

Oh, the Places You've Been!

User Reactions to Longitudinal Transparency About
Third-Party Web Tracking and Inferencing



BY

Ben Weinshel

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Shawn Shan

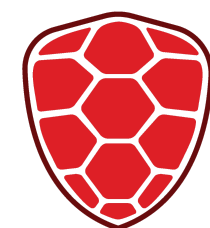
Claire Dolin

Michelle L. Mazurek

Blase Ur

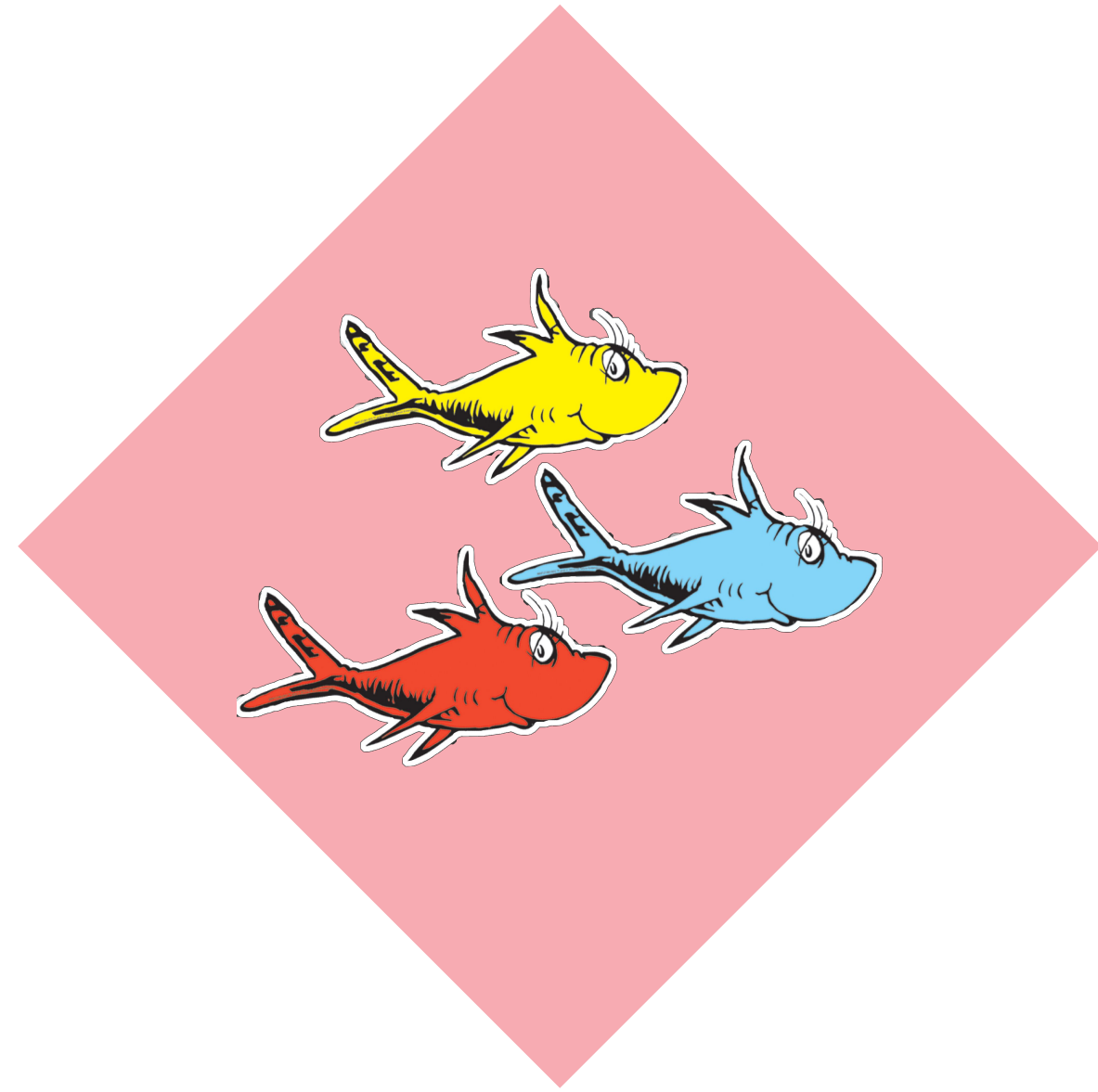


Security, Usability, & Privacy
Education & Research



SP²
SECURITY. PRIVACY. PEOPLE

this talk will contain
many references to Dr. Seuss







user-facing tracking controls

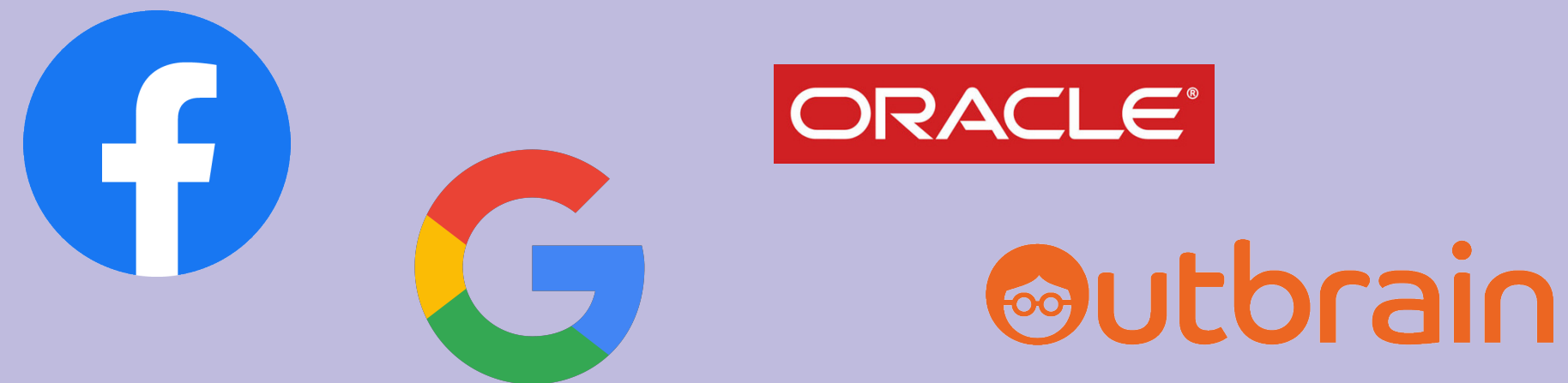
ad- & tracker-blocking extensions



built-in browser defenses



privacy dashboards



Dr. Seuss' Horton Hears a Who! x +

rottentomatoes.com/m/horton_hears_a_who2008

What's the Tomatometer®? Critics SIGN UP | LOG IN

Rotten Tomatoes Search movies, TV, actors, more...

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TRENDING ON RT Best Netflix Horror Movies Rotten Movies We Love Scare Central Fall TV

IN THEATERS DVD & STREAMING TV SHOWS

TOP DVD & STREAMING

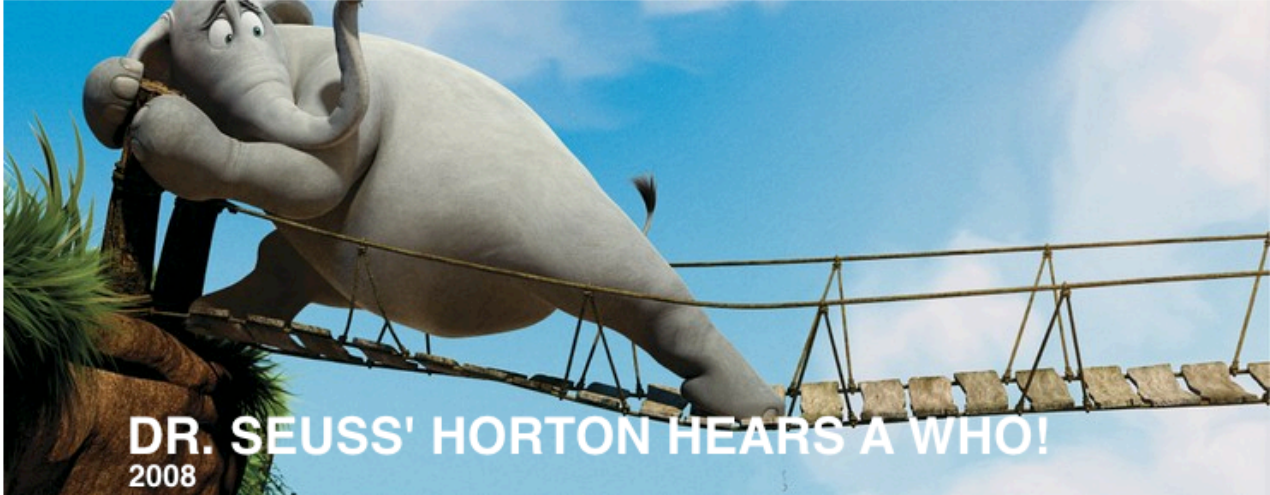
- 99% The Farewell
- 79% Good Boys
- 73% The Angry Birds Movie 2
- 41% 47 Meters Down: Unca...
- 92% Luce

[View All](#)

NEW ON DVD/STREAMING THIS WEEK

- 99% The Farewell
- 79% Good Boys
- 73% The Angry Birds Movie 2
- 41% 47 Meters Down: Unca...
- 92% Luce

[View All](#)



DR. SEUSS' HORTON HEARS A WHO!
2008

JIM CARREY STEVE CARELL

DR. SEUSS' HORTON HEARS A WHO!

Critics Consensus

Horton Hears A Who! is both whimsical and heartwarming, and is the rare Dr. Seuss adaptation that stays true to the spirit of the source material.

FRESH 79% **POP CORN 73%**



GHOSTERY Simple View Detailed View

Upgrade to *Plus*

25

www.rottentomatoes.com

Trackers Blocked: 11
Requests Modified: 6
Page Load: -

Trust Site

Restrict Site

Pause Ghostery

OFF ON ON

TRACKERS Block All

Collapse All

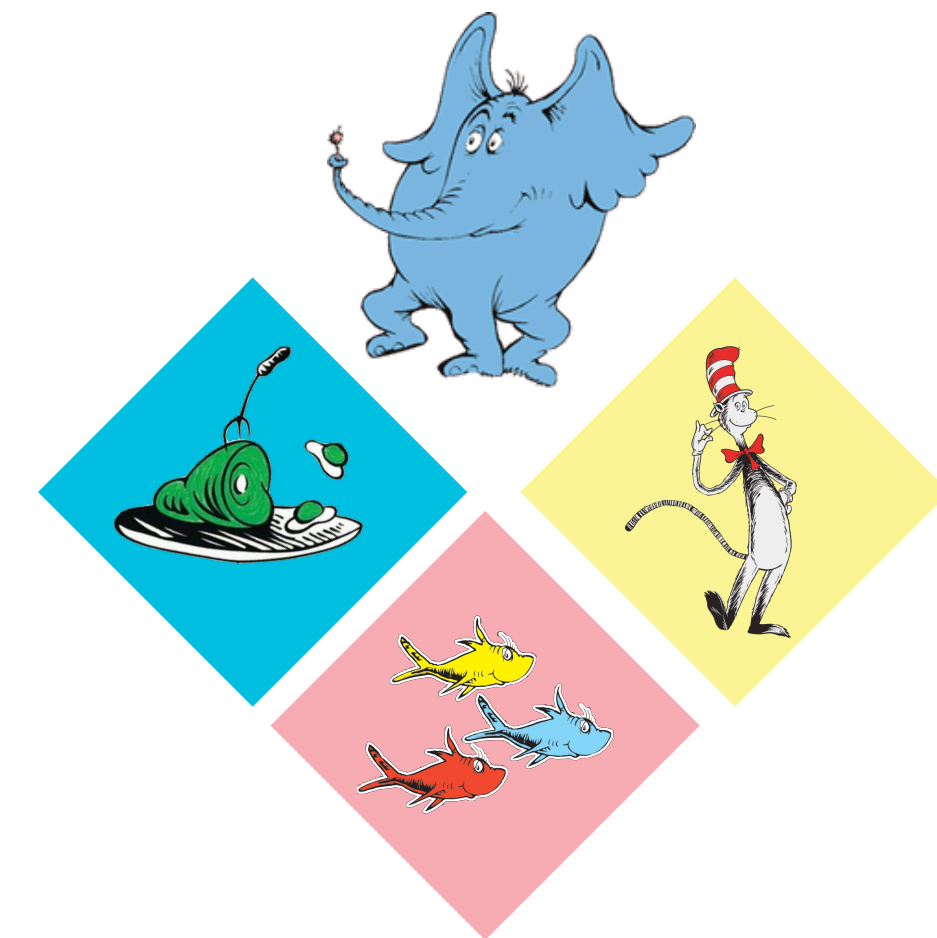
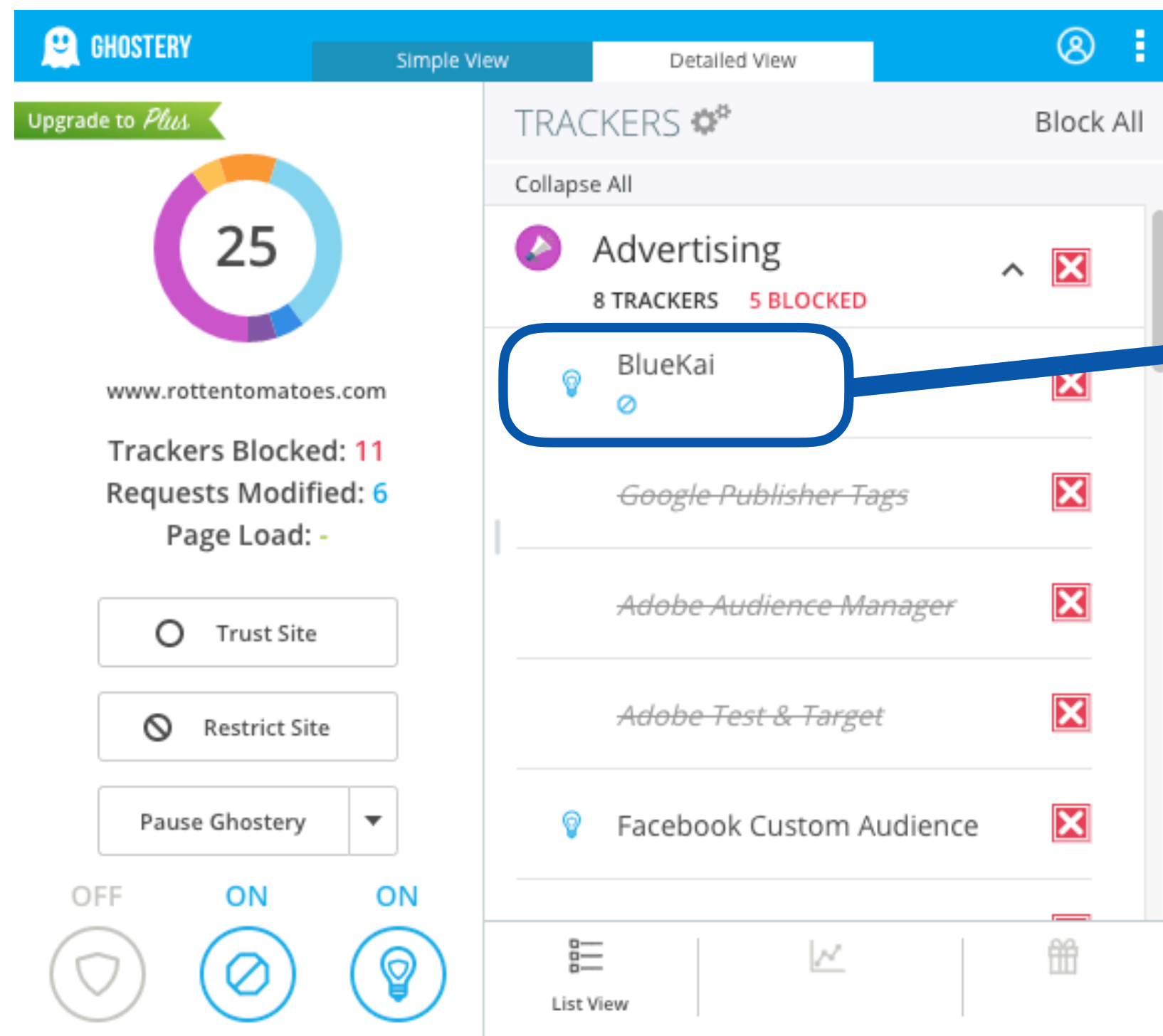
Advertising 8 TRACKERS 5 BLOCKED

- BlueKai
- Google Publisher Tags
- Adobe Audience Manager
- Adobe Test & Target
- Facebook Custom Audience

List View



current tools only provide snapshots of tracking



privacy dashboards are limited

How your ads are personalized

Ads are based on personal info you've added to your Google Account, data from advertisers that partner with Google, and Google's estimation of your interests. Choose any factor to learn more or update your preferences. [Learn more](#)



