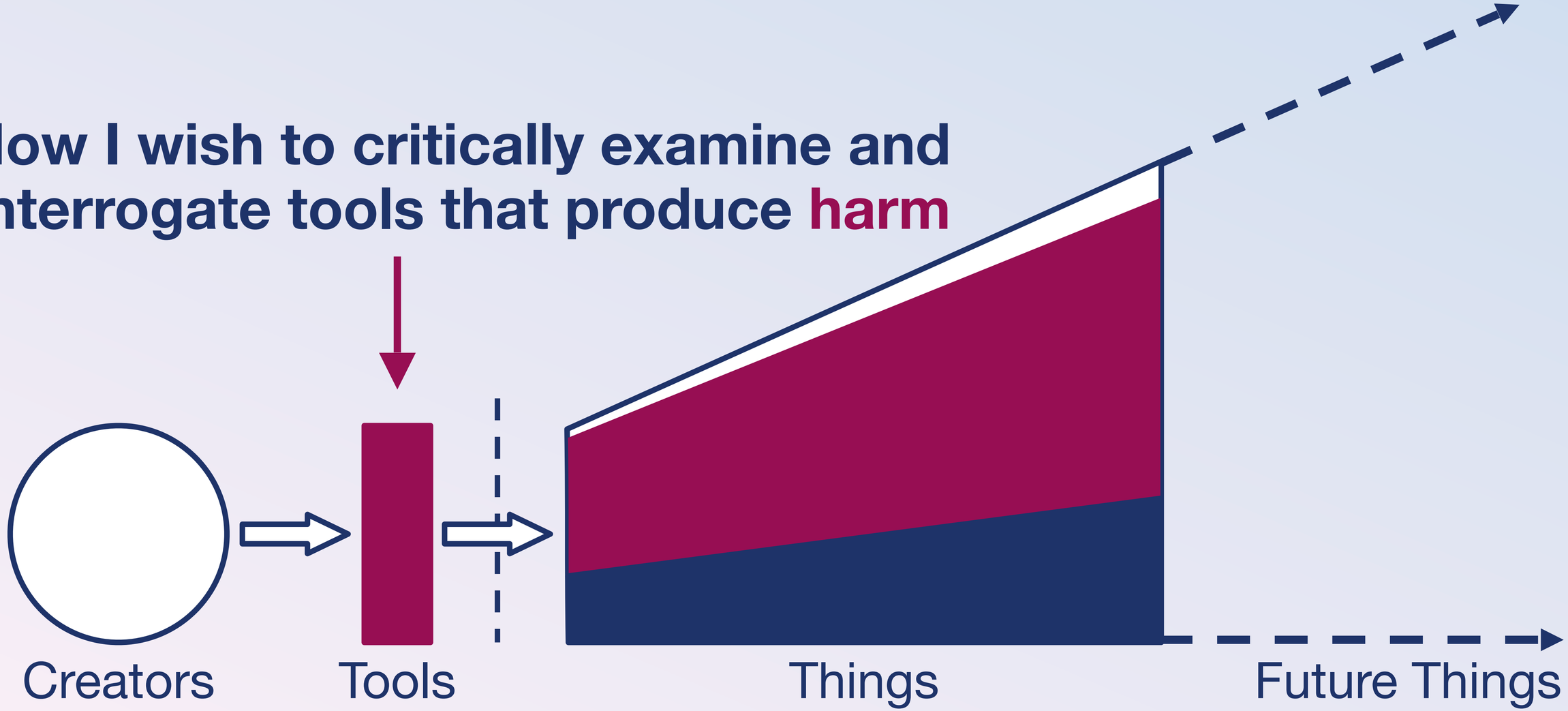
Can better tools reduce inaccessibility?



Making *good* tools isn't enough.



Now I wish to critically examine and interrogate tools that produce harm



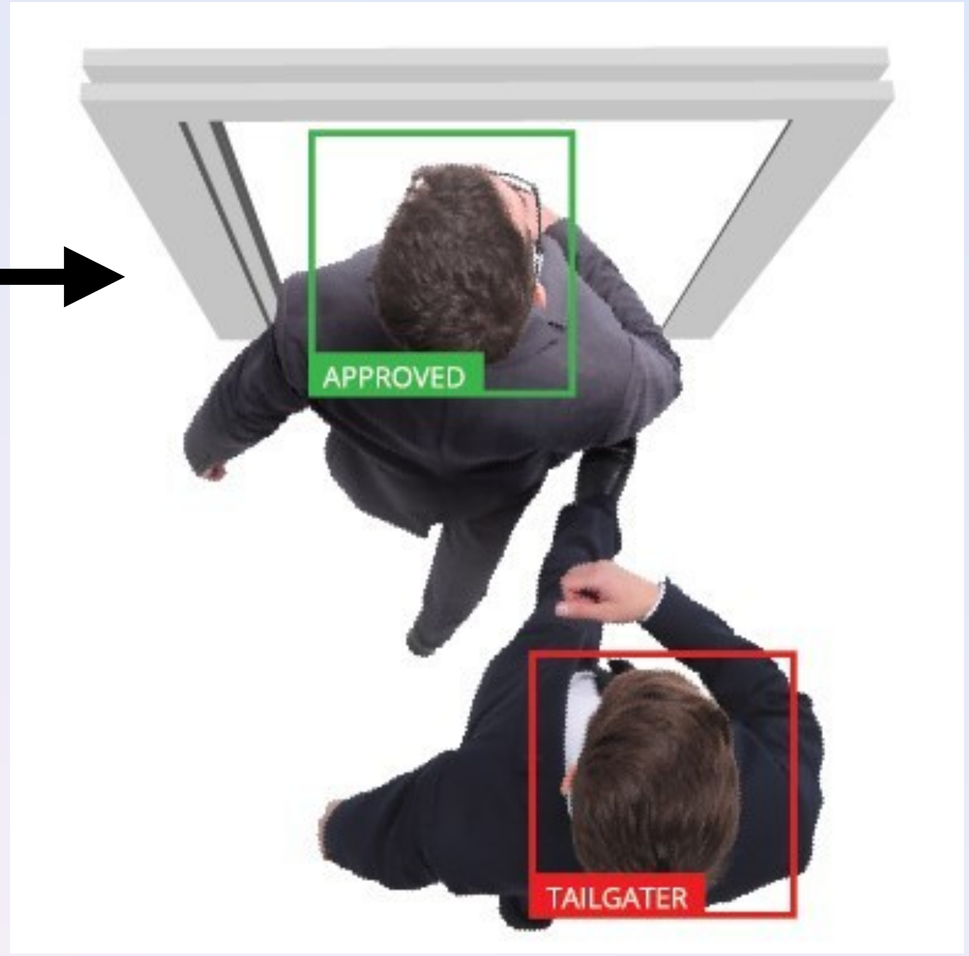
Future agenda: how can the study of harmful tools help us build a better world?

