# Unpacking Perceptions of Data-Driven Inferences Underlying Online Targeting and Personalization

You are seeing this ad because you have recently browsed pages related to *Food* and *Montreal*.

**Claire Dolin, Ben Weinshel,**

Shawn Shan, Chang Min Hahn, Euirim Choi,

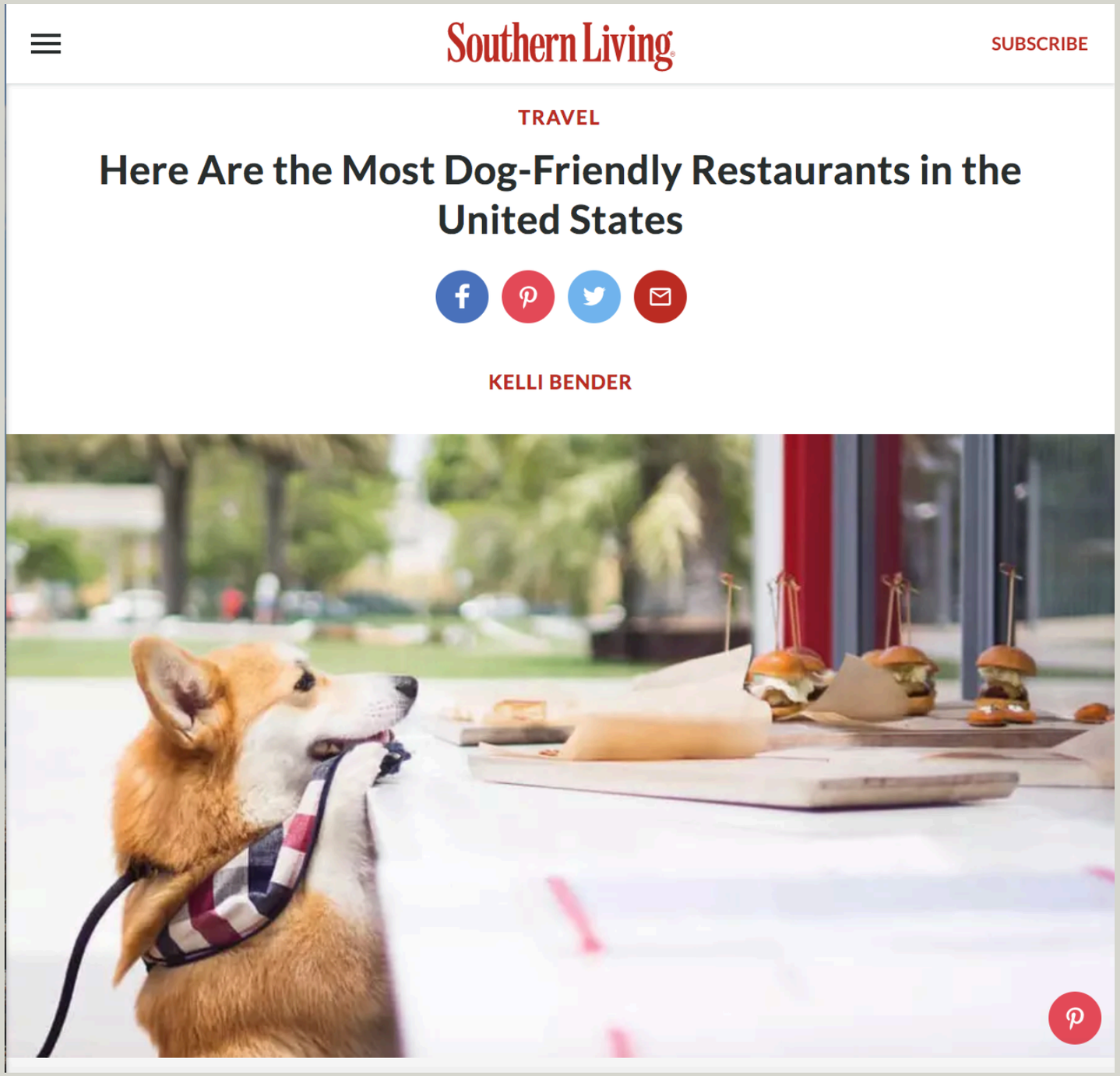
Michelle L. Mazurek, Blase Ur

THE UNIVERSITY OF CHICAGO

UNIVERSITY OF MARYLAND

UCHICAGO SUPER GROUP

# Advertisers use web activity to make inferences…



You might like dogs!

# …which advertisers can use to target ads

Interests & remarketing

**Affinity audiences**

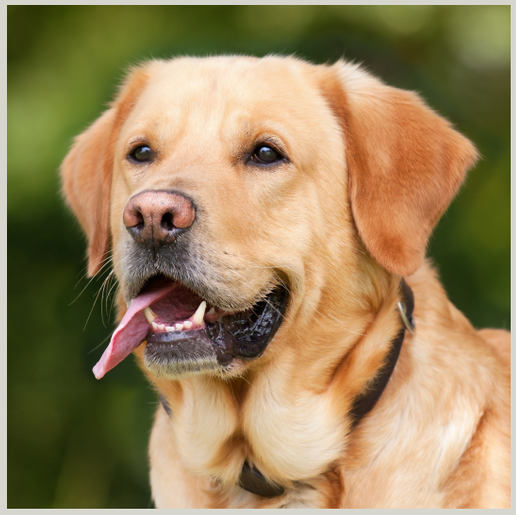
Music Lovers »

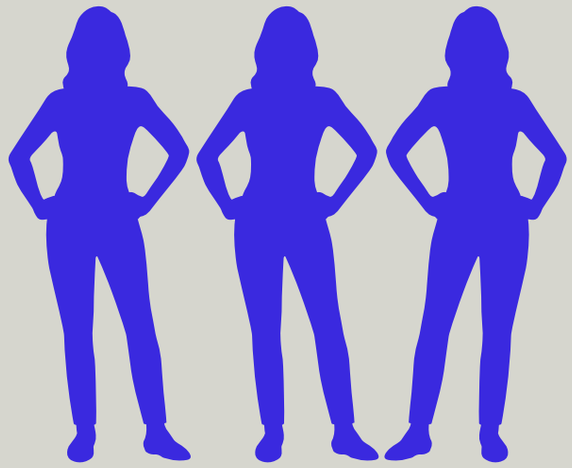
News Junkies »

Nightlife Enthusiasts »

Outdoor Enthusiasts »

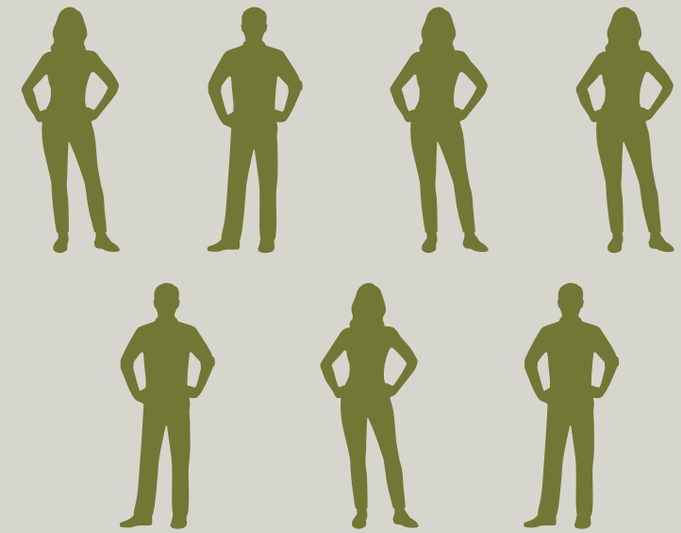
Pet Lovers »





# Research Questions

How does the **method of targeting** impact privacy attitudes?



How do the **interests that are inferred** and the **accuracy of these inferences** impact privacy attitudes?