18-24 years old



Female

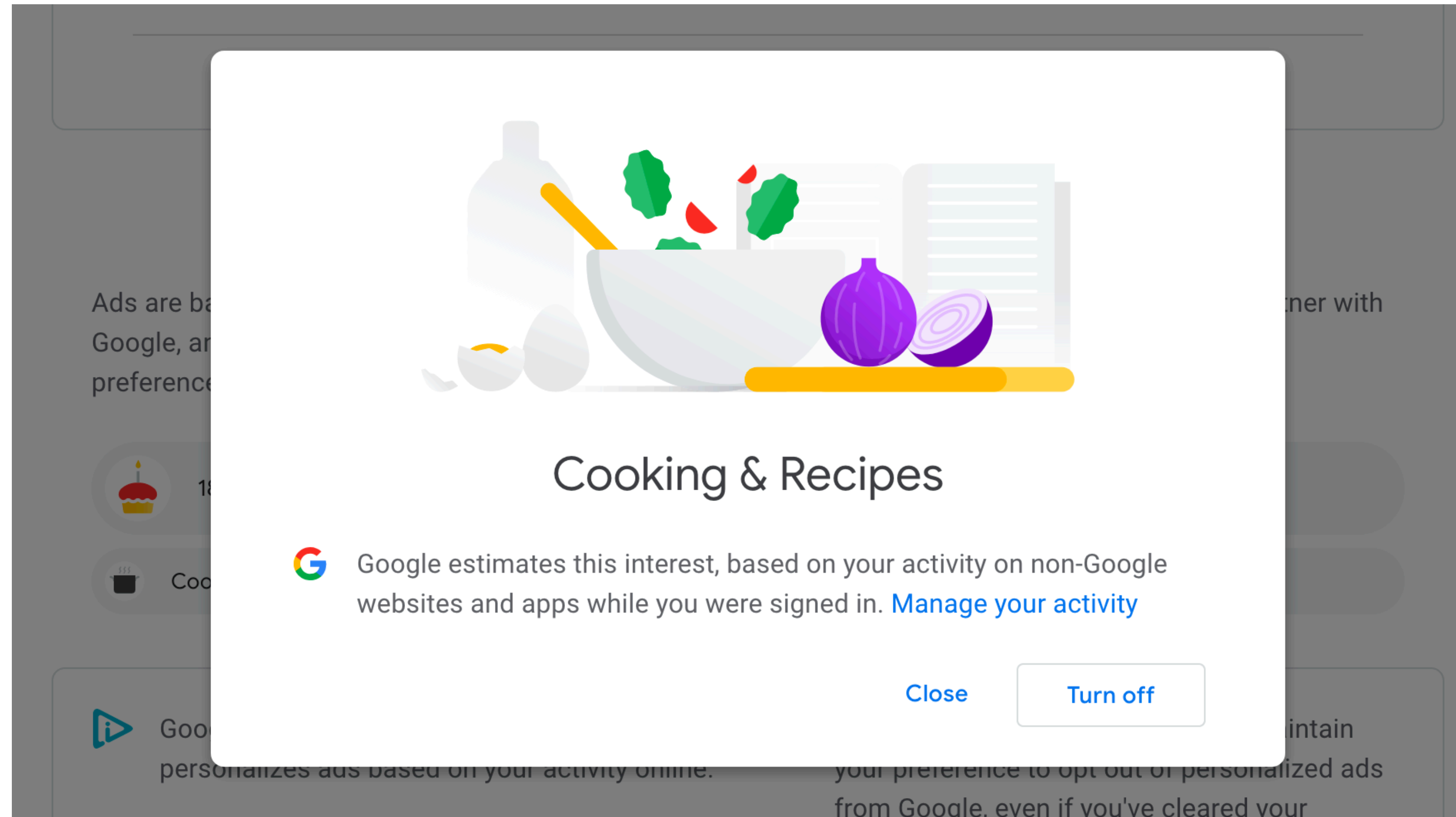


Cooking & Recipes



Shopping

privacy dashboards are limited



Autos & Vehicles>Vehicle Brands>Mitsubishi
Autos & Vehicles>Vehicle Brands>Nissan
Autos & Vehicles>Vehicle Brands>Nissan>Infiniti
Autos & Vehicles>Vehicle Brands>Peugeot
Autos & Vehicles>Vehicle Brands>Pontiac
Autos & Vehicles>Vehicle Brands>Porsche
Autos & Vehicles>Vehicle Brands>Renault-Samsung
Autos & Vehicles>Vehicle Brands>Rolls-Royce
Autos & Vehicles>Vehicle Brands>Saab
Autos & Vehicles>Vehicle Brands>Saturn
Autos & Vehicles>Vehicle Brands>Subaru
Autos & Vehicles>Vehicle Brands>Suzuki
Autos & Vehicles>Vehicle Brands>Toyota
Autos & Vehicles>Vehicle Brands>Toyota>Scion
Autos & Vehicles>Vehicle Brands>Vauxhall-Opel
Autos & Vehicles>Vehicle Brands>Volkswagen
Autos & Vehicles>Vehicle Brands>Volvo
Autos & Vehicles>Vehicle Licensing & Registration
Autos & Vehicles>Vehicle Maintenance
Autos & Vehicles>Vehicle Parts & Accessories
Autos & Vehicles>Vehicle Parts & Accessories>Auto Exterior
Autos & Vehicles>Vehicle Parts & Accessories>Auto Interior
Autos & Vehicles>Vehicle Parts & Accessories>Engine & Transmission
Autos & Vehicles>Vehicle Parts & Accessories>Vehicle Fuels & Lubricants
Autos & Vehicles>Vehicle Parts & Accessories>Vehicle Wheels & Tires
Autos & Vehicles>Vehicle Shopping
Autos & Vehicles>Vehicle Shopping>Fuel Economy & Gas Prices
Autos & Vehicles>Vehicle Shopping>Vehicle Specs, Reviews & Comparisons
Autos & Vehicles>Vehicle Shows
Beauty & Fitness
Beauty & Fitness>Beauty Pageants
Beauty & Fitness>Body Art
Beauty & Fitness>Cosmetic Procedures
Beauty & Fitness>Cosmetic Procedures>Cosmetic Surgery



Google Ads

WANT: longitudinal data about **which trackers** made **which inferences** about you and **based on which browsing activity**

???

[Ur et al. 2012,
Warsaw et al. 2016]



outline

1. motivation

2. our tool

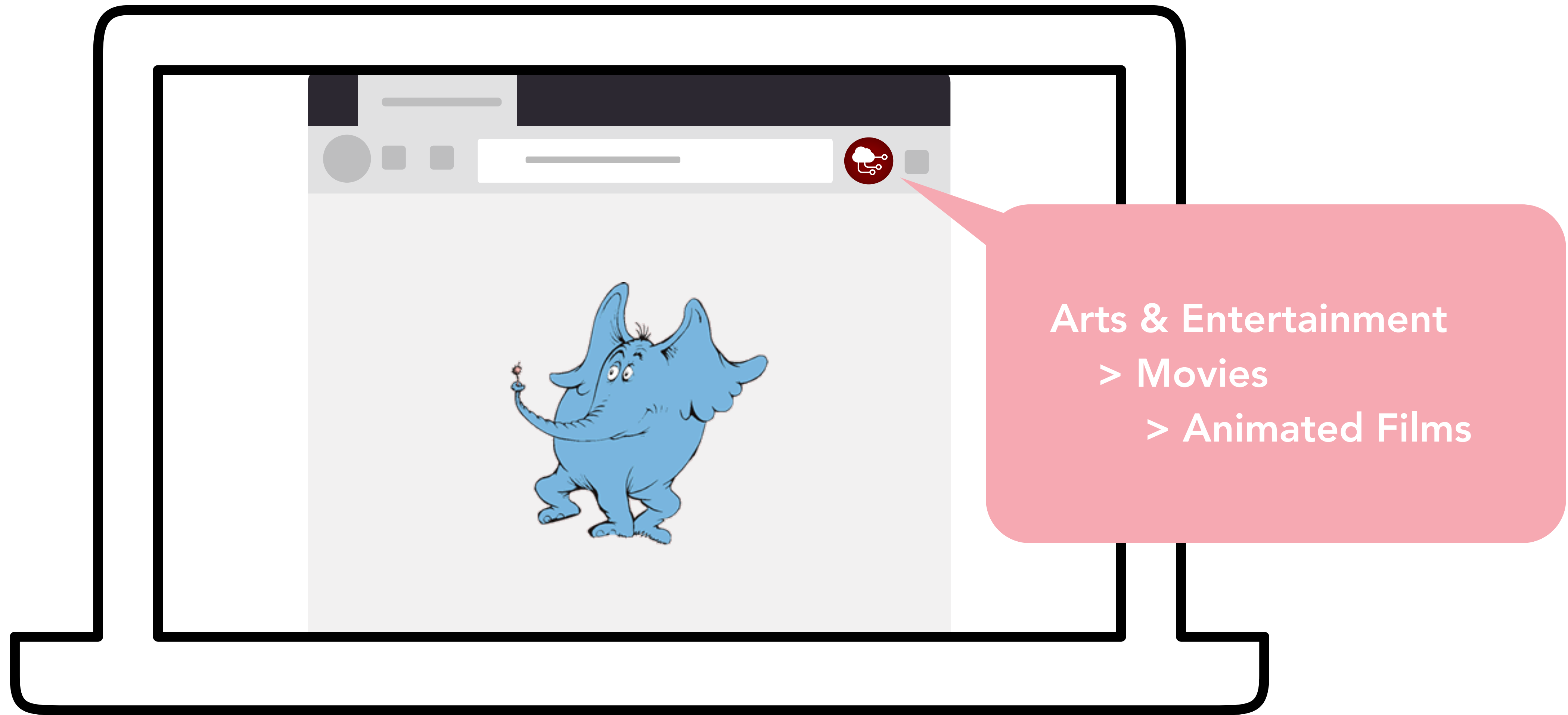
3. method

4. results

5. conclusion



how it works



topic modeling algorithm



Google Ads

+



WIKIPEDIA
The Free Encyclopedia

use 1,932
categories as
potential topics

extract &
preprocess text

TF-IDF (+Word2Vec)
LDA (+W2V)
TextRank (+W2V)
LSTM+W2V (sm/lg)
random

games

keyword1,
keyword2,
...

movies

keyword1,
keyword2,
...

...

keyword1,
keyword2,
...

chosen based on 2 online experiments

1) crowdsourced accuracy

- 187 participants, 9 topic-page pairings each

2) crowdsourced accuracy + precision:

- 54 participants, 12 topic-page-display triples each

topic modeling algorithm



Google Ads

+



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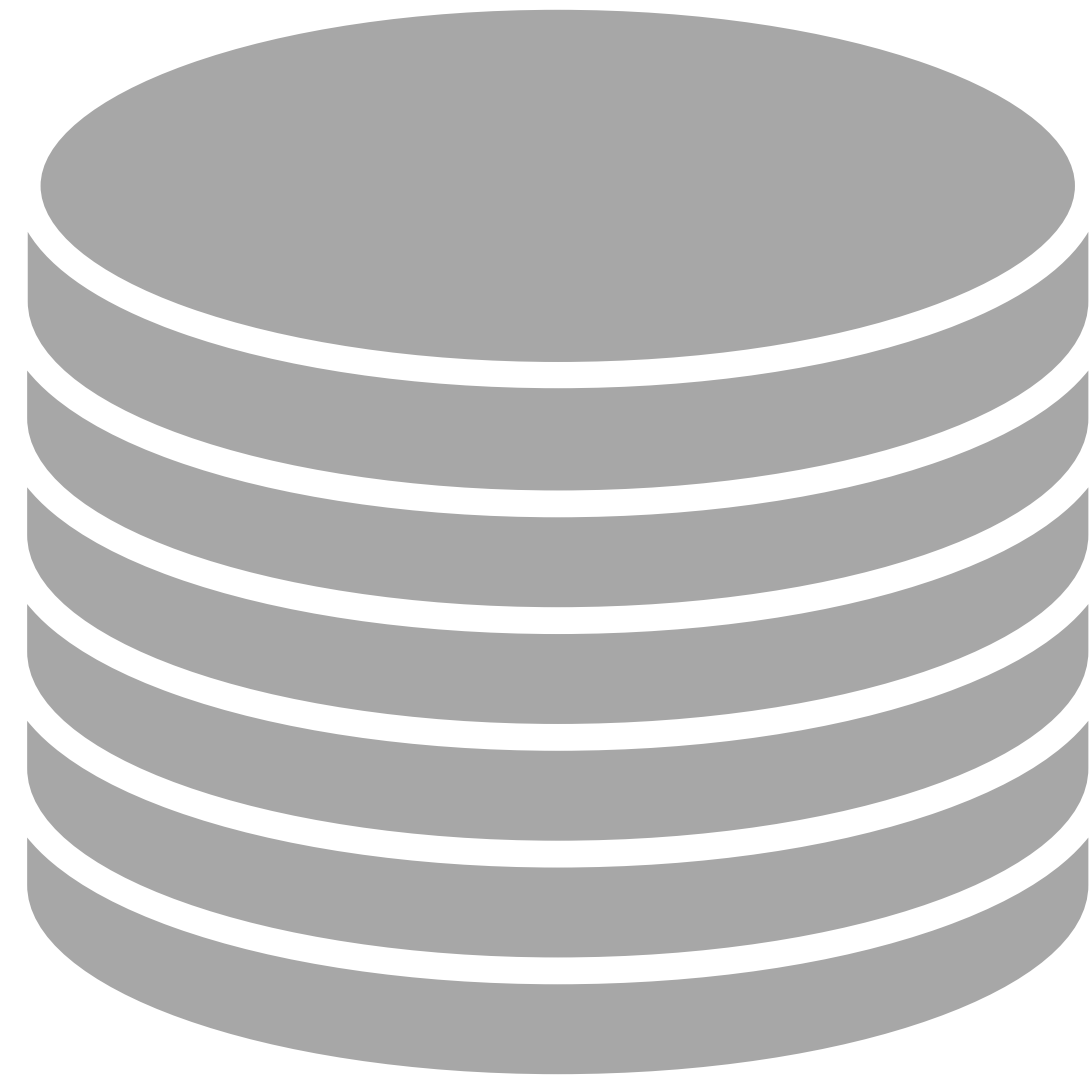
...


keyword1,
keyword2,
...

* generates plausible topics to facilitate our larger goal of displaying longitudinal visualizations of tracking



fully client-side data collection



- local database
- collect pages visited
 - inferred ad-interest category
 - trackers on that page (using  blacklist)
 - metadata about page



WIKIPEDIA
The Free Encyclopedia

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Horton Hears a Who! (film)

From Wikipedia, the free encyclopedia

Horton Hears a Who! (also known as ***Dr. Seuss' Horton Hears a Who!***) is a 2008 American [computer animated adventure comedy film](#) based on the [book of the same name](#) by [Dr. Seuss](#), produced by [Blue Sky Studios](#) and distributed by [20th Century Fox](#). Directed by [Jimmy Hayward](#) and [Steve Martino](#) in their [directorial debuts](#), the film's screenplay was written by [Cinco Paul](#) and [Ken Daurio](#), and features the voices of [Jim Carrey](#) and [Steve Carell](#) as [Horton the Elephant](#) and Mayor Ned McDodd, respectively, alongside [Carol Burnett](#), [Will Arnett](#), [Seth Rogen](#), [Isla Fisher](#), and [Amy Poehler](#).^[4] [John Powell](#) composed the film's music.

The film was released theatrically on March 14, 2008, and grossed \$297 million on a budget of \$85 million. *Horton Hears a Who!* was the third [Dr. Seuss feature film adaptation](#),^[5] the first adaptation to be fully animated,^[6] and the second [Dr. Seuss film](#) starring [Jim Carrey](#) after *[How the Grinch Stole Christmas](#)* (2000).^[6]

Contents [hide]

- [Plot](#)
- [Voice cast](#)
- [Production](#)
- [Soundtrack](#)
- [Reception](#)
 - [Critical reception](#)
 - [Box office](#)
 - [Interpretations](#)
 - [Awards](#)
- [Home media release](#)
- [References](#)
- [External links](#)

Plot [edit]

A dust speck is dislodged from its obscure place and sent adrift through the Jungle of Nool. At the same time, [Horton the Elephant](#), the jungle's eccentric nature teacher, takes a dip in the pool. The dust speck floats past him in the air, and he hears a tiny velp coming from it. Believing that an entire society of microscopic



Theatrical release poster

Directed by [Jimmy Hayward](#)
[Steve Martino](#)

Produced by [Bob Gordon](#)
[Bruce Anderson](#)

Screenplay by [Cinco Paul](#)
[Ken Daurio](#)

Based on *[Horton Hears a Who!](#)*
by [Dr. Seuss](#)

Starring [Jim Carrey](#)
[Steve Carell](#)
[Will Arnett](#)
[Seth Rogen](#)
[Isla Fisher](#)
[Amy Poehler](#)



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- Permanent link
- Page information
- Wikidata item
- Cite this page

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- Wikiquote

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- Create a book
- Download as PDF
- Printable version

Languages

Article [Talk](#)

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- 2 Voice cast
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 - 5.2 Box office
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 - 5.4 Awards
- 6 Home media release
- 7 References
- 8 External links

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A dust speck is dislodged from its obscure place and sent adrift through the Jungle of Nool. At the same time, **Horton the Elephant**, the jungle's eccentric nature teacher, takes a dip in the pool. The dust speck floats past him in the air, and he hears a tiny velp coming from it. Believing that an entire society of microscopic

Summary

You are on "Horton Hears a Who! (film) - W...".

This page may be about **Pets & Animals**.

There are **0 trackers** on this page.

227

👁 Trackers encountered

30289

📄 Pages visited

145

👍 Potential interests

[Open Tracking Transparency dashboard](#)



Theatrical release poster

- Directed by** Jimmy Hayward
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- Produced by** Bob Gordon
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- Screenplay by** Cinco Paul
Ken Daurio
- Based on** *Horton Hears a Who!*
by Dr. Seuss
- Starring** Jim Carrey
Steve Carell
Will Arnett
Seth Rogen
Isla Fisher
Amy Poehler

Home

What are *trackers* and *interests*?



When you browse online, your online activity can be tracked by ad networks and analytics companies.

We call these *trackers*.



These companies track your browsing to make guesses about what topics you might be interested in.

We call these topics *interests*.



Companies can personalize your online experience based on these interests. *Click on the circles above to learn more.*

Your Top Trackers

- 1 [Google](#)
- 2 [Facebook](#)
- 3 [comScore](#)
- 4 [Microsoft](#)
- 5 [New Relic](#)

Your Top Interests

- 1 [Shopping](#)
- 2 [Online Communities](#)
- 3 [Law & Government](#)
- 4 [Travel](#)
- 5 [People & Society](#)

300

Trackers encountered

38801

Pages visited

157

Potential interests

Recent Interests

- [People & Society](#)
- [Law & Government](#)
- [Food & Drink](#)
- [News](#)
- [Travel](#)

Recent Sites

- [facebook.com](#)
- [instagram.com](#)
- [list-manage.com](#)
- [washington.edu](#)
- [google.com](#)

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Recent Interests

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Recent Sites

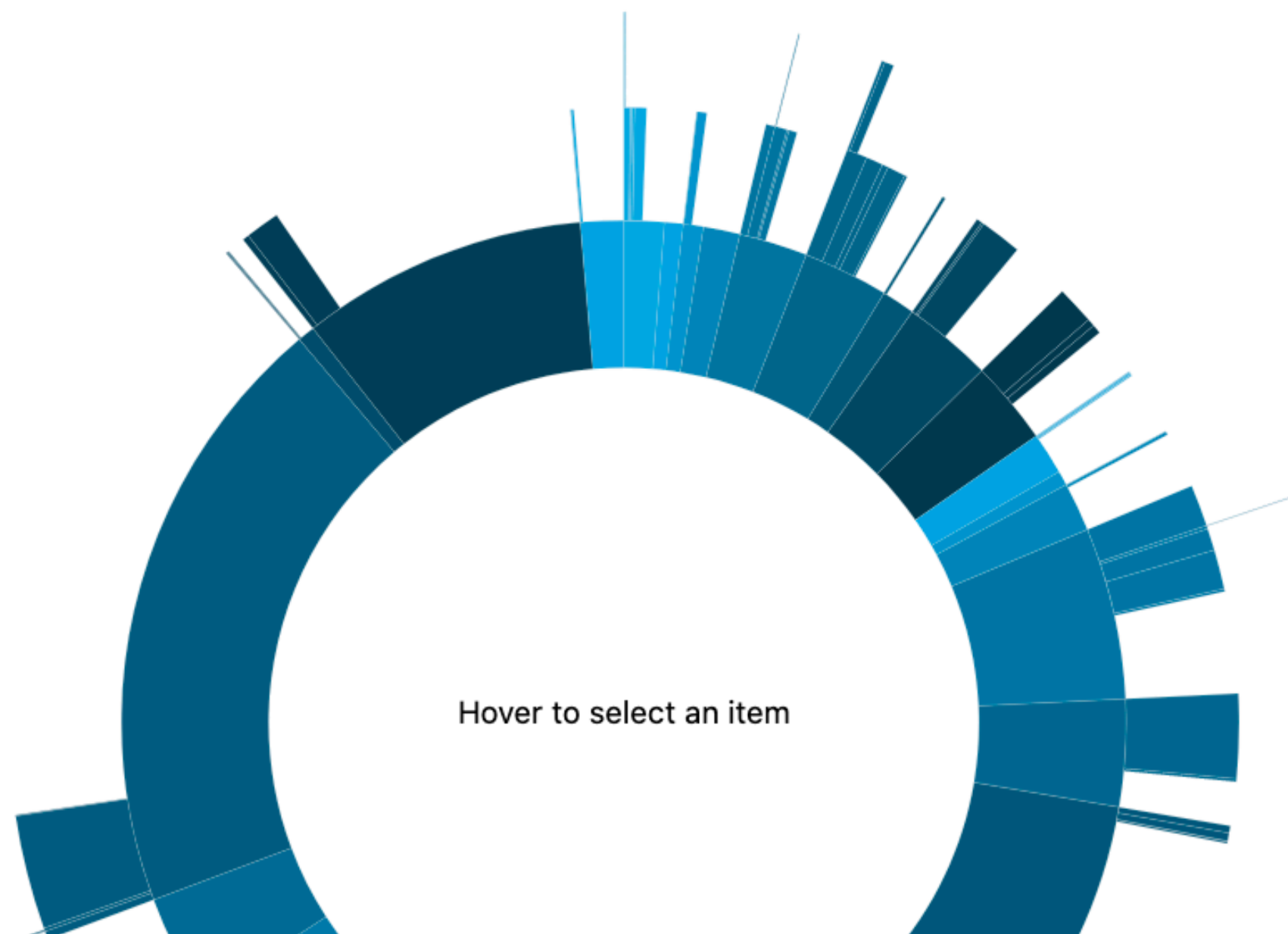
- facebook.com
- instagram.com
- list-manage.com
- washington.edu
- google.com

[Home](#) > Interests

👍 What interests might they think you have?

