

Oh, the Places You've Been!

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

BY

Ben Weinshel

Miranda Wei

Mainack Mondal

Euirim Choi

Shawn Shan

Claire Dolin

Michelle L. Mazurek

Blase Ur

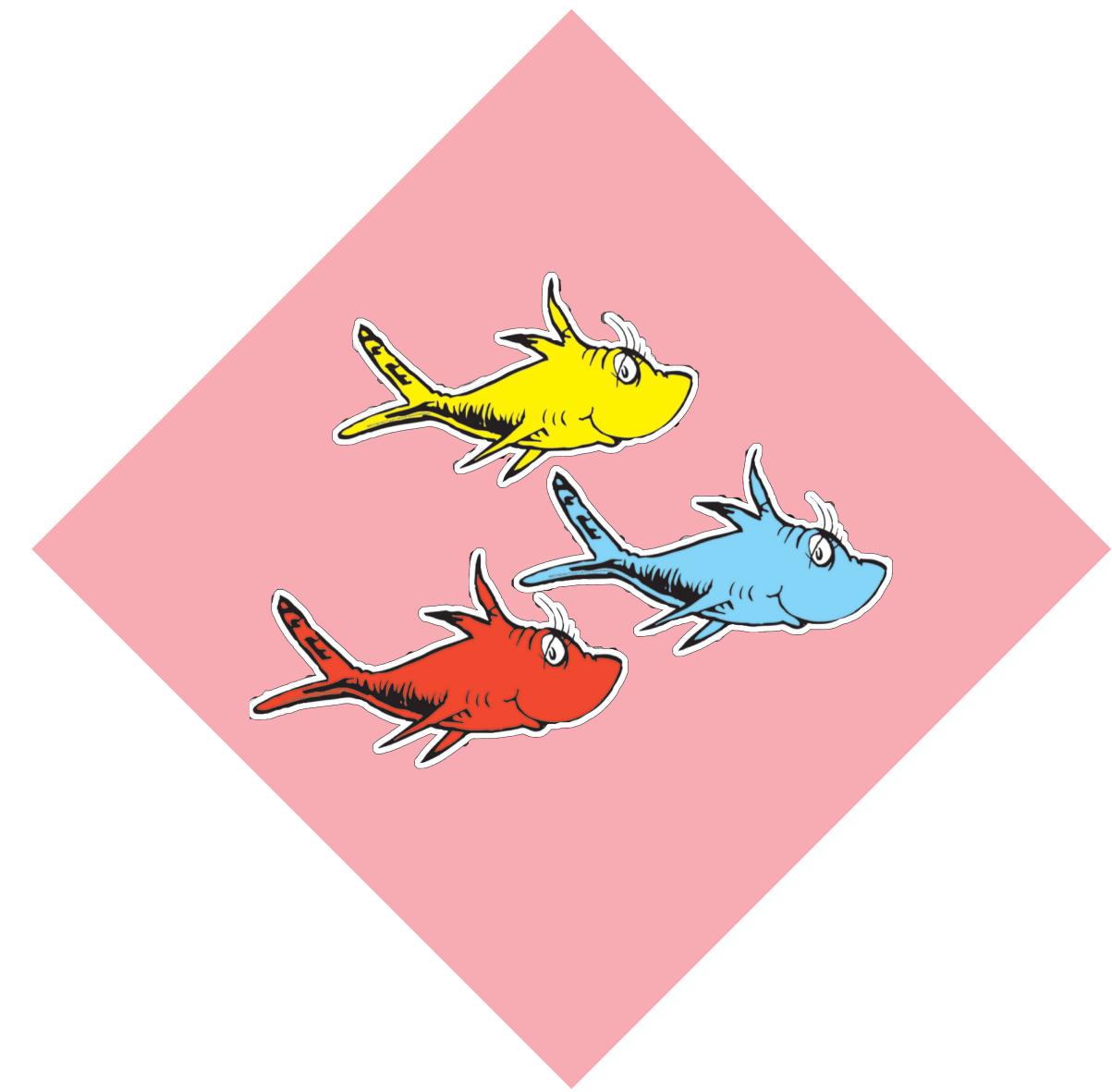


Security, Usability, & Privacy
Education & Research



this talk will contain
many references to Dr. Seuss









user-facing tracking controls

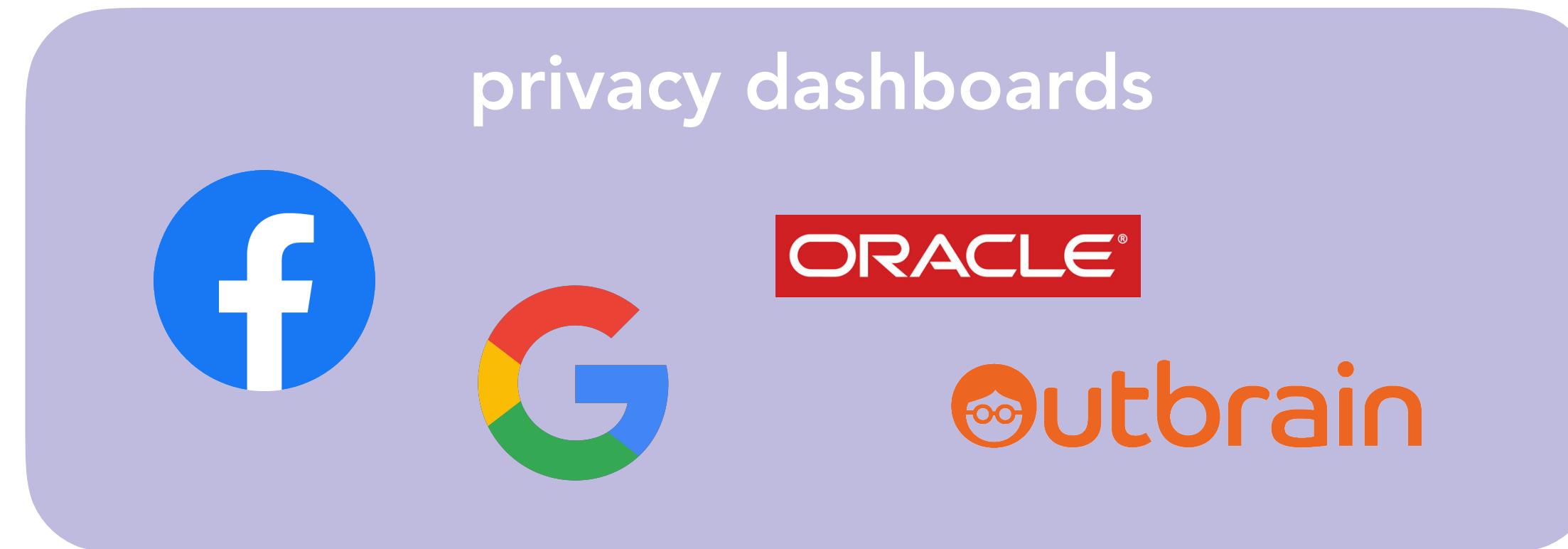
ad- & tracker-blocking extensions



built-in browser defenses



privacy dashboards



Dr. Seuss' Horton Hears a Who! | X

rottentomatoes.com/m/horton_hears_a_who2008

Rotten Tomatoes

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

Search movies, TV, actors, more... MOVIES & DVDS ▾ TV ▾ NEWS ▾ TICKETS & SHOWTIMES

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: Unc...
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: Unc...
92% Luce

[View All](#)

DR. SEUSS' HORTON HEARS A WHO! 2008

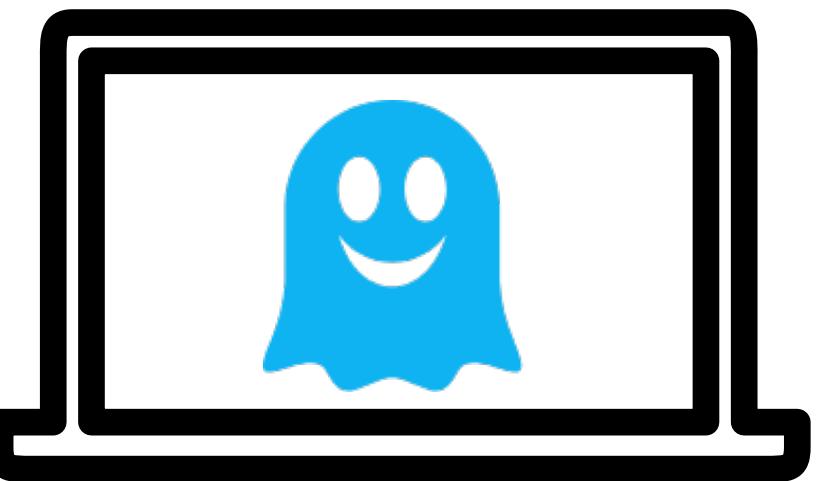
JIM CARREY STEVE CARELL

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.

79% 73%



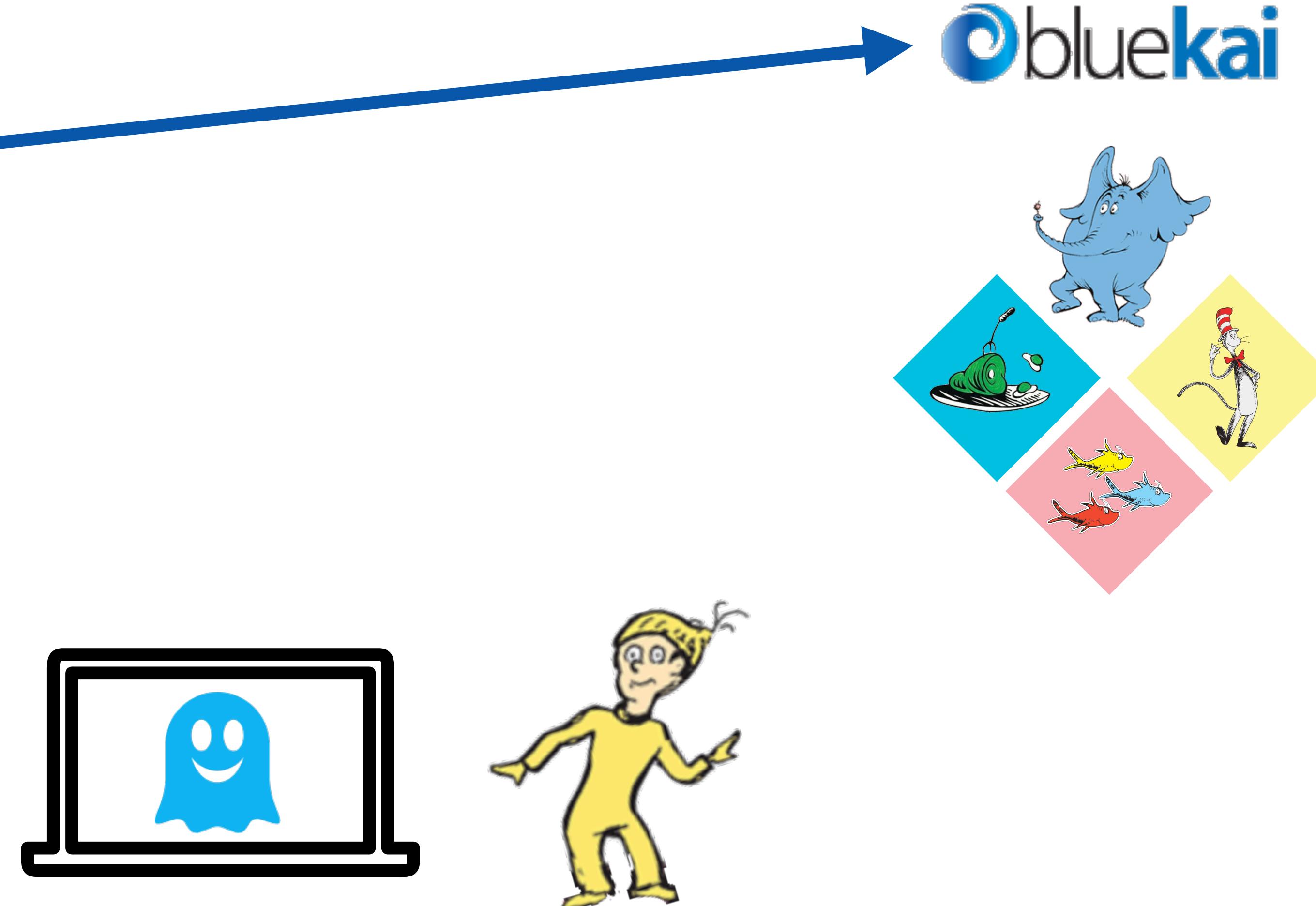
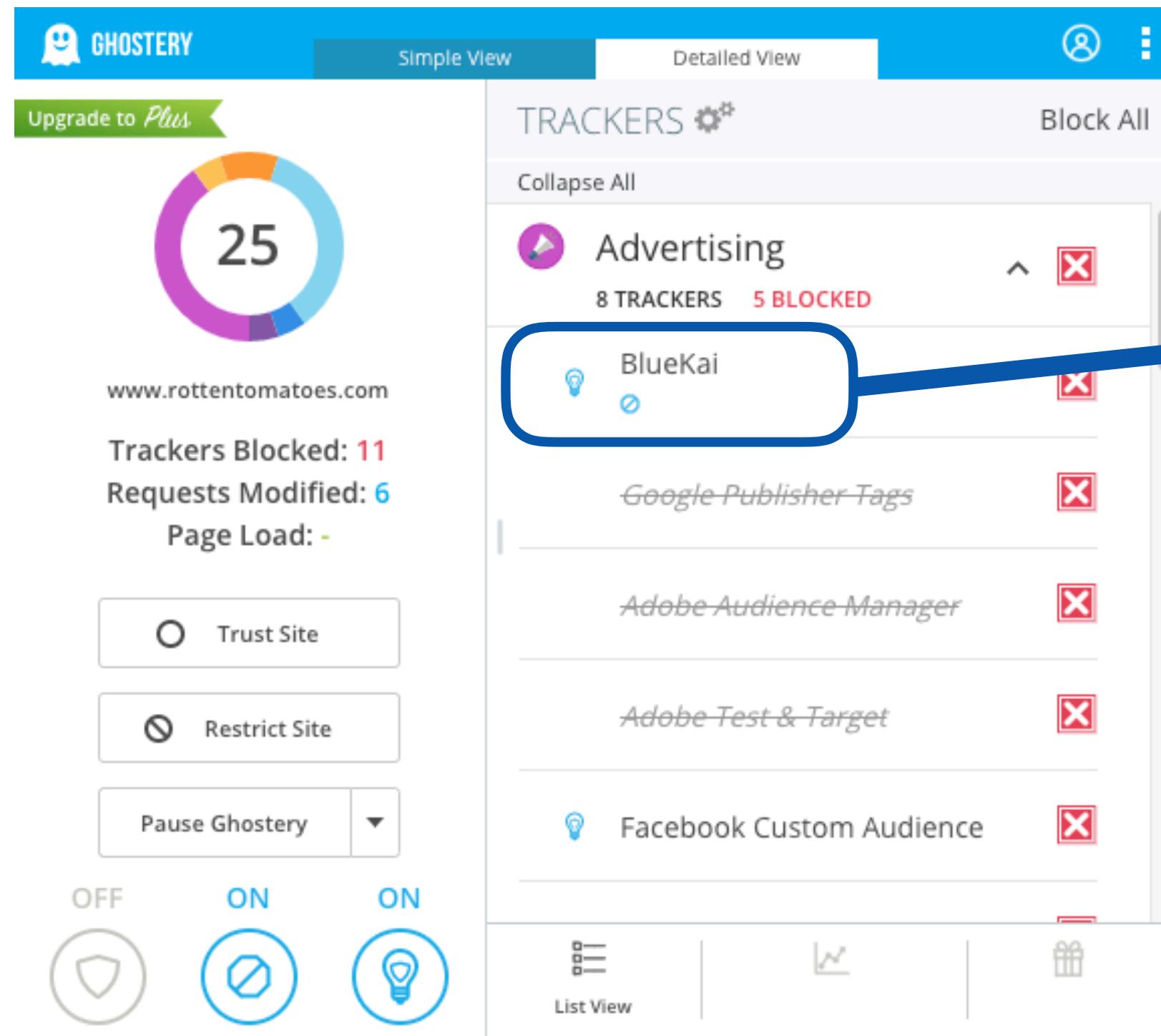
The screenshot shows the Ghostery extension interface. At the top, there's a blue header with the Ghostery logo, a 'Simple View' button (which is currently selected), a 'Detailed View' button, and a settings icon. Below the header is a green banner with the text 'Upgrade to Plus' and a circular progress bar indicating 25% completion.

The main area displays tracking information for the website www.rottentomatoes.com. It shows 'Trackers Blocked: 11' and 'Requests Modified: 6'. The 'Page Load:' section includes buttons for 'Trust Site', 'Restrict Site', and 'Pause Ghostery'. Below these are three toggle switches: 'OFF' (shield icon), 'ON' (stop icon), and 'ON' (lightbulb icon).

The 'TRACKERS' section lists blocked trackers under the 'Advertising' category, with 8 total trackers and 5 blocked. The listed trackers are: BlueKai, Google Publisher Tags, Adobe Audience Manager, Adobe Test & Target, and Facebook Custom Audience. Each tracker entry has a red 'X' icon to its right.