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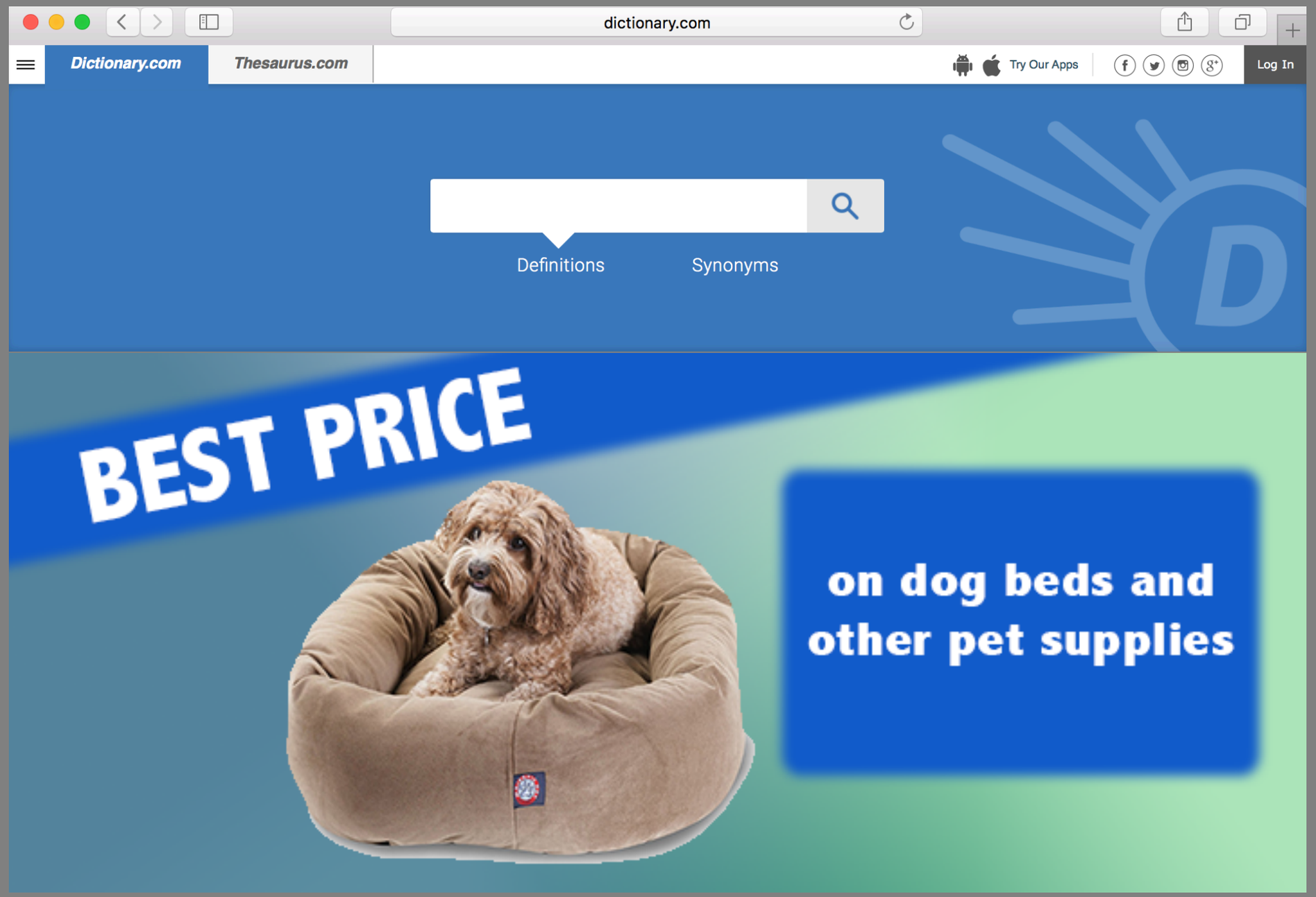
# Study Setup: Simulated Ad



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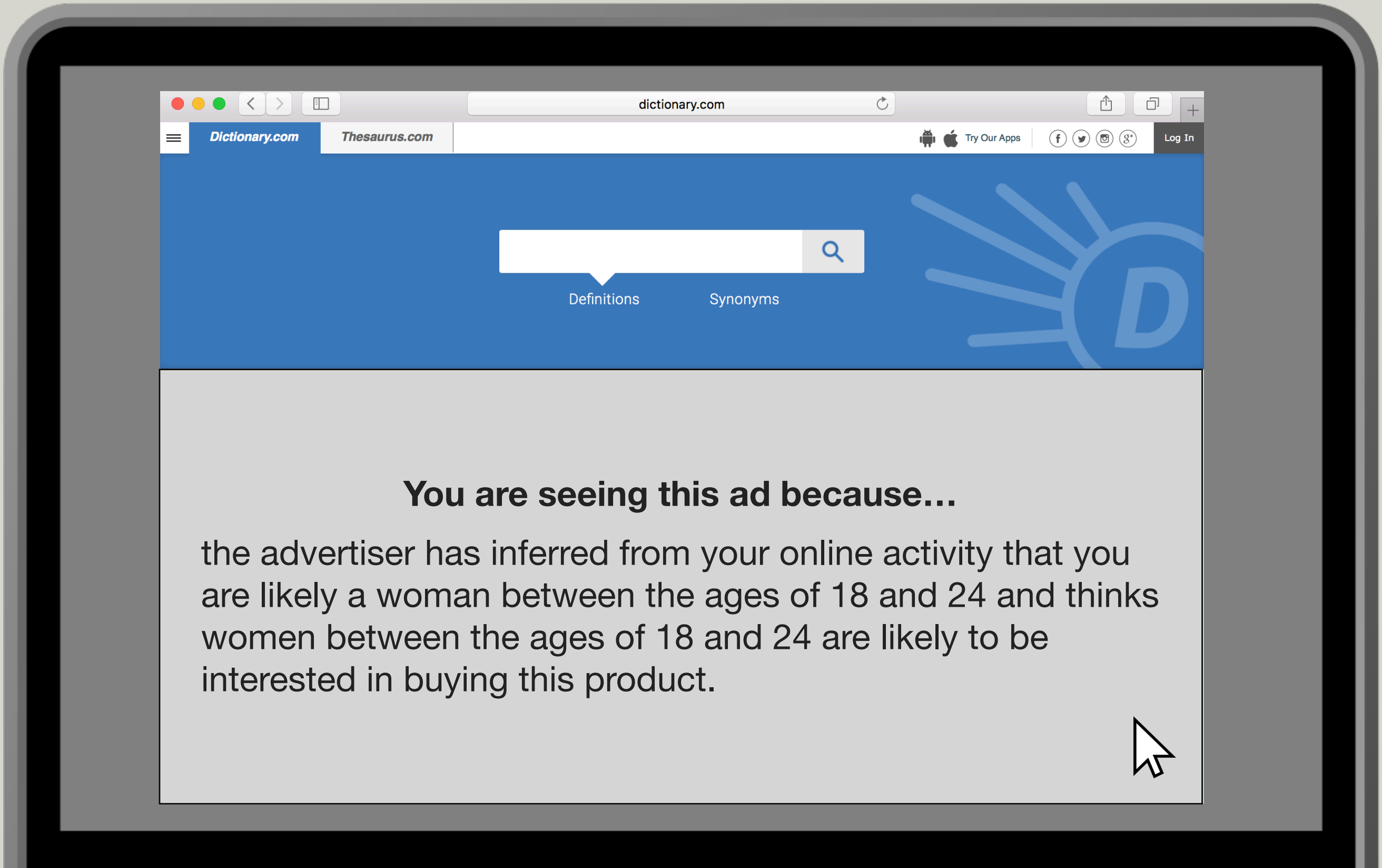

# Targeting Explanations Reflect Prevalent Methods

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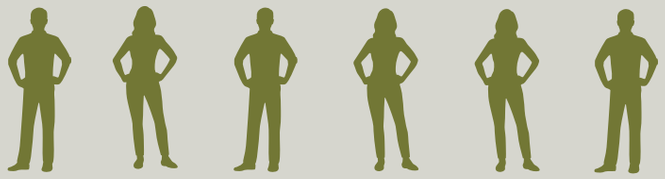