Tailgating on accessibility

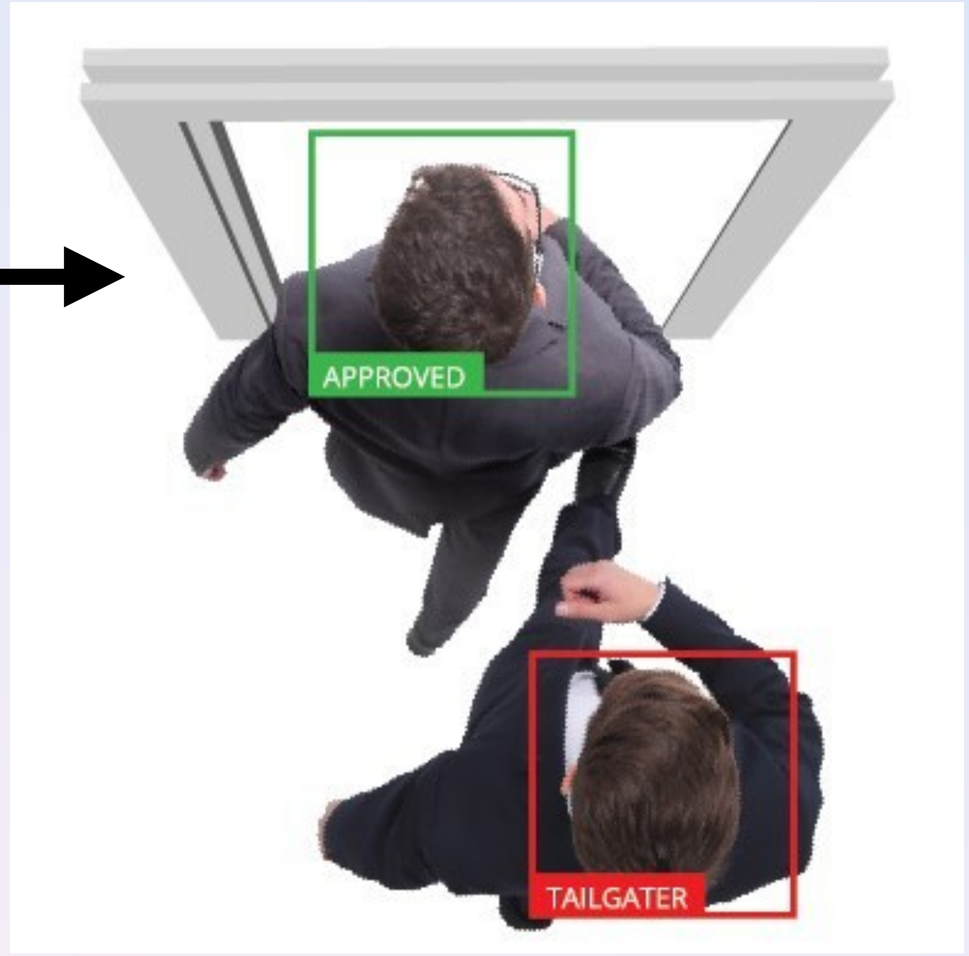
Tailgating on accessibility

fje@cmu.edu
Pittsburgh, PA

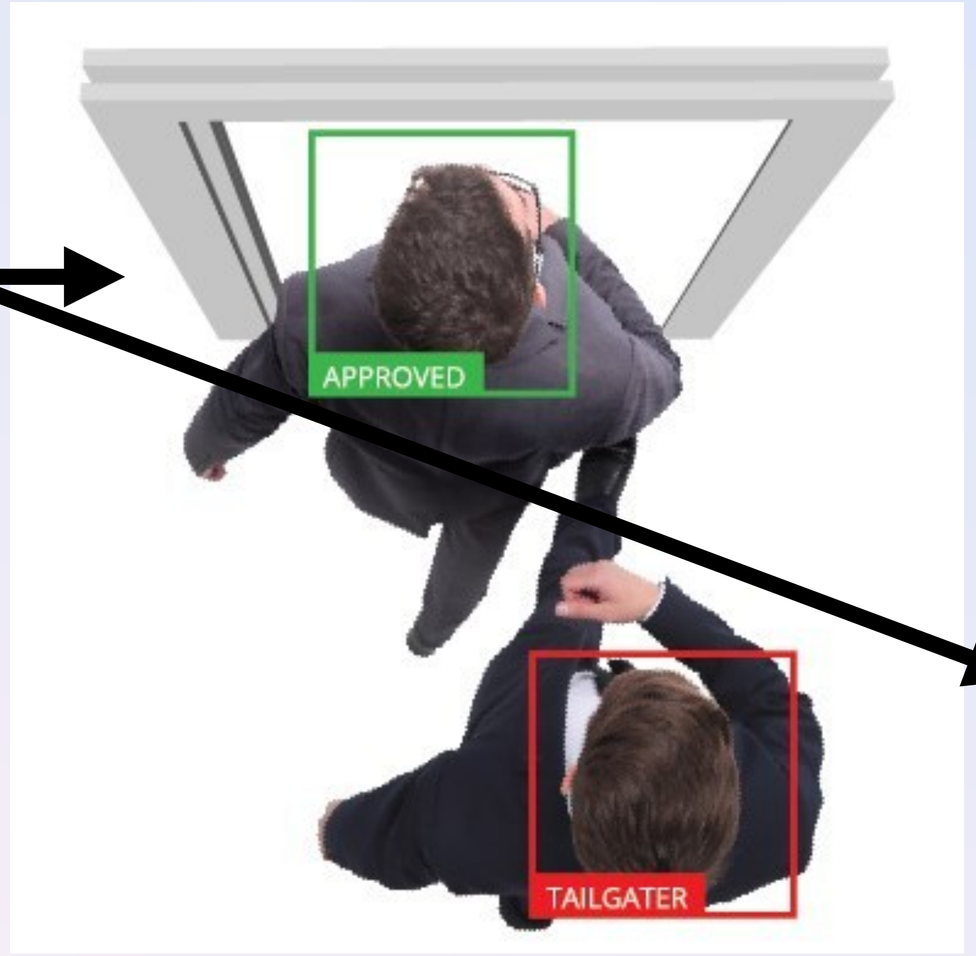
```
<div class="intro">…</div>
<div class="me"> == $0
  <picture>
    <source srcset="/images/frank.png"
    type="image/jpg">
    <img src="/images/frank.png" alt="I
    t's me! A white man smiling with me
    dium-short brown hair, glasses, and
    a light brick pink t-shirt.">
  </picture>
  <ul class="no-list">…</ul>
 </div>
</div>
```



Tailgating on accessibility



Tailgating on accessibility



First web crawler: 1994, according to the “timeline of ai achievements” - coincidentally when TB Lee first conceived of the “semantic” web

Tailgating on accessibility

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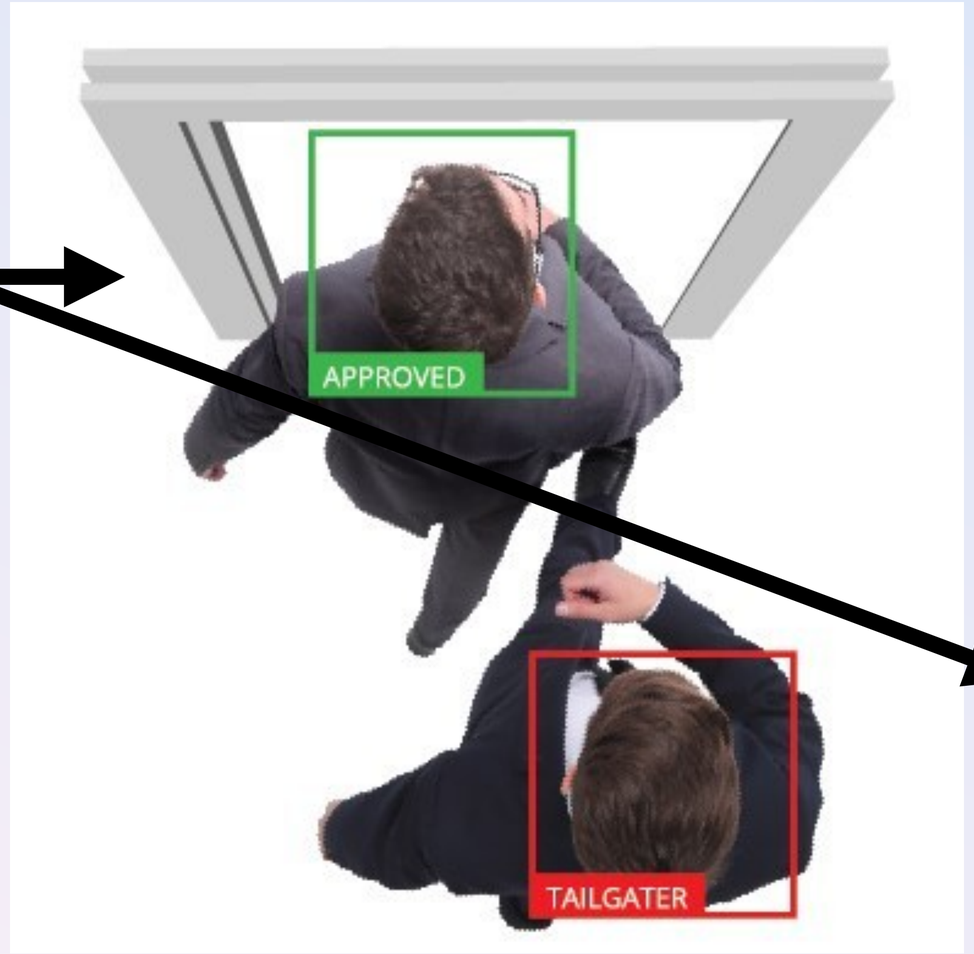