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

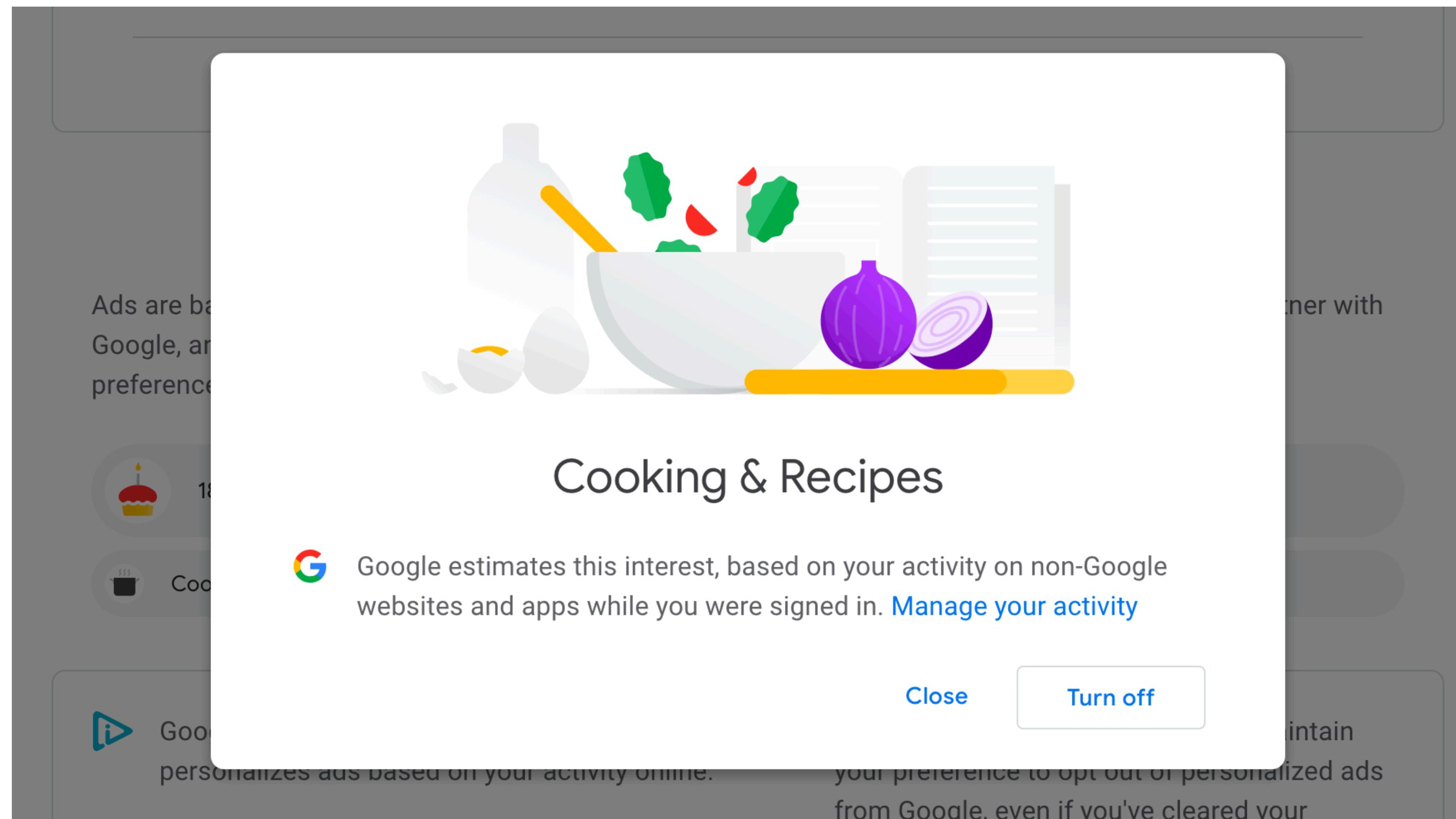


Cooking & Recipes



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,
Warshaw et al. 2016]

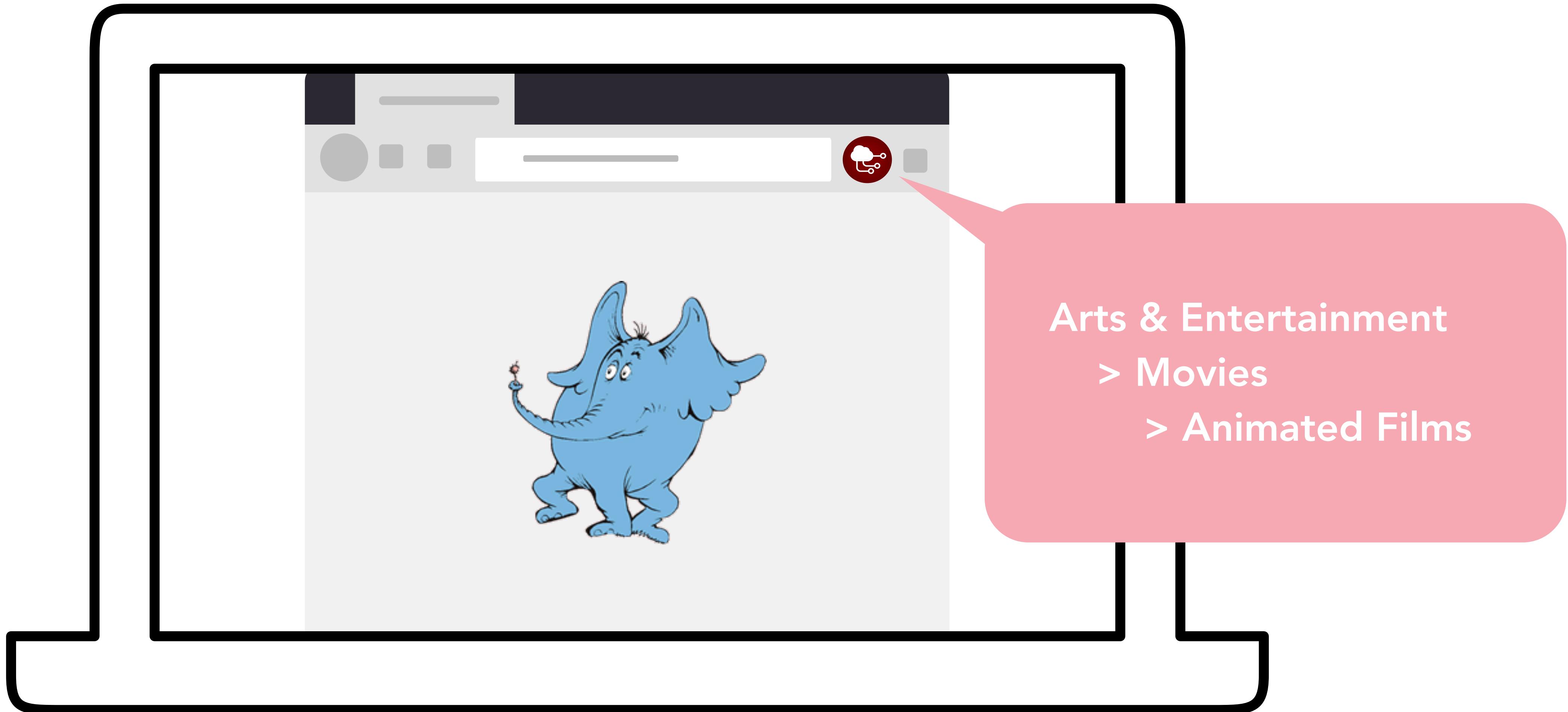


outline

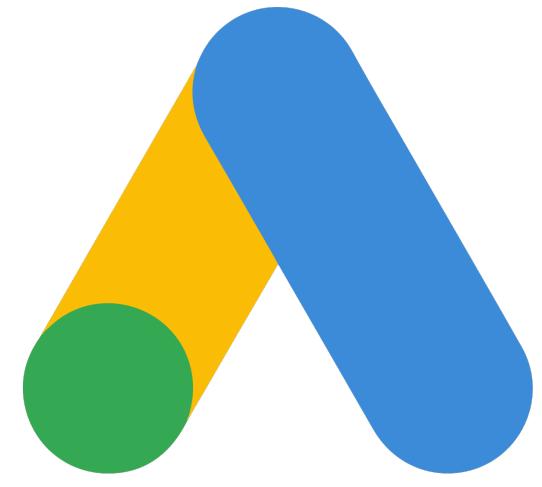
1. motivation
2. our tool
3. method
4. results
5. conclusion



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



WIKIPEDIA
The Free Encyclopedia

use 1,932
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potential topics

extract &
preprocess text



* 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  blacklisted)
 - metadata about page



WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact page

Tools
What links here
Related changes
Upload file
Special pages
Permanent link
Page information
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Cite this page

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Read Edit View history

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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]

- 1 Plot
- 2 Voice cast
- 3 Production
- 4 Soundtrack
- 5 Reception
 - 5.1 Critical reception
 - 5.2 Box office
 - 5.3 Interpretations
 - 5.4 Awards
- 6 Home media release
- 7 References
- 8 External links

Horton Hears a Who!



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

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 yelp coming from it. Believing that an entire society of microscopic



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The Free Encyclopedia

Main page
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Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact page

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What links here
Related changes
Upload file
Special pages
Permanent link
Page information
Wikidata item
Cite this page
In other projects
Wikimedia Commons
Wikiquote

Print/export
Create a book
Download as PDF
Printable version
Languages

Article Talk

Horton Hears a Who! (film)

From Wikipedia, the free encyclopedia

Horton Hears a Who! (also known as *Dr. Seuss' Horton Hears a Who!*) is an animated adventure comedy film based on the book of the same name by Dr. Seuss. It was produced by Illumination Entertainment and distributed by 20th Century Fox. Directed by Jimmy Hayward and Jim Carrey, it is the first feature film to be directed by Jimmy Hayward and the first film to feature Jim Carrey in a directorial debut. The film's screenplay was written by Cinco Paul and Ken Daurio, and the music was composed by Steve Martino. Jim Carrey and Steve Carell as Horton the Elephant and Mayor Ned McDodd. Amy Poehler, Will Arnett, Seth Rogen, Isla Fisher, and Amy Poehler.^[4] John Powell composed the score.

The film was released theatrically on March 14, 2008, and grossed \$297 million worldwide. It received mixed reviews from critics. It was the third Dr. Seuss feature film adaptation,^[5] the first computer-animated,^[6] and the second Dr. Seuss film starring Jim Carrey after *How the Grinch Stole Christmas* (2000).^[6]

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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

30289

145

Trackers encountered

Pages visited

Potential interests

Open Tracking Transparency dashboard



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](#)

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.

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

Tracking Transparency Interests **Trackers** Sites Activity About 

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300 **38801** **157**

Trackers encountered Pages visited Potential interests

Recent Interests

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Recent Sites

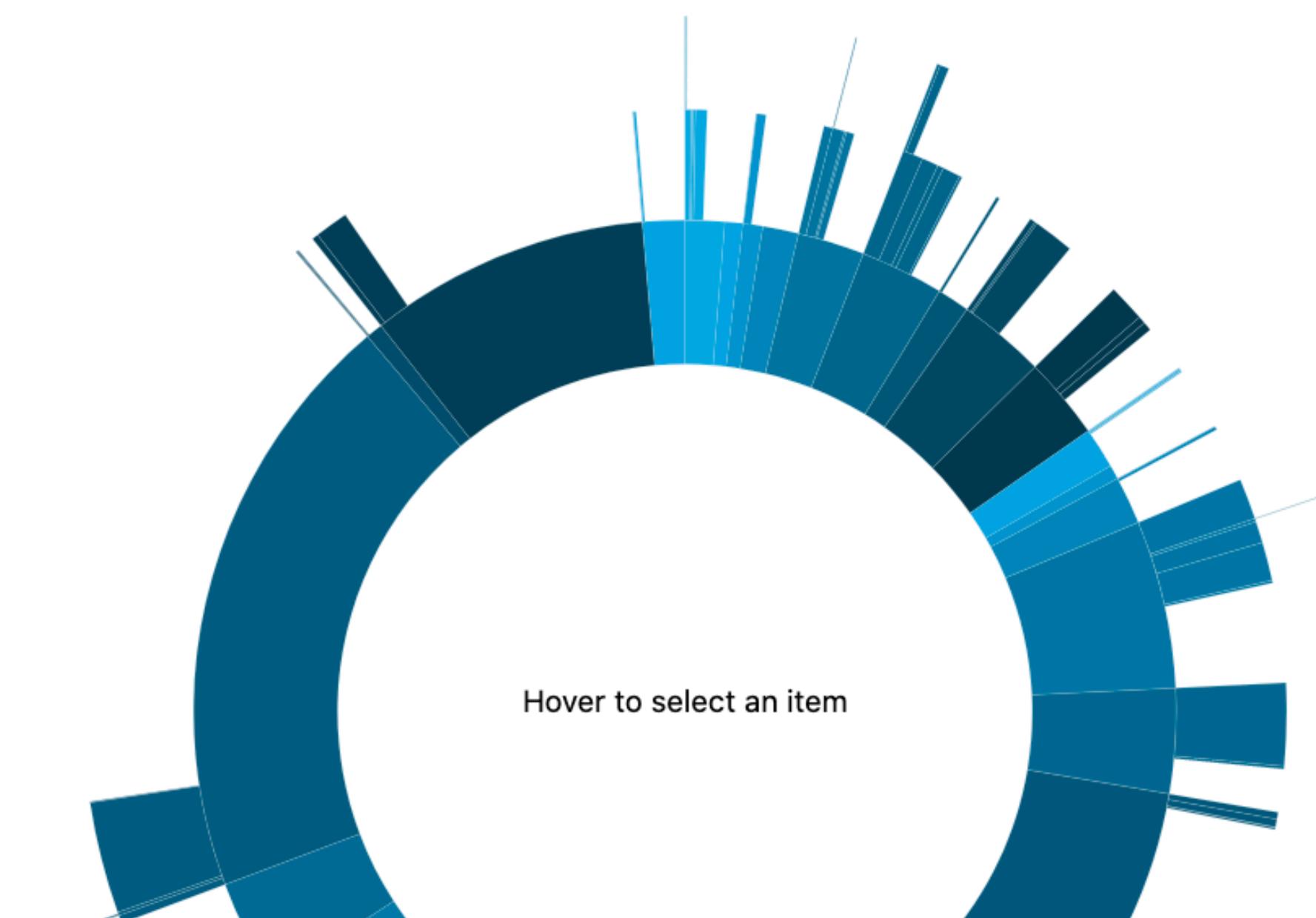
- facebook.com
- instagram.com
- list-manage.com
- washington.edu
- google.com