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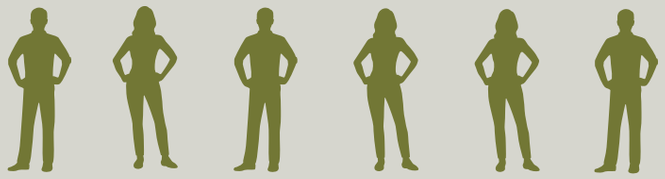

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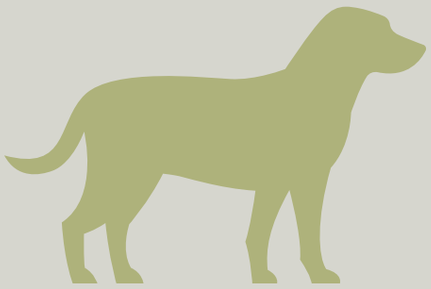

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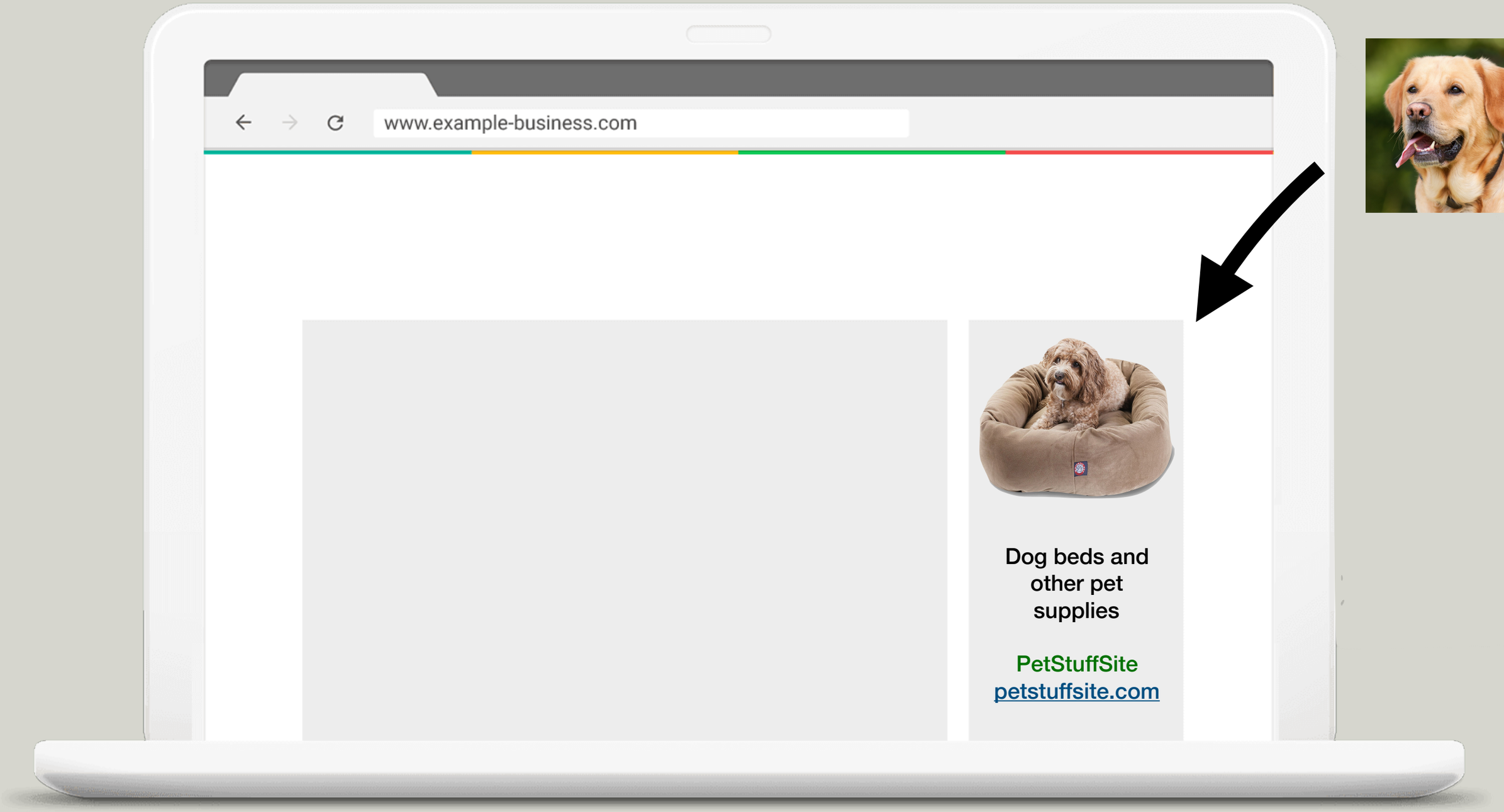
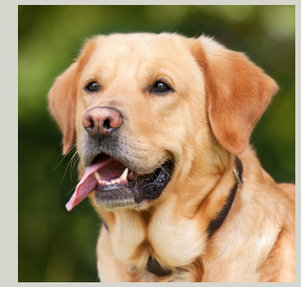
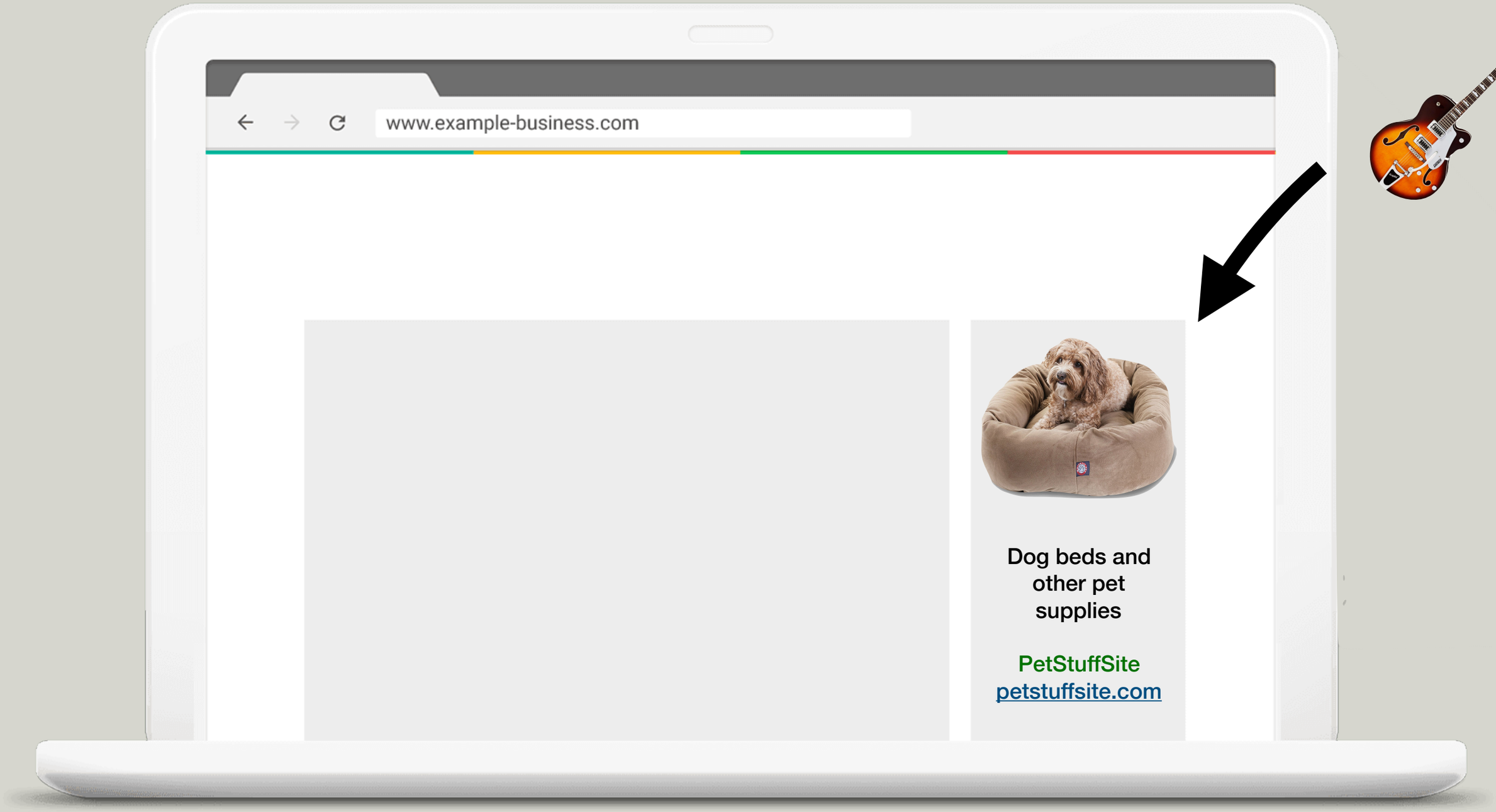
# Ads may be targeted by obvious connections