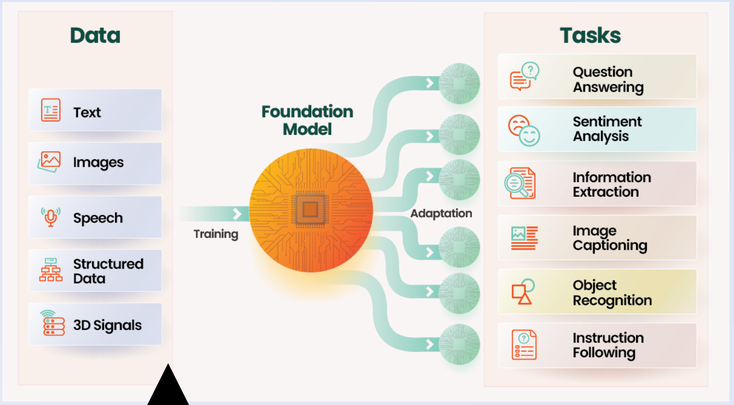
    t's me! A white man smiling with me
    dium-short brown hair, glasses, and
    a light brick pink t-shirt.">
  </picture>
  <ul class="no-list">…</ul>
 </div>
</div>
```

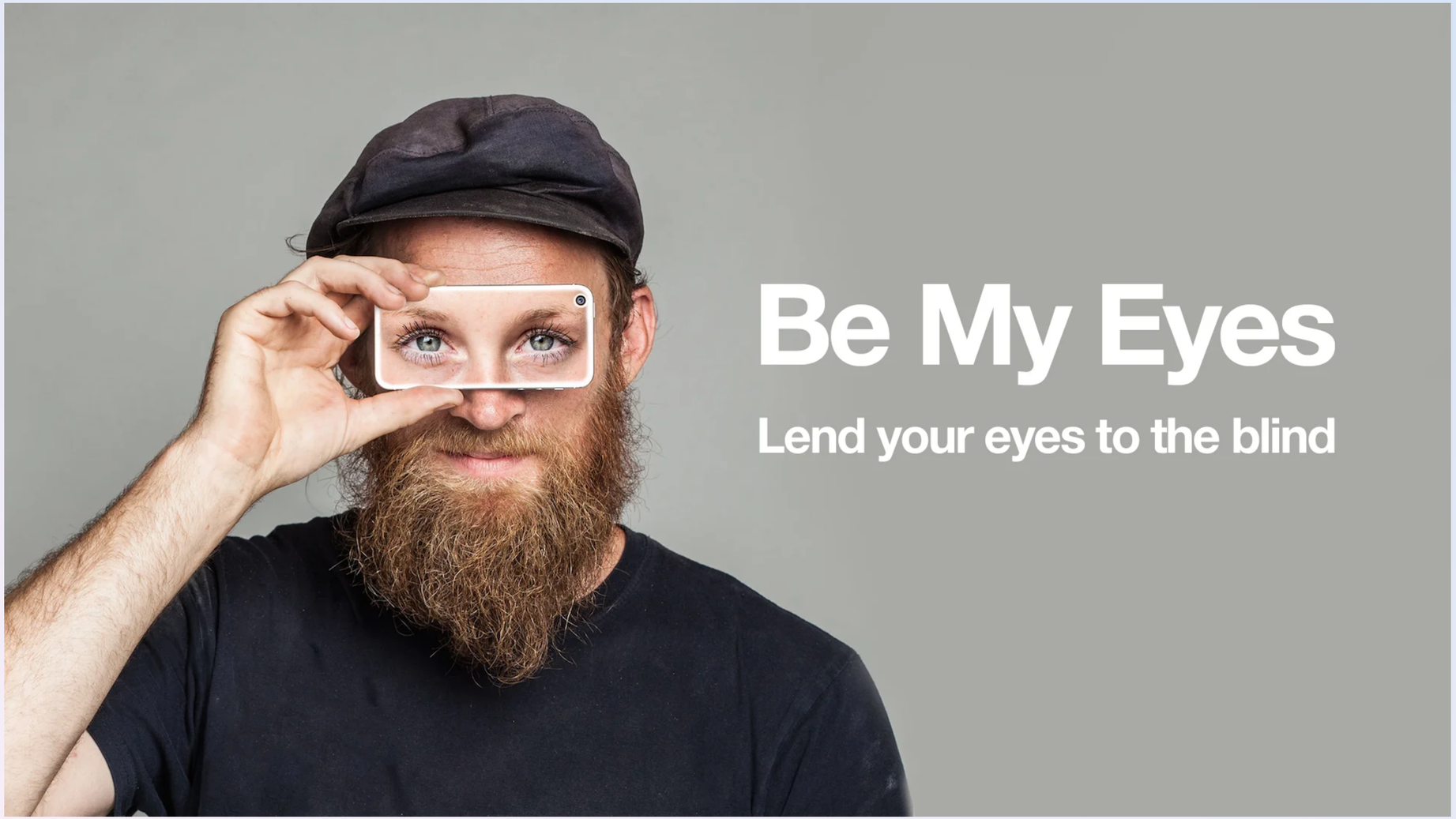
It's me! A white man smiling with medium-short brown hair, glasses, and a light brick pink t-shirt., image





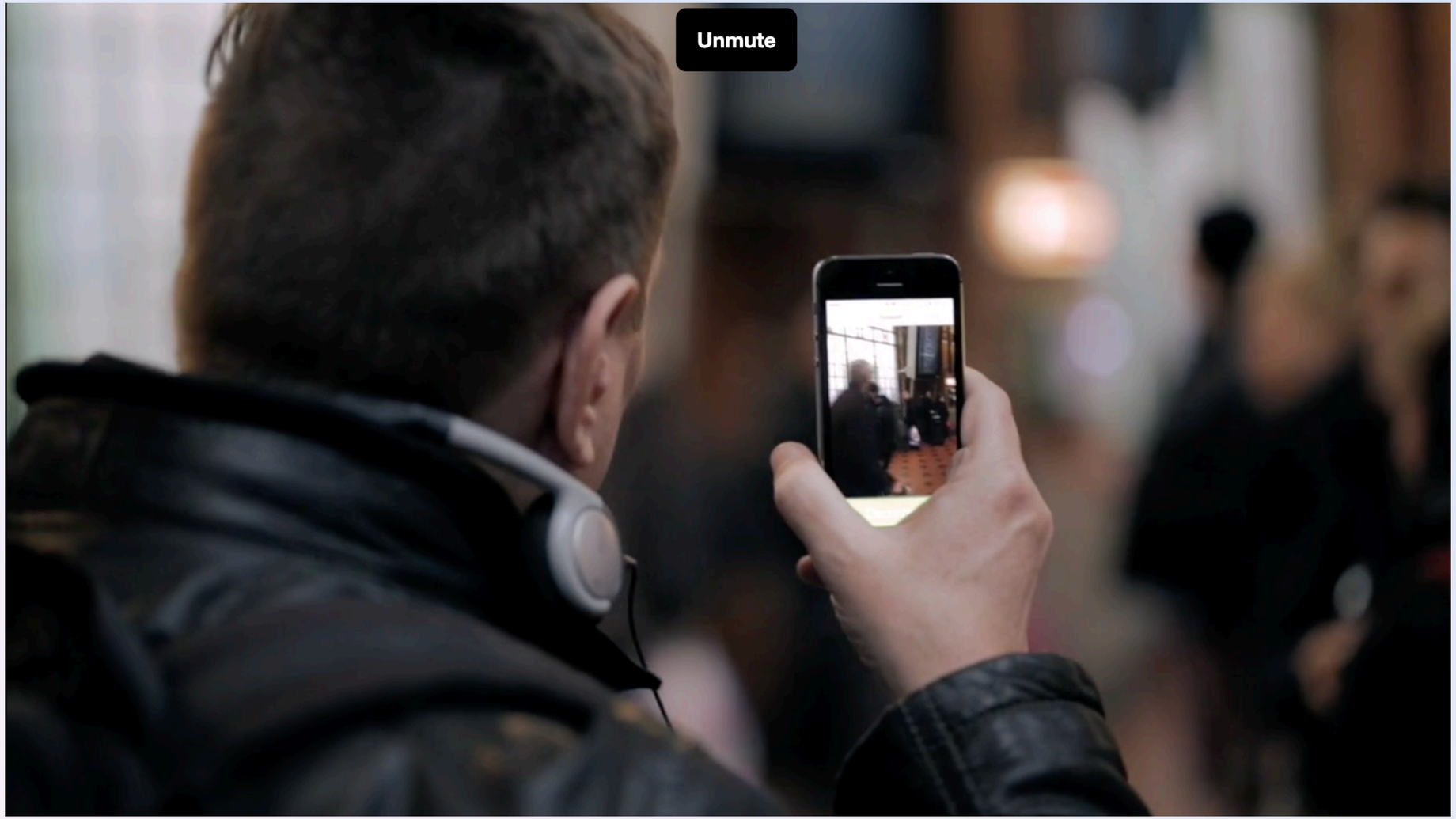
First web crawler: 1994, according to the “timeline of ai achievements” - coincidentally when TB Lee first conceived of the “semantic” web

Piggybacking on accessibility: Be My Eyes



Promotional material for Be My Eyes, source: Vimeo

Have people who are blind become a source of vision for modern machine learning models?



Promotional material for Be My Eyes, source: Vimeo

Piggybacking on accessibility: Be My AI