[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

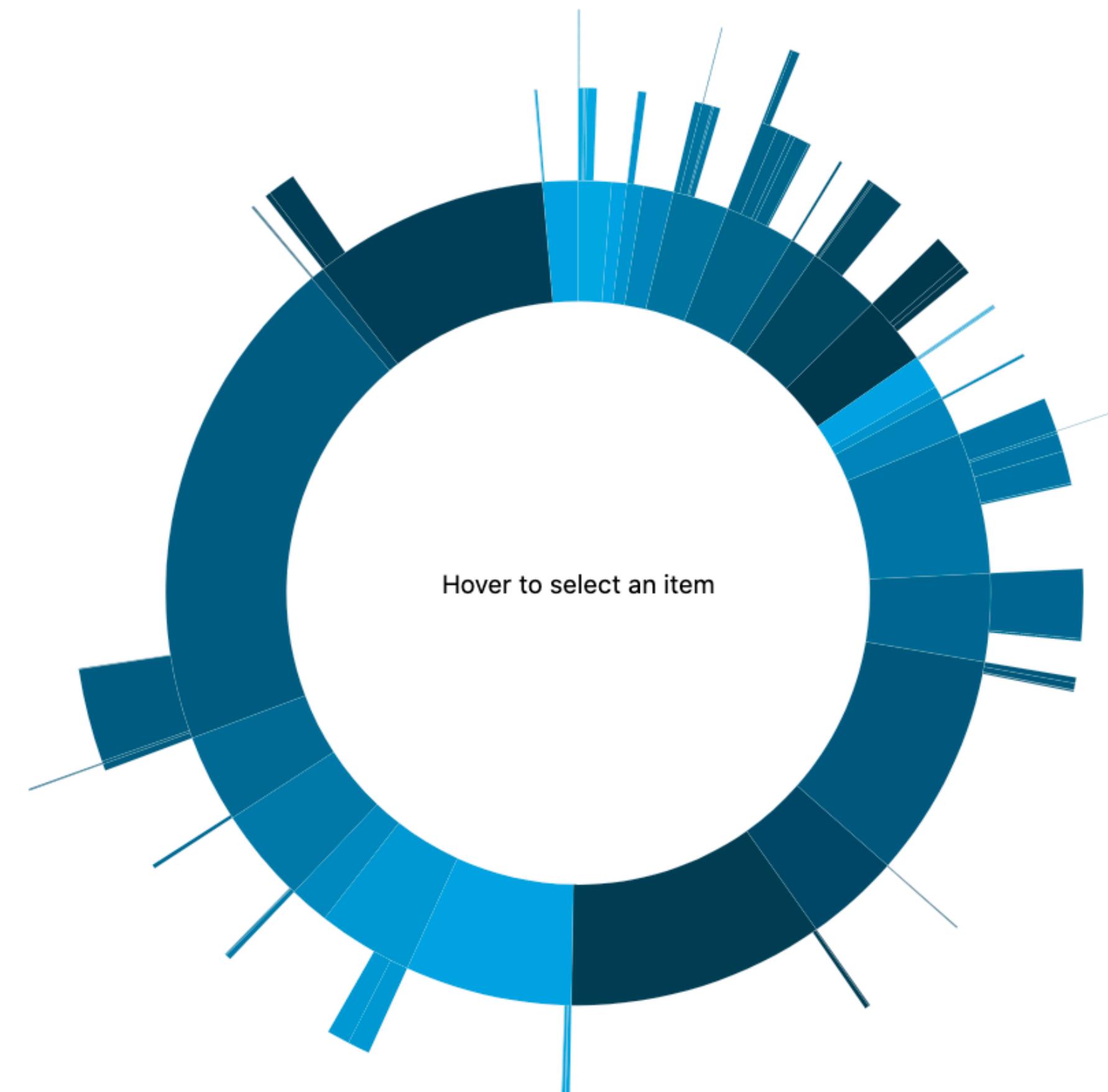
Popularity ALL LESS MORE

Comfort ALL LESS MORE



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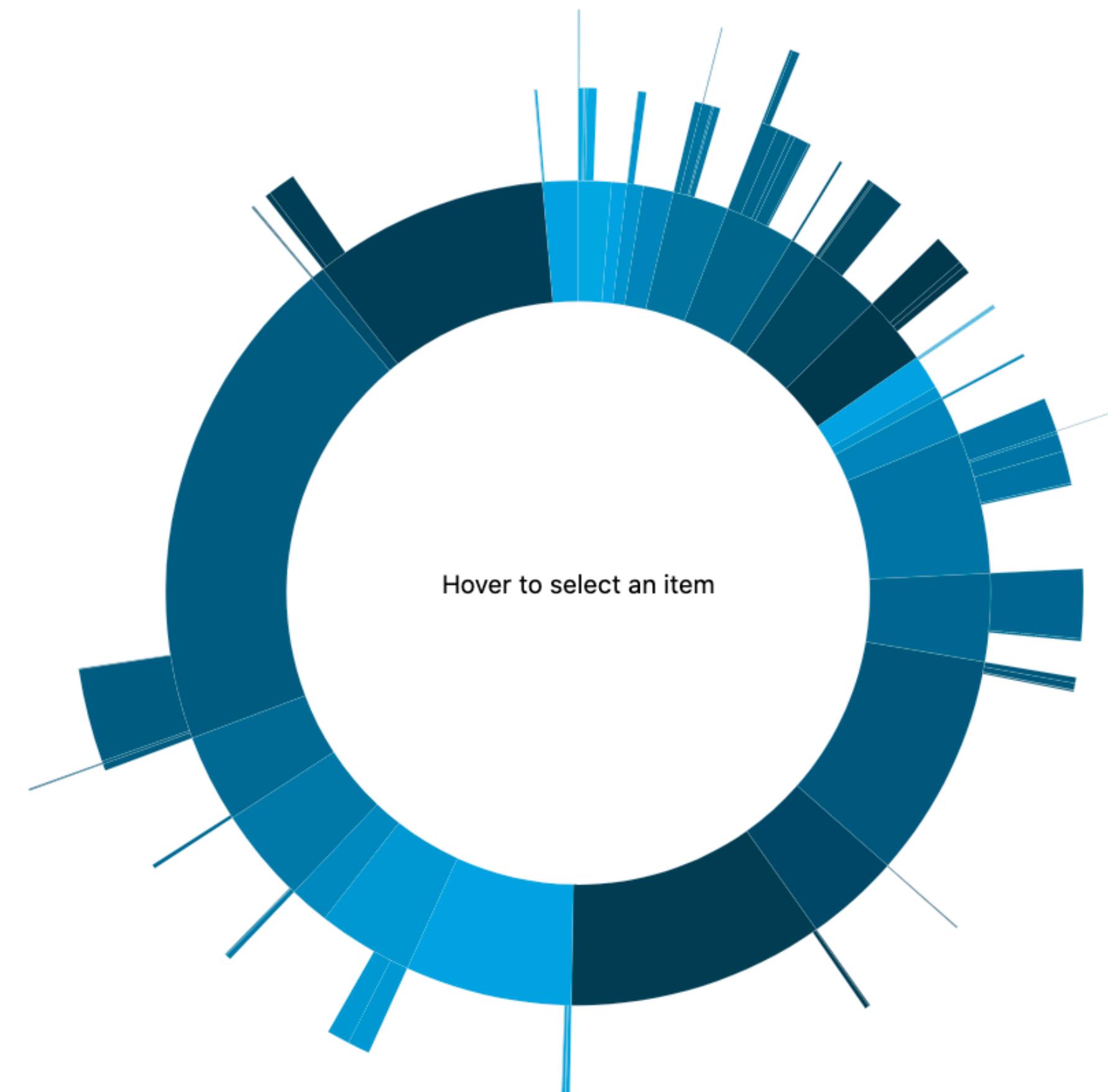
Recency	i	ALL	24 HRS	7 DAYS
Popularity	i	ALL	LESS	MORE
Comfort	i	ALL	LESS	MORE





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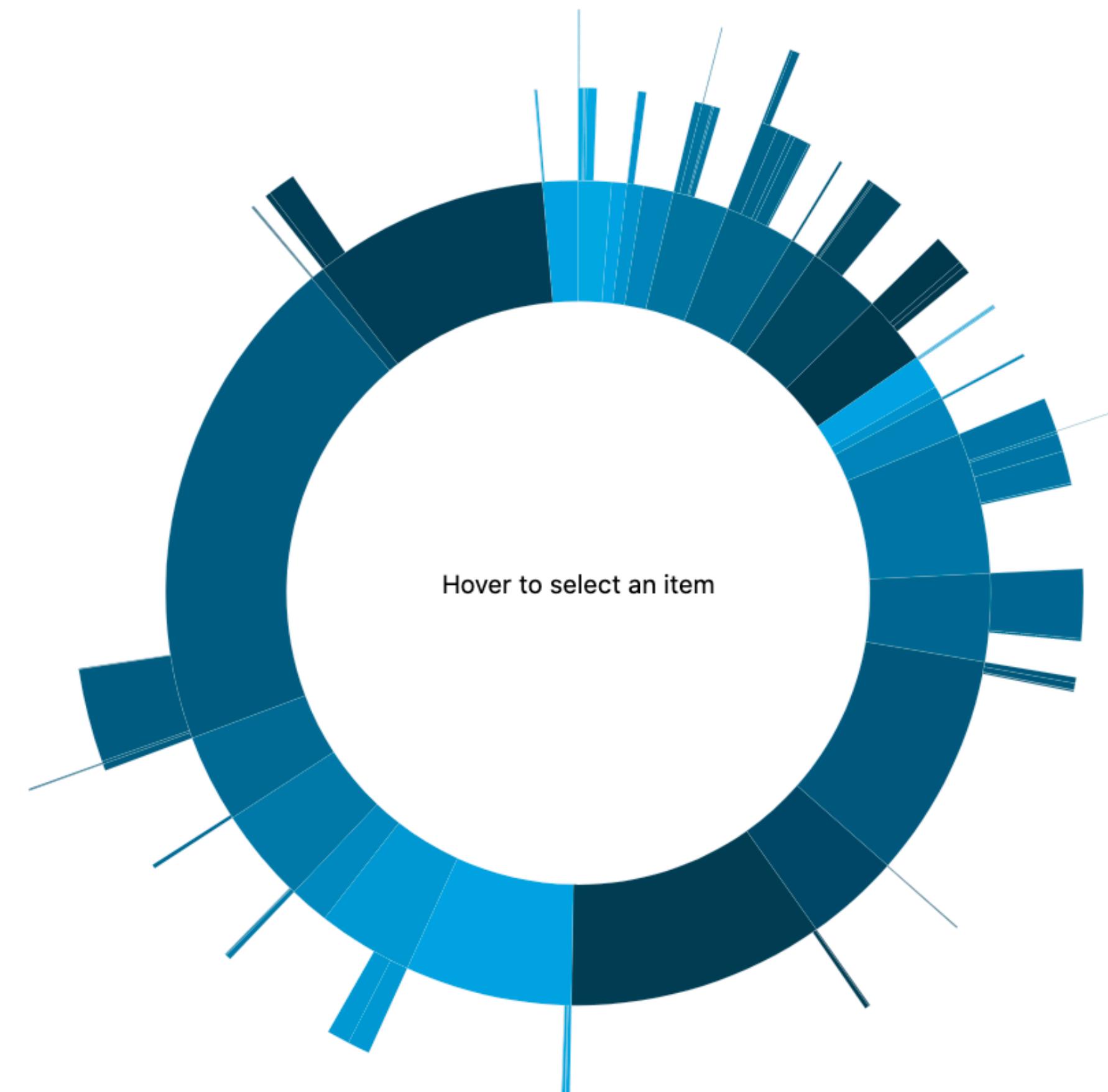
Recency	<i>i</i>	<input type="button" value="ALL"/>	<input type="button" value="24 HRS"/>	<input type="button" value="7 DAYS"/>
Popularity	<i>i</i>	<input type="button" value="ALL"/>	<input type="button" value="LESS"/>	<input type="button" value="MORE"/>
Comfort	<i>i</i>	<input type="button" value="ALL"/>	<input type="button" value="LESS"/>	<input type="button" value="MORE"/>





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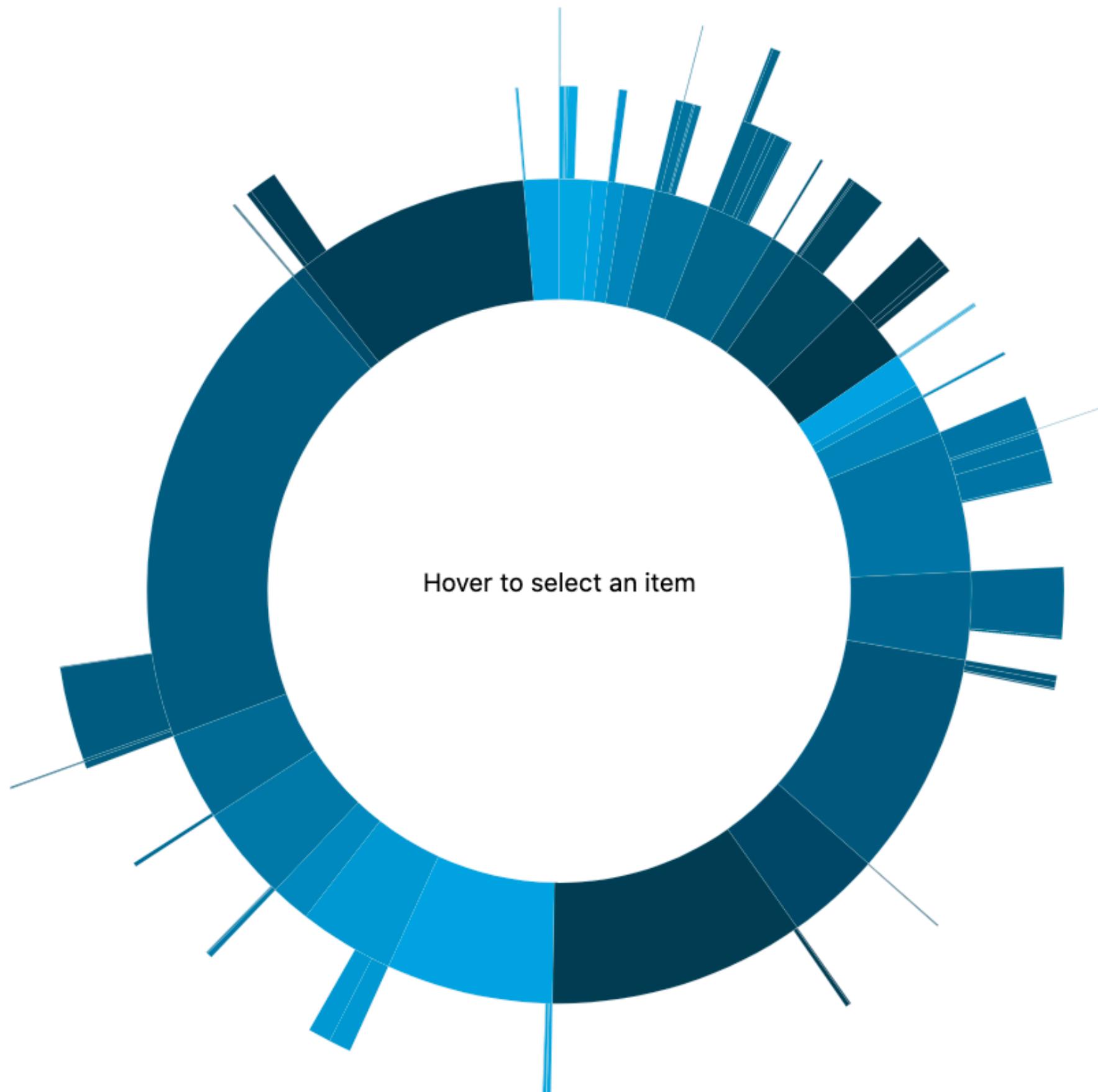
Filters

Recency		<input type="button" value="ALL"/> <input type="button" value="24 HRS"/> <input type="button" value="7 DAYS"/>
Popularity		<input type="button" value="ALL"/> <input type="button" value="LESS"/> <input type="button" value="MORE"/>
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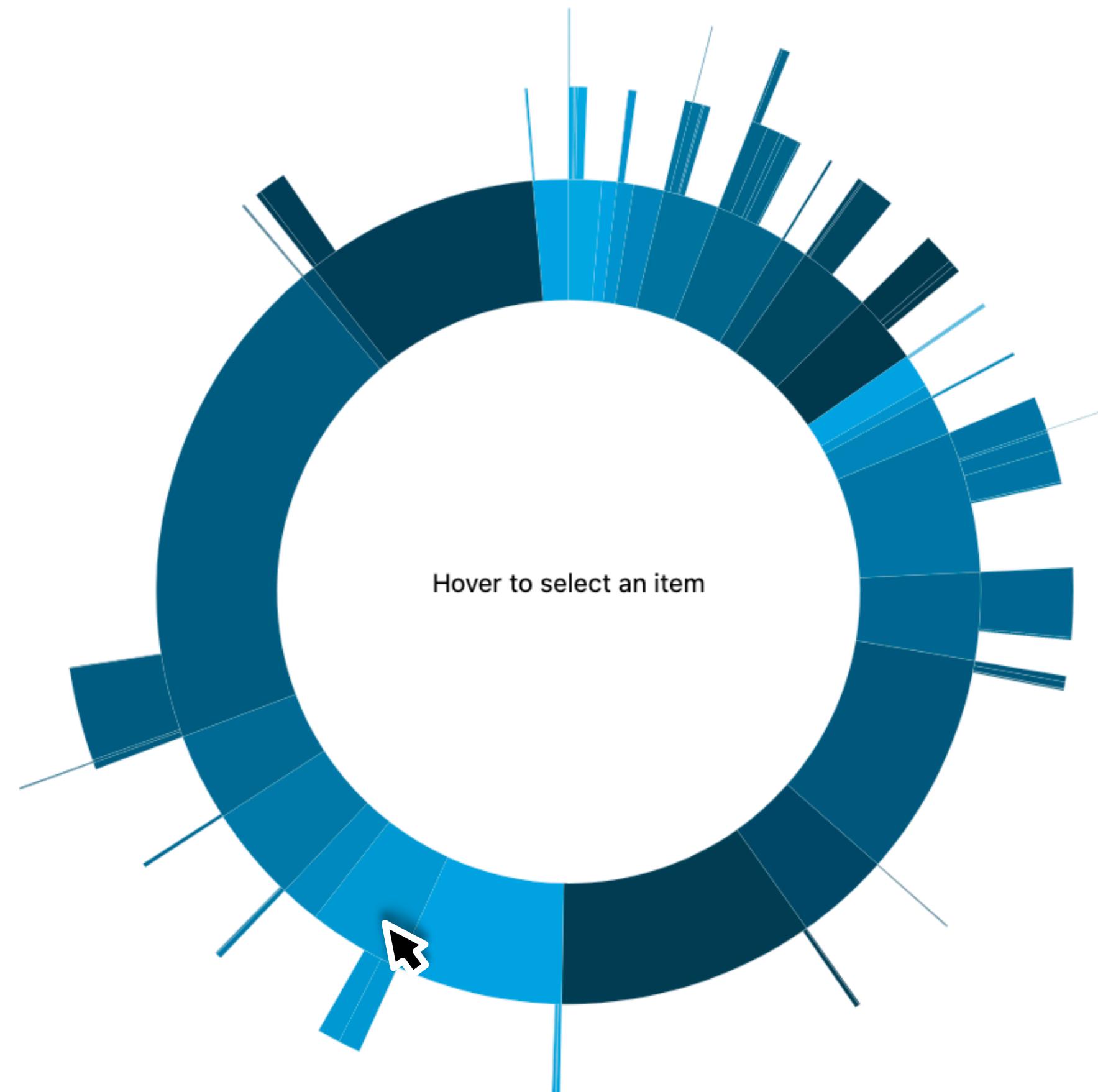
Unpacking Perceptions of Data-Driven Inferences Underlying Online Targeting and Personalization

Claire Dolin*, Ben Weinshel*, Shawn Shan,
Chang Min Hahn, Euirim Choi, Michelle L. Mazurek†, Blase Ur
University of Chicago and University of Maryland (†)

{cdolin, weinshel, shanshioxing, changhahn, euirim, blase}@uchicago.edu, mmazurek@cs.umd.edu (†)