# But algorithms can make unintuitive predictions



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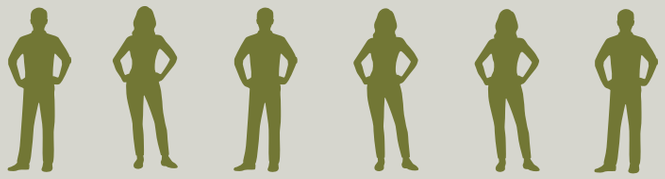

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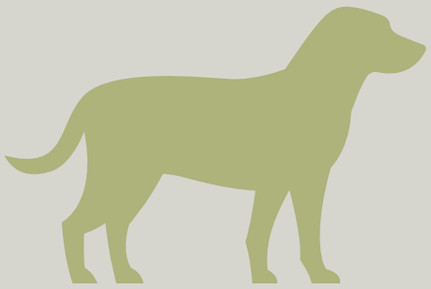

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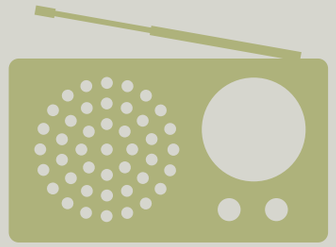

# Targeting Explanations Reflect Prevalent Methods

…the advertiser decided to purchase an ad on this site. **(Control)**

…the advertiser's computer algorithms have determined that this ad would be effective. **(Algorithm)**

# Reaction Statements—Likert Scale Responses

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**fair to target** for this reason

**fair to collect** information needed

**annoyed** by this type of targeting

# Planned Comparisons

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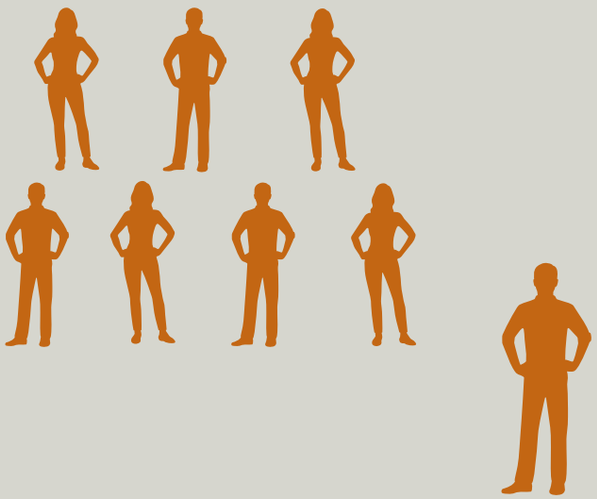

Visitors vs. You

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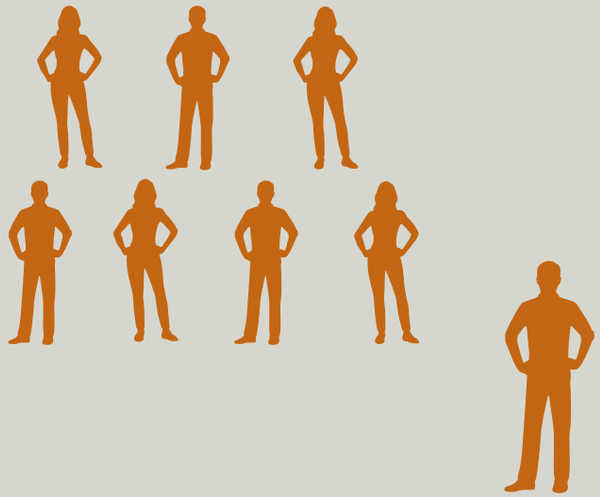

Visitors vs. You

Control vs. Algorithm

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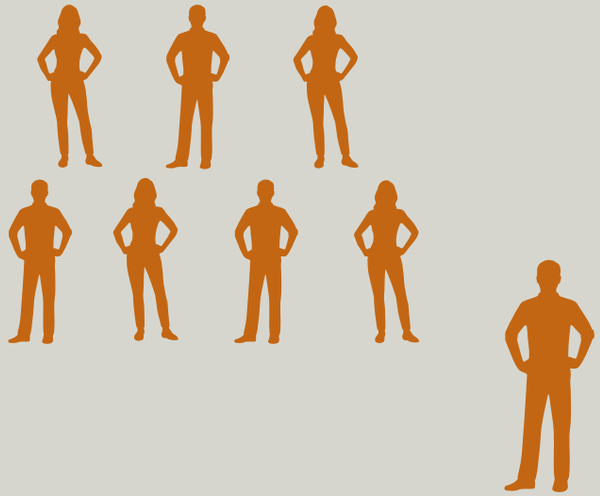

Visitors vs. You

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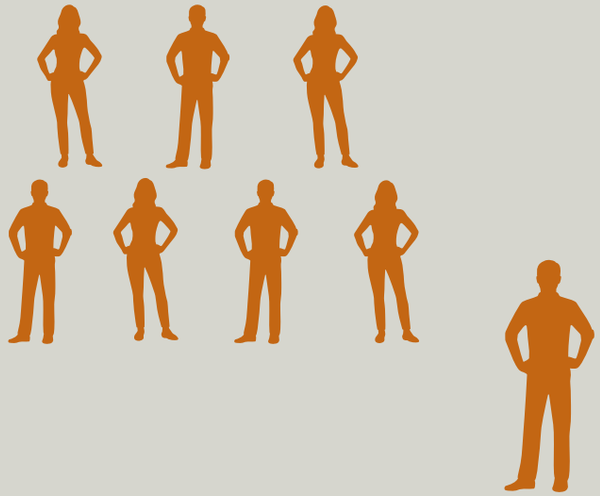

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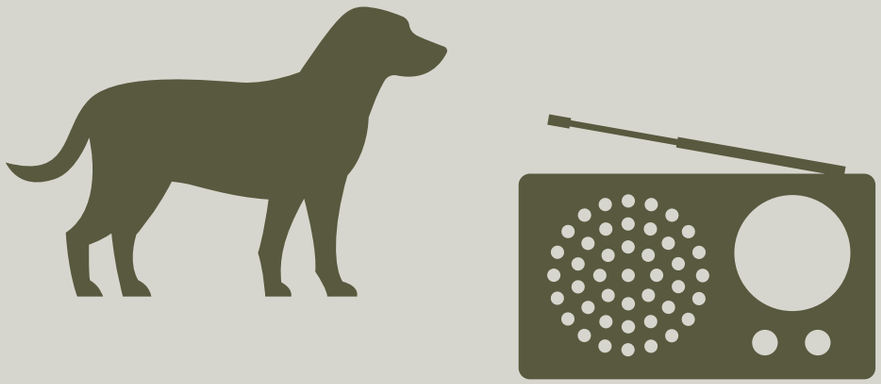