Trackers collect information about the pages you visit and use this information to identify topics, or *interests*, that might be relevant to you. These interests are then used to target ads to you and personalize what you see online. Companies don't usually reveal how they determine your potential interests. Based on the pages you visited, Tracking Transparency's simulations have identified **155 topics** trackers might think are relevant to you.

The chart below shows the interests suggested by your browsing activity. Click a slice of the chart to see more details.



Click a slice of the chart to see what trackers think you might be interested in.

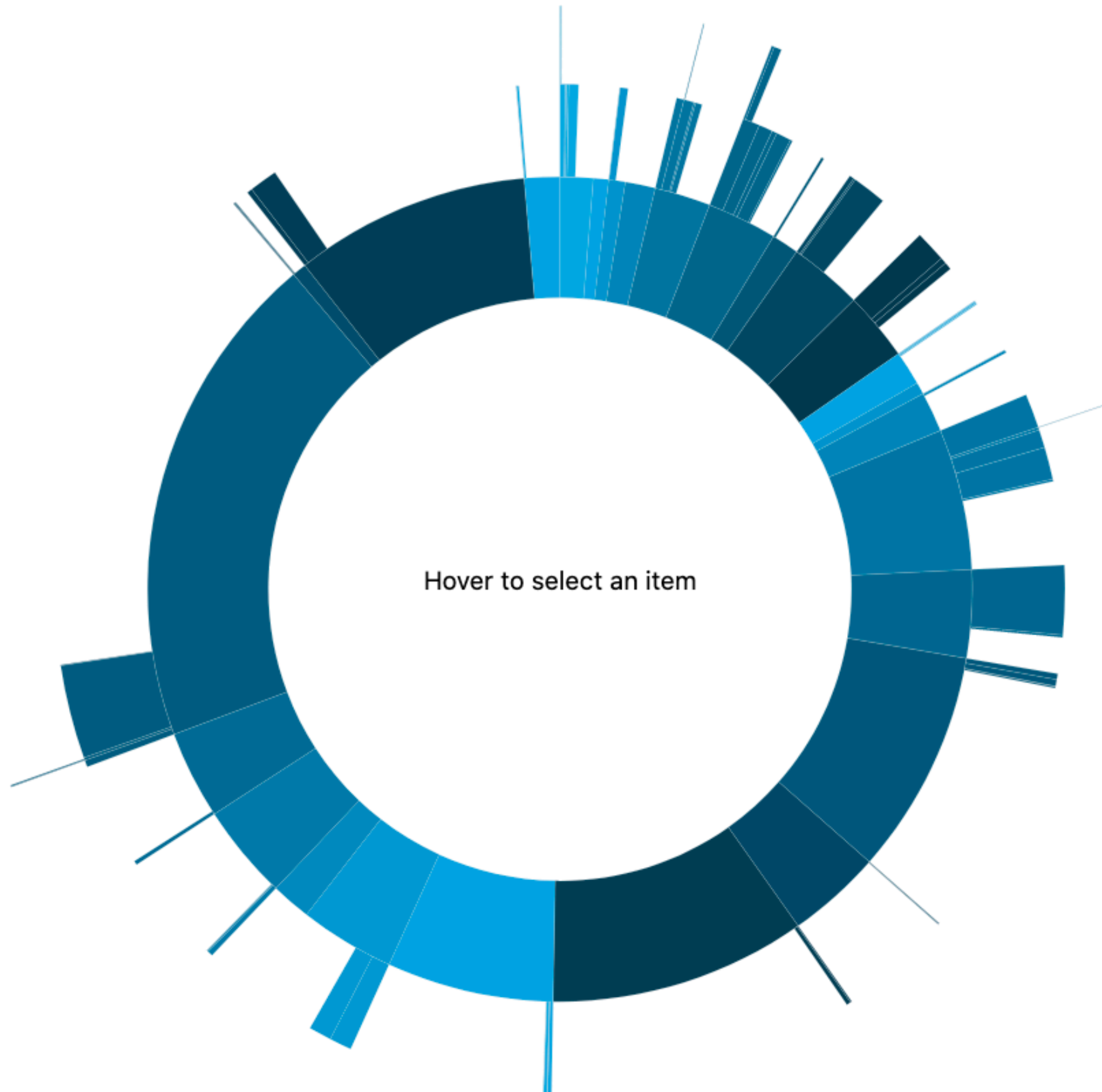
Filters

- Recency ⓘ ALL 24 HRS 7 DAYS
- Popularity ⓘ ALL LESS MORE
- Comfort ⓘ ALL LESS MORE



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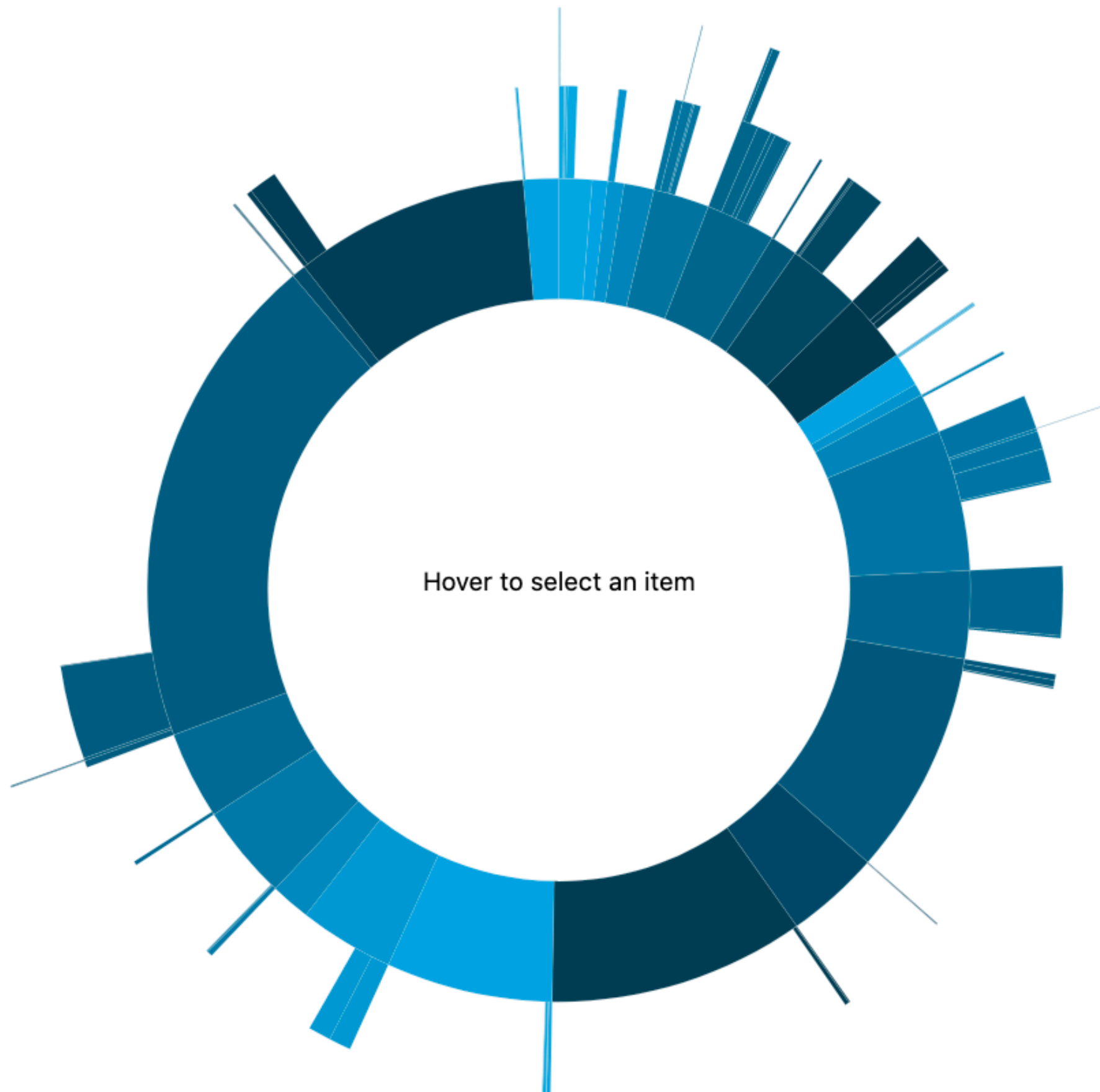
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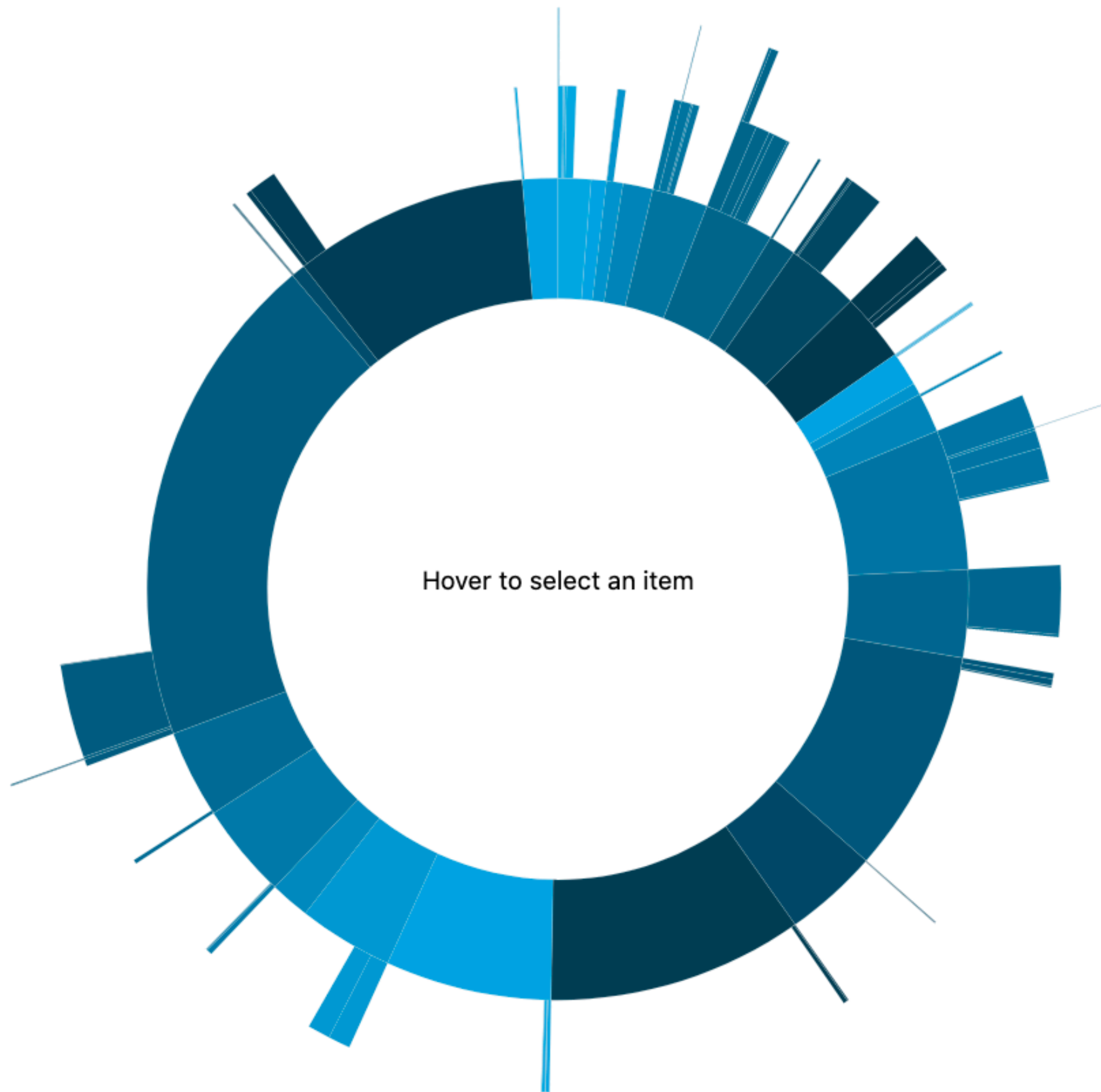
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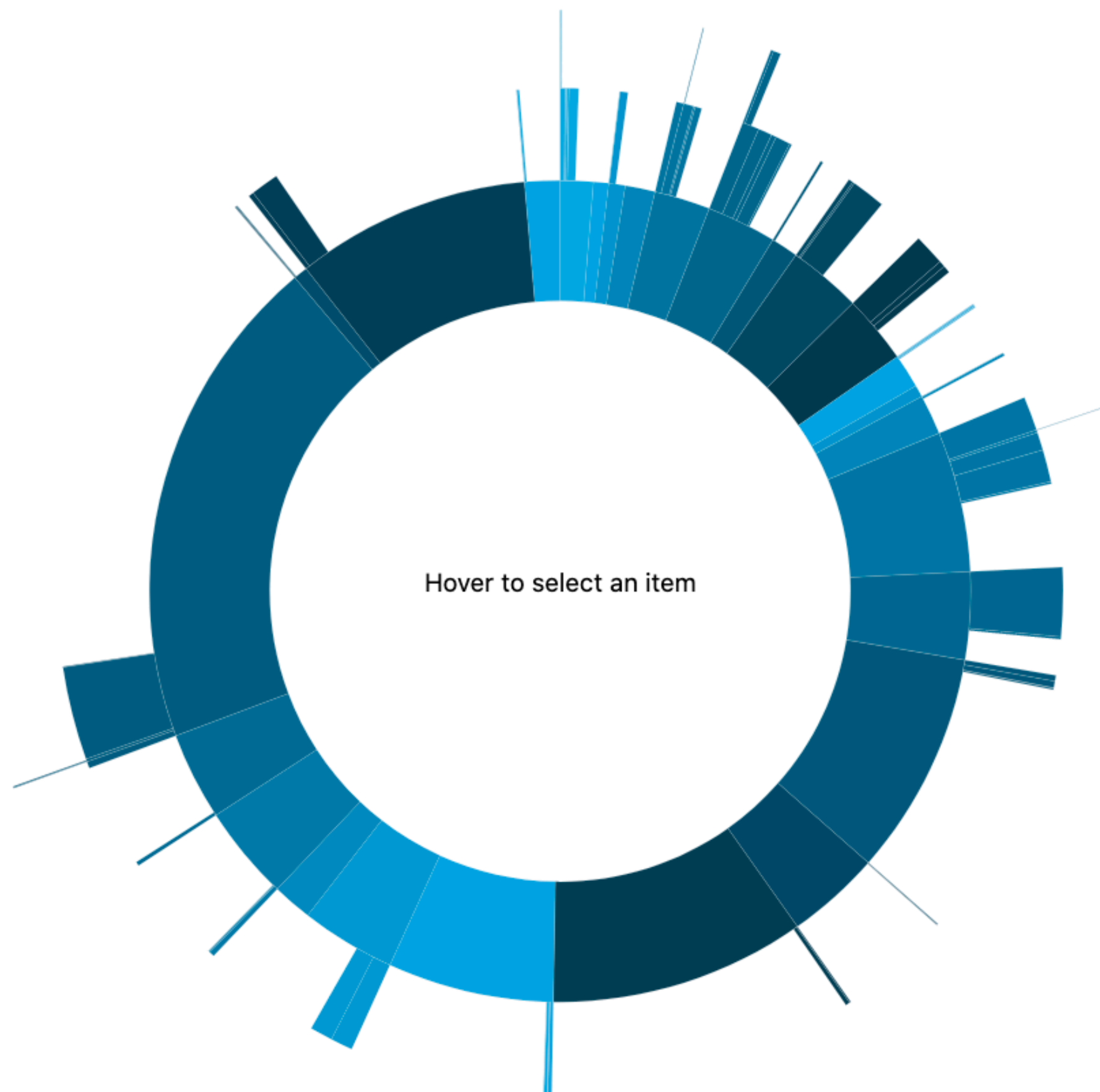
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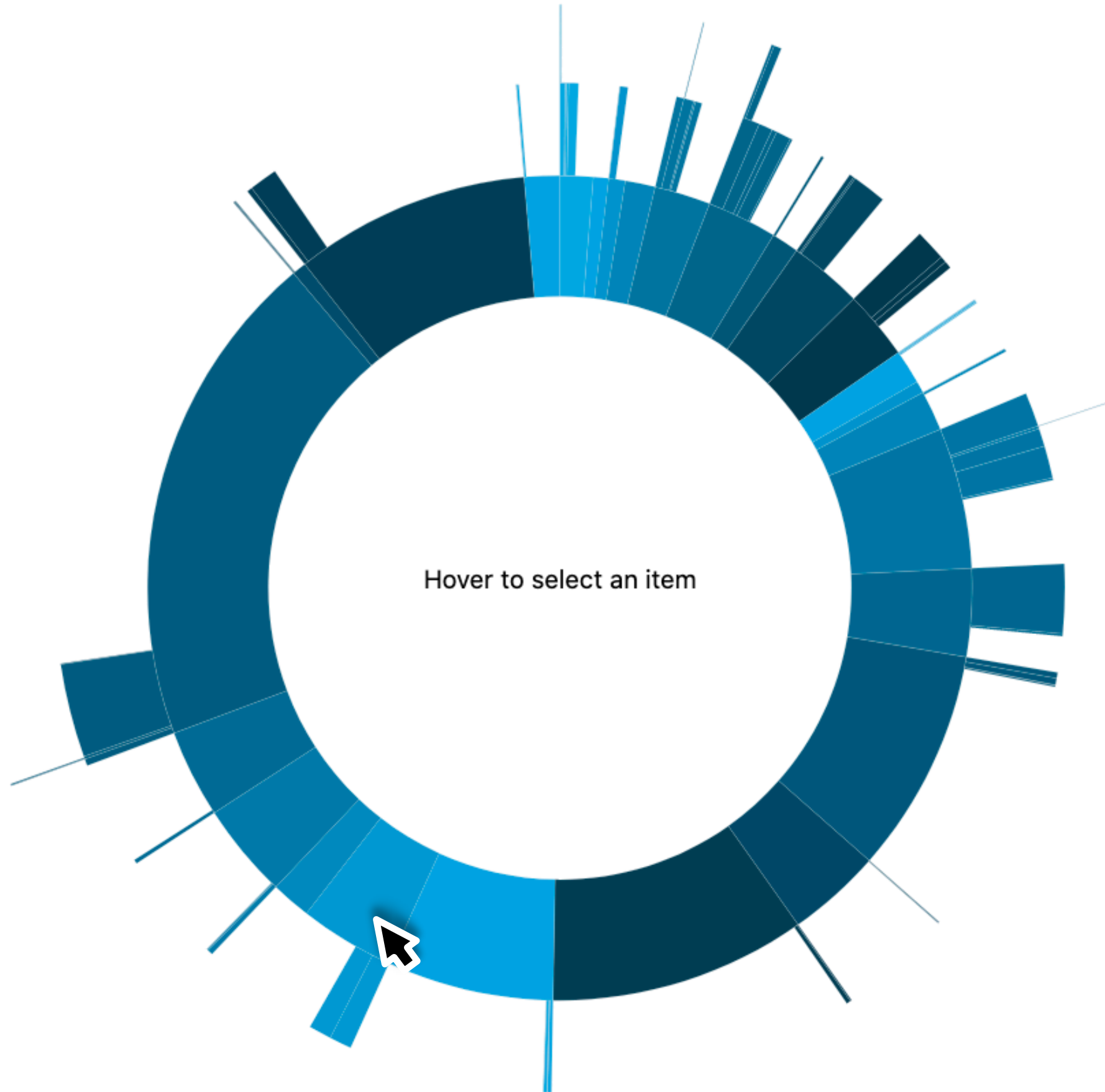
Recency ⓘ ALL 24 HRS 7 DAYS
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Unpacking Perceptions of Data-Driven Inferences Underlying Online Targeting and Personalization

Claire Dolin*, Ben Weinschel*, Shawn Shan,
Chang Min Hahn, Euirim Choi, Michelle L. Mazurek†, Blase Ur
University of Chicago and University of Maryland (†)
{cdolin, weinschel, shansixioing, changhahn, euirim, blase}@uchicago.edu, mmazurek@cs.umd.edu (†)

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Pets & Animals

79
Sites

88
Trackers

79 of the sites you visited were about Pets & Animals. These sites contained a total of **88 trackers**.