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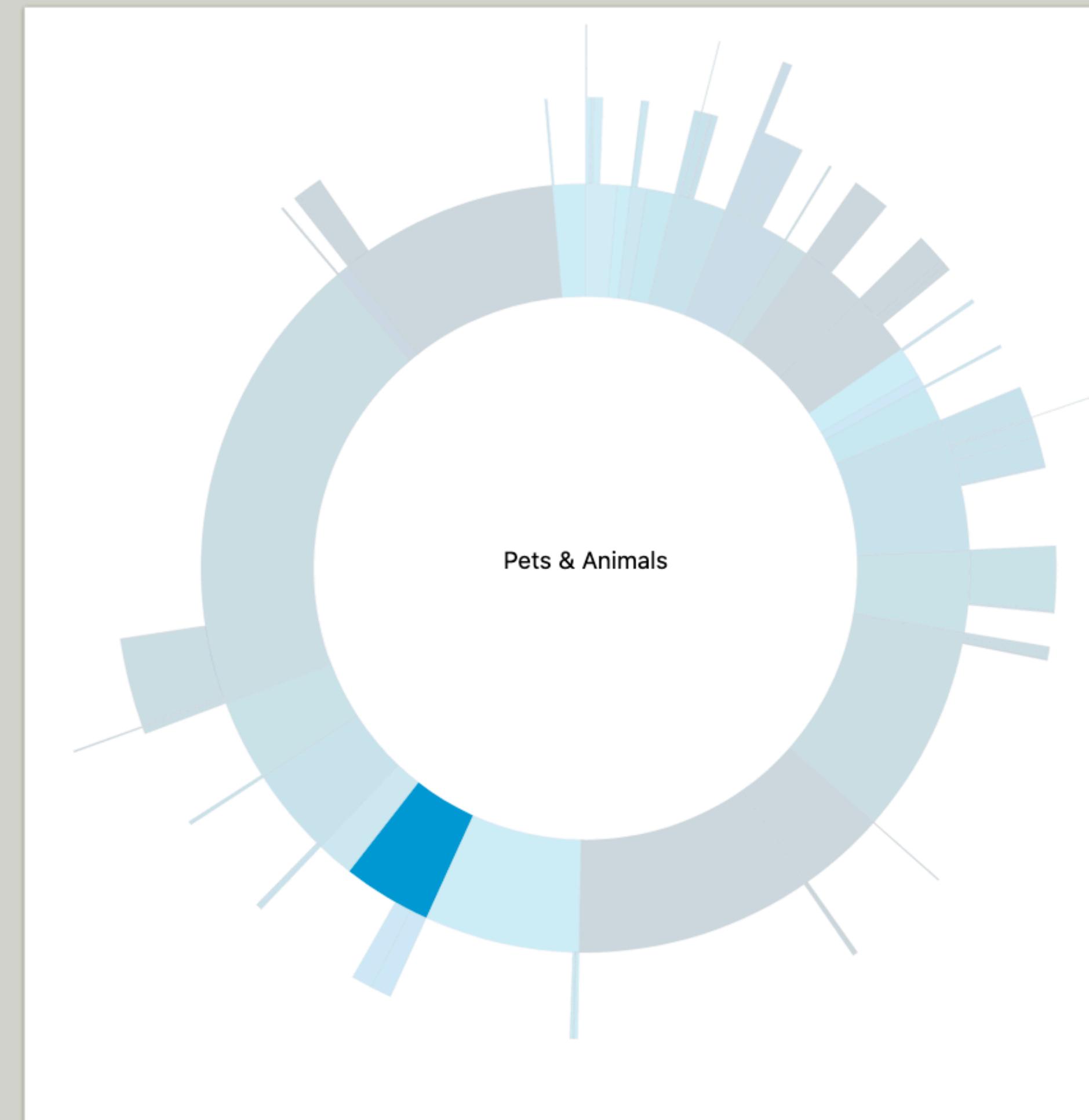
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The chart below shows the interests suggested by your browsing activity. Click a slice of the chart to see more details.



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

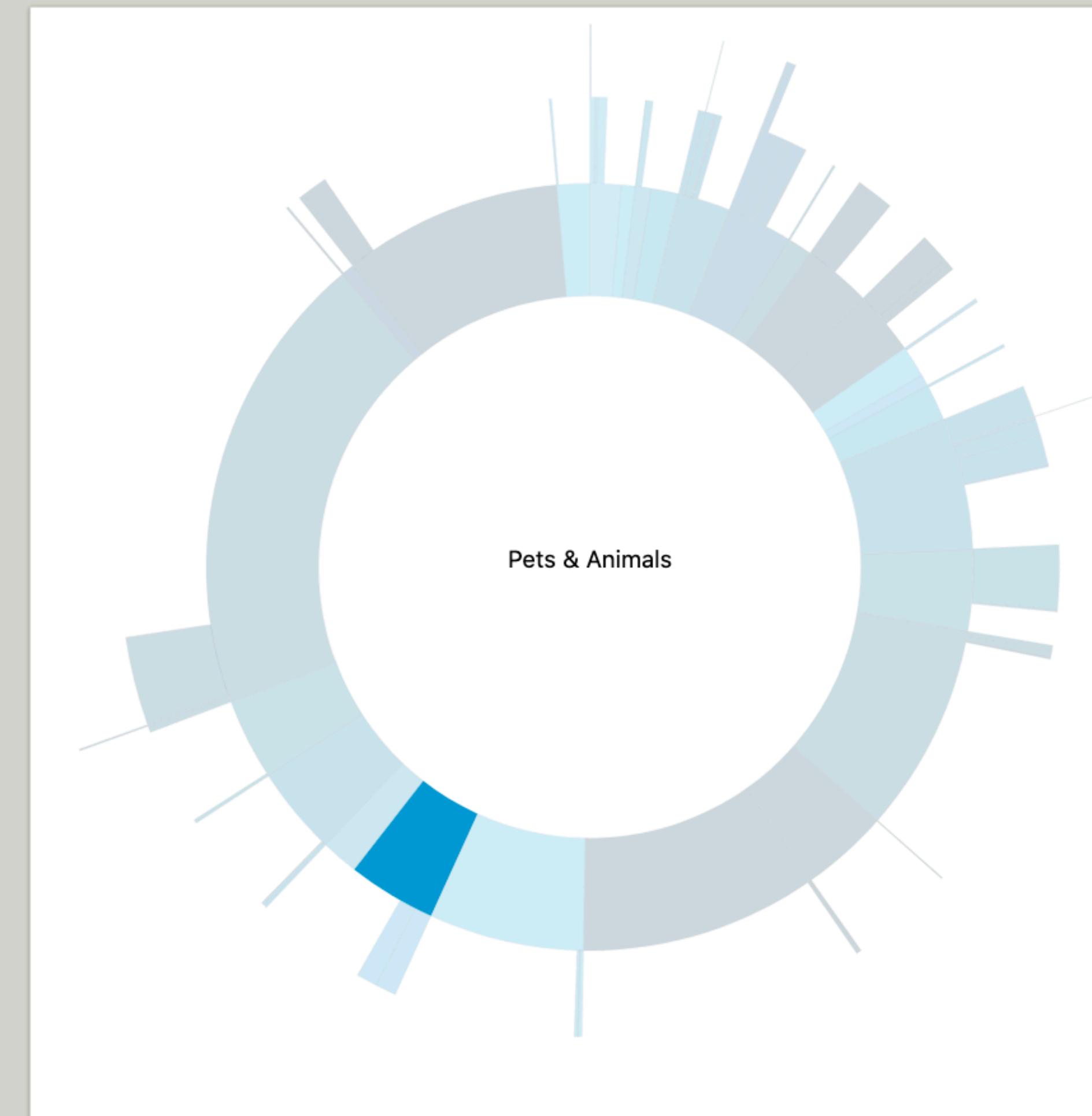
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Recency ALL 24 HRS 7 DAYS

Popularity ALL LESS MORE

Comfort ALL LESS MORE

Home > Interests > Pets & Animals

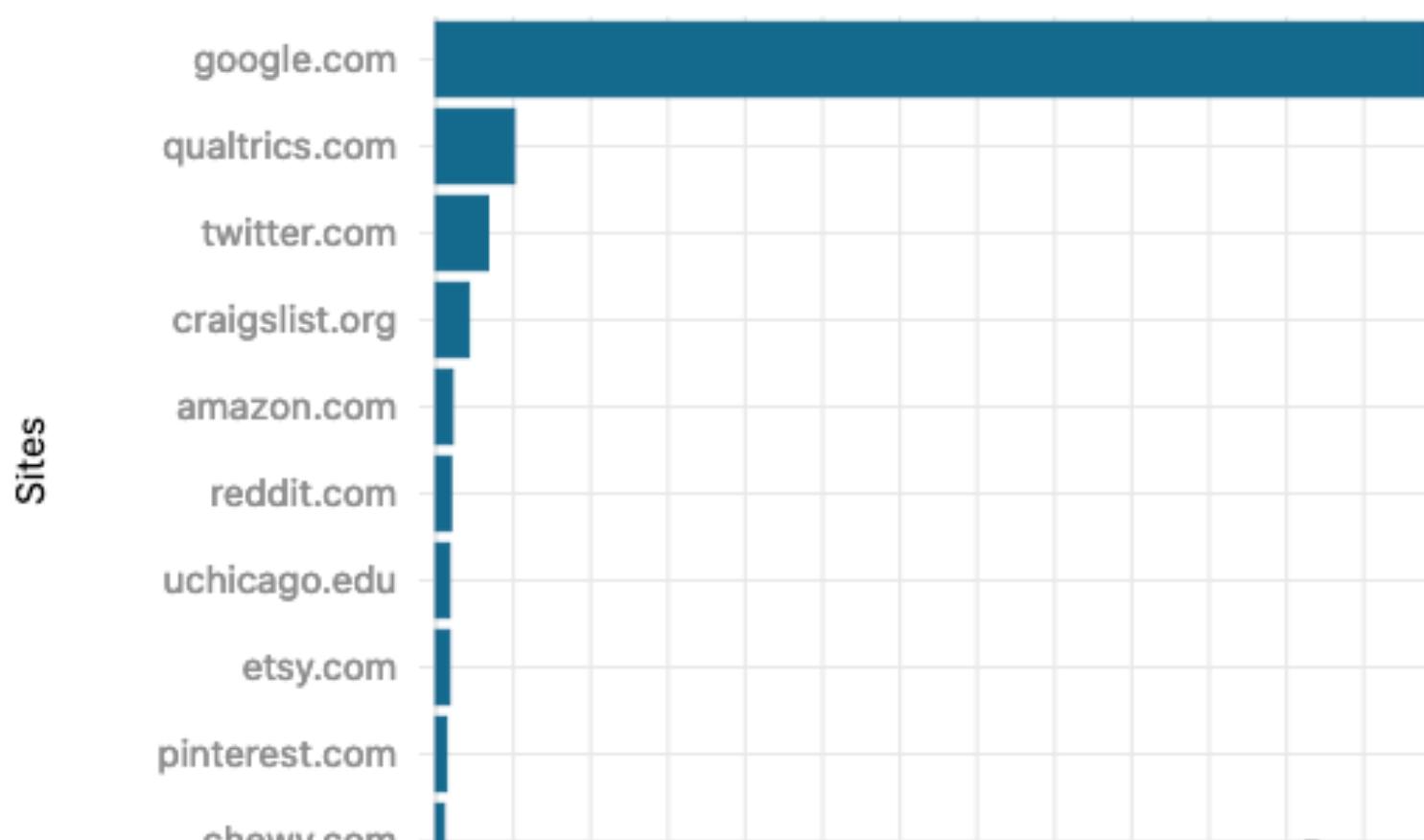
👍 Your *Pets & Animals* profile

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.

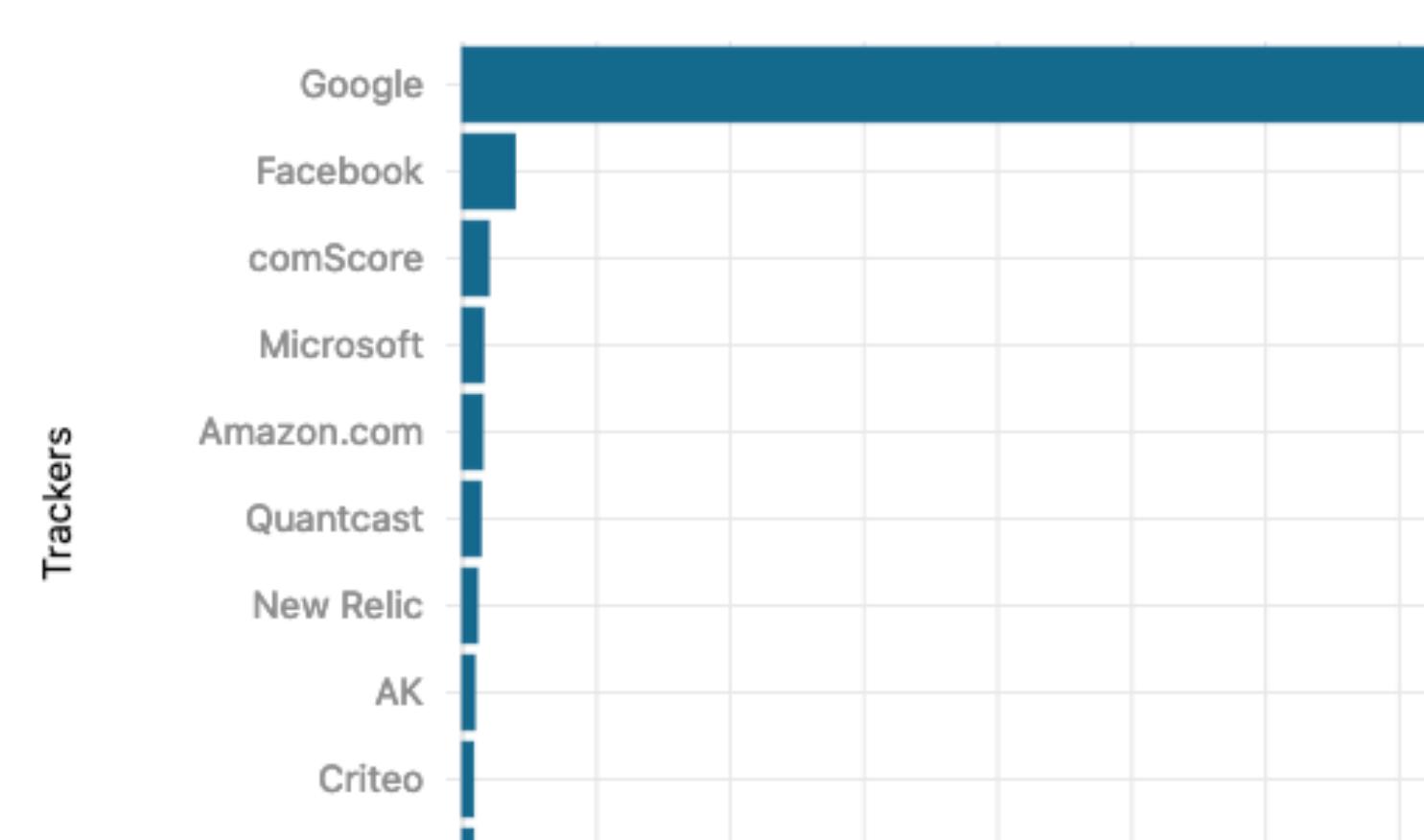
Which sites were about *Pets & Animals*?