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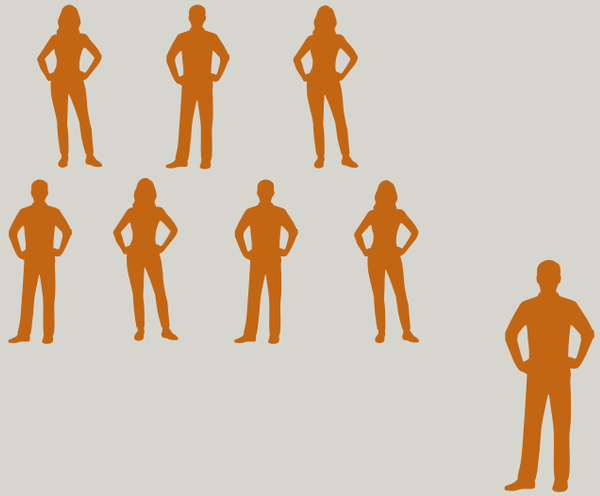

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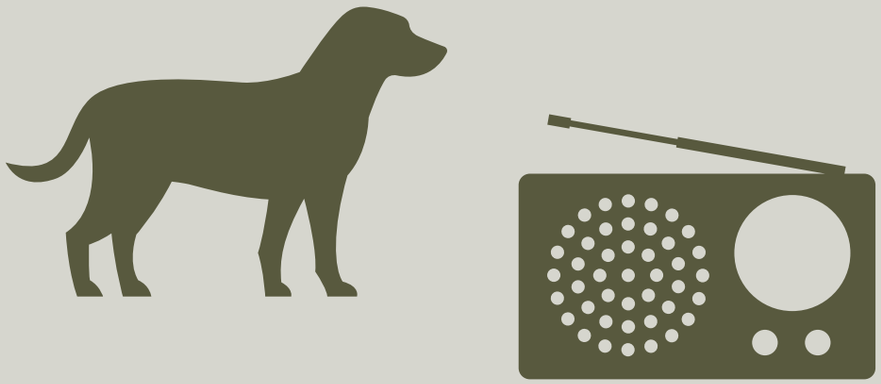

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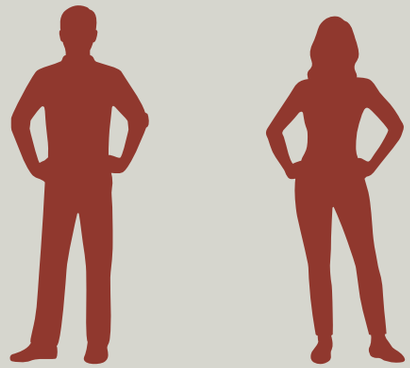


Demographic vs.
Wrong Demographic

# More comfort with generalized targeting

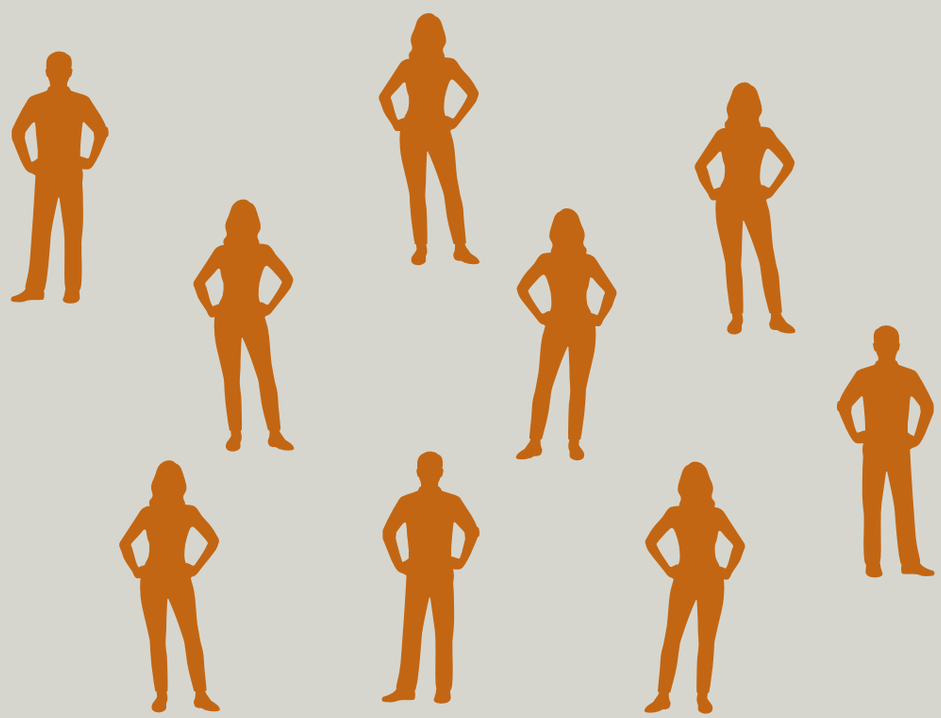
## Visitors

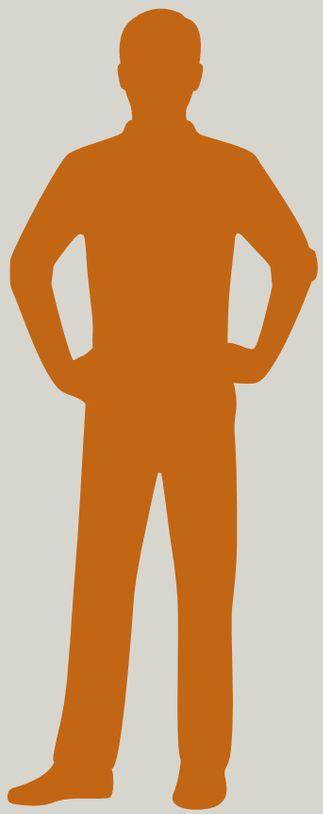
advertiser has inferred from general data that visitors to this site…

vs.

## You

advertiser has inferred from your browsing data that you…





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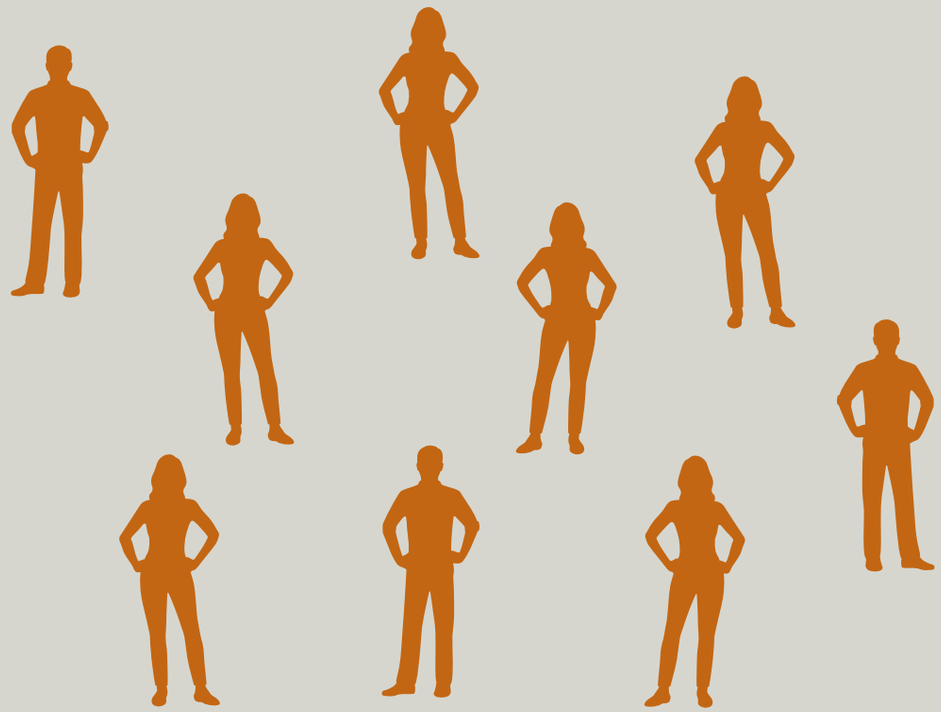
**More Fair to Target**