Pets & Animals is a **popular** interest.

Other people are often **somewhat comfortable** with having their interest in this topic being used to personalize their web experience.

[More about this interest >](#)

Filters

Recency ⓘ ALL 24 HRS 7 DAYS
Popularity ⓘ ALL LESS MORE
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Recency ⓘ ALL 24 HRS 7 DAYS
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Comfort ⓘ ALL LESS MORE

Home > Interests > Pets & Animals

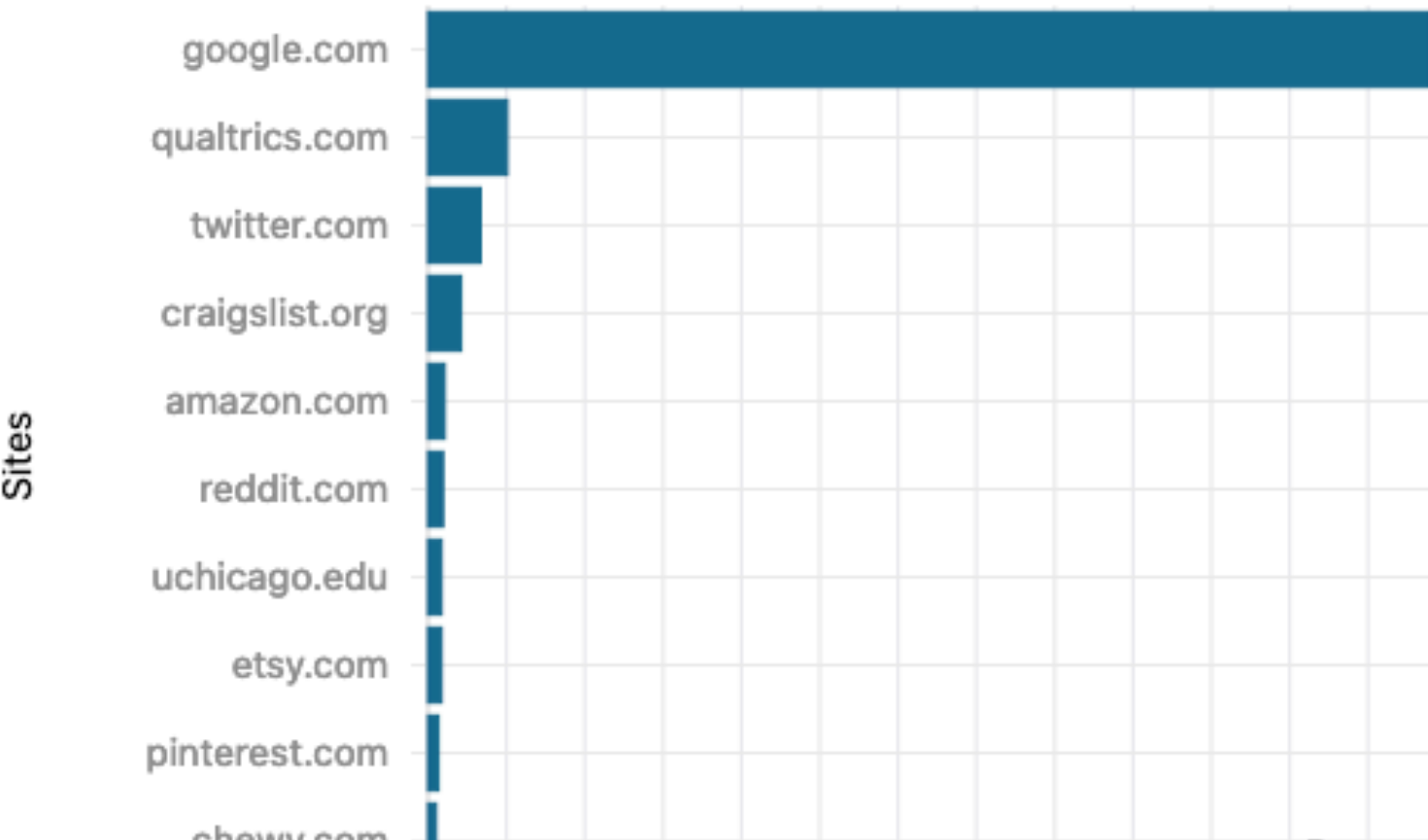
👍 Your *Pets & Animals* profile

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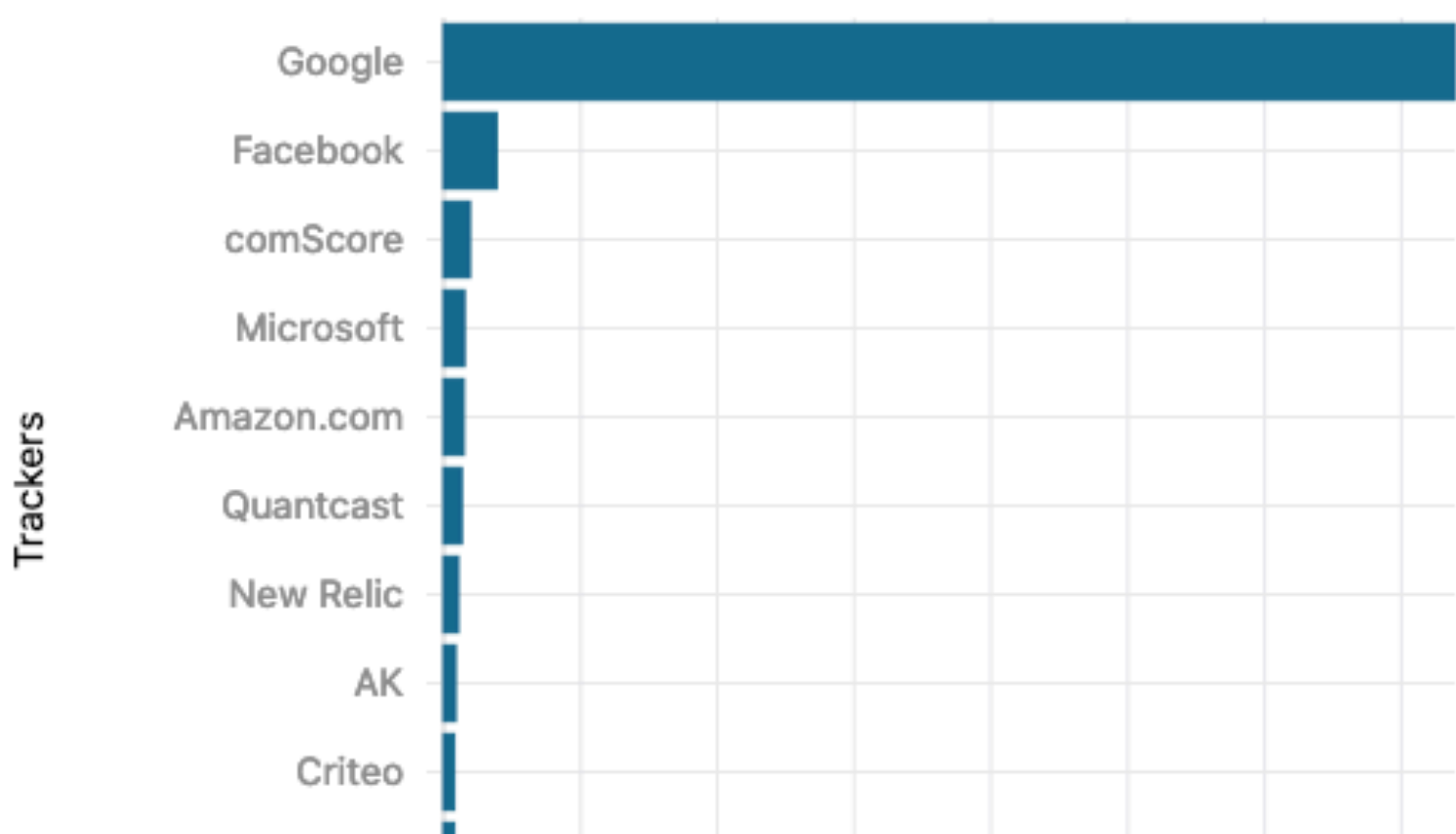
Which sites were about *Pets & Animals*?

You visited **75 sites** that may have been about Pets & Animals. Therefore, trackers may have guessed this is relevant to you. *Click on a bar to learn more.*



Which trackers might think you are interested in *Pets & Animals*?

89 trackers may have guessed that you are interested in Pets & Animals. *Click on a bar to learn more.*



Home > Interests > Pets & Animals

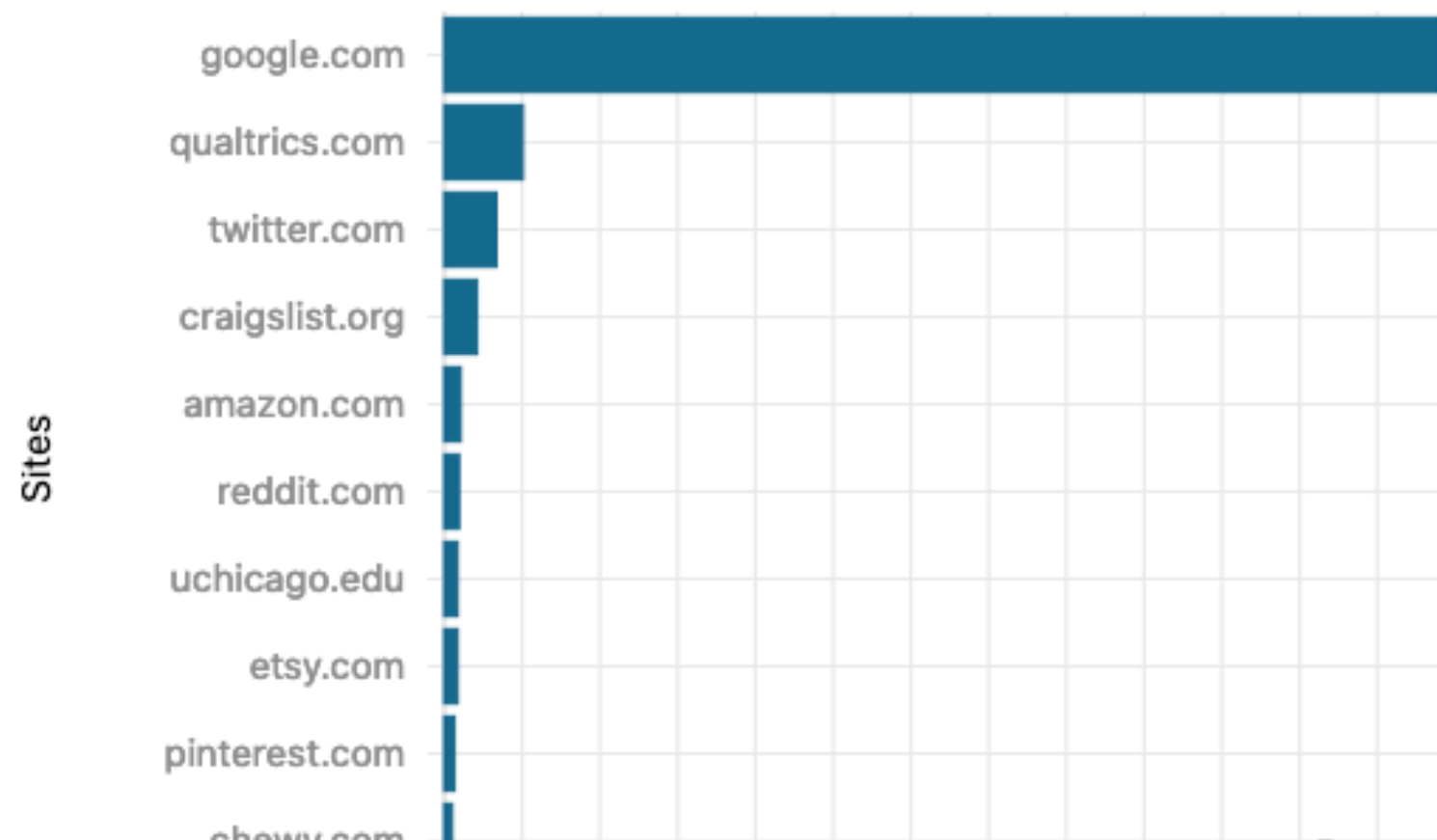
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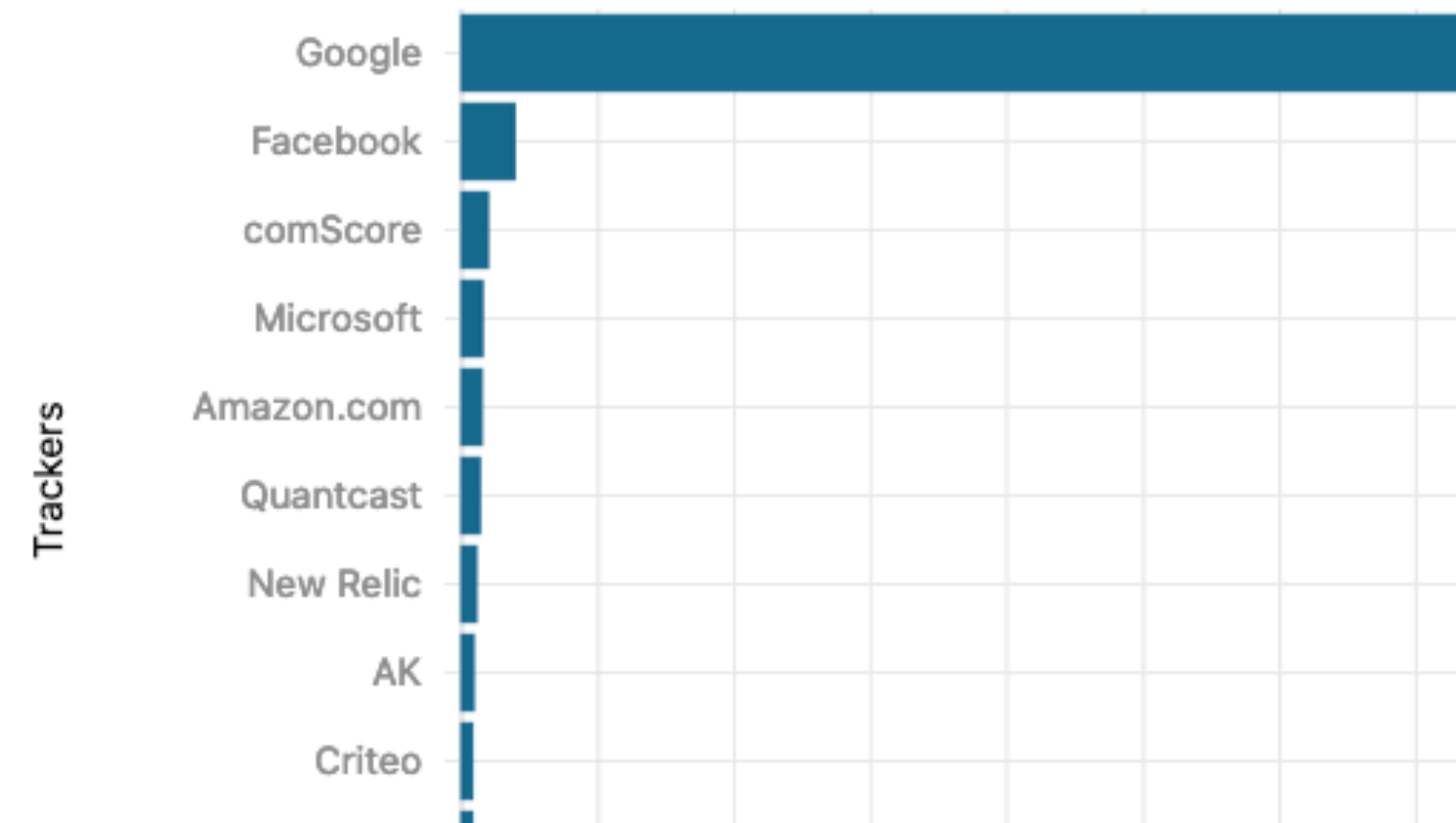
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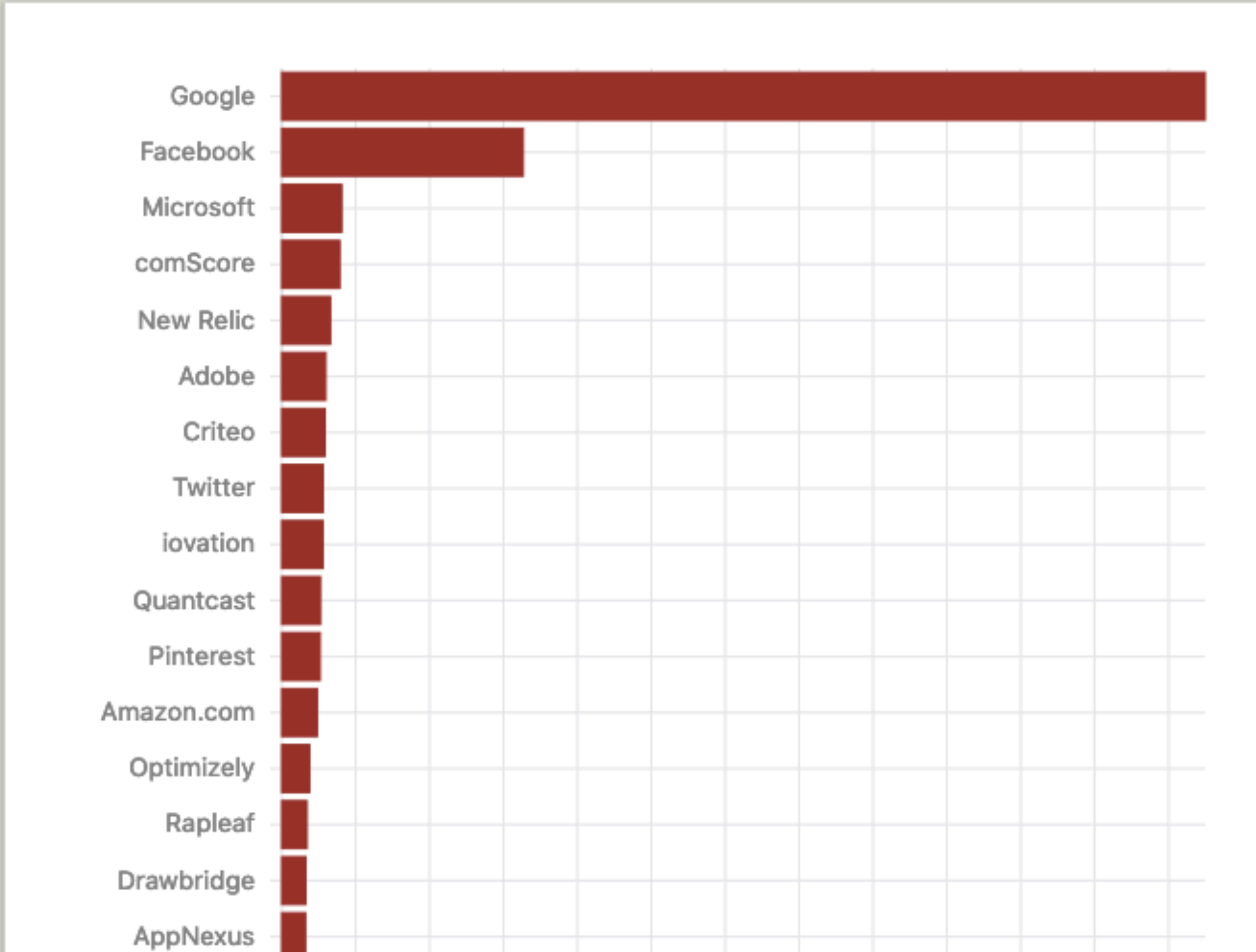
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[Home](#) > Trackers

👁️ Who is tracking you?