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.*



Tracking Transparency Interests Trackers Sites Activity About 

Home > Interests > Pets & Animals

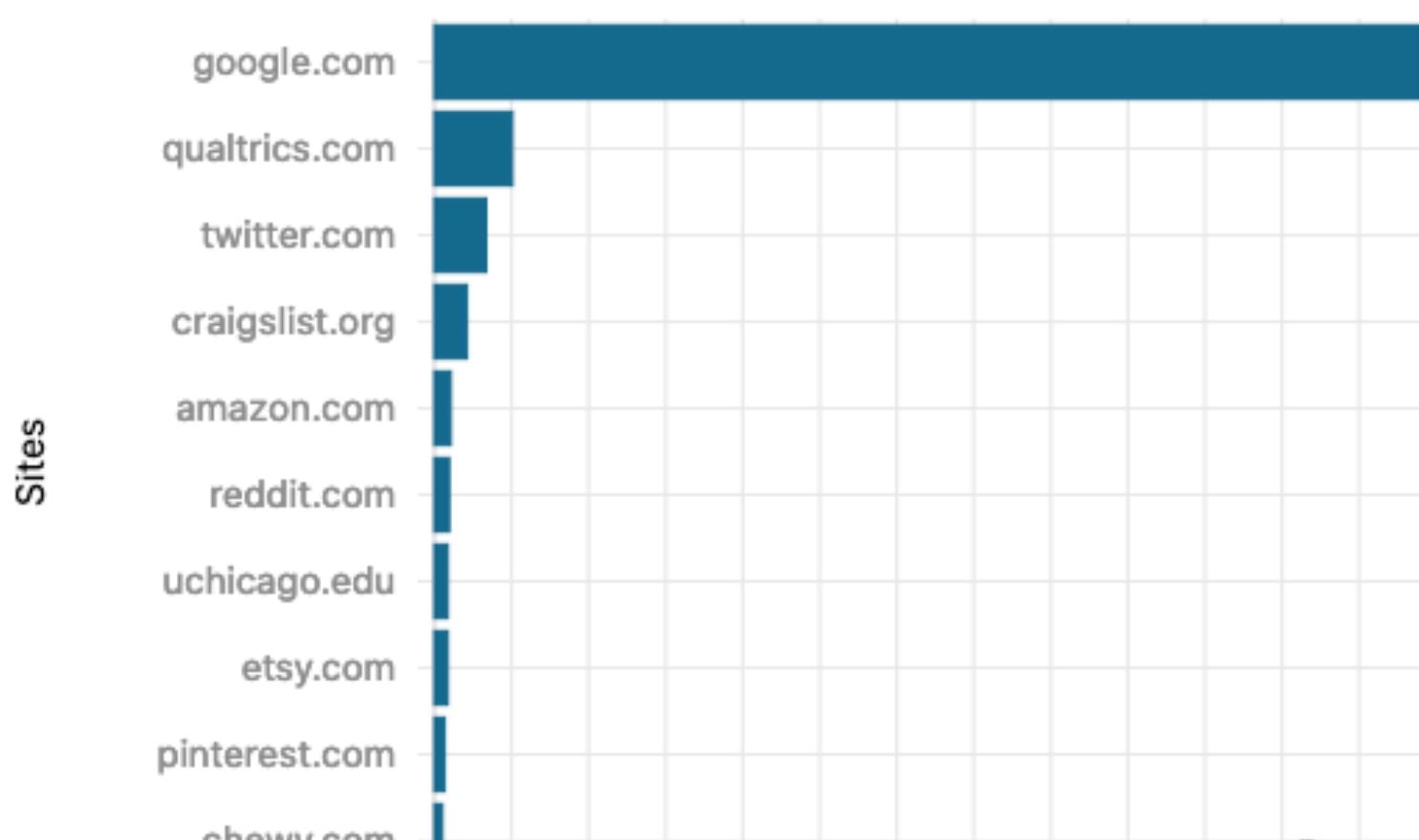
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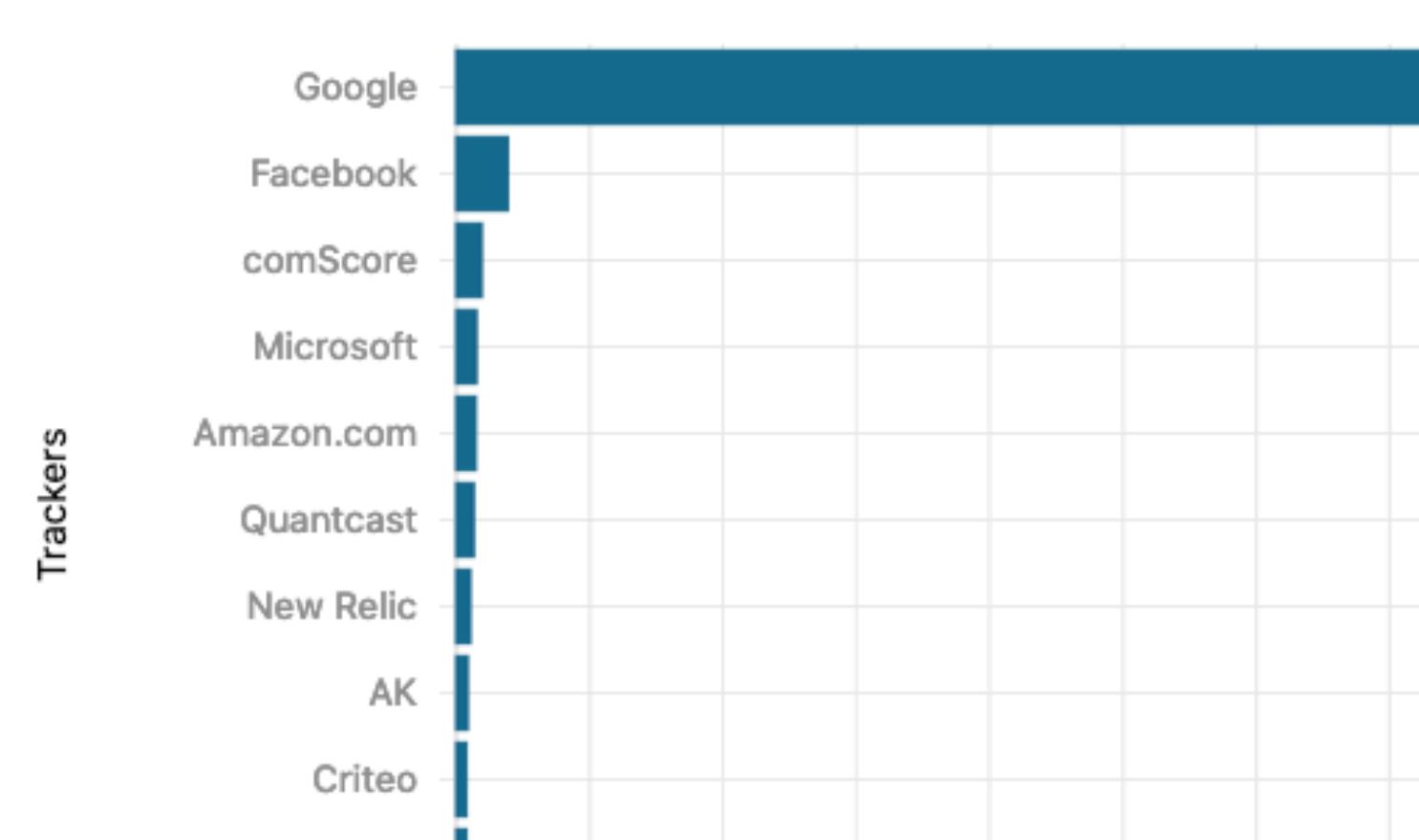
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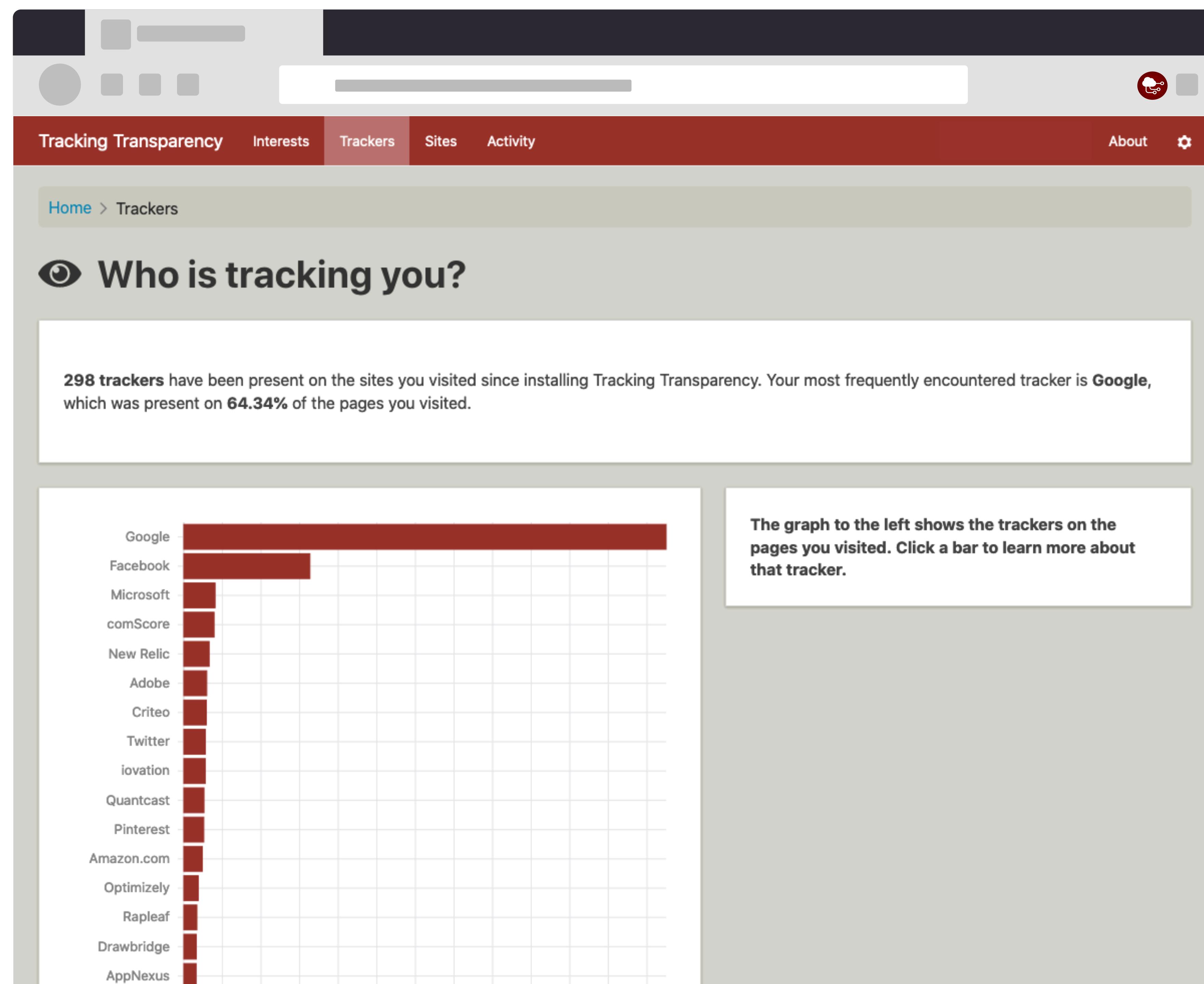
Sites	Visits
google.com	75
qualtrics.com	5
twitter.com	3
craigslist.org	2
amazon.com	1
reddit.com	1
uchicago.edu	1
etsy.com	1
pinterest.com	1
chewy.com	1

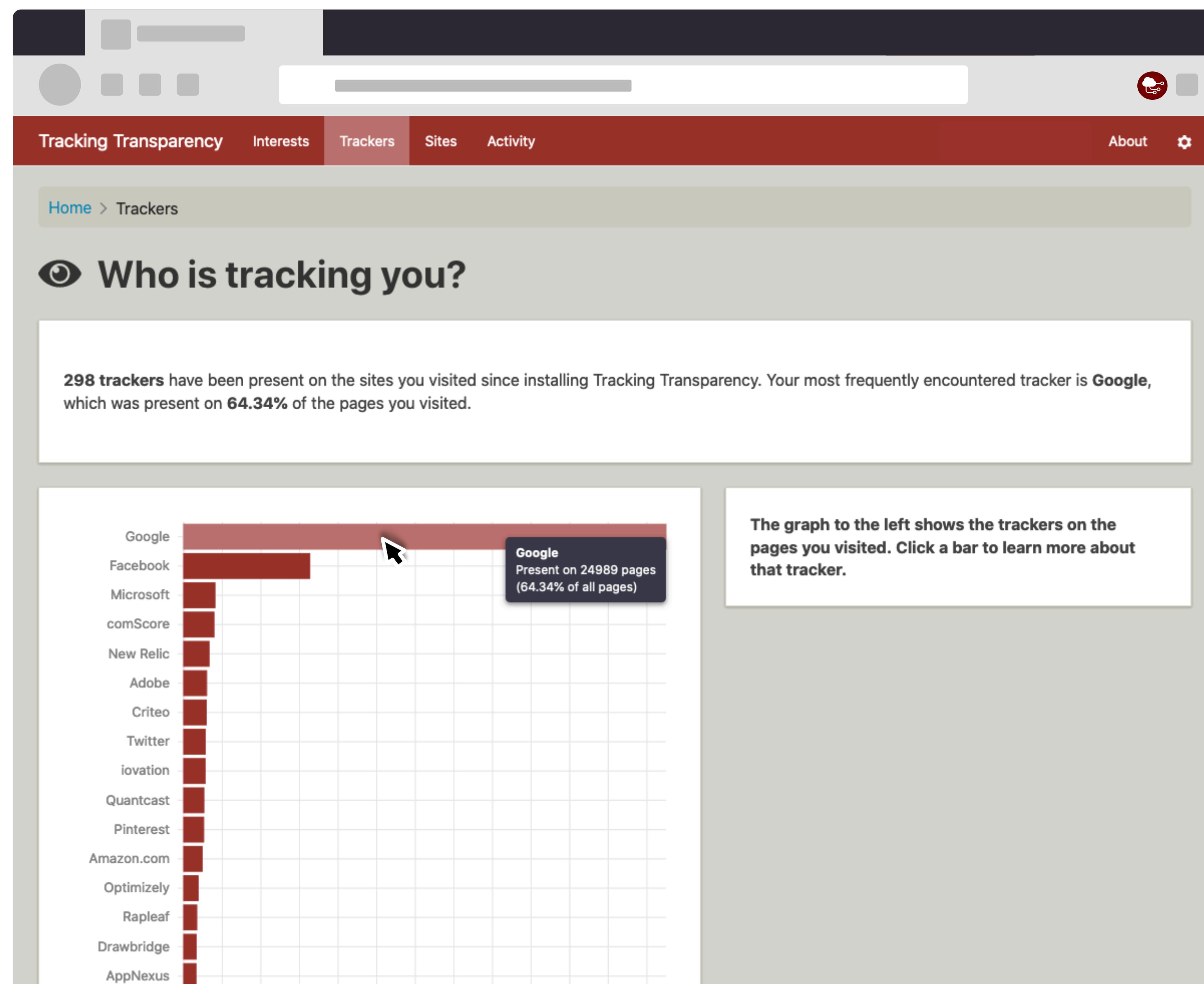
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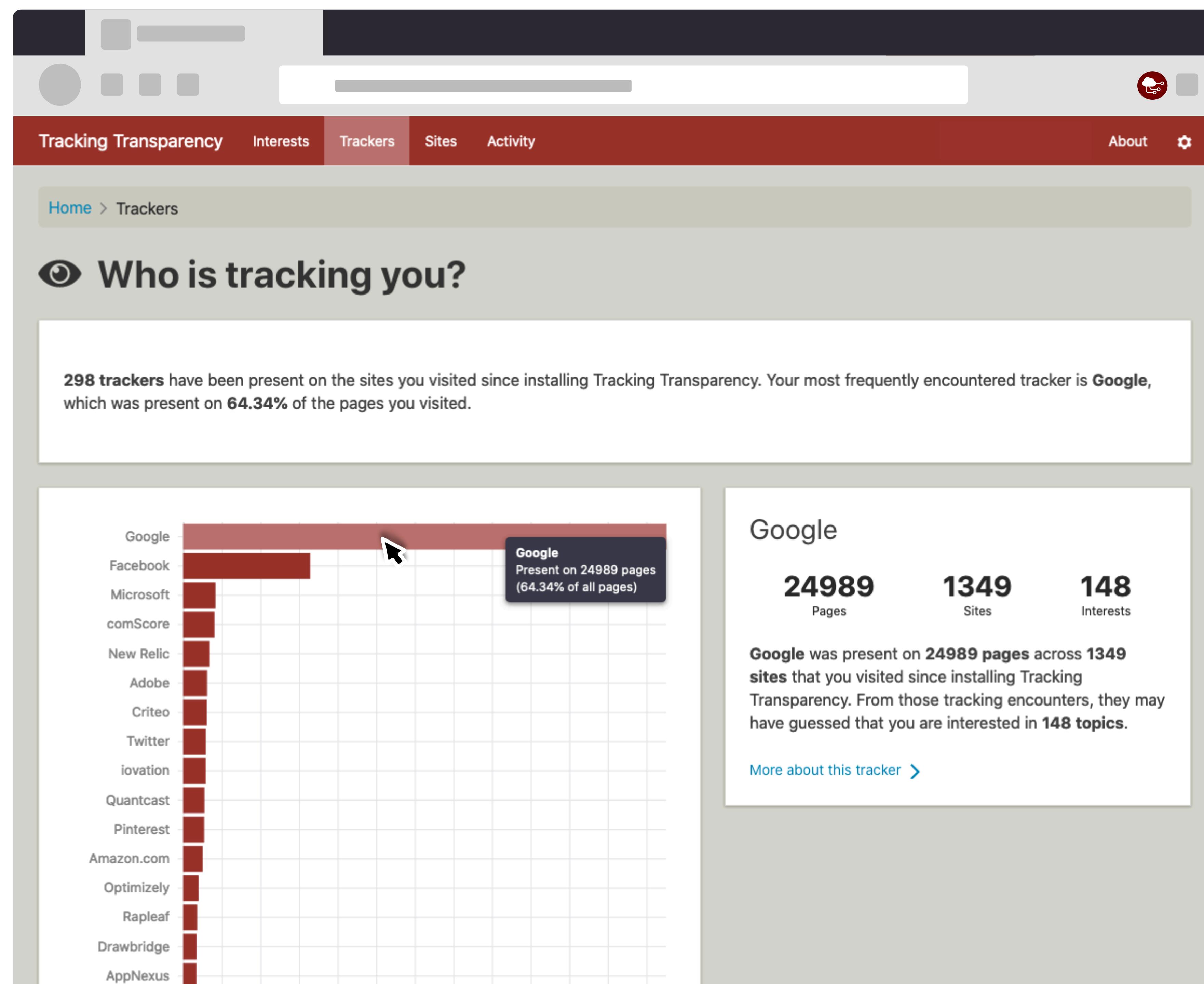
89 trackers may have guessed that you are interested in Pets & Animals. *Click on a bar to learn more.*



Trackers	Count
Google	89
Facebook	5
comScore	2
Microsoft	1
Amazon.com	1
Quantcast	1
New Relic	1
AK	1
Criteo	1







Tracking Transparency Interests Trackers Sites Activity About 

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.*



Computer Security
Business Operations
Jobs & Education
Sports
Computers & Electronics
Food & Drink
Finance
Real Estate
Service Providers
Business & Industrial
Books & Literature
Games
Law & Government