Promotional material for Be My AI at Meta, source: Youtube

Piggybacking on accessibility: Be My AI

Promotional material for Be My AI at Meta, source: Youtube

Piggybacking on accessibility: Be My AI

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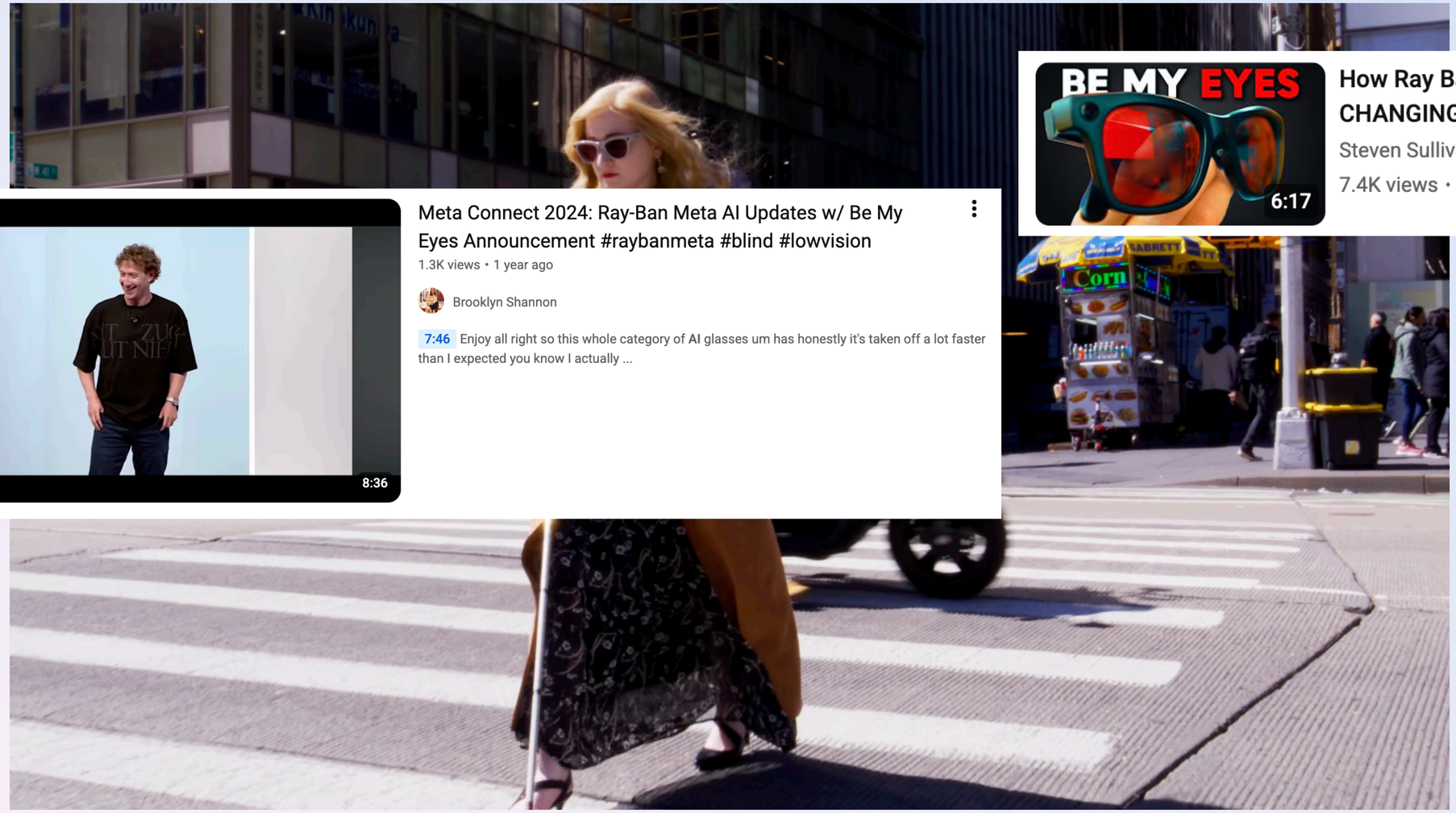
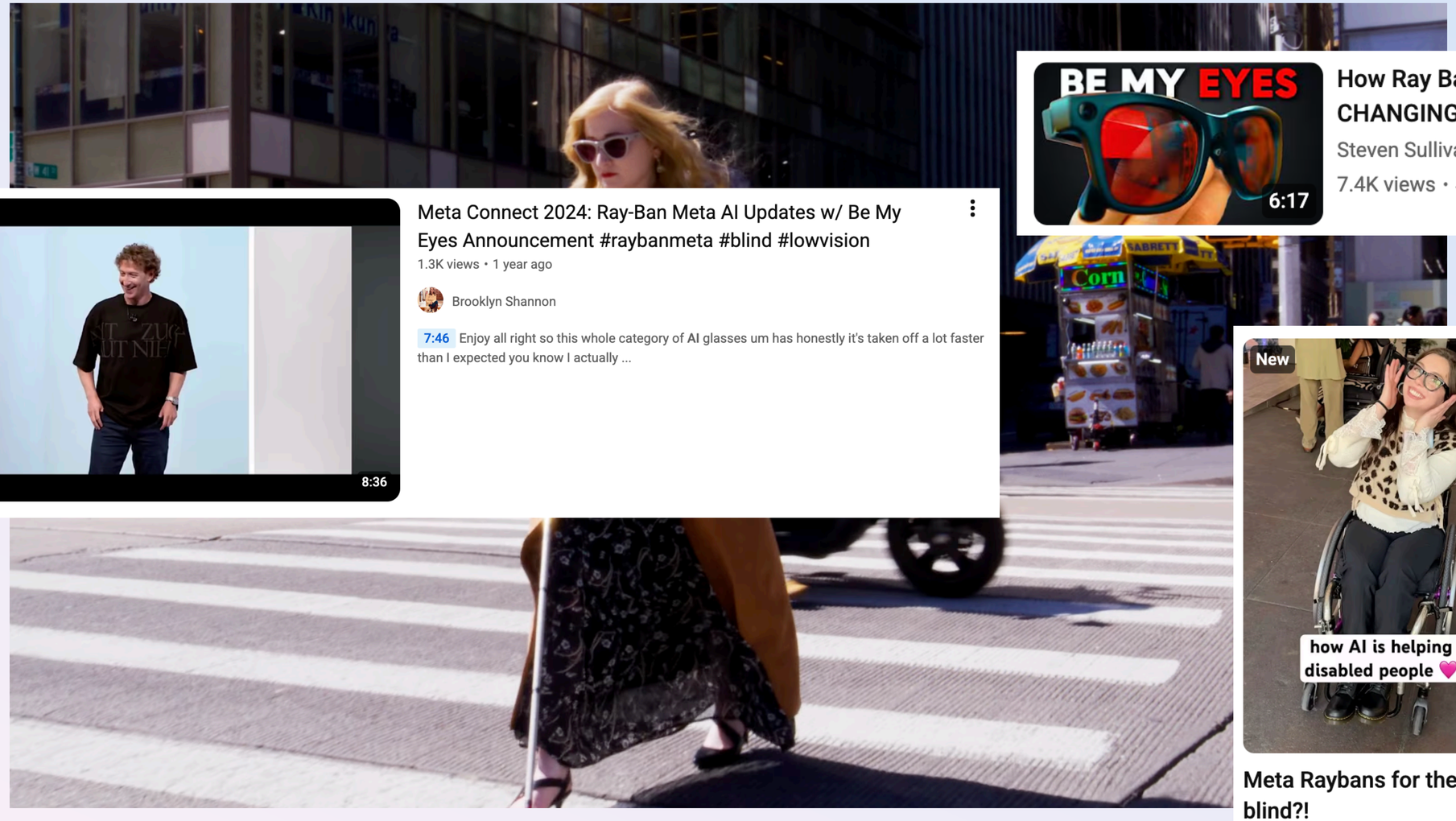
Piggybacking on accessibility: Be My AI



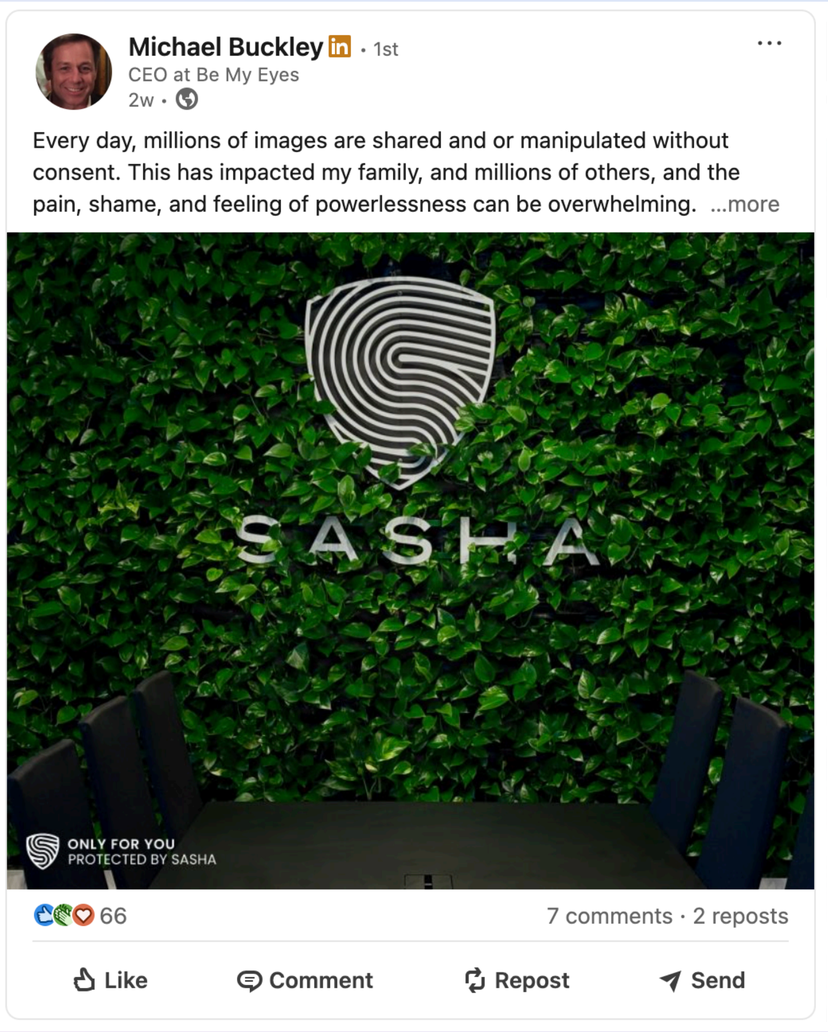
Promotional material for Be My AI at Meta, source: Youtube

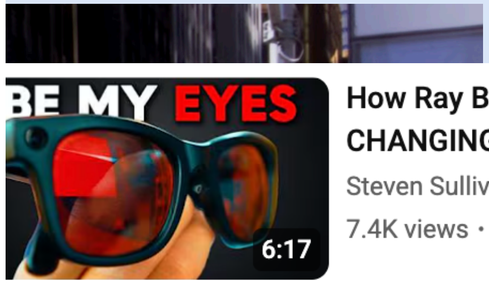
Piggybacking on accessibility: Be My AI



Promotional material for Be My AI at Meta, source: Youtube

Piggybacking on accessibility: Be My AI

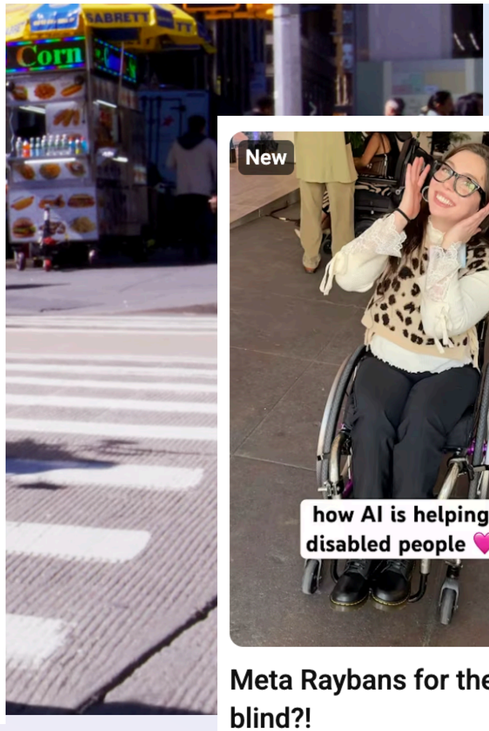




How Ray Ban Meta Is LIFE-CHANGING For Blind People

Steven Sullivan

7.4K views · 4 months ago



Meta Raybans for the blind?!