298 trackers have been present on the sites you visited since installing Tracking Transparency. Your most frequently encountered tracker is **Google**, which was present on **64.34%** of the pages you visited.

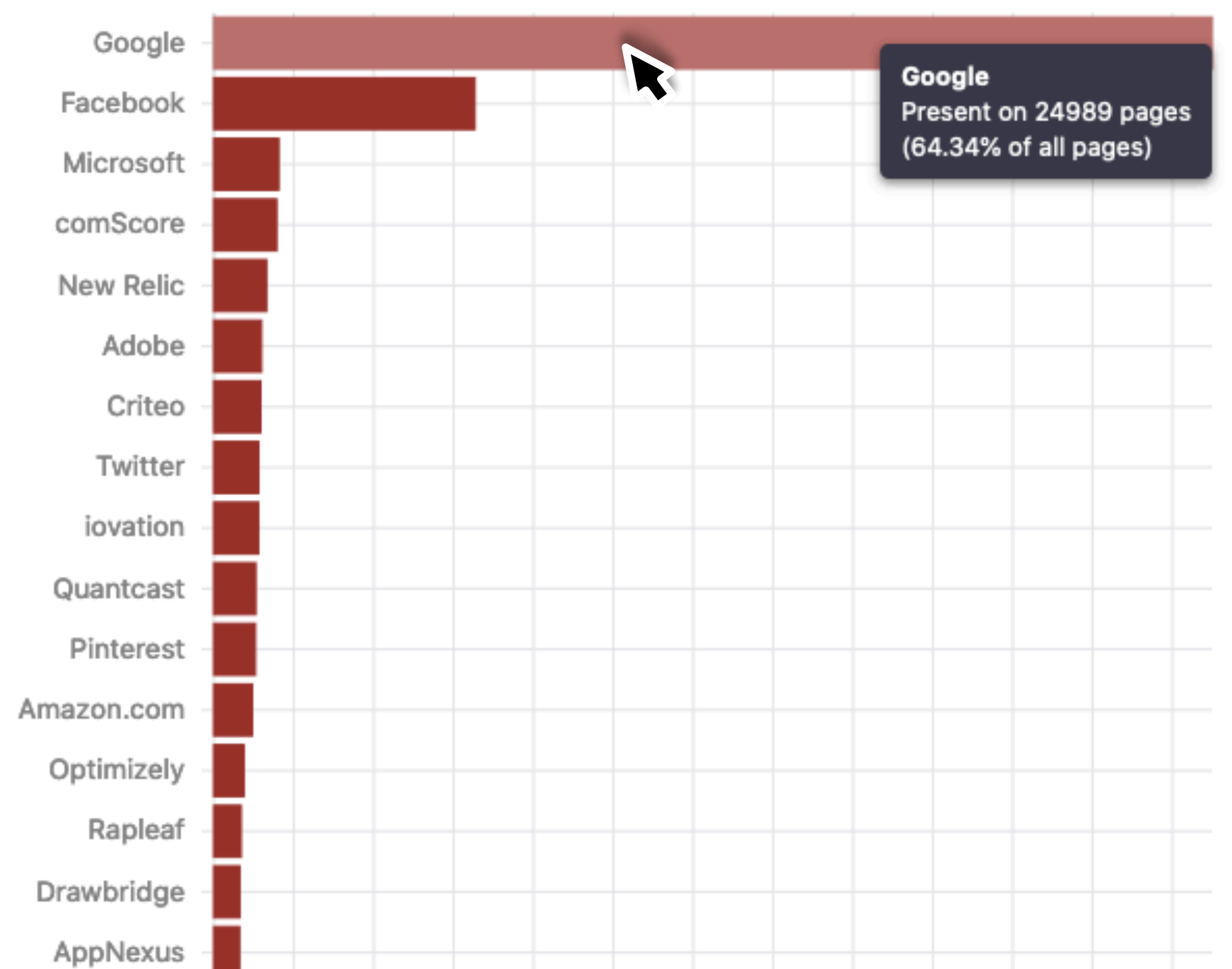


The graph to the left shows the trackers on the pages you visited. Click a bar to learn more about that tracker.

Home > Trackers

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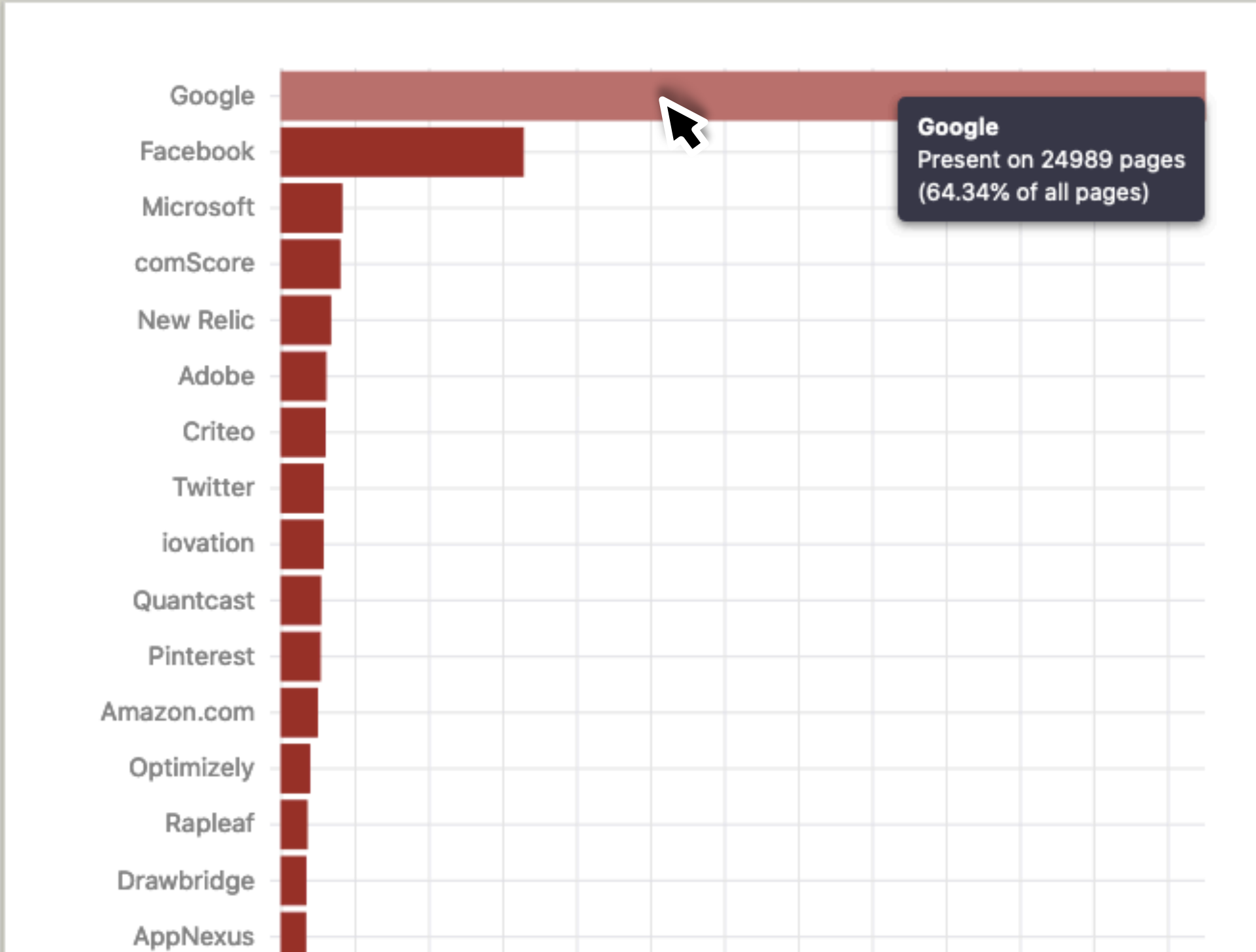
Google
Present on 24989 pages
(64.34% of all pages)

The graph to the left shows the trackers on the pages you visited. Click a bar to learn more about that tracker.

[Home](#) > Trackers

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Google

24989 Pages	1349 Sites	148 Interests
-----------------------	----------------------	-------------------------

Google was present on **24989 pages** across **1349 sites** that you visited since installing Tracking Transparency. From those tracking encounters, they may have guessed that you are interested in **148 topics**.

[More about this tracker >](#)

Home > Trackers > Google

Your Google profile

What does Google do?

"Google AdSense is a program run by Google that allows publishers in the Google Network of content sites to serve automatic text, image, video, or interactive media advertisements, that are targeted to site content and audience." – [Source](#)

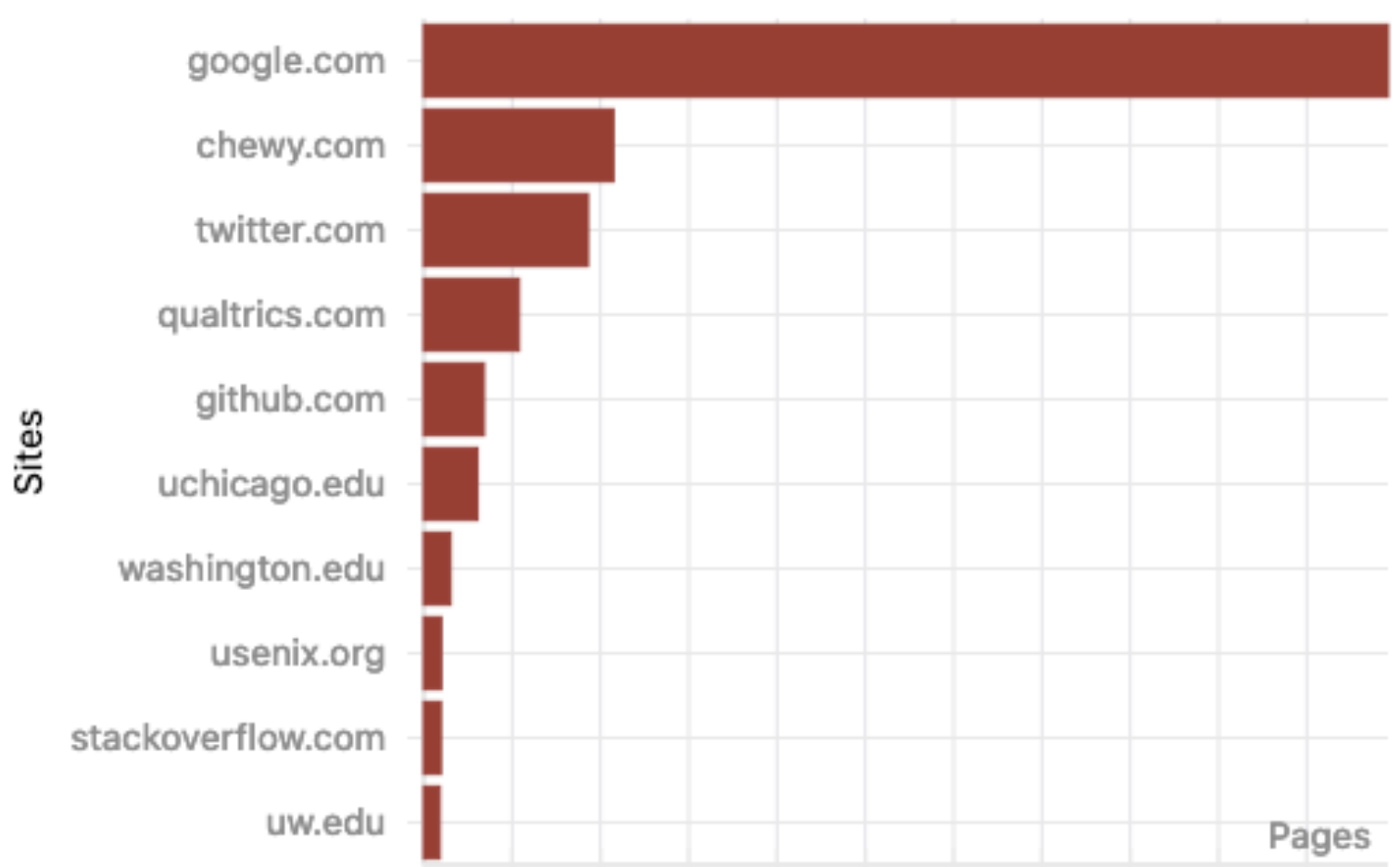
Based on your browsing, what would Google think your interests are?

Using a machine to assign categories to pages you visit, Google may have guessed that you are interested in **150 topics**.
Click on a link in the wordcloud to learn more about each interest.



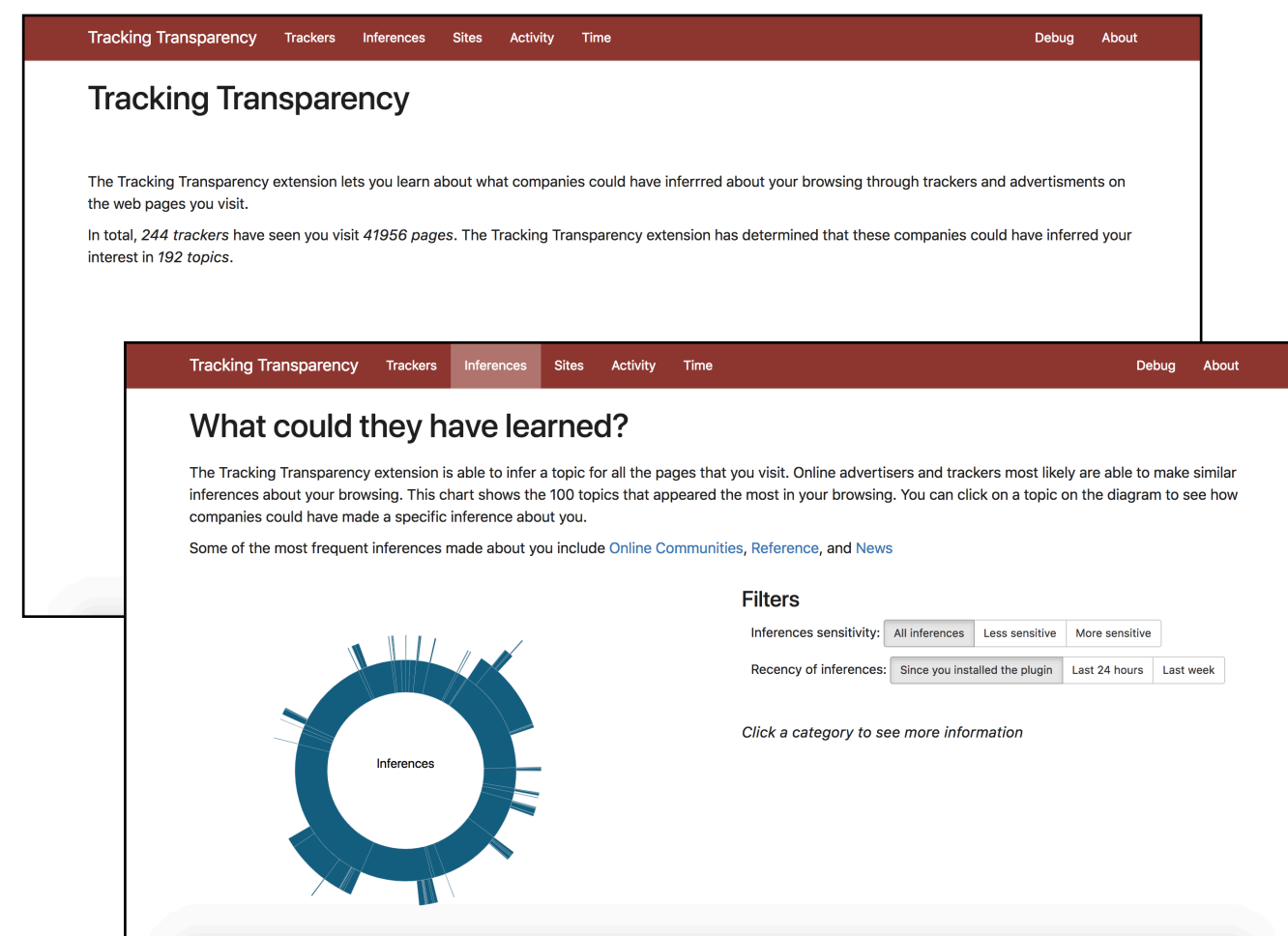
On which sites did Google track you?

Google has tracked you on **1412 sites**. Click on a bar to learn more.