**More Comfortable**



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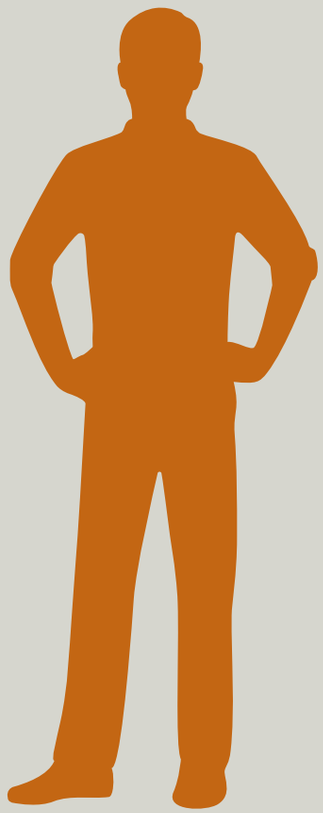

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advertiser decided to purchase an ad on this site

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advertiser’s computer algorithms determined this ad would be effective

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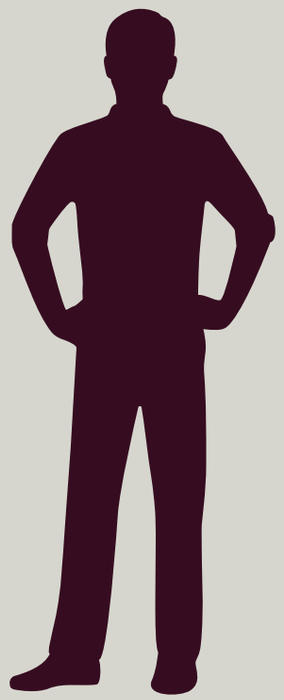
advertiser thinks you are interested in dogs and therefore likely to buy this product



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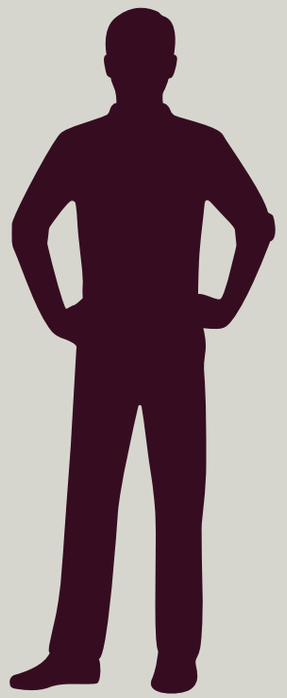
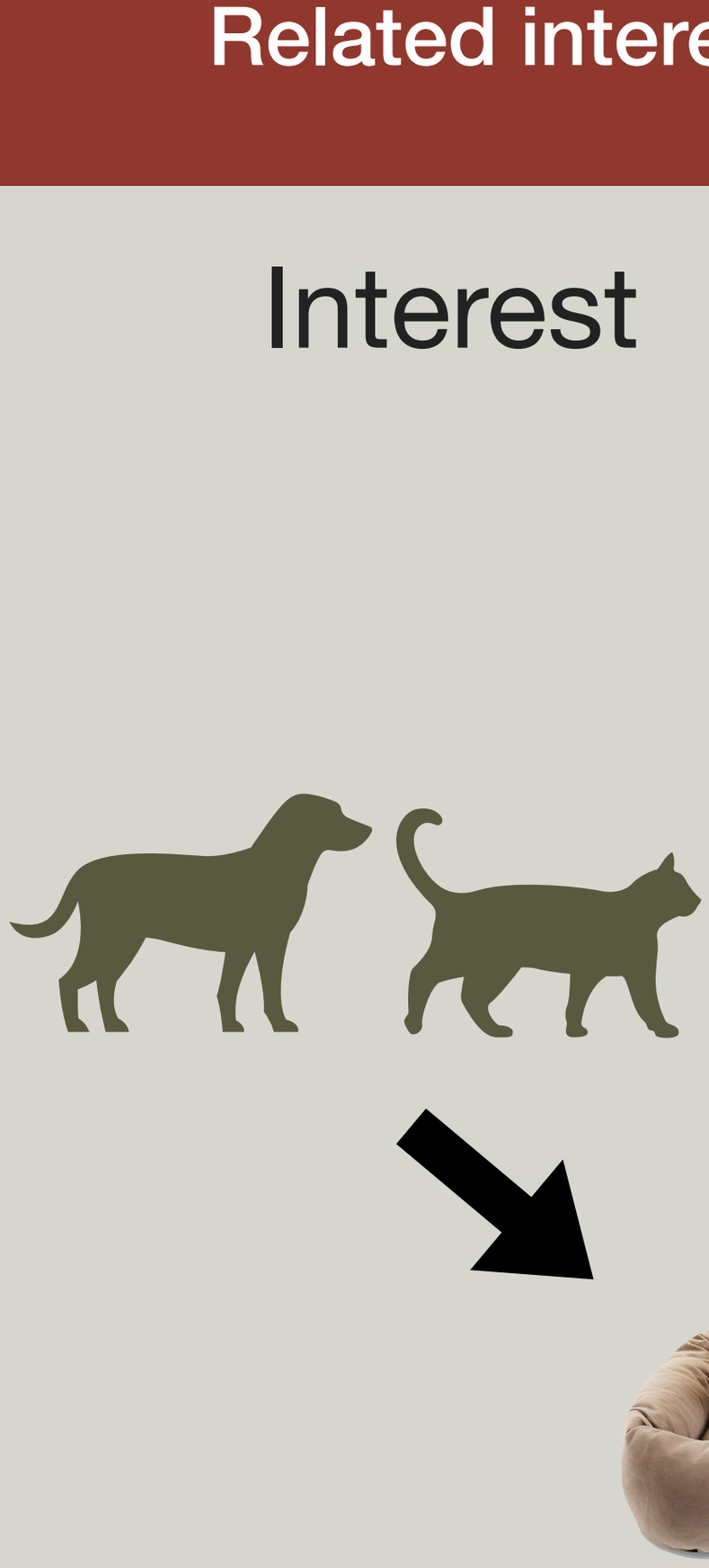
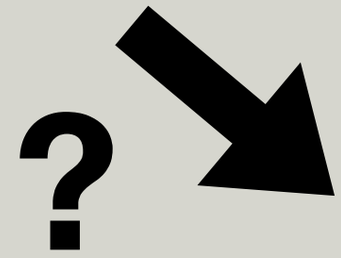


# Related interest-based targeting more useful

Interest vs. Unrelated Interest





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## Interest vs. Unrelated Interest

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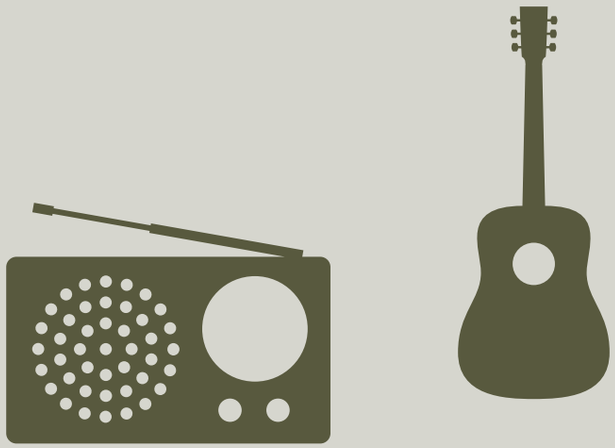
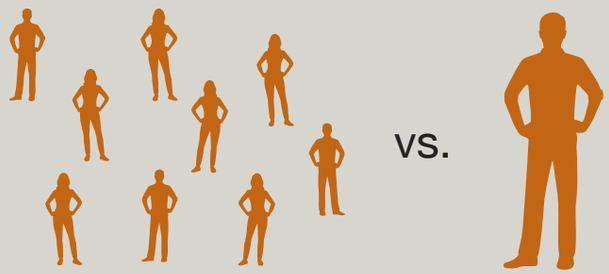


?