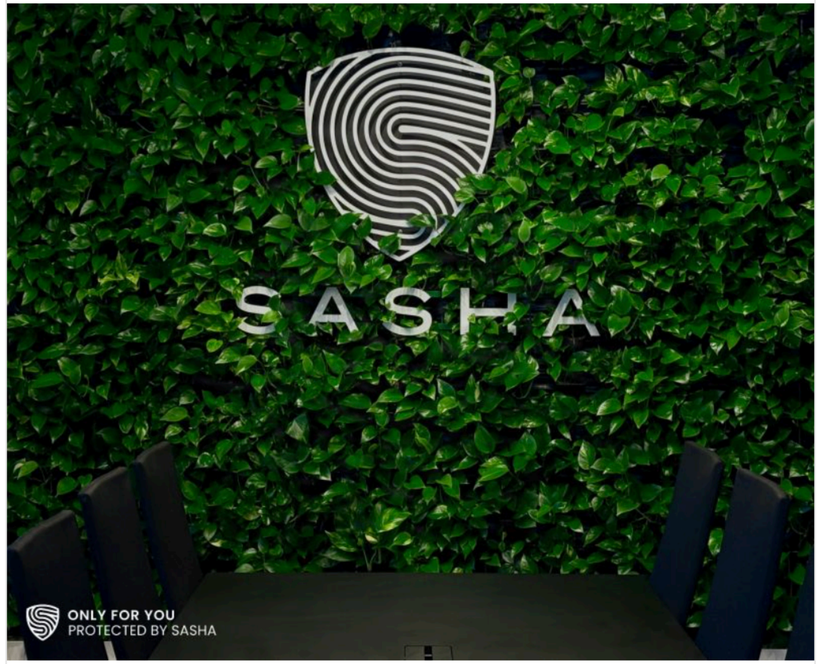
1.5K views

Promotional material for Be My AI at Meta, source: Youtube

Piggybacking on accessibility: Be My AI

Michael Buckley • 1st
CEO at Be My Eyes
2w •

Every day, millions of images are shared and or manipulated without consent. This has impacted my family, and millions of others, and the pain, shame, and feeling of powerlessness can be overwhelming. ...more



66 7 comments · 2 reposts

Like Comment Repost Send

Michael Buckley • 1st
CEO at Be My Eyes
3w • Edited •

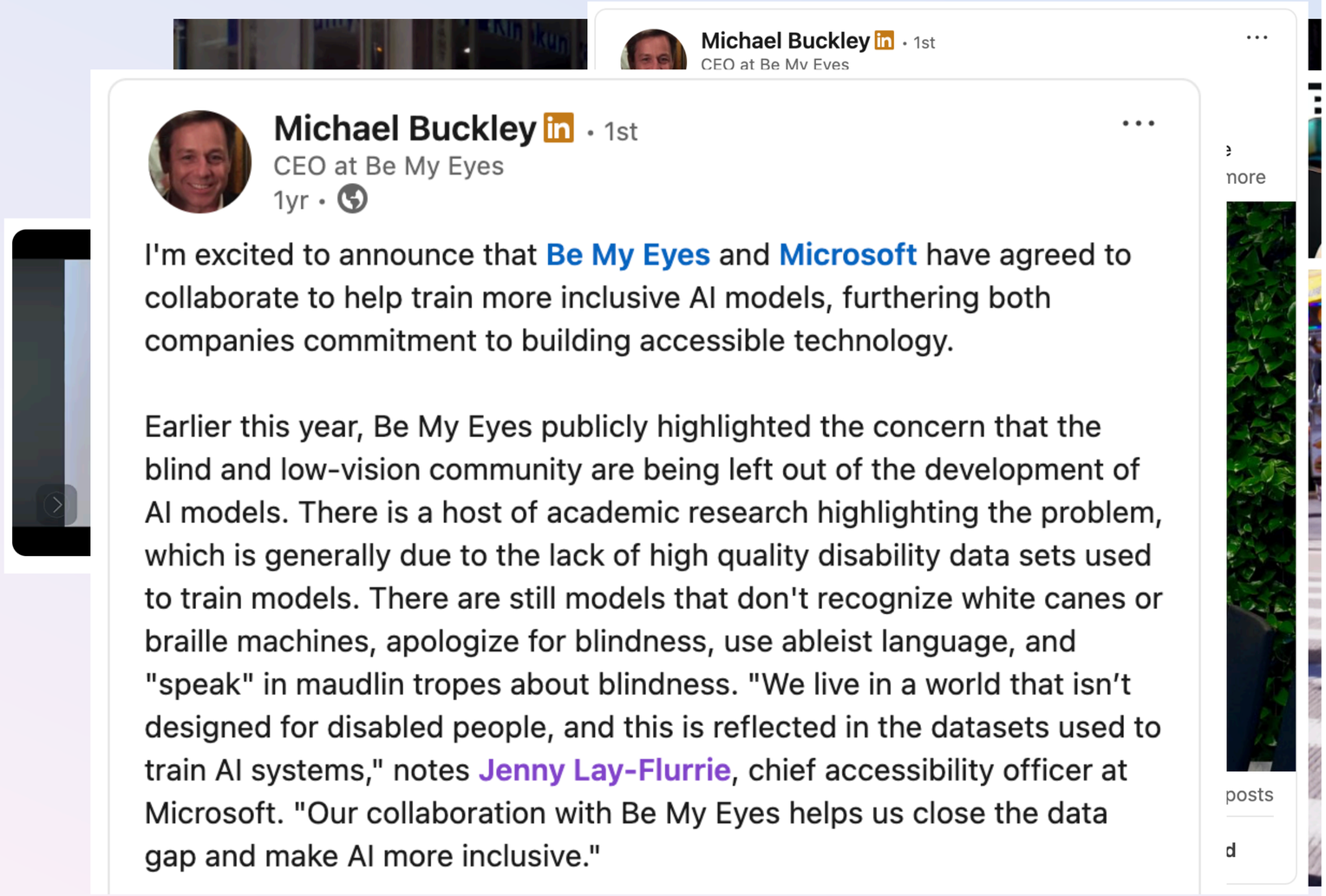
10 billion tokens and counting at Be My Eyes.