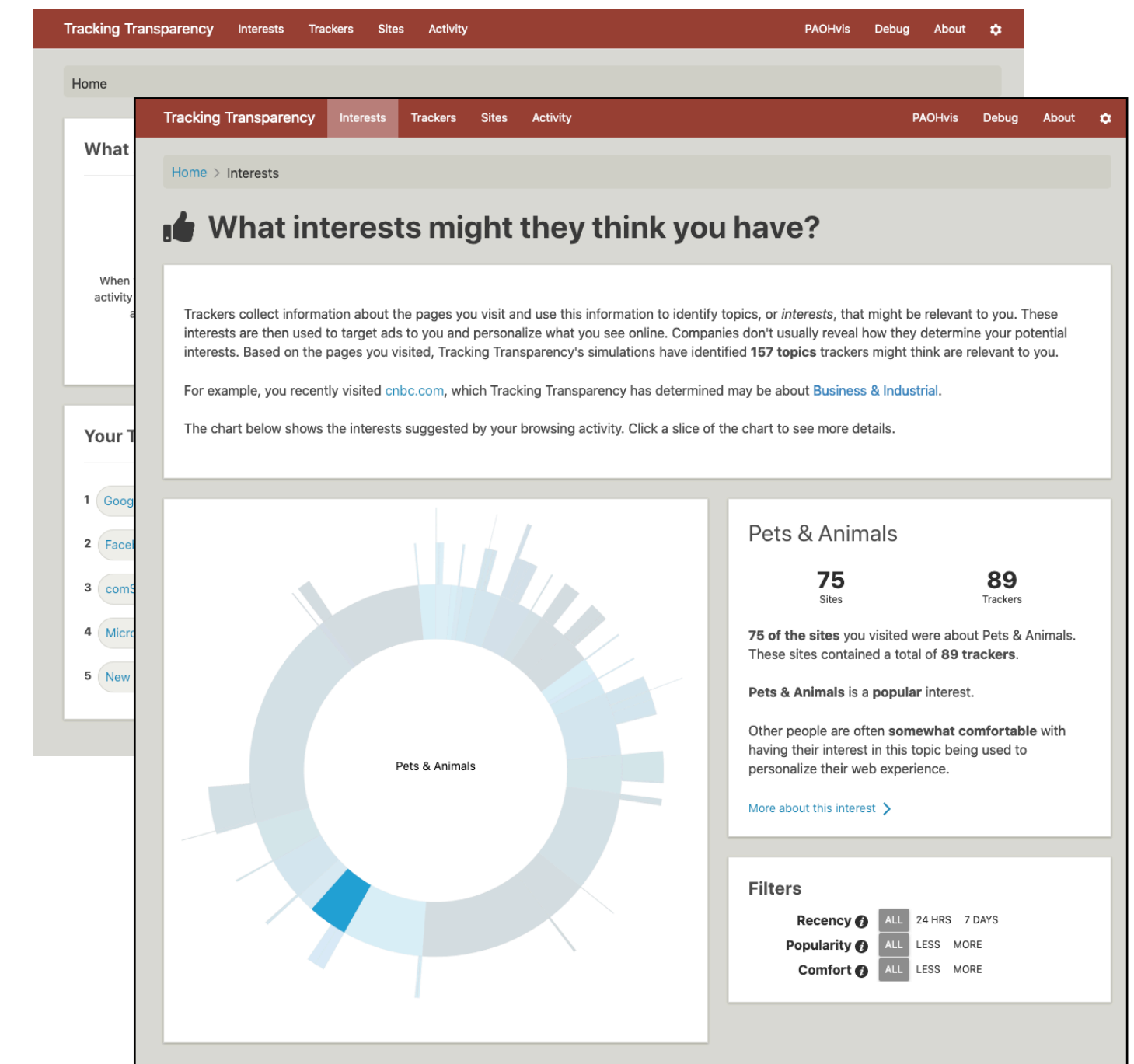


method

iterative usability interviews



13 participants
30 minutes
\$10 Amazon gift card



field study

425 participants, 18+, located in the US, 95% HIT approval rating,
use Firefox or Chrome regularly

pre-usage survey

[15 minutes, \$3]

- demographics
- estimates of tracking
- knowledge and attitudes about OBA

use Tracking Transparency for one week

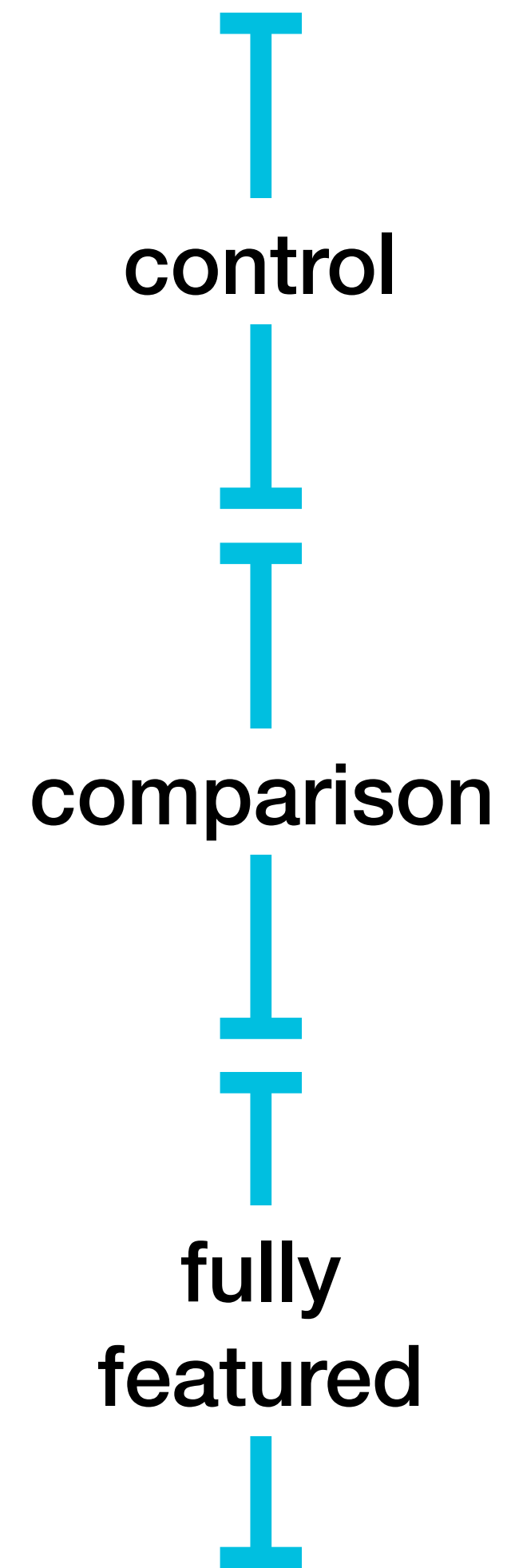
- collected telemetry data
- # of distinct web pages
 - # of trackers
 - inferred topics

post-usage survey

[20 minutes, \$7]

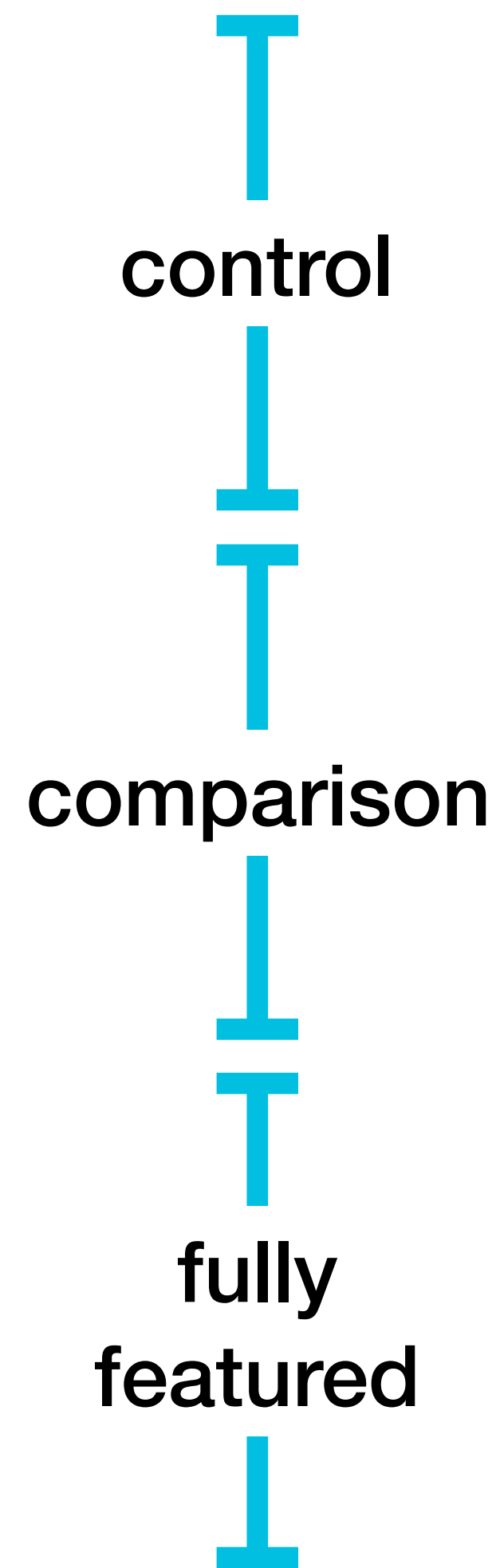
- qualitative reactions
- behavioral intentions
- estimates of tracking
- knowledge and attitudes about OBA

study conditions

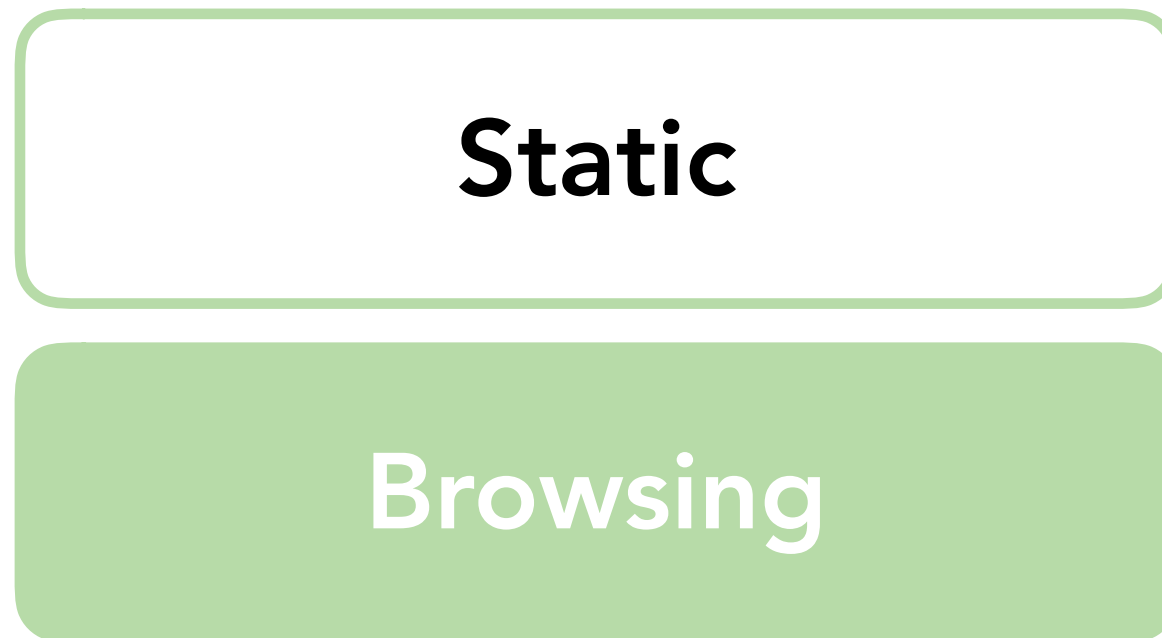
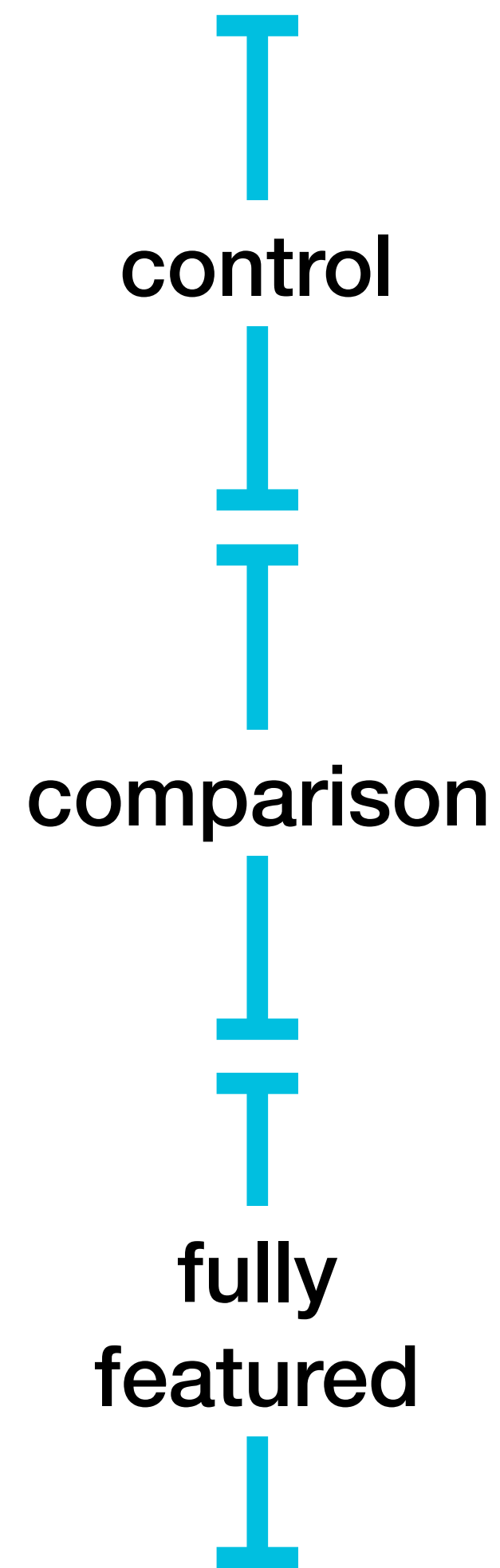


study conditions

Static



study conditions



Tracking Transparency Sites Activity About

Home > Sites

Where were you tracked?

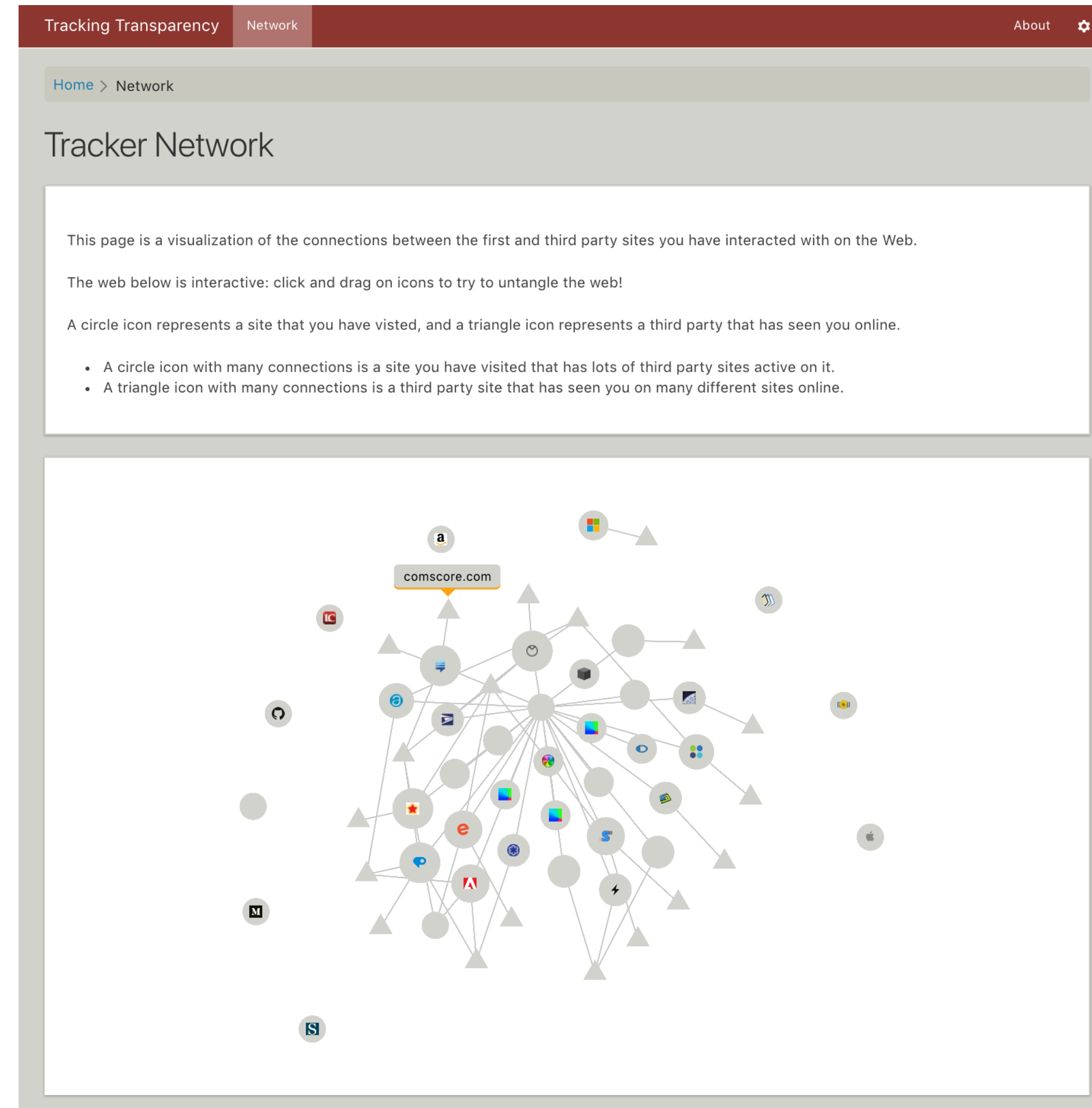
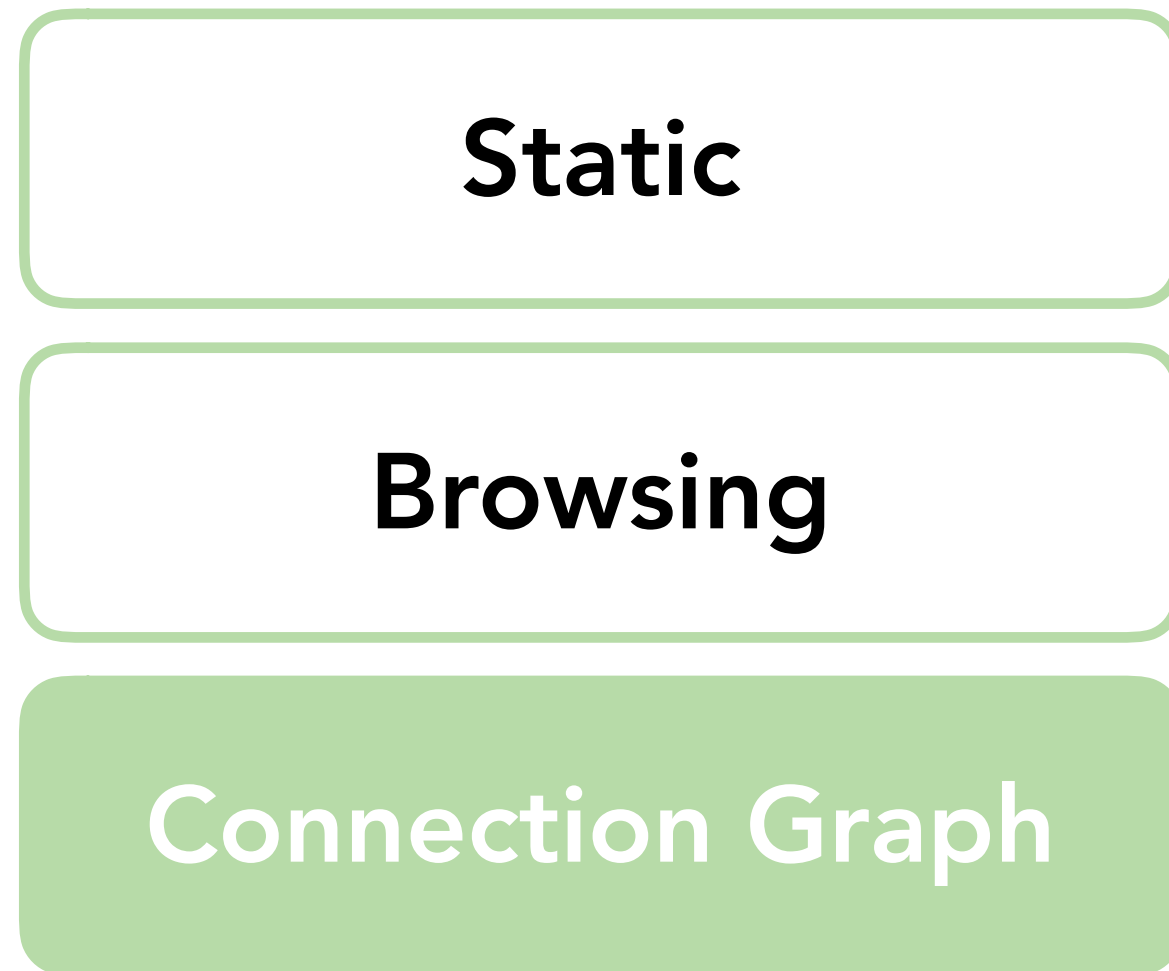
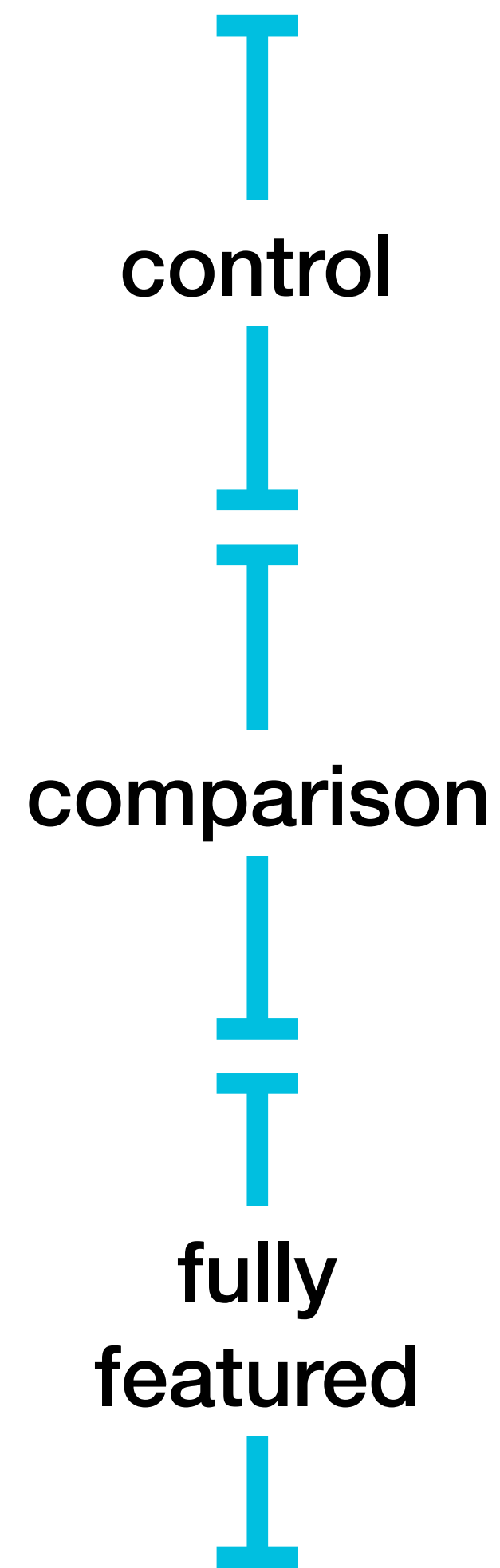
Since installing this browser extension, you have visited **38501 different pages** on **1585 sites**.