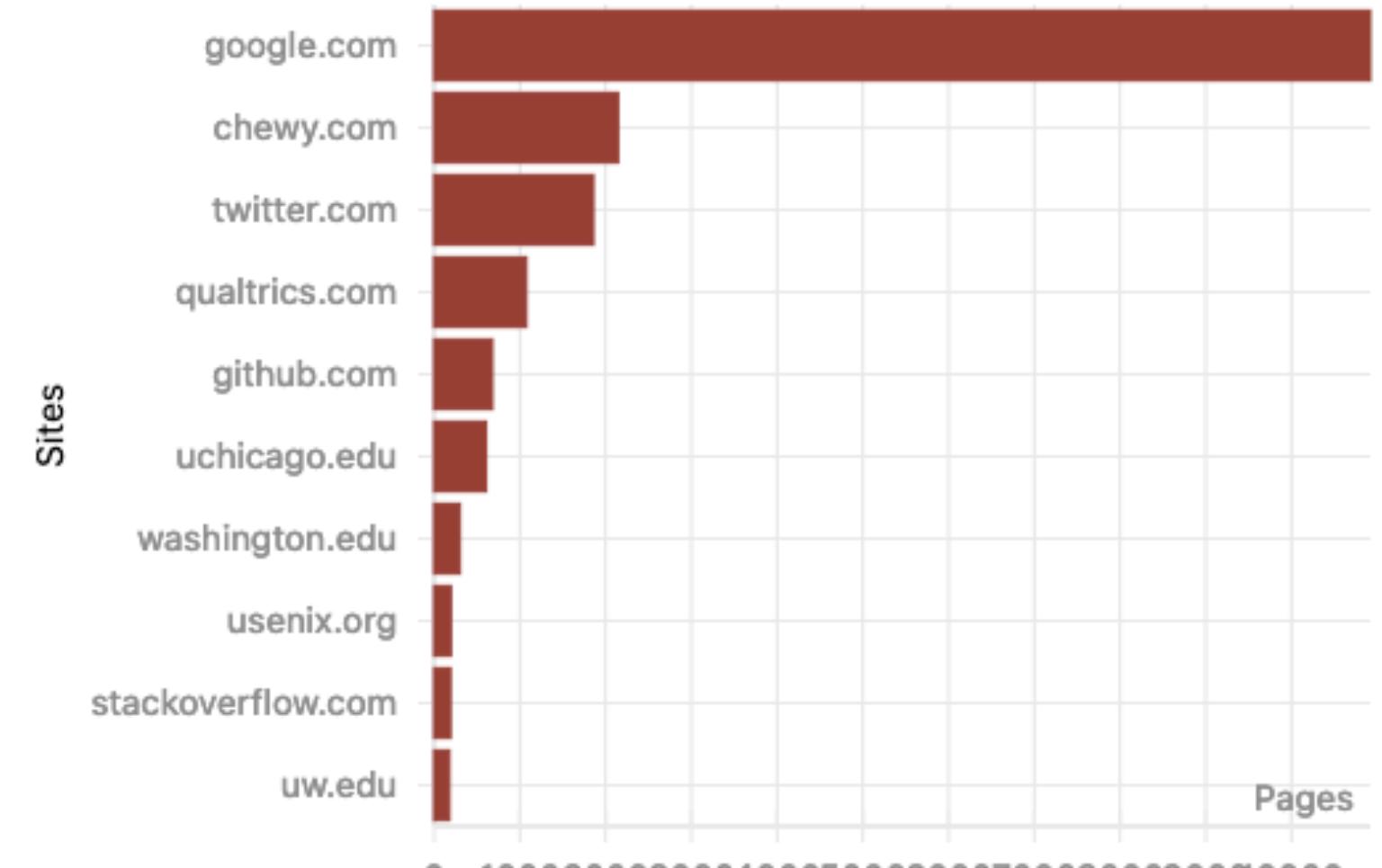
Shopping

Travel

Law & Government

On which sites did Google track you?

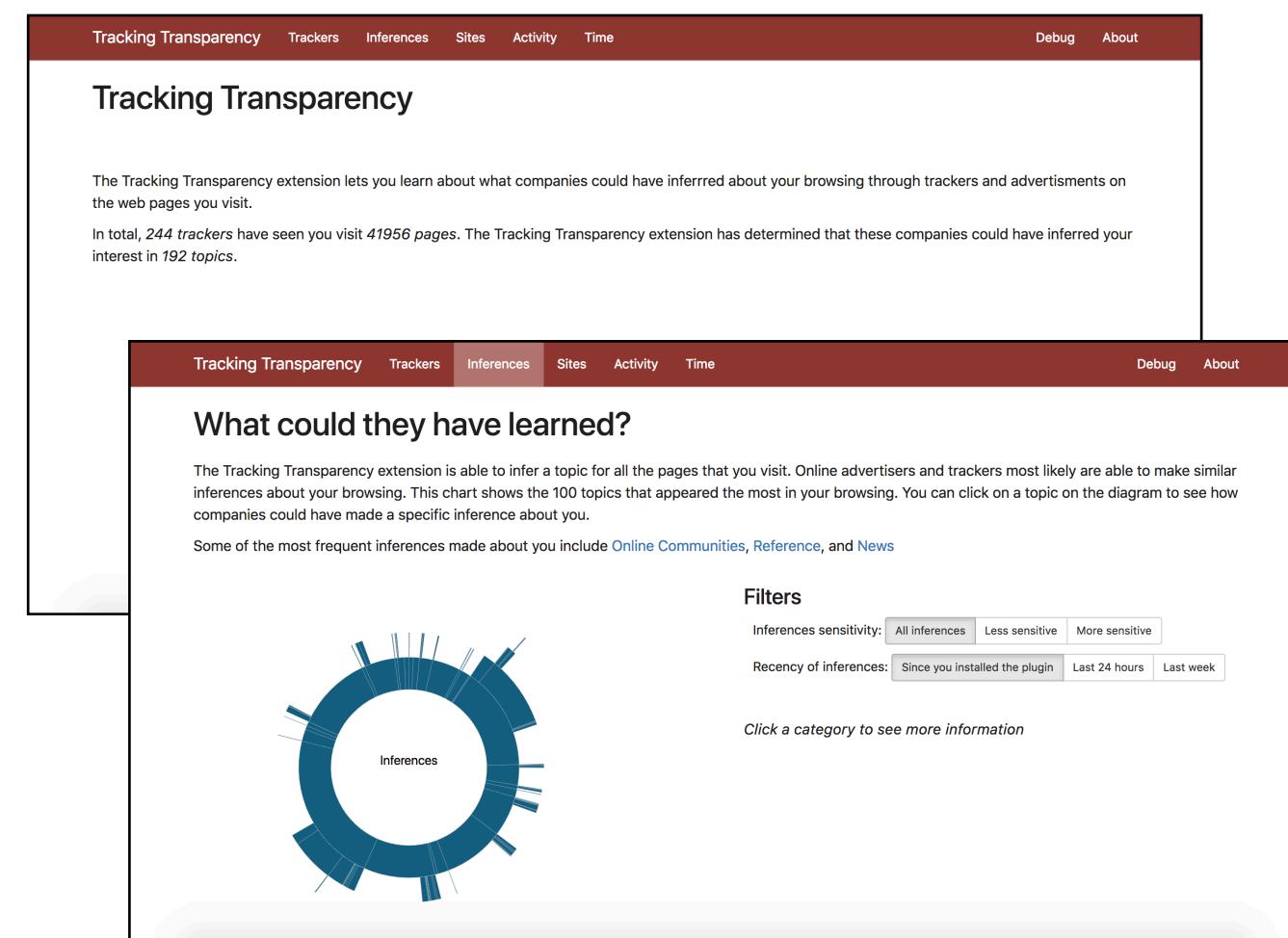
Google has tracked you on **1412 sites**. Click on a bar to learn more.



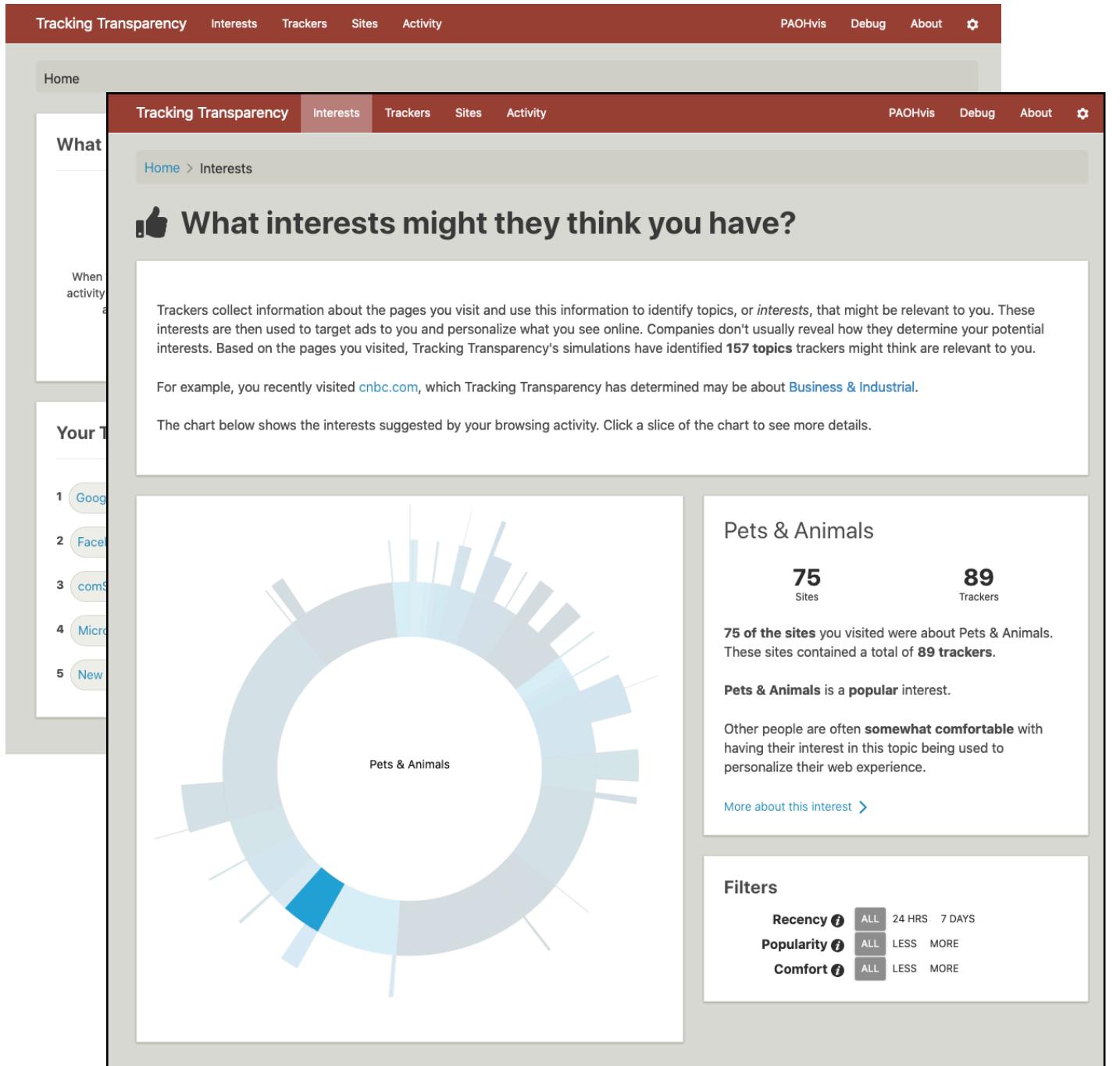
Sites	Pages
google.com	1412
chewy.com	~100
twitter.com	~80
qualtrics.com	~50
github.com	~30
uchicago.edu	~20
washington.edu	~15
usenix.org	~10
stackoverflow.com	~5
uw.edu	~2

method

iterative usability interviews



13 participants
30 minutes
\$10 Amazon gift card

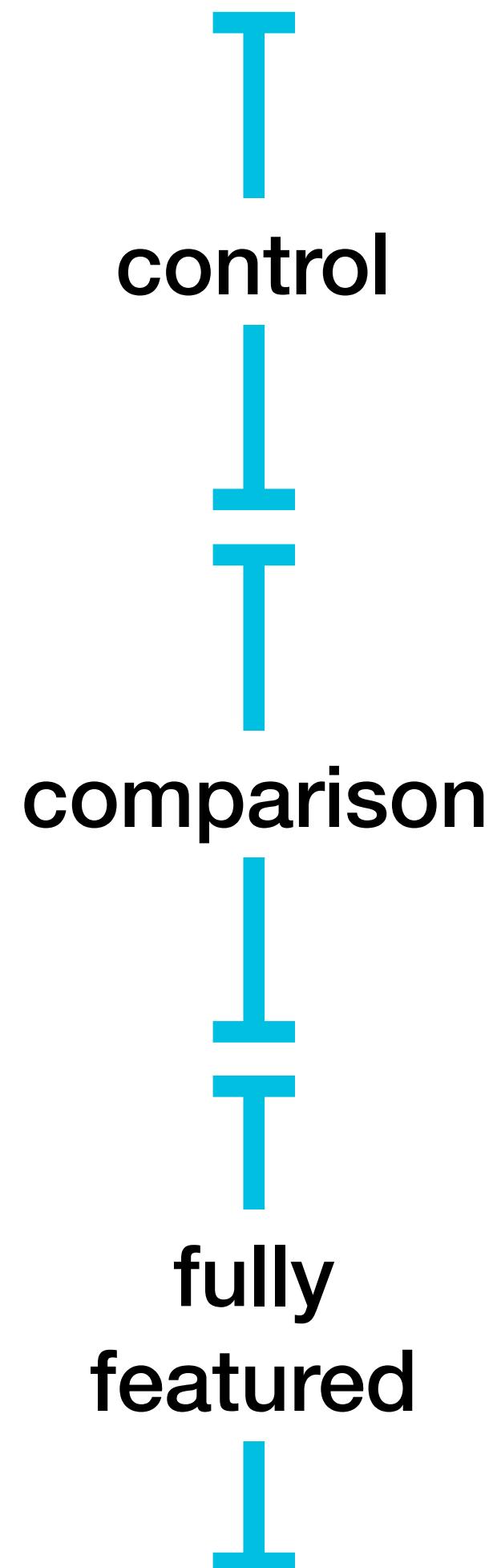


field study

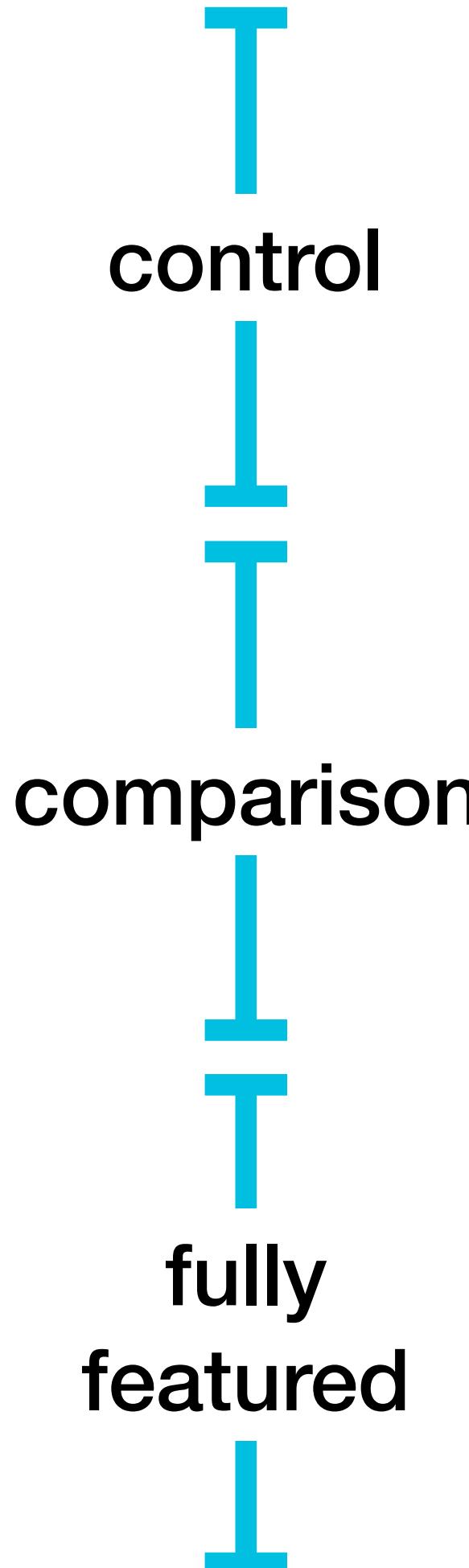
425 participants, 18+, located in the US, 95% HIT approval rating,
use Firefox or Chrome regularly

pre-usage survey	use Tracking Transparency for one week	post-usage survey
[15 minutes, \$3] <ul style="list-style-type: none">- demographics- estimates of tracking- knowledge and attitudes about OBA	collected telemetry data <ul style="list-style-type: none">- # of distinct web pages- # of trackers- inferred topics	[20 minutes, \$7] <ul style="list-style-type: none">- qualitative reactions- behavioral intentions- estimates of tracking- knowledge and attitudes about OBA

study conditions



study conditions



Static

Tracking Transparency

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.

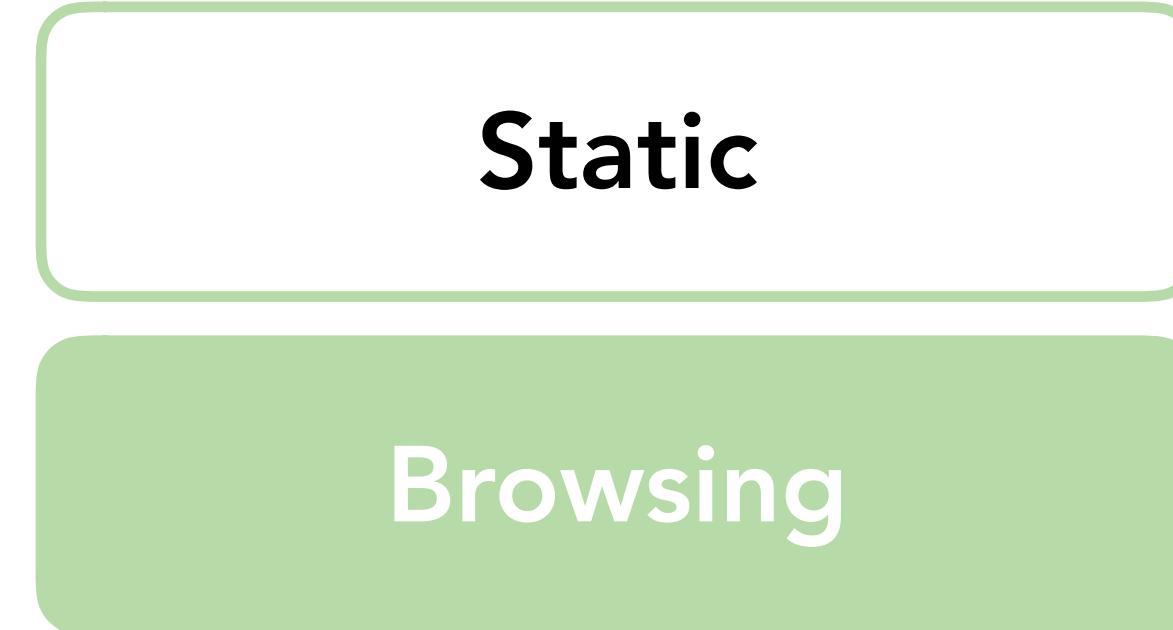
We call these *topics* *interests*.