Crazy. ...more

Ricardo Gonzalez and 301 others 18 comments · 4 reposts

Promotional material for Be My AI at Meta, source: Youtube

Piggybacking on accessibility: Be My AI



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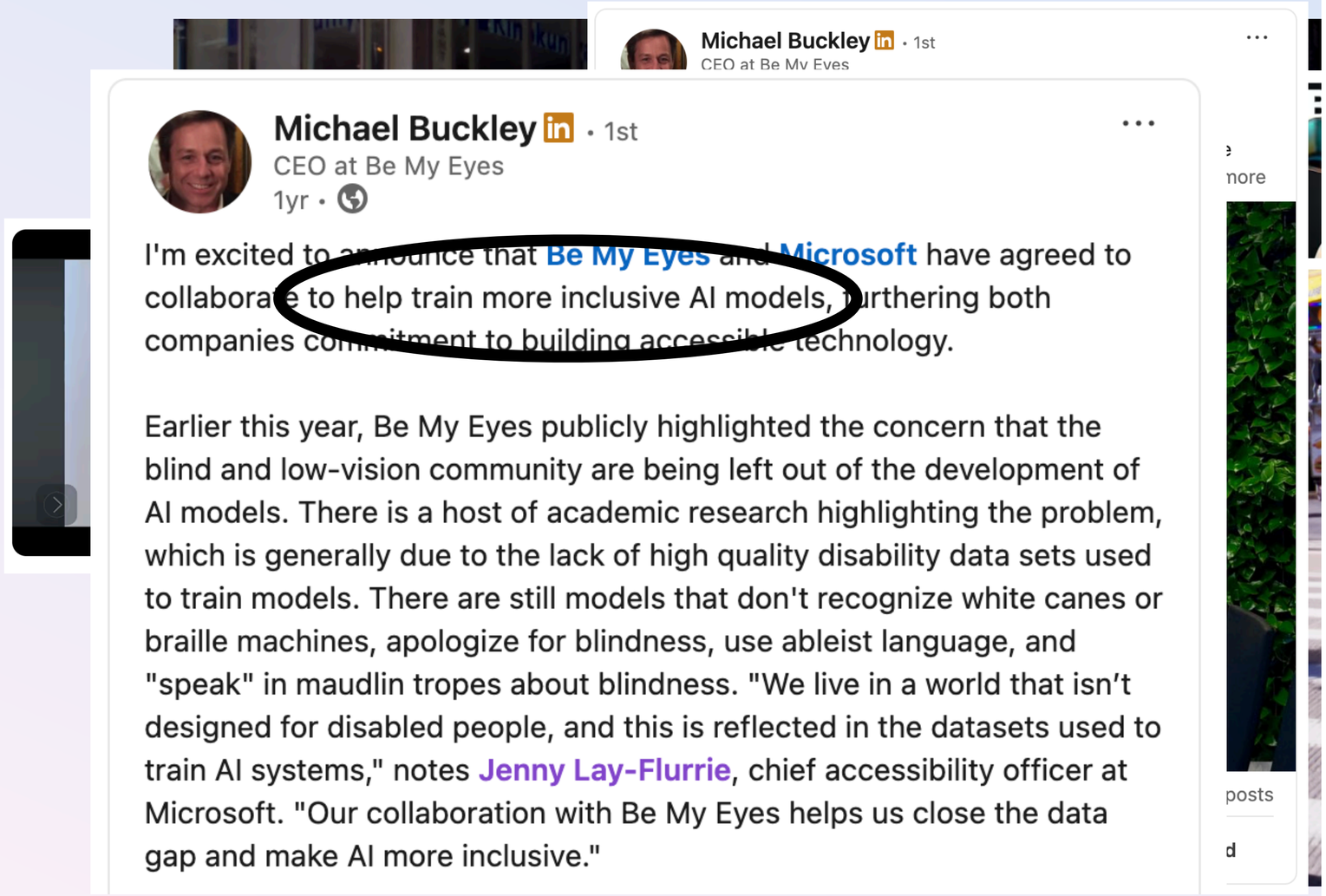

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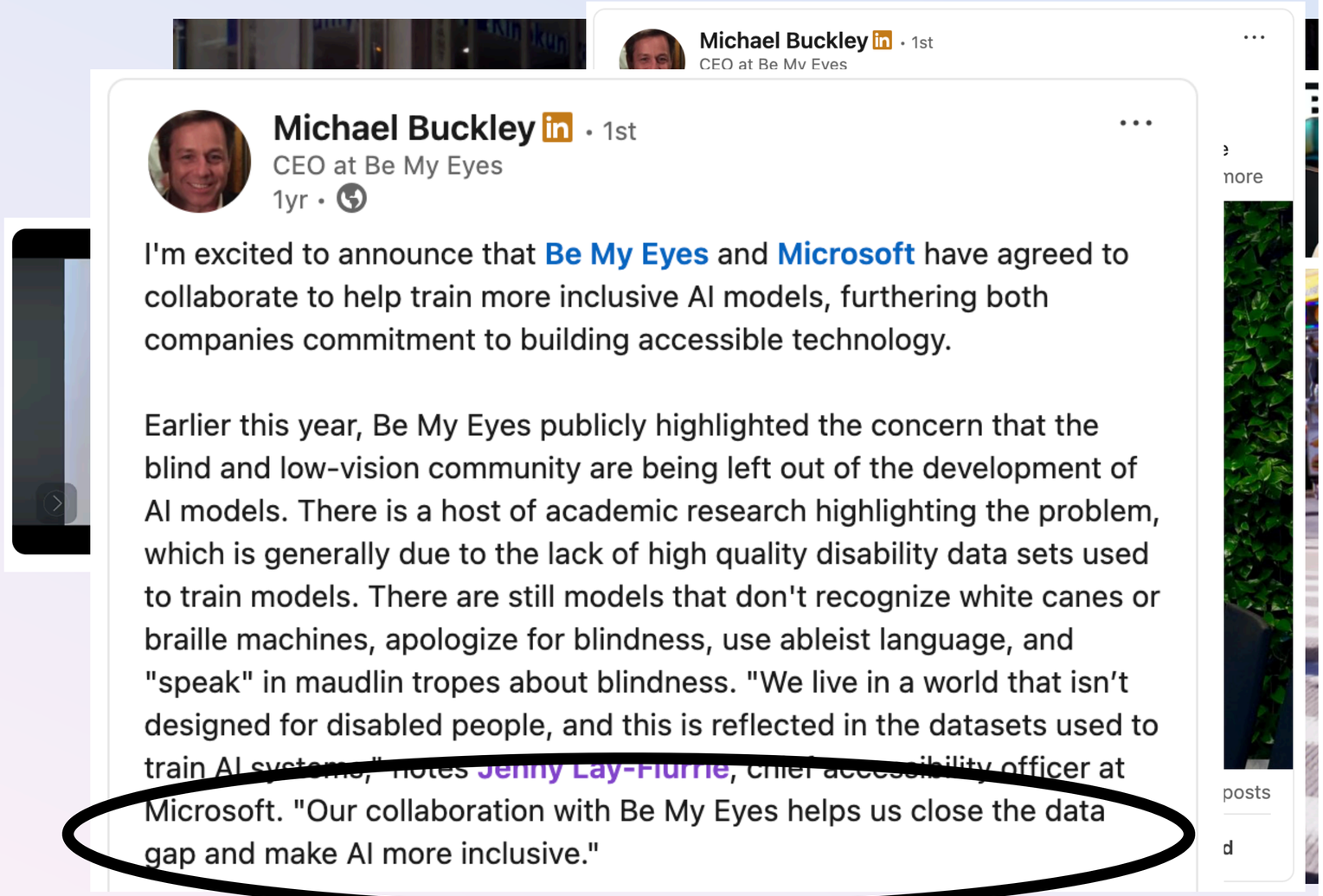
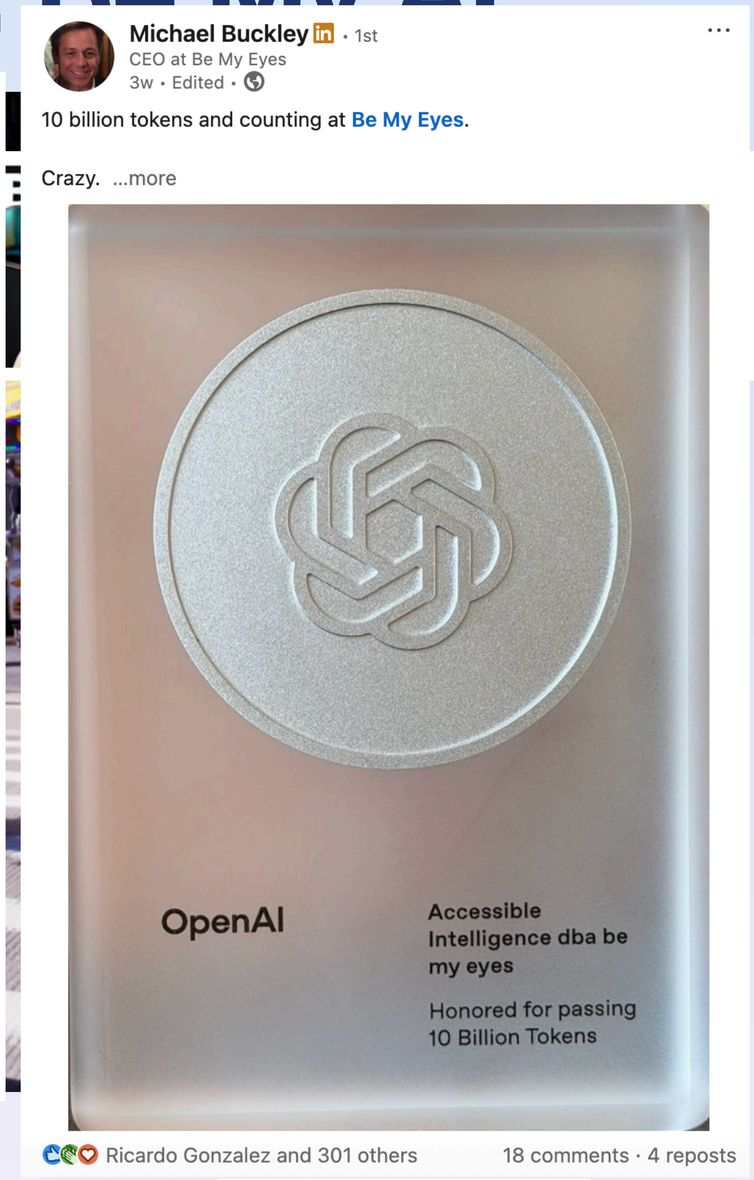
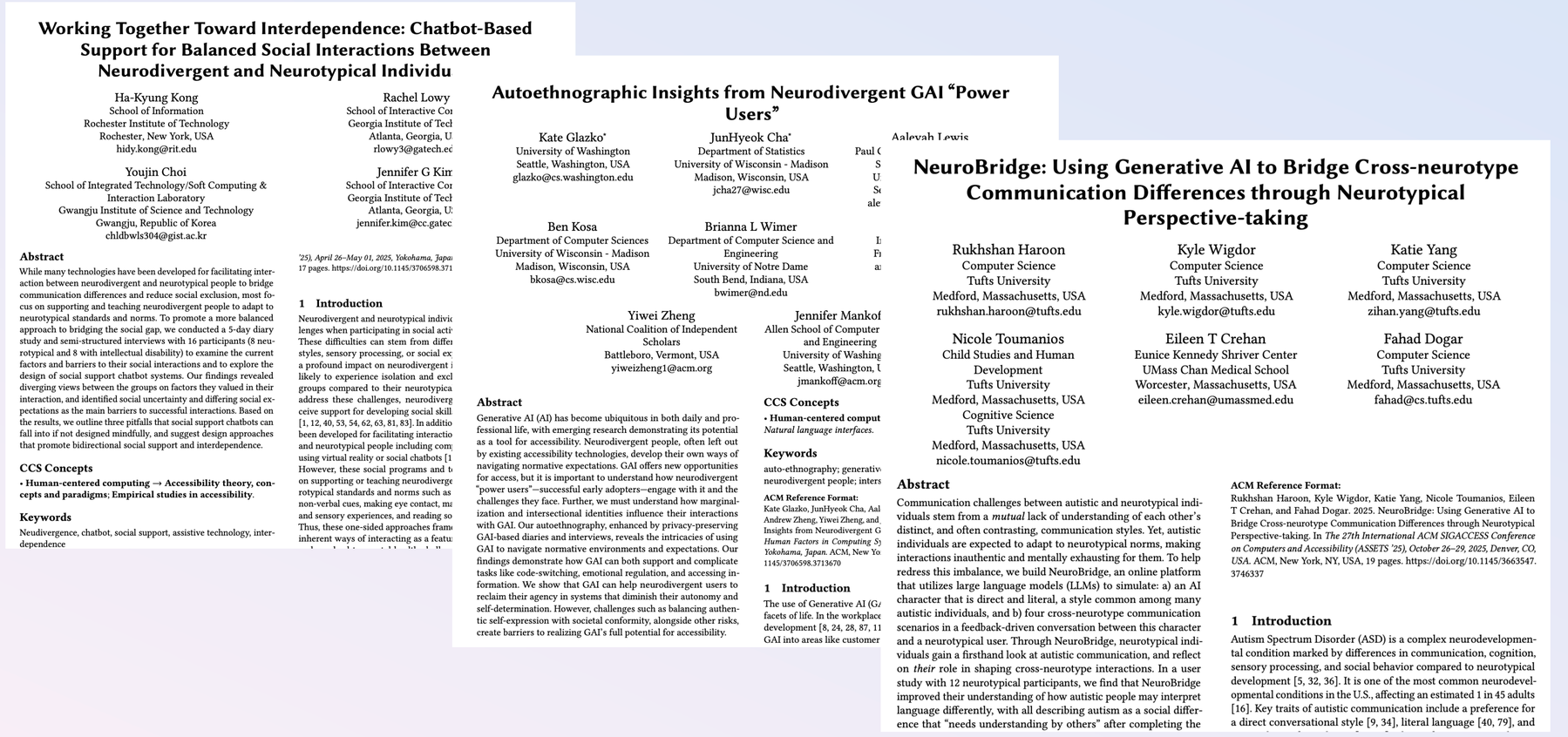




Promotional material for Be My AI at Meta, source: Youtube

Access washing: Have disabled bodies become a way to ethically justify AI?