Trackers see which sites you visited through a variety of tracking methods, including third-party cookies, tracking pixels, and browser fingerprinting. When a tracker sees that you have visited multiple sites, they can use that activity to link together your interests.

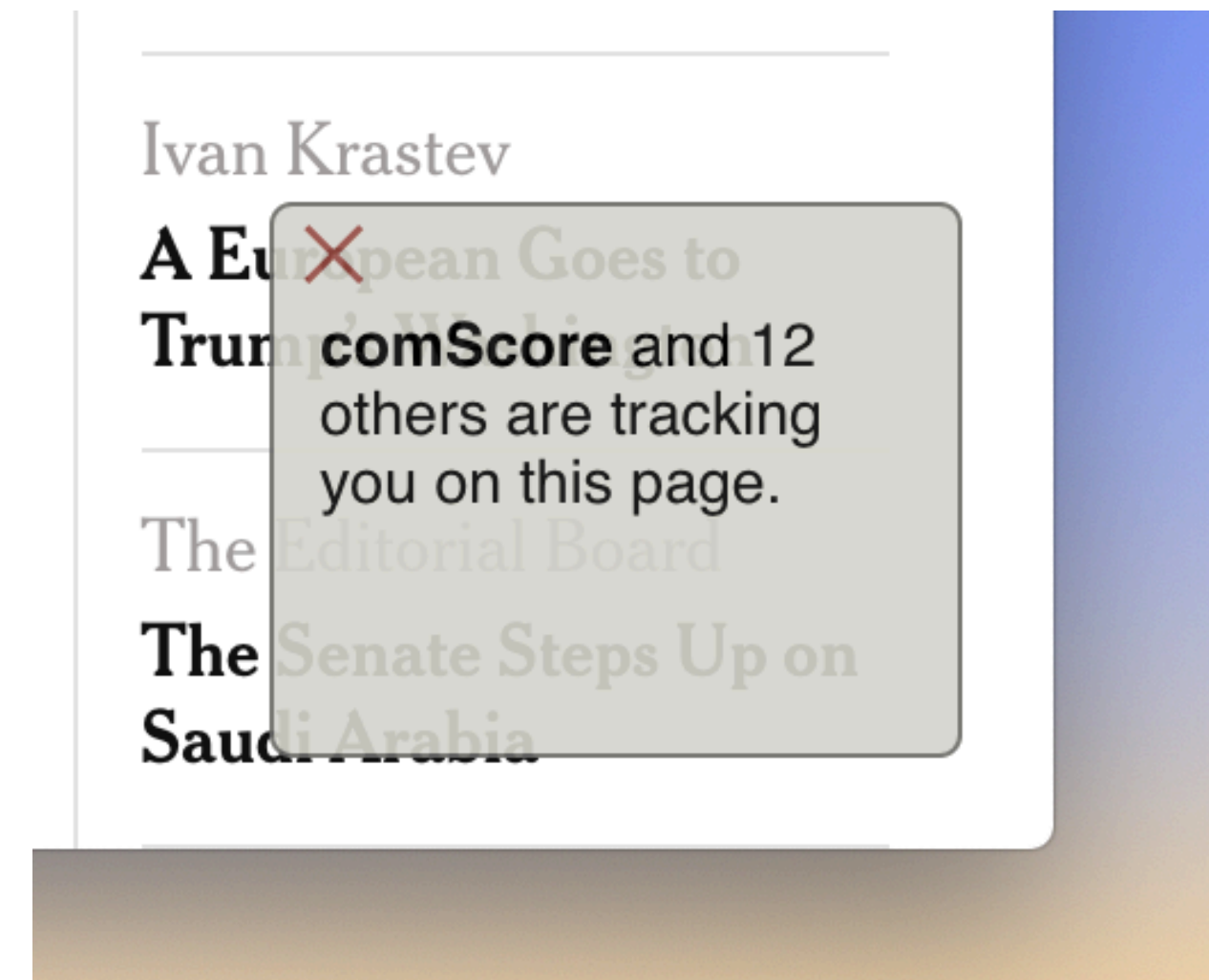
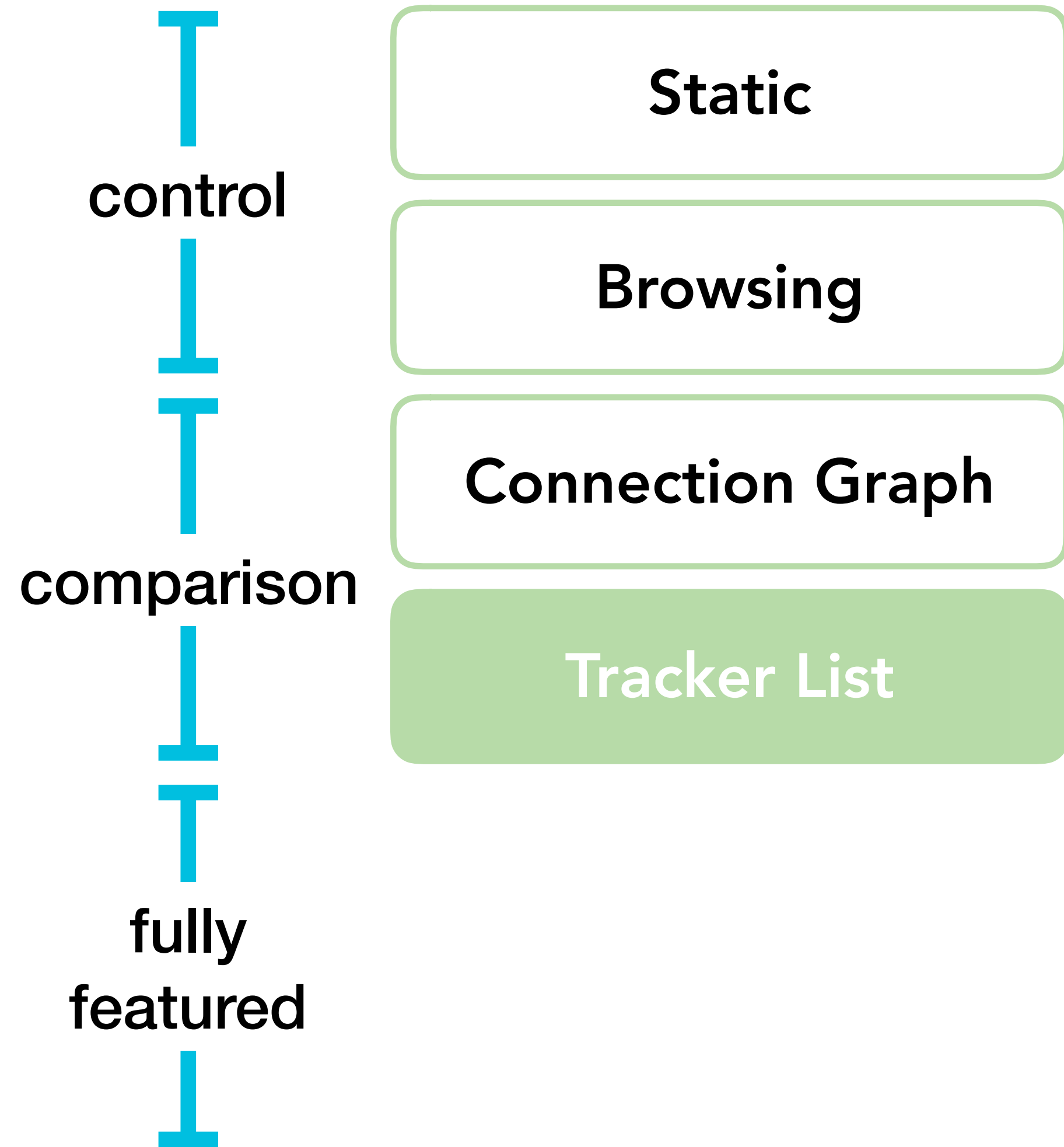
Most recently visited sites

- git.io
- github.blog
- google.com
- github.com

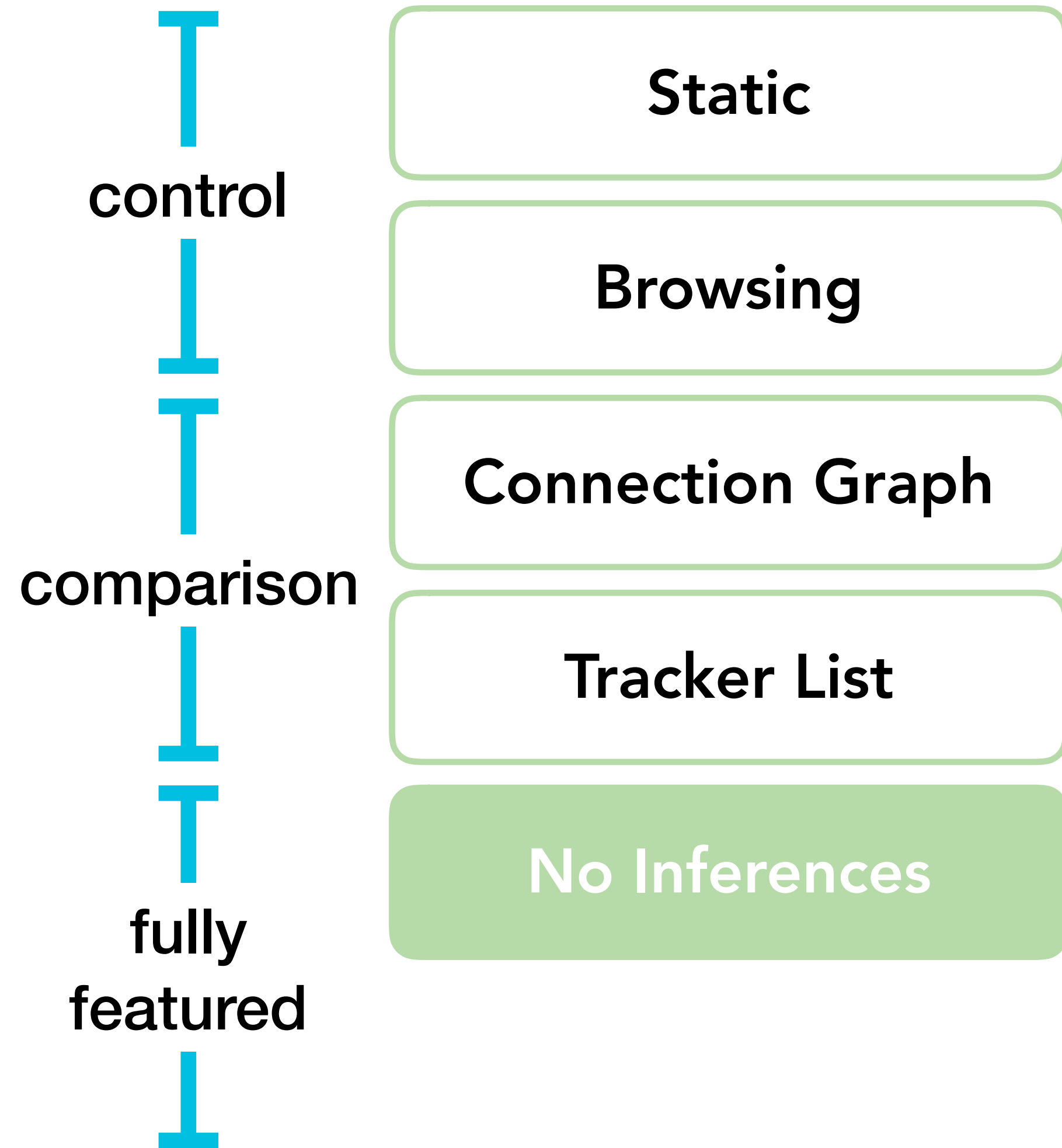
study conditions



study conditions



study conditions



Tracking Transparency Trackers Sites Activity About

Home

What are *trackers* and *interests*?

When you browse online, your online activity can be tracked by ad networks and analytics companies. We call these *trackers*.

These companies track your browsing to make guesses about what topics you might be interested in. We call these topics *interests*.

Companies can personalize your online experience based on these interests. Click on the circles above to learn more.

Your Top Trackers

- Google
- Facebook
- Microsoft
- comScore
- New Relic

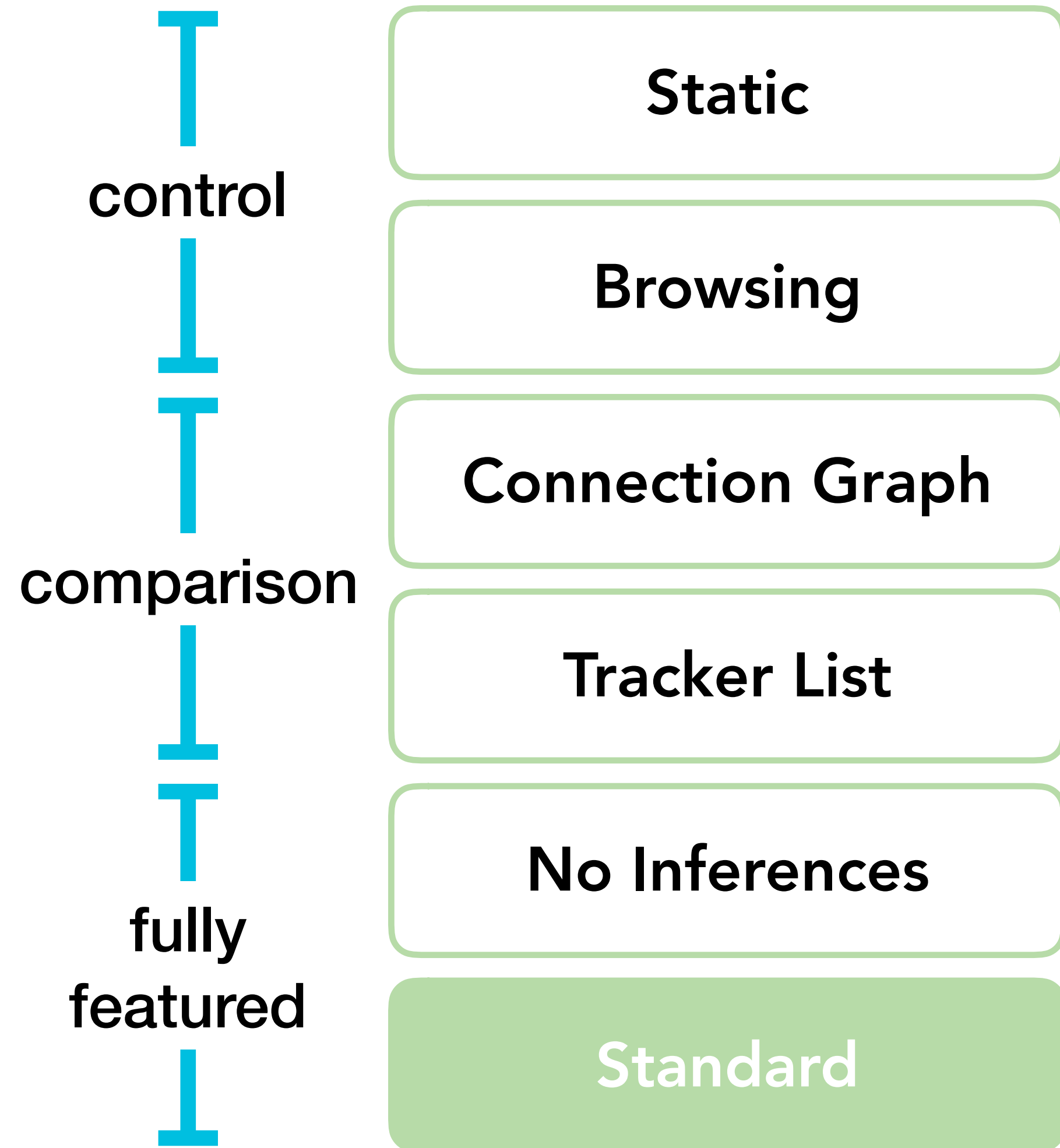
298 Trackers encountered

38503 Pages visited

Recent Sites

- nyt.com
- github.com
- git.io
- github.blog
- google.com

study conditions



Tracking Transparency Interests Trackers Sites Activity About

Home

What are *trackers* and *interests*?