You want to know more about apples, the fruit, so you might search for "apple". However, if you often search for technical topics, you might see results for Apple, the tech company.

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

study conditions

T
control



T
comparison

Tracking Transparency Sites Activity

Home > Sites

Where were you tracked?

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

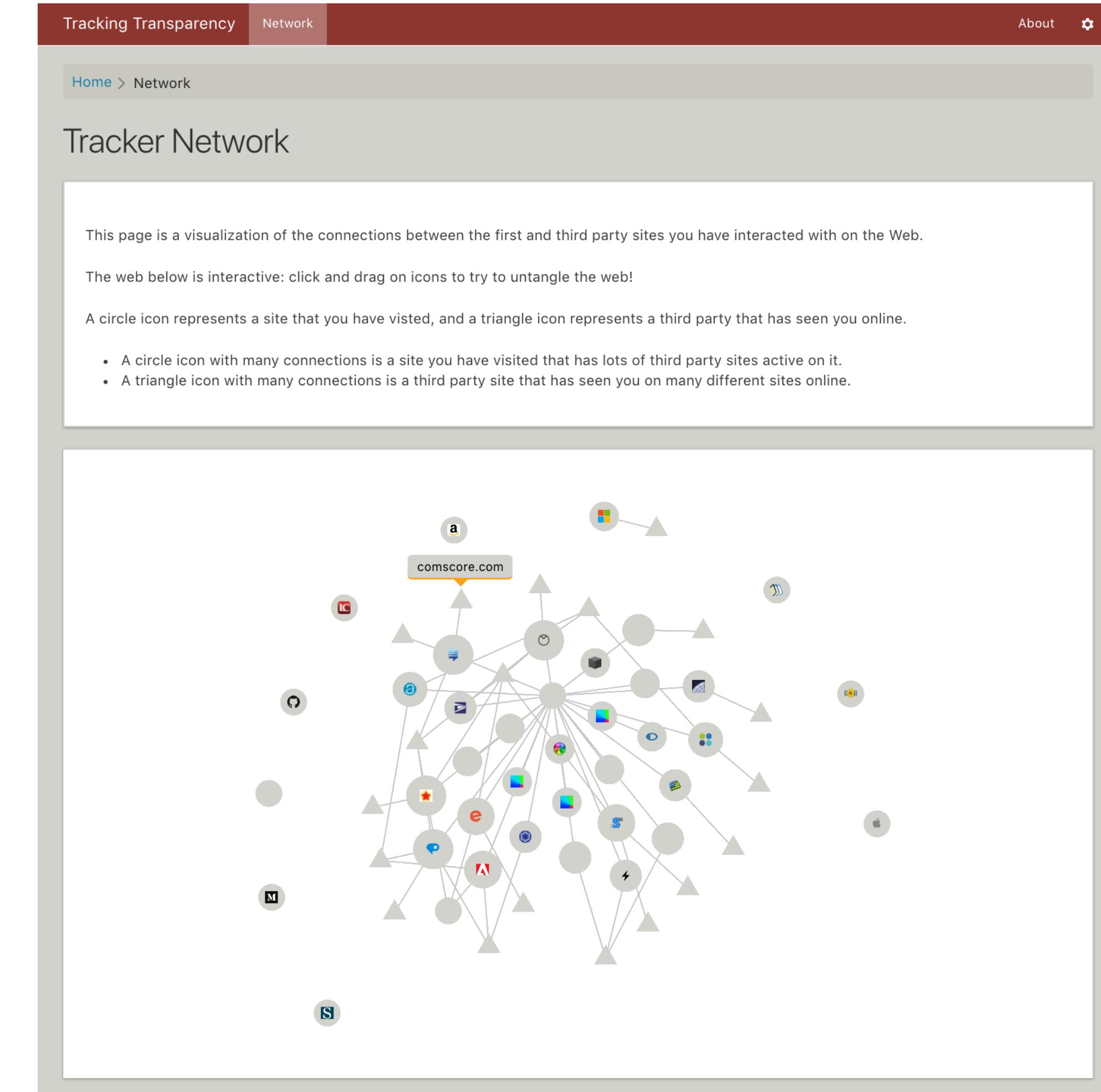
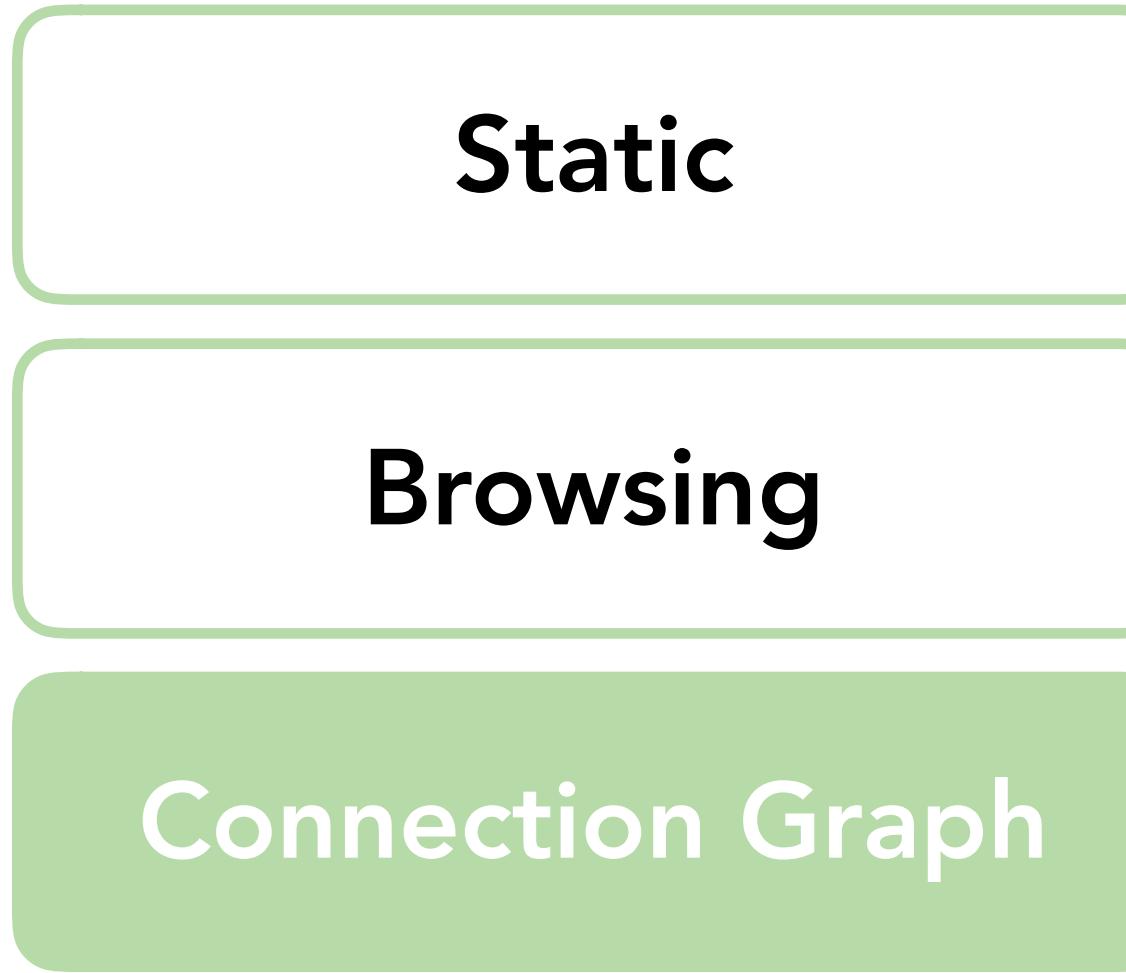
Trackers see which sites you visited through a variety of tracking methods, including third-party cookies, tracking pixels, and browser fingerprinting. When a tracker sees that you have visited multiple sites, they can use that activity to link together your interests.

Most recently visited sites
git.io
github.blog
google.com
github.com

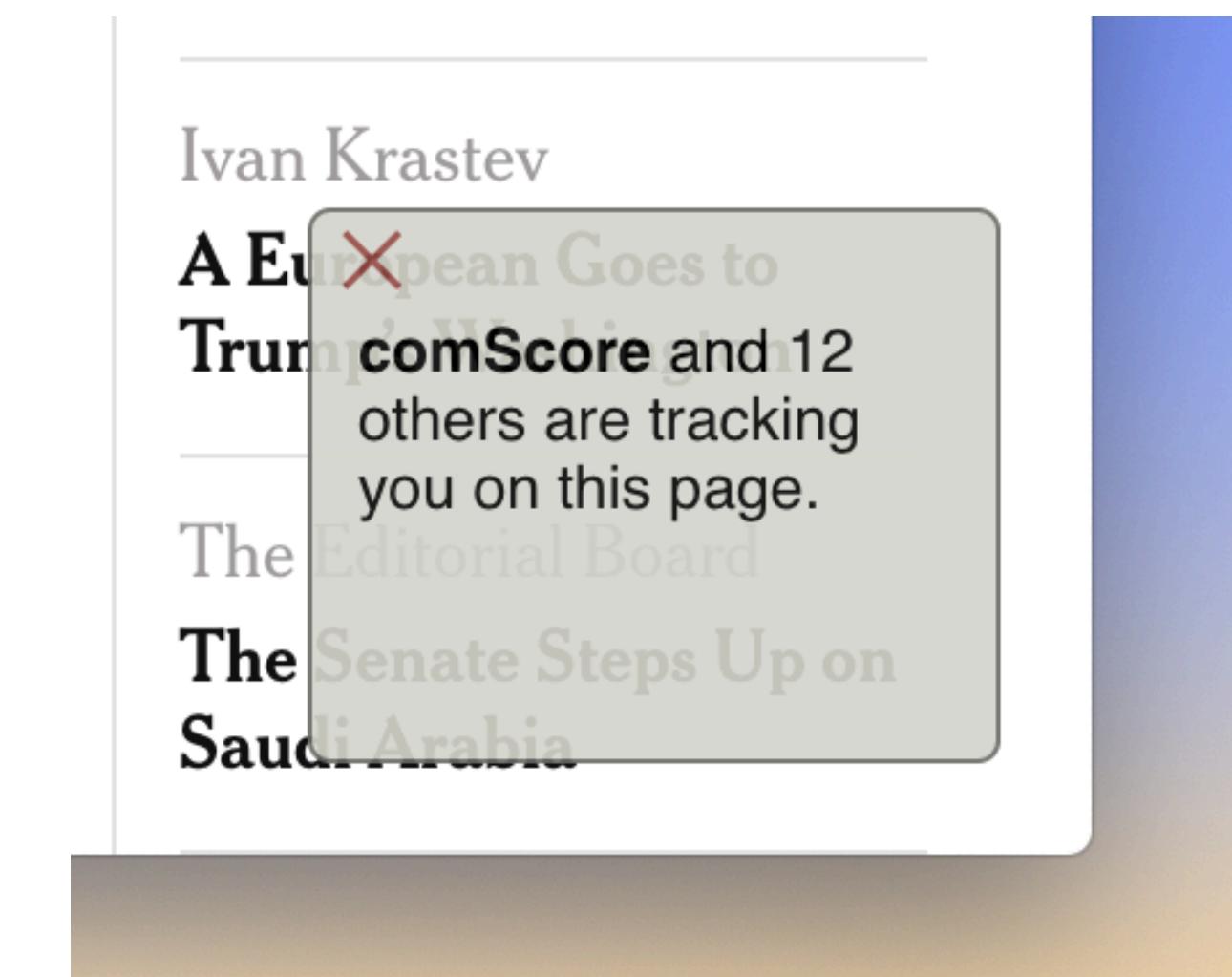
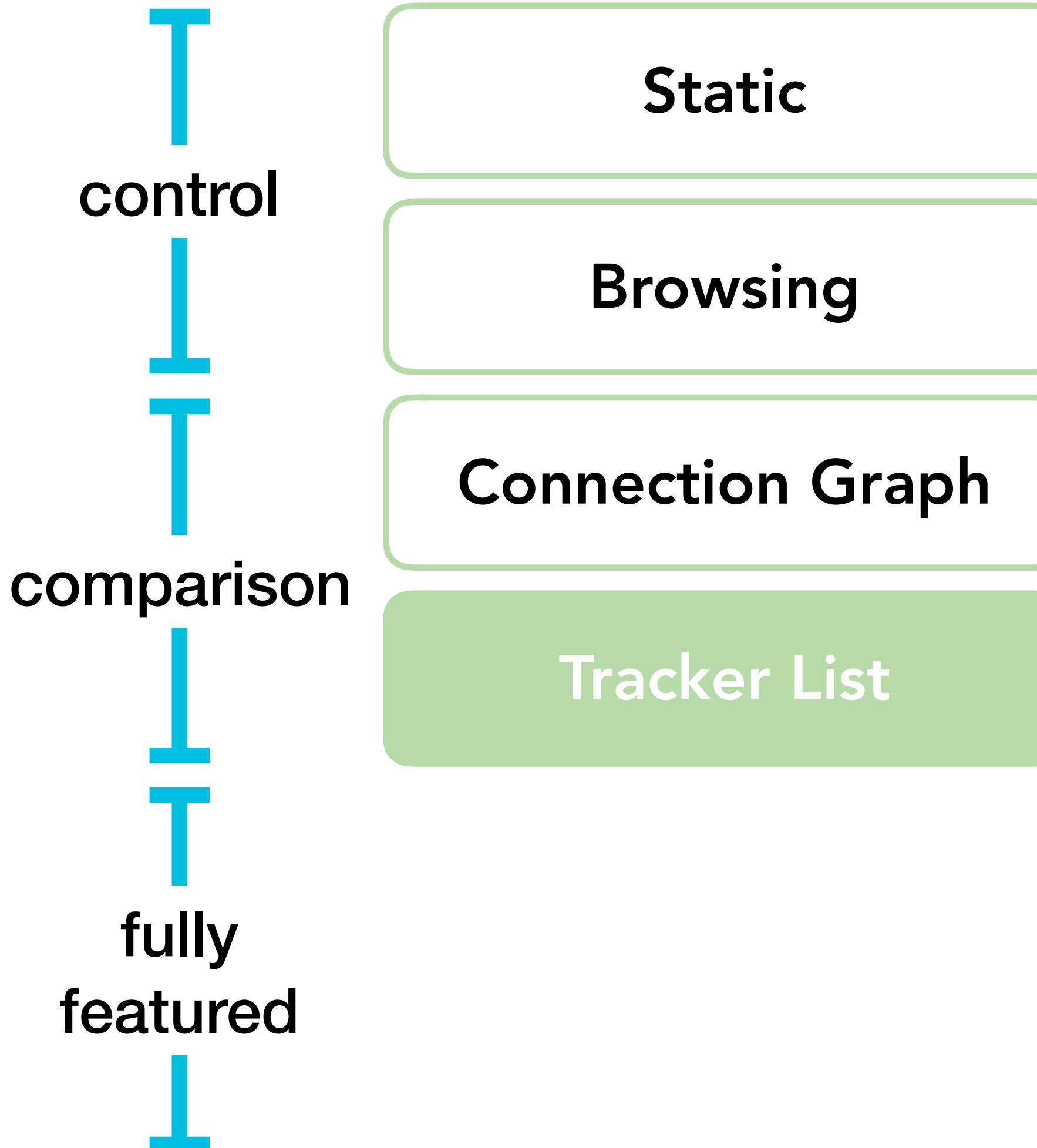
T
fully
featured

study conditions

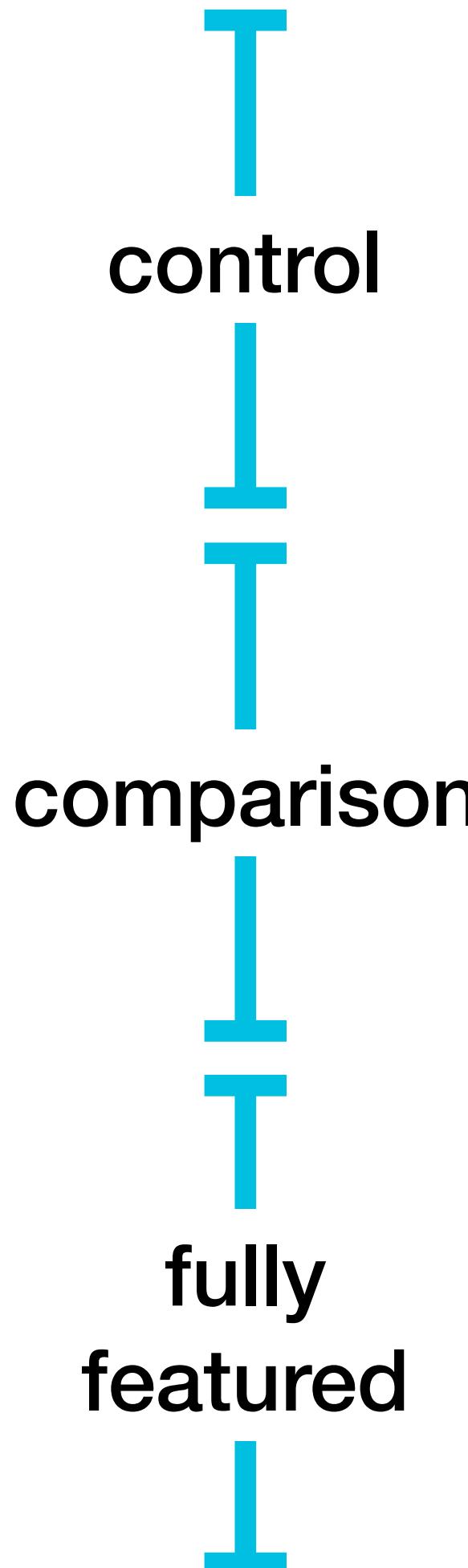
T
control
T
comparison
T
fully
featured



study conditions



study conditions



The screenshot shows the Tracking Transparency tool interface. At the top, there are navigation links: Tracking Transparency, Trackers, Sites, Activity, About, and a settings icon.