# Summary: Privacy attitudes and targeting methods

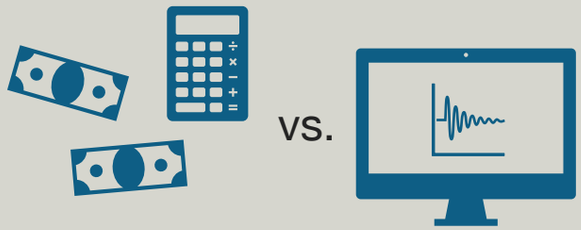
## Study 1

**Visitors** vs. **You**



More fair to target
More comfortable

**Control** vs. **Algorithm**



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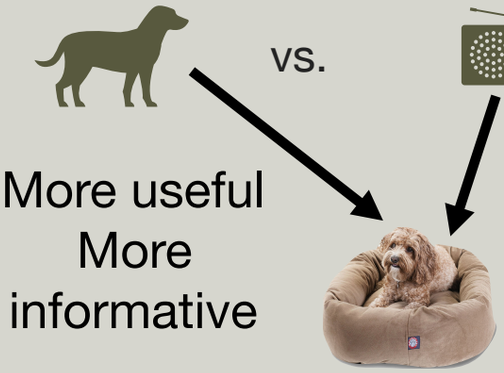
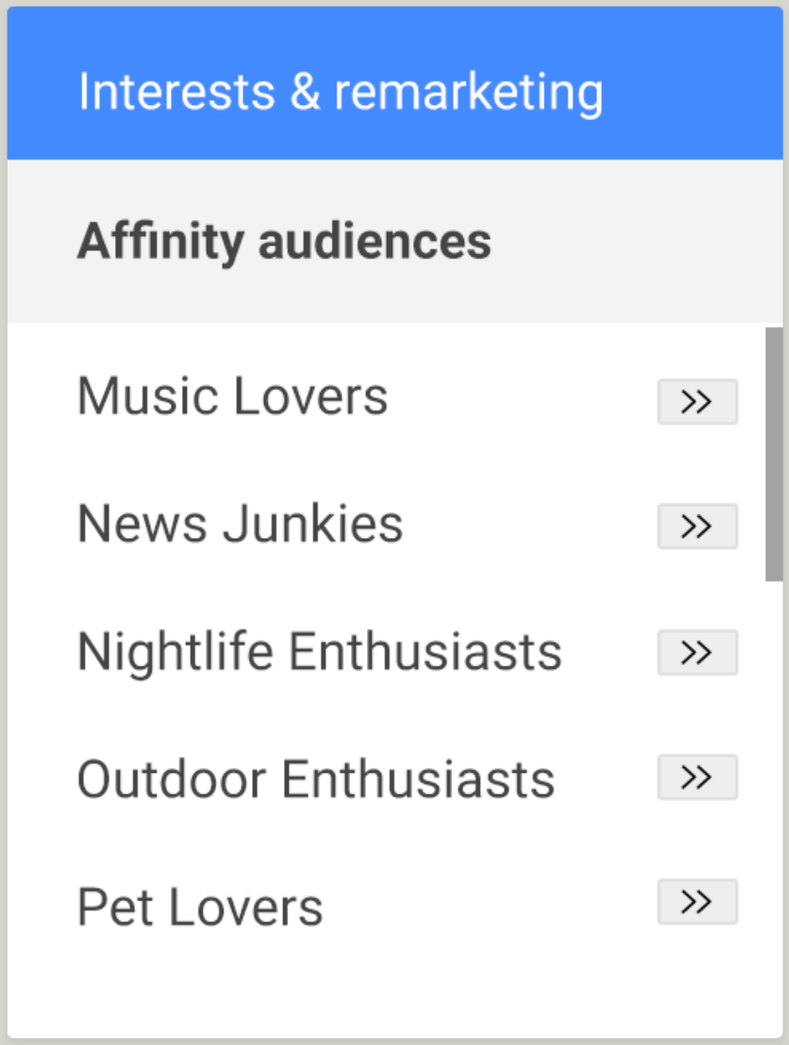
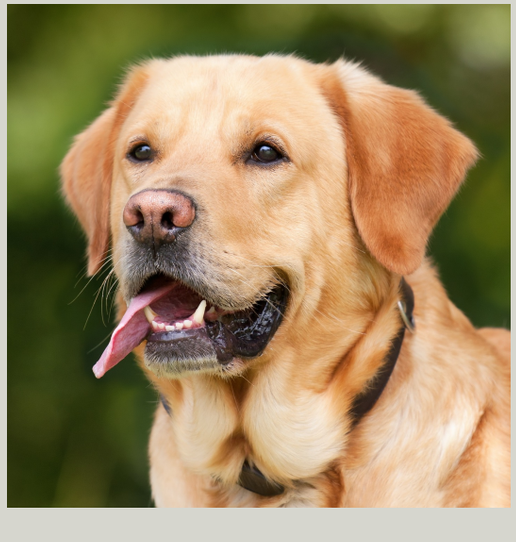


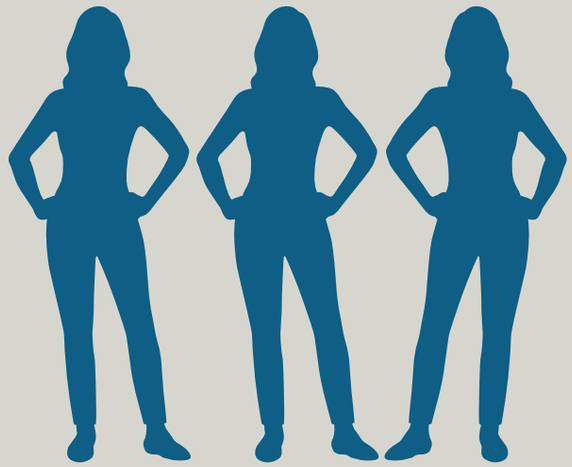

More useful
More informative

***Next:*** *How do* ***particular inferences*** *and the* ***accuracy of these inferences*** *impact privacy attitudes?*

# Advertisers can target ads based off of many interests





# Market leaders provide thousands of interests for advertisers to target

Arts & Entertainment
Arts & Entertainment>Celebrities & Entertainment News
Arts & Entertainment>Comics & Animation
Arts & Entertainment>Comics & Animation>Anime & Manga
Arts & Entertainment>Comics & Animation>Cartoons
Arts & Entertainment>Comics & Animation>Comics
Arts & Entertainment>Entertainment Industry
Arts & Entertainment>Entertainment Industry>Film & TV Industry
Arts & Entertainment>Entertainment Industry>Film & TV Industry>Film & TV Awards
Arts & Entertainment>Entertainment Industry>Film & TV Industry>Film & TV Production
Arts & Entertainment>Entertainment Industry>Recording Industry
Arts & Entertainment>Entertainment Industry>Recording Industry>Music Awards
Arts & Entertainment>Entertainment Industry>Recording Industry>Record Labels
Arts & Entertainment>Events & Listings
Arts & Entertainment>Events & Listings>Clubs & Nightlife
Arts & Entertainment>Events & Listings>Concerts & Music Festivals
Arts & Entertainment>Events & Listings>Film Festivals
Arts & Entertainment>Events & Listings>Live Sporting Events
Arts & Entertainment>Events & Listings>Movie Listings & Theater Showtimes
Arts & Entertainment>Events & Listings>Ticket Sales
Arts & Entertainment>Fun & Trivia
Arts & Entertainment>Fun & Trivia>Flash-Based Entertainment
Arts & Entertainment>Fun & Trivia>Fun Tests & Silly Surveys
Arts & Entertainment>Humor
Arts & Entertainment>Humor>Live Comedy
Arts & Entertainment>Humor>Political Humor
Arts & Entertainment>Humor>Spoofs & Satire
Arts & Entertainment>Movies