Working Together Toward Interdependence: Chatbot-Based Support for Balanced Social Interactions Between Neurodivergent and Neurotypical Individu

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Abstract

While many technologies have been developed for facilitating interaction between neurodivergent and neurotypical people to bridge communication differences and reduce social exclusion, most focus on supporting and teaching neurodivergent people to adapt to neurotypical standards and norms. To promote a more balanced approach to bridging the social gap, we conducted a 5-day diary study and semi-structured interviews with 16 participants (8 neurotypical and 8 with intellectual disability) to examine the current factors and barriers to their social interactions and to explore the design of social support chatbot systems. Our findings revealed diverging views between the groups on factors they valued in their interaction, and identified social uncertainty and differing social expectations as the main barriers to successful interactions. Based on the results, we outline three pitfalls that social support chatbots can fall into if not designed mindfully, and suggest design approaches that promote bidirectional social support and interdependence.

CCS Concepts

• **Human-centered computing** → **Accessibility theory, concepts and paradigms**; **Empirical studies in accessibility**.

Keywords

Neudivergence, chatbot, social support, assistive technology, interdependence

'25), April 26–May 01, 2025, Yokohama, Japa
17 pages. https://doi.org/10.1145/3706598.371

1 Introduction

Neurodivergent and neurotypical indivi
lenges when participating in social acti
These difficulties can stem from diffe
styles, sensory processing, or social ex
a profound impact on neurodivergent
likely to experience isolation and excl
groups compared to their neurotypica
address these challenges, neurodiverg
ceive support for developing social skill
[1, 12, 40, 53, 54, 62, 63, 81, 83]. In additio
been developed for facilitating interactio
and neurotypical people including com
using virtual reality or social chatbots [1
However, these social programs and t
on supporting or teaching neurodiverge
rotypical standards and norms such as
non-verbal cues, making eye contact, ma
and sensory experiences, and reading so
Thus, these one-sided approaches frame
inherent ways of interacting as a featu

Autoethnographic Insights from Neurodivergent GAI "Power Users"

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S
U
Sc
ale

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Jennifer Mankof
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Abstract

Generative AI (AI) has become ubiquitous in both daily and professional life, with emerging research demonstrating its potential as a tool for accessibility. Neurodivergent people, often left out by existing accessibility technologies, develop their own ways of navigating normative expectations. GAI offers new opportunities for access, but it is important to understand how neurodivergent "power users"—successful early adopters—engage with it and the challenges they face. Further, we must understand how marginalization and intersectional identities influence their interactions with GAI. Our autoethnography, enhanced by privacy-preserving GAI-based diaries and interviews, reveals the intricacies of using GAI to navigate normative environments and expectations. Our findings demonstrate how GAI can both support and complicate tasks like code-switching, emotional regulation, and accessing information. We show that GAI can help neurodivergent users to reclaim their agency in systems that diminish their autonomy and self-determination. However, challenges such as balancing authentic self-expression with societal conformity, alongside other risks, create barriers to realizing GAI's full potential for accessibility.

CCS Concepts

• **Human-centered comput**
Natural language interfaces.

Keywords

auto-ethnography; generativ
neurodivergent people; inters

ACM Reference Format:
Kate Glazko, JunHyeok Cha, Aal
Andrew Zheng, Yiwei Zheng, and
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1 Introduction

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Aalevah Lewis

NeuroBridge: Using Generative AI to Bridge Cross-neurotype Communication Differences through Neurotypical Perspective-taking

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Abstract

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1 Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition marked by differences in communication, cognition, sensory processing, and social behavior compared to neurotypical development [5, 32, 36]. It is one of the most common neurodevelopmental conditions in the U.S., affecting an estimated 1 in 45 adults [16]. Key traits of autistic communication include a preference for a direct conversational style [9, 34], literal language [40, 79], and

Executive dysfunction and *autism* have become central points of discussion, legitimizing genAI

Working Together Toward Interdependence: Chatbot-Based Support for Balanced Social Interactions Between Neurodivergent and Neurotypical Individu

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Abstract

While many technologies have been developed for facilitating interaction between neurodivergent and neurotypical people to bridge communication differences and reduce social exclusion, most focus on supporting and teaching neurodivergent people to adapt to neurotypical standards and norms. To promote a more balanced approach to bridging the social gap, we conducted a 5-day diary study and semi-structured interviews with 16 participants (8 neurotypical and 8 with intellectual disability) to examine the current factors and barriers to their social interactions and to explore the design of social support chatbot systems. Our findings revealed diverging views between the groups on factors they valued in their interaction, and identified social uncertainty and differing social expectations as the main barriers to successful interactions. Based on the results, we outline three pitfalls that social support chatbots can fall into if not designed mindfully, and suggest design approaches that promote bidirectional social support and interdependence.

CCS Concepts

• **Human-centered computing** → **Accessibility theory, concepts and paradigms**; **Empirical studies in accessibility**.

Keywords

Neudivergence, chatbot, social support, assistive technology, interdependence

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Autoethnographic Insights from Neurodivergent GAI "Power Users"

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Abstract

Generative AI (AI) has become ubiquitous in both daily and professional life, with emerging research demonstrating its potential as a tool for accessibility. Neurodivergent people, often left out by existing accessibility technologies, develop their own ways of navigating normative expectations. GAI offers new opportunities for access, but it is important to understand how neurodivergent "power users"—successful early adopters—engage with it and the challenges they face. Further, we must understand how marginalization and intersectional identities influence their interactions with GAI. Our autoethnography, enhanced by privacy-preserving GAI-based diaries and interviews, reveals the intricacies of using GAI to navigate normative environments and expectations. Our findings demonstrate how GAI can both support and complicate tasks like code-switching, emotional regulation, and accessing information. We show that GAI can help neurodivergent users to reclaim their agency in systems that diminish their autonomy and self-determination. However, challenges such as balancing authentic self-expression with societal conformity, alongside other risks, create barriers to realizing GAI's full potential for accessibility.

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• **Human-centered comput**
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"It's the only thing I can trust": Envisioning Large Language Model Use by Autistic Workers for Communication Assistance

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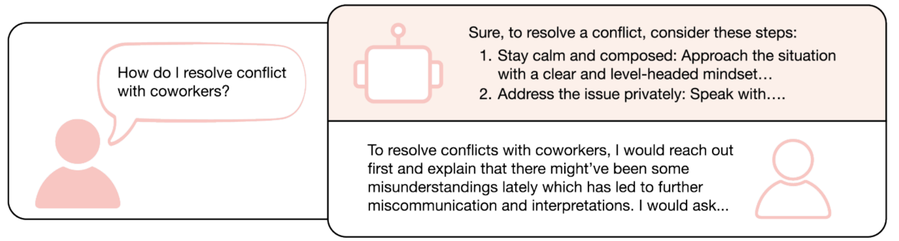

Figure 1: We investigate opportunities and risks from autistic workers' use of LLMs for assistance with social communication and scenarios and had participants juxtapose LLM and human confederate-generated responses. A question from one of our participant sessions is displayed, along with corresponding LLM and human confederate replies.

ABSTRACT

Autistic adults often experience stigma and discrimination at work, leading them to seek social communication support from coworkers, friends, and family despite emotional risks. Large language models (LLMs) are increasingly considered an alternative. In this work, we investigate the phenomenon of LLM use by autistic adults at work and explore opportunities and risks of LLMs as a source of social communication advice. We asked 11 autistic participants to present questions about their own workplace-related social difficulties to (1) a GPT-4-based chatbot and (2) a disguised human confederate. Our evaluation shows that participants strongly preferred LLM over confederate interactions. However, a coach specializing in supporting autistic job-seekers raised concerns that the LLM was dispensing questionable advice. We highlight how this divergence in participant and practitioner attitudes reflects existing schisms in HCI on the relative privileging of end-user wants versus normative good and propose design considerations for LLMs to center autistic experiences.