The main content area has a header "Home" and a section titled "What are trackers and interests?" with three steps:

- An eye icon followed by the text: "When you browse online, your online activity can be tracked by ad networks and analytics companies. We call these *trackers*.
→
- A thumbs-up icon followed by the text: "These companies track your browsing to make guesses about what topics you might be interested in. We call these *topics*.
→
- Icons for paw, search, and question mark, followed by the text: "Companies can personalize your online experience based on these interests. Click on the circles above to learn more."

Below this is a section titled "Your Top Trackers" with a list of 5 trackers:

Rank	Tracker
1	Google
2	Facebook
3	Microsoft
4	comScore
5	New Relic

Next to it is a summary of tracker counts: "298 Trackers encountered" and "38503 Pages visited".

Finally, there is a "Recent Sites" section listing:

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

study conditions

T control
T comparison
T fully featured

- Static
- Browsing
- Connection Graph
- Tracker List
- No Inferences
- Standard

The screenshot shows the 'Tracking Transparency' tool's home page. At the top, there are tabs for 'Tracking Transparency', 'Interests', 'Trackers', 'Sites', and 'Activity'. On the far right, there are 'About' and settings icons. Below the tabs, a navigation bar includes 'Home', 'What are trackers and interests?', and links to 'About', 'FAQ', 'Help', and 'Contact'.

What are trackers and interests?

The page illustrates the tracking process through three stages:

- trackers:** An eye icon with a magnifying glass. Text: "When you browse online, your online activity can be tracked by ad networks and analytics companies. We call these *trackers*".
- interests:** A thumbs-up icon. Text: "These companies track your browsing to make guesses about what topics you might be interested in. We call these *topics* *interests*".
- personalization:** Icons for a paw print, magnifying glass, and question mark. Text: "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

Summary Metrics:

300	38801	157
Trackers encountered	Pages visited	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

results

telemetry data

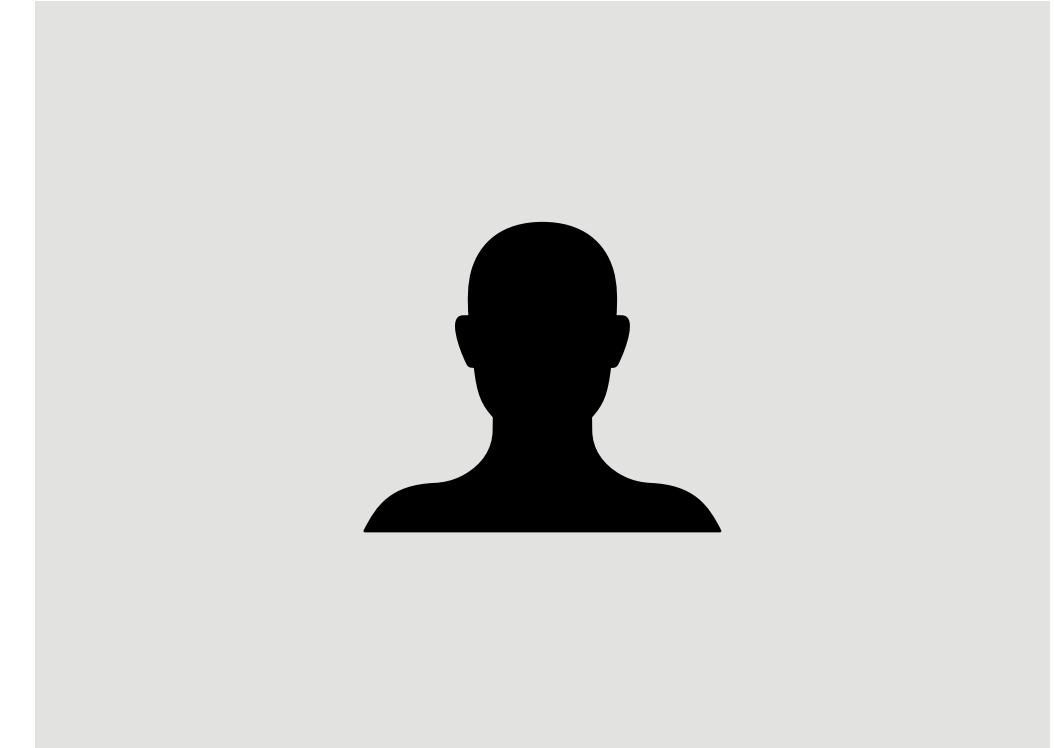


425 participants

**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

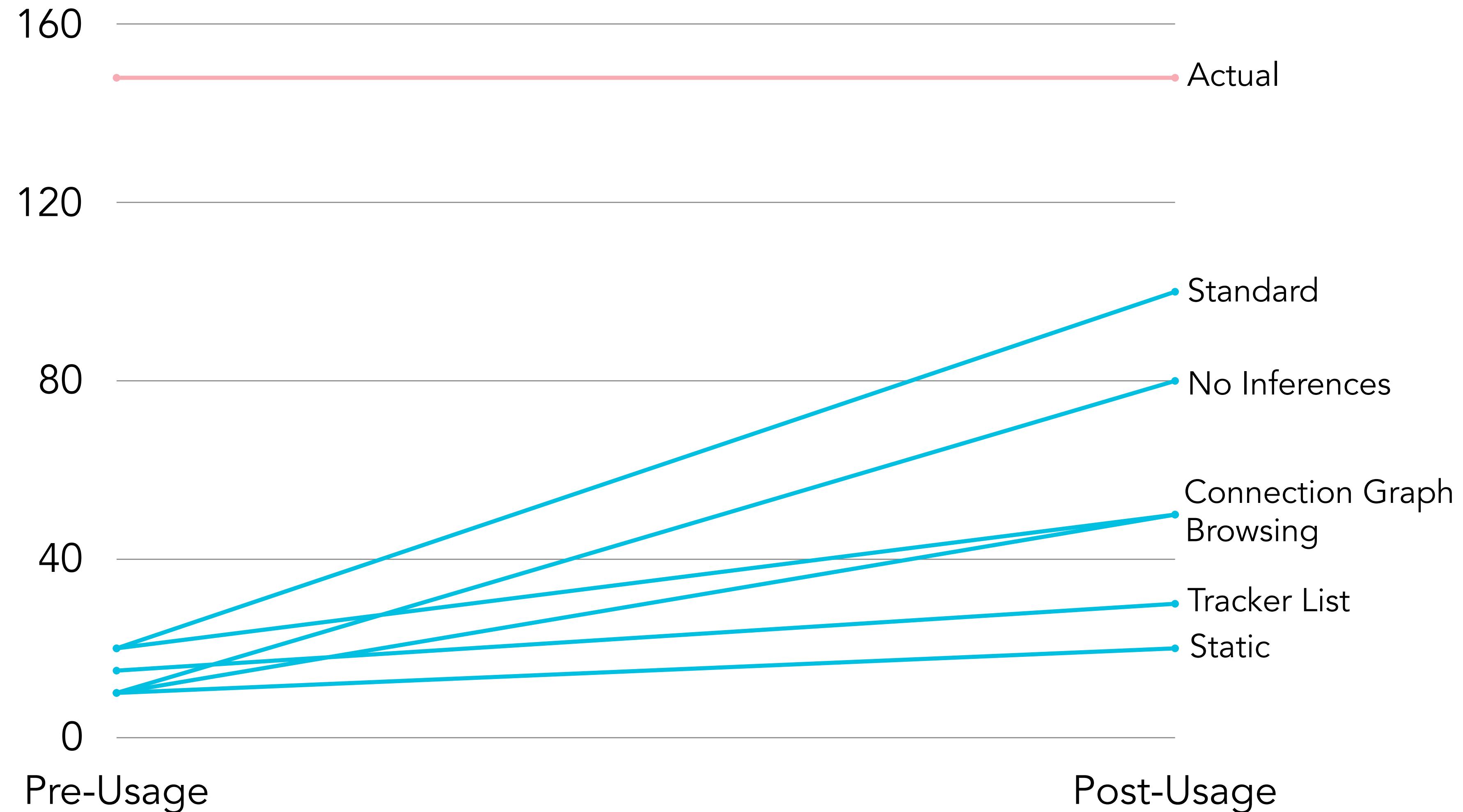
improved knowledge about tracking

“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)

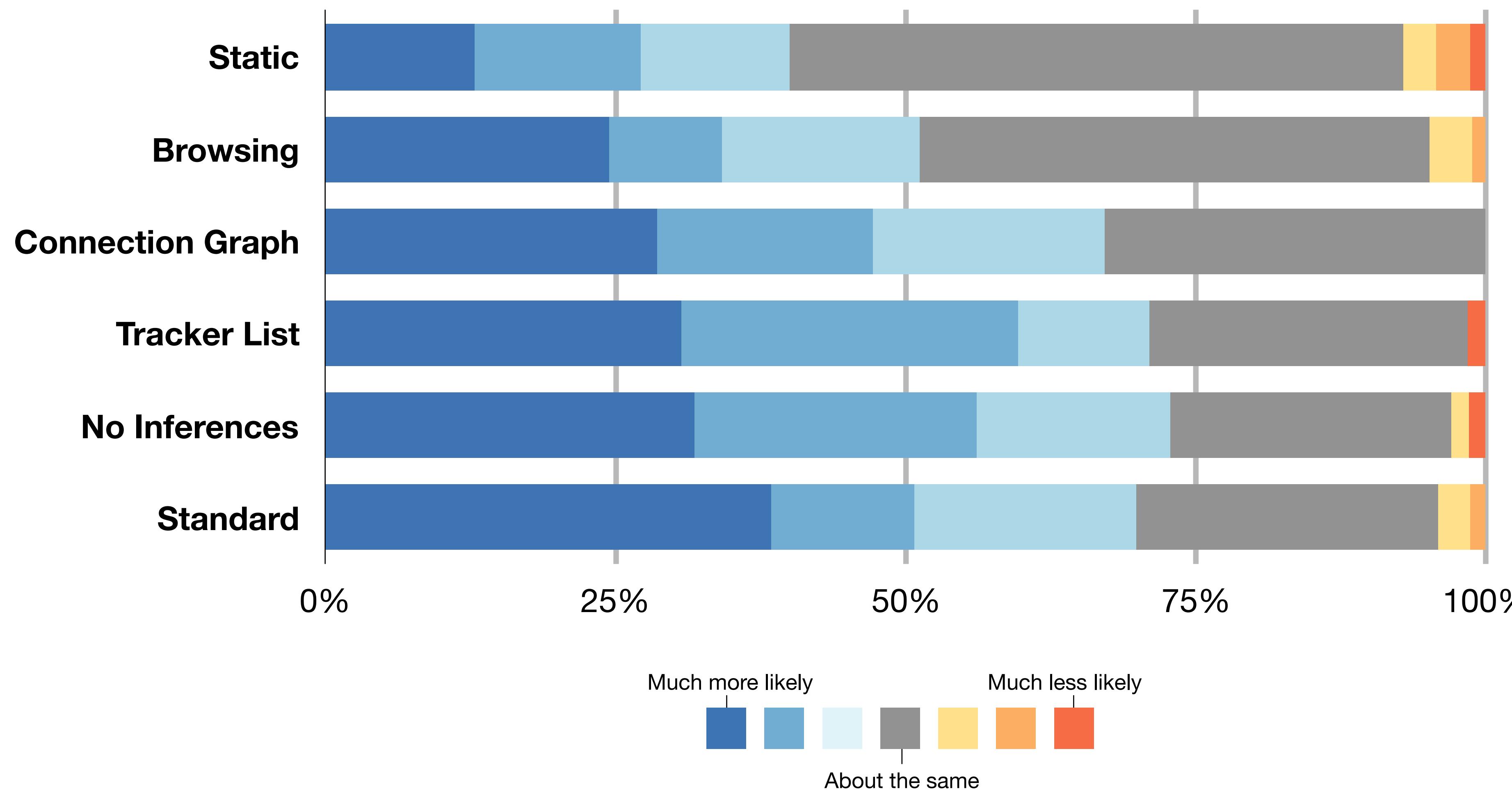
participants learned about...

- tracking's use for advertising
- inferencing in OBA

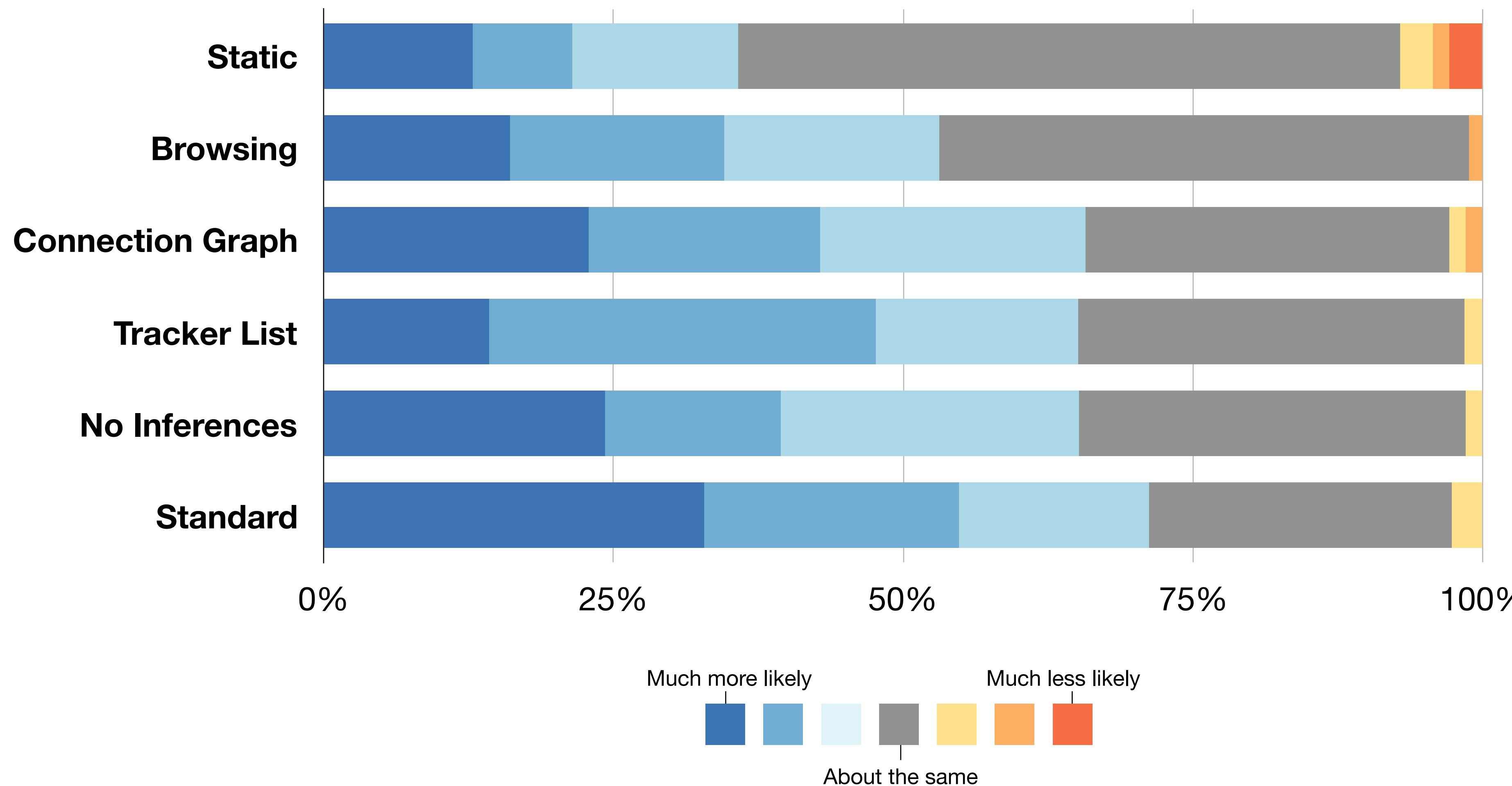
improved estimates of trackers encountered



more likely to use blocking tools



more likely to use private browsing

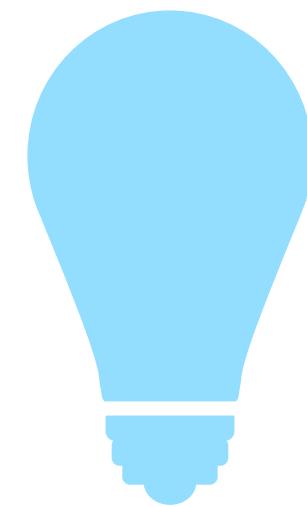


conclusion

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 Beeh!

By

Ben Weinshel

Miranda Wei

Mainack Mondal

Euirim Choi

Shawn Shan

Claire Dolin

Michelle L. Mazurek

Blase Ur

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



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**



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

<https://git.io/trackingtransparency>