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Autos & Vehicles>Vehicle Brands>Mazda
Autos & Vehicles>Vehicle Brands>Mercedes-Benz
Autos & Vehicles>Vehicle Brands>Mercury
Autos & Vehicles>Vehicle Brands>Mini
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
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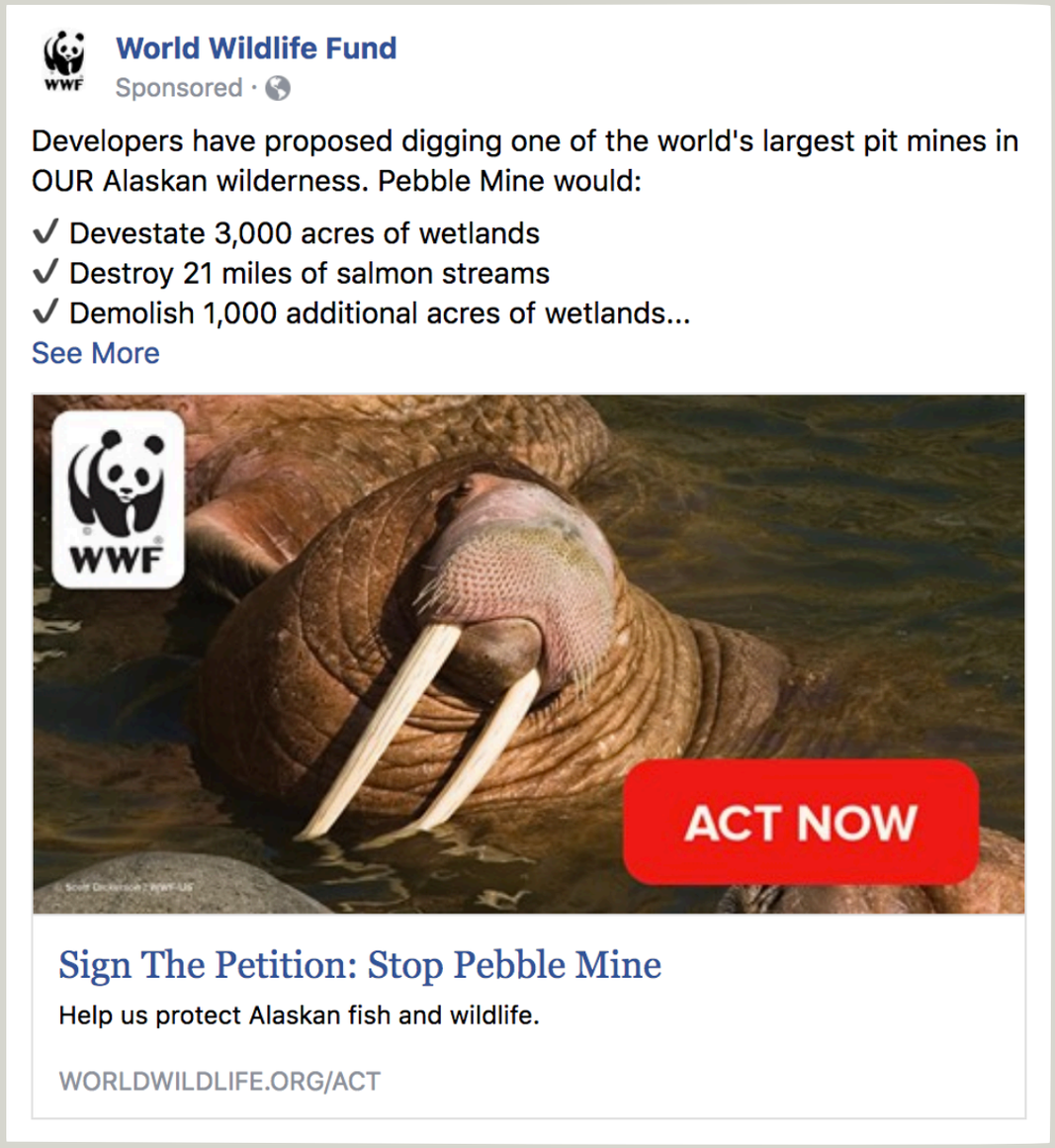
Autos & Vehicles>Vehicle Brands>Suzuki
Autos & Vehicles>Vehicle Brands>Toyota
Autos & Vehicles>Vehicle Brands>Toyota>Scion
Autos & Vehicles>Vehicle Brands>Vauxhall-Opel
Autos & Vehicles>Vehicle Brands>Volkswagen
Autos & Vehicles>Vehicle Brands>Volvo
Autos & Vehicles>Vehicle Licensing & Registration
Autos & 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

# Targeting interests are sometimes revealed to users




One reason you're seeing this ad is that **World Wildlife Fund** wants to reach people who like their page.

There may be other reasons you're seeing this ad, including that **World Wildlife Fund** wants to reach **people ages 18 and older who live in the United States**. This is information based on your Facebook profile and where you've connected to the internet.

# Research Question

How do the **interests that are inferred** and the **accuracy of these inferences** impact privacy attitudes?

# Survey Design

**237 Mechanical Turk respondents**

# Survey Design

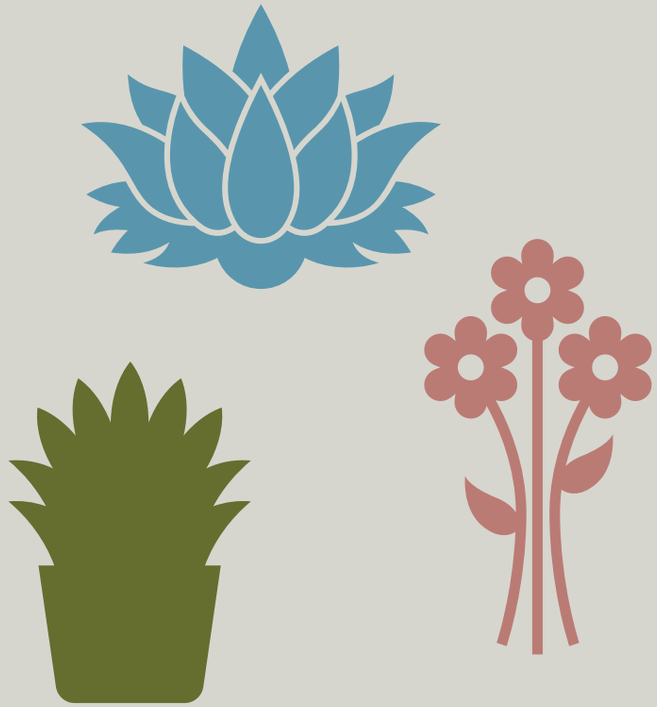
**237 Mechanical Turk respondents**

**160 Google AdWords categories**

# Categories & Reaction Statements

## Home & Garden

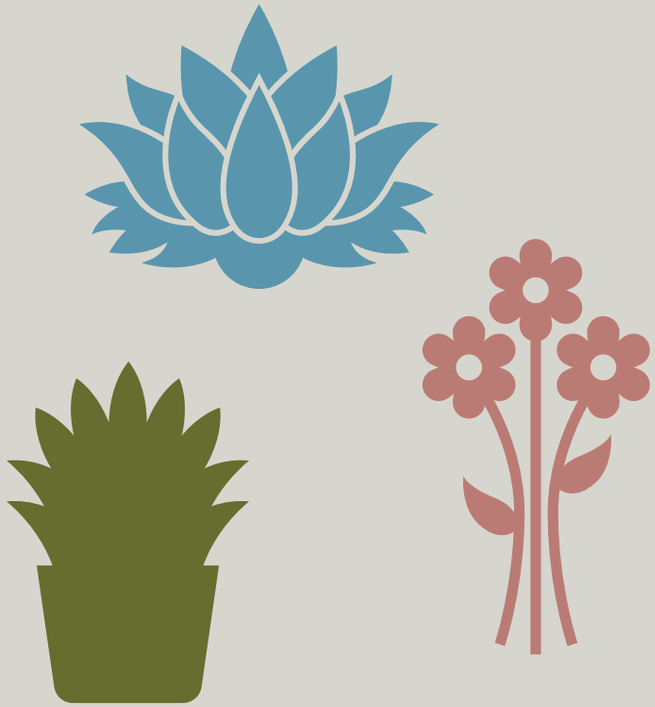
### ↳ Gardening & Landscaping



# Categories & Reaction Statements

**Home & Garden**

↳ **Gardening & Landscaping**



**accuracy** of inference

**comfortable** with inference

**usefulness** of inference for personalization

# Interest in topic increases comfort

*With increase in interest…*

**10x** more likely to be **more comfortable** with personalization

**3x** more likely to find personalization **more useful**

Google