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KEYWORDS

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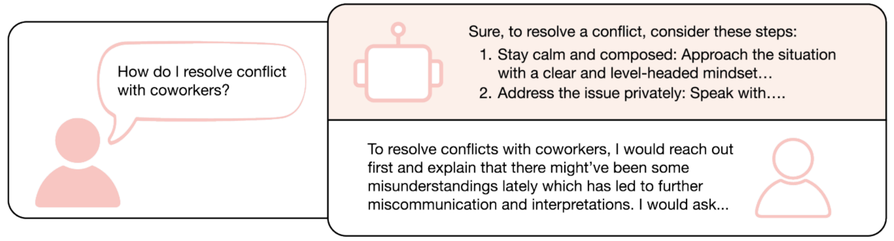

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KEYWORDS

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In order for AI to grant “ability,”
it requires the user to be *disabled*.

Re-defining disability:

Painting with Cameras and Drawing with Text: AI Use in Accessible Creativity

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Abstract

Generative AI (GAI) is proliferating, and among its many applications are to support creative work (e.g., generating text, images, music) and to enhance accessibility (e.g., captions of images and audio). As GAI evolves, creatives must consider how (or how not) to incorporate these tools into their practices. In this paper, we present interviews at the intersection of these applications. We learned from 10 creatives with disabilities who intentionally use and do not use GAI in and around their creative work. Their mediums ranged from audio engineering to leatherwork, and they collectively experienced a variety of disabilities, from sensory to motor to invisible disabilities. We share cross-cutting themes of their access hacks, how creative practice and access work become entangled, and their perspectives on how GAI should and should not fit into their workflows. In turn, we offer qualities of accessible creativity with responsible AI that can inform future research.

CCS Concepts

• **Human-centered computing → Empirical studies in accessibility**.

Keywords

Accessibility, creativity, disability, generative AI, responsible AI

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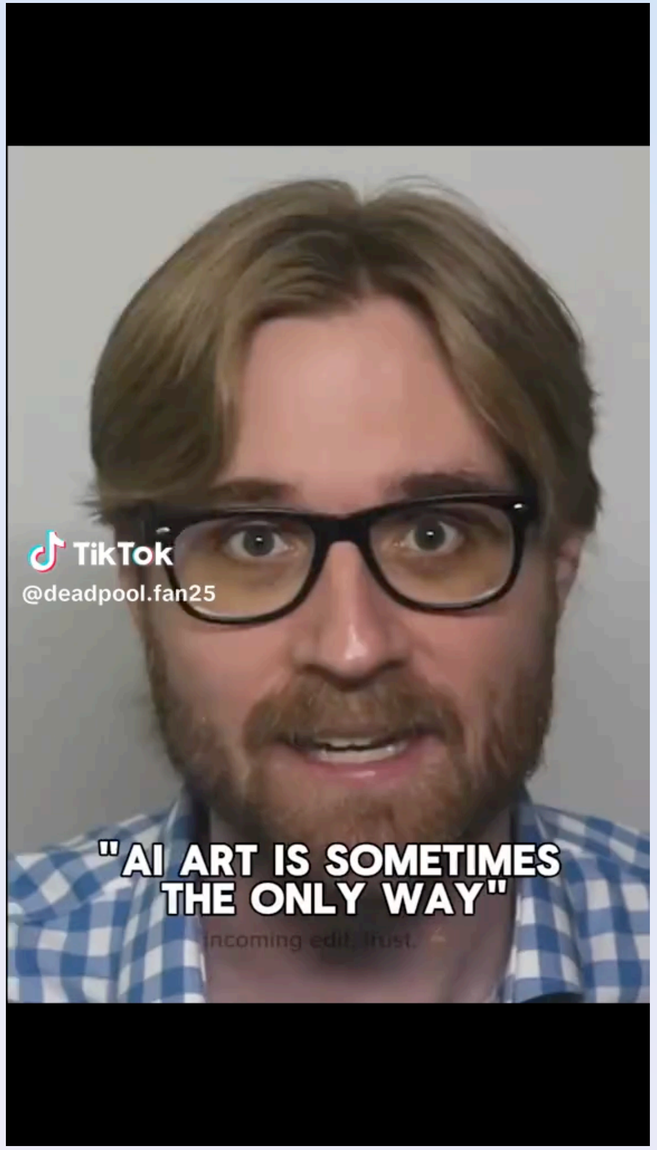
1 Introduction

Generative artificial intelligence (GAI) is raising excitement and concern regarding its impacts on creatives. One common example is the rise of natural language interfaces of text-to-image (T2I) machine learning (ML) models that enable users to input text prompts and get back images, songs, and videos. These interactions and capabilities have sparked conversation and experimentation on how creativity may evolve in exciting and concerning ways [29, 109]. For example, new art movements, such as "promptism," followed the public release of multimodal tools [52, 72]; and artists in the wider art-and-technology community have long incorporated ML into visual art, showing work in traditional art museums (e.g., [3]). Meanwhile, these same tools raise concerns about where and how training data is sourced and whether it includes copyrighted material [18, 58, 96], and in response, resources and tools are being developed to protect artists [19, 105, 106]. Amidst this discourse, what counts as "art" (e.g., prompt engineering text input into a T2I tool) has been called into question, with assertions that "AI art is not art" [53, 76, 104].

The question of what counts as art and who counts as an artist implicates logics of inclusion and exclusion in the context of creativity. By *creativity*, we mean the broad scope of practices united by processes that lead to new artifacts, outcomes, or actions within a specific context ([60, p. 6]; see also: [47, 98]). Despite this broad conception, creative communities and institutions have paradoxically not always welcomed people with disabilities as creators or consumers [60]. From the inaccessible architecture and social norms of creative spaces [67, 107] to narrow techniques and processes considered "correct" that result in "good" art, people with disabilities have experienced friction and outright hostility in pursuing creative endeavors [24, 41, 62]. Though GAI may improve digital accessibility [49, 97], research suggests GAI for creativity already follows other exclusionary art domains, as these tools, including T2I interfaces, are inaccessible to some users [36, 55, 114]. Inaccessible GAI products prevent disabled creatives from fully participating in the evolution of creative tools and the important discourses and actions taken toward their responsible development and use in creative domains [58, 109].

*Cynthia L. Bennett and Renee Shelby contributed equally to this research



Making good tech isn’t enough: We need preventative, proactive policies

But also: is policy enough? What other ways can we do *prefigurative justice* in AIS?

But also: is policy enough? What other ways can we do *prefigurative justice* in AIS?

How do you use Chartability?

There are a lot of different ways to perform an audit, and so there are also many different ways to use Chartability. Sometimes an audit is as casual as checking your work while you do it. And other times it is a big affair that involves teams of specialists and lawyers.

Realistically, while a highly trained auditor may be able to casually evaluate an artifact in as little as 30 minutes or even hold heuristics in mind as they are doing their own creative work, those new to auditing may take anywhere between 1 and 4 hours to complete a full pass of Chartability. Professional audits, which can take weeks or months, often include multiple auditors and provide rigorous documentation and detailed recommendations for remediation. Typically in the form of a report, Chartability is meant to serve both quick pass and deep dive styles of audits, so users are expected to leverage it as they see fit.

Below we give an example of what might be a fast pass audit, using Chartability. In 5 steps. This isn't super thorough, but it is good way to quickly check a handful of access barriers quickly.

1. Visual Testing

Contrast Checker

Figure 1: A low contrast chart (left) compared to a higher contrast version (right). A dropper tool is extracting the fill color of the bar and then a contrast ratio has been calculated. Note that the fill color is the same on both bars, but darker borders have been added to ensure the visualization passes contrast tests.

Checking for contrast is the most common critical failure across all of our audits (88% of audits failed this heuristic. In order to evaluate contrast, often a combination of automatic (code-driven) and manual tooling is performed. When manually auditing, practitioners typically use a dropper and a contrast calculator (Figure 1). Contrast is measured by finding adjacent colors that are intended to convey meaning or boundaries, and finding a ratio between them. Standards require a different minimum contrast for text (4.5:1) than geometries can be tricky to handle. Testing for contrast accomplishes 3 different heuristics in Chartability: ensuring text/geometries have contrast, interactive states for elements have enough contrast, and the keyboard focus indicator is easy to distinguish.

On Tools, AI, and Disability

What do we mean when we say that "AI is a tool," and what does disability have to do with it?

- **Produce a book** with 4 areas of focus, each with a contributing chapter by myself and by at least 1 or 2 peers (>50% with a disability, intersectional):
  1. Technologies of *control* and *capture,* from tailgating/piggybacking on assistive technology to accessibility-surveillance
  2. The complex entanglement of people with disabilities and AI tools: auto-ethnographic studies of use, refusal, and resistance
  3. Access washing: using neurodiversity, blindness, and more to justify generative AI
  4. The “tool model of disability” or ways that disabled bodies contribute to, and are constructed by, tool-technologies

Teaching and course contributions in AIS

(Or possible dream courses that I'd love to teach)

- (Introductory) **Technology, Power, and Justice**
- (Mid-level, theory/sts) **Data Justice** *or* **Visualization and Society**
- (Mid-level, practical hci) **Designing and Prototyping Data Tools**
- (Graduate seminar + prototyping lab) **Disability, Data, and Resistance**
- (Advanced/small-group "research seminar") **Philosophy of Tools, From the Hammer to the Algorithm**

2025

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