When you browse online, your online activity can be tracked by ad networks and analytics companies. We call these *trackers*.

These companies track your browsing to make guesses about what topics you might be interested in. We call these topics *interests*.

Companies can personalize your online experience based on these interests. Click on the circles above to learn more.

300 Trackers encountered

38801 Pages visited

157 Potential interests

Your Top Trackers

- Google
- Facebook
- comScore
- Microsoft
- New Relic

Your Top Interests

- Shopping
- Online Communities
- Law & Government
- Travel
- People & Society

Recent Interests

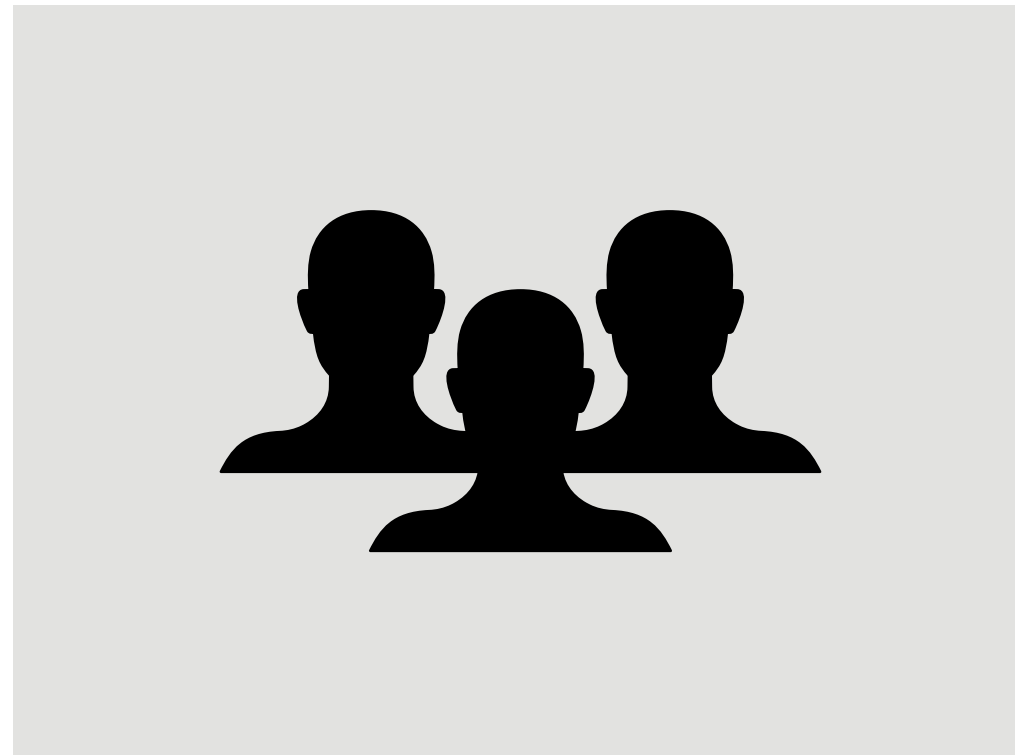
- People & Society
- Law & Government
- Food & Drink
- News
- Travel

Recent Sites

- facebook.com
- instagram.com
- list-manage.com
- washington.edu
- google.com

results

telemetry data

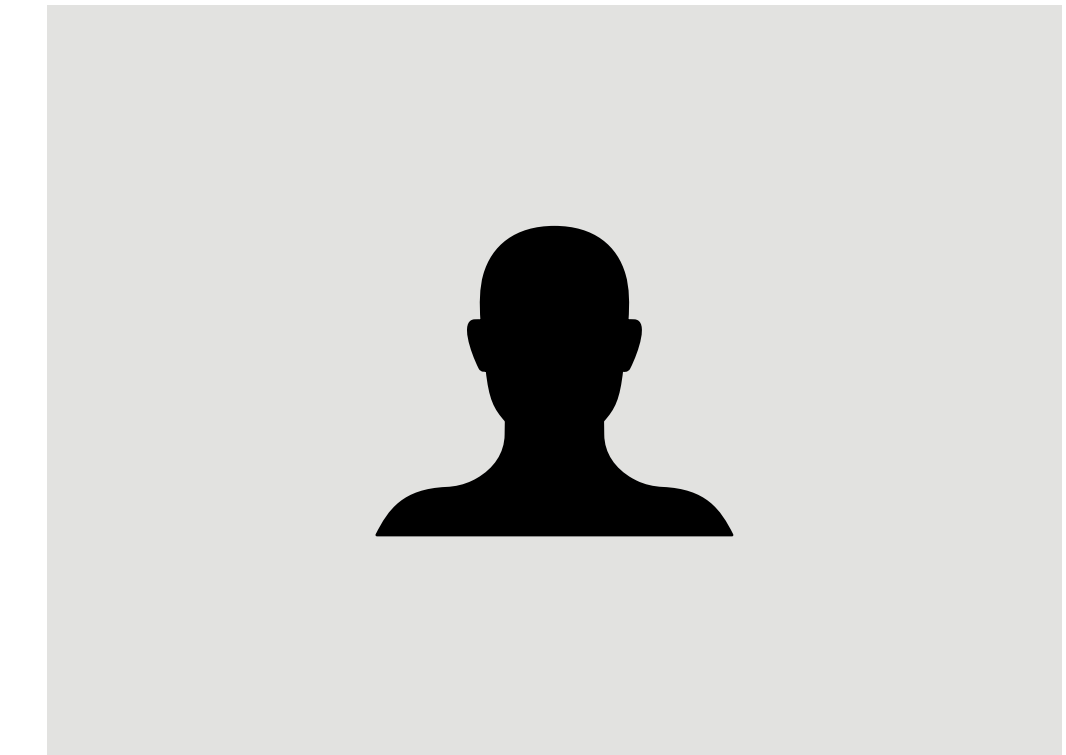


425 participants

**1,068,302 web
pages visited**



**39% use ad-
or tracker-
blocking tool**



**2.58/2.15 trackers
per page**

59 categories

improved awareness of tracking

participants were surprised by....

- the amount of tracking

“I was surprised at how much I was tracked by Amazon and Google. I was also surprised to find that I was tracked on over 75% of the pages I visited.” (P369)

improved awareness of tracking

participants were surprised by....

- the amount of tracking
- where they were tracked

“That live.com is the site with the most trackers. That is scary considering I only use live.com for email.” (P140)

improved knowledge about tracking

“Everything was pretty surprising and it feels like my privacy has been exposed. I never knew that companies tried to create ads supported for me based on my recent searches” (P175)

participants learned about...

- tracking's use for advertising

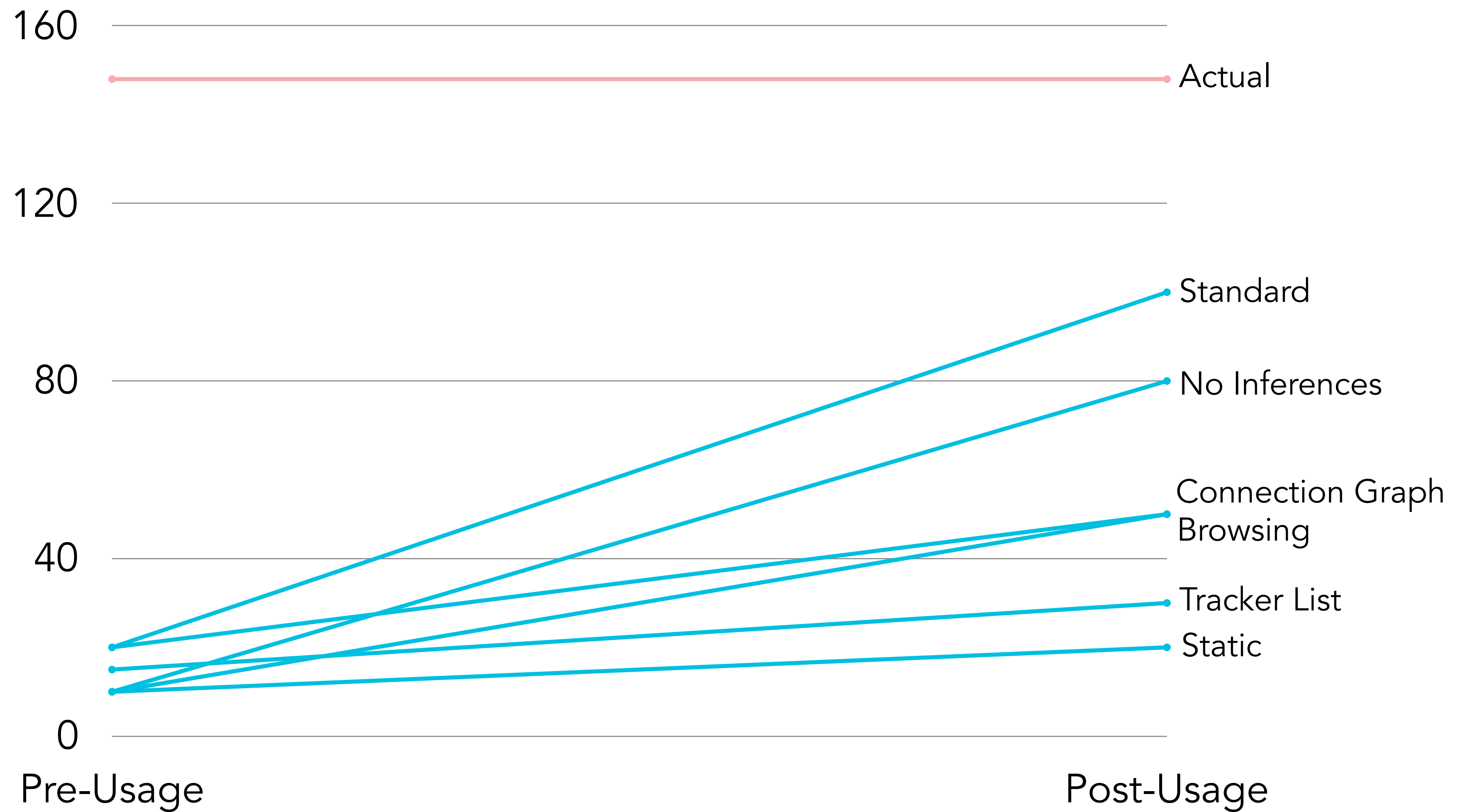
improved knowledge about tracking

“It shows my top interest is shopping, which i didn't figure that to be true, since i usually hate shopping. but it made me realize that i do a lot of shopping online now. that's new to me. It's also new that I have 75 potential interests.” (P161)

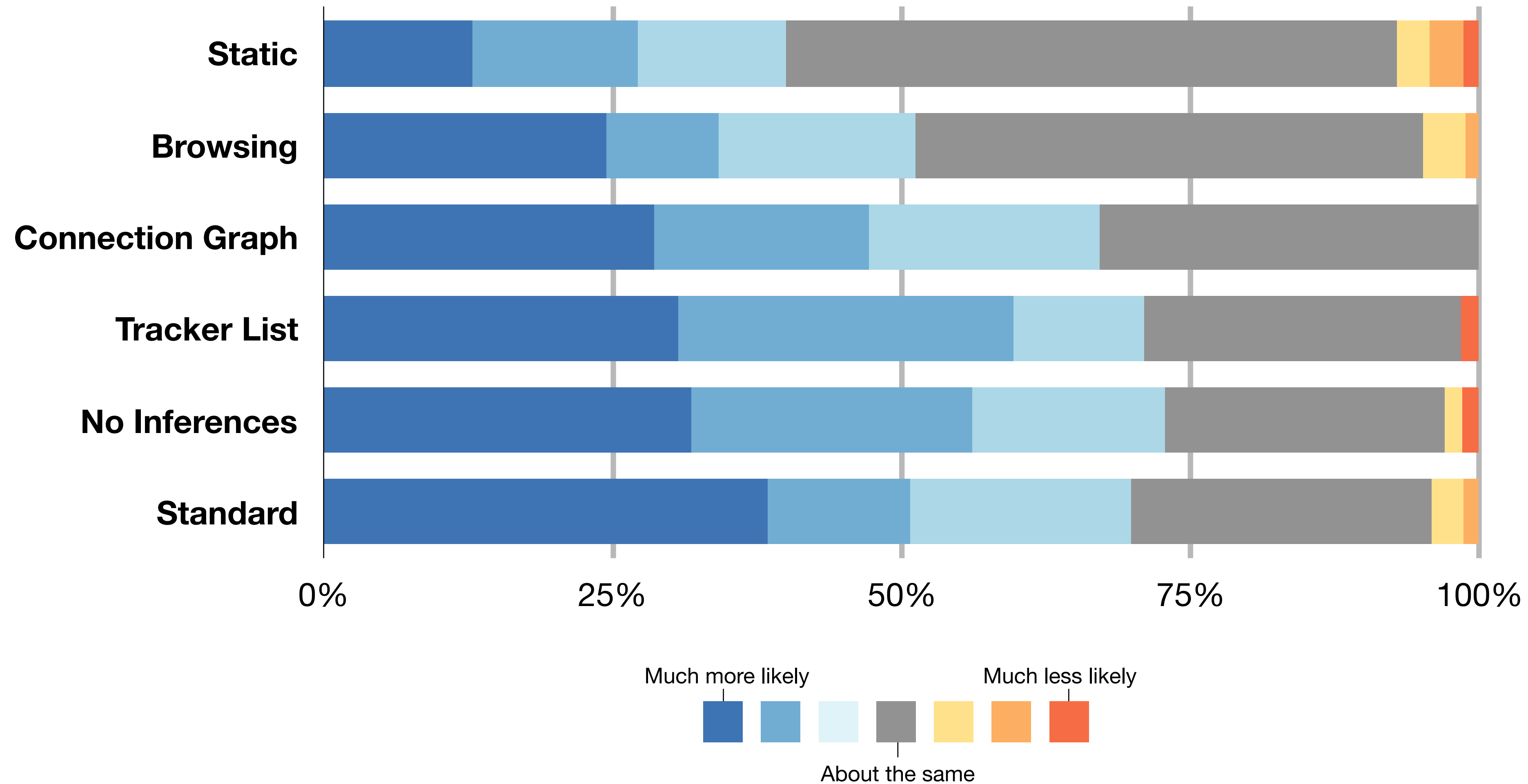
participants learned about...

- tracking's use for advertising
- inferencing in OBA

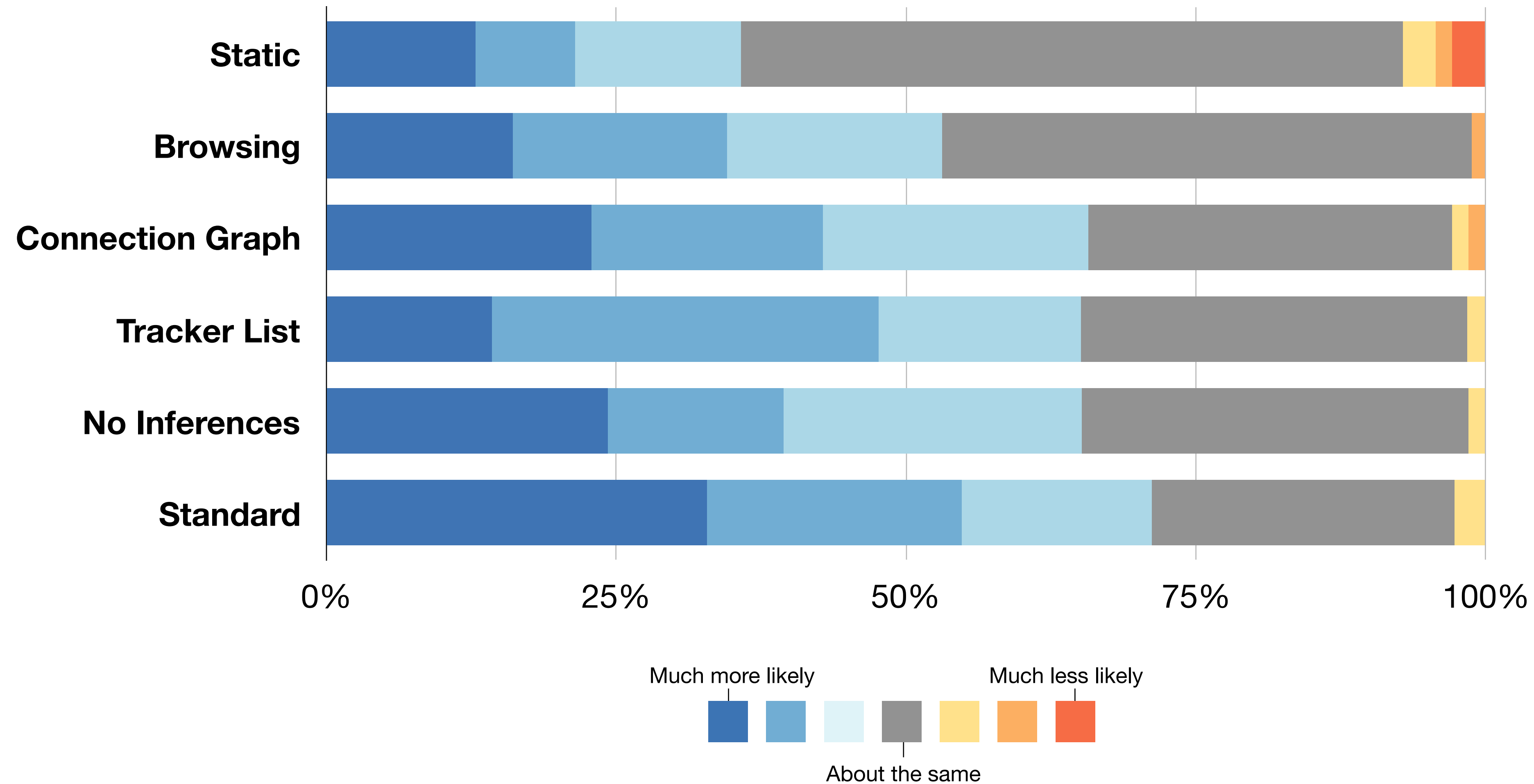
improved estimates of trackers encountered



more likely to use blocking tools



more likely to use private browsing

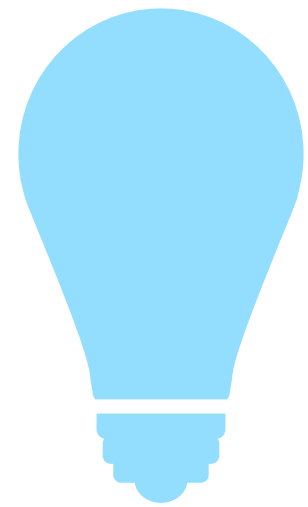


conclusion

takeaways



built a platform to show users data about tracking in their own browsing



tool increased awareness of how inferences are made & ability to quantify tracking



longitudinal visualizations about tracking
increased privacy intentions

find the code on GitHub!



UChicago SUPERgroup

**[https://git.io/
trackingtransparency](https://git.io/trackingtransparency)**

Oh, the Places You've Been!

User Reactions to Longitudinal Transparency About Third-Party Web Tracking and Inferencing

BY

Ben Weinshel

Shawn Shan

Miranda Wei

Claire Dolin

Mainack Mondal

Michelle L. Mazurek

Euirim Choi

Blase Ur



Many thanks to the Data Transparency
Lab, Mozilla, and the DoD!



built a platform to show users data
about tracking in their own browsing



tool increased awareness of how
inferences are made & ability to
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longitudinal visualizations about
tracking **increased privacy intentions**

<https://git.io/trackingtransparency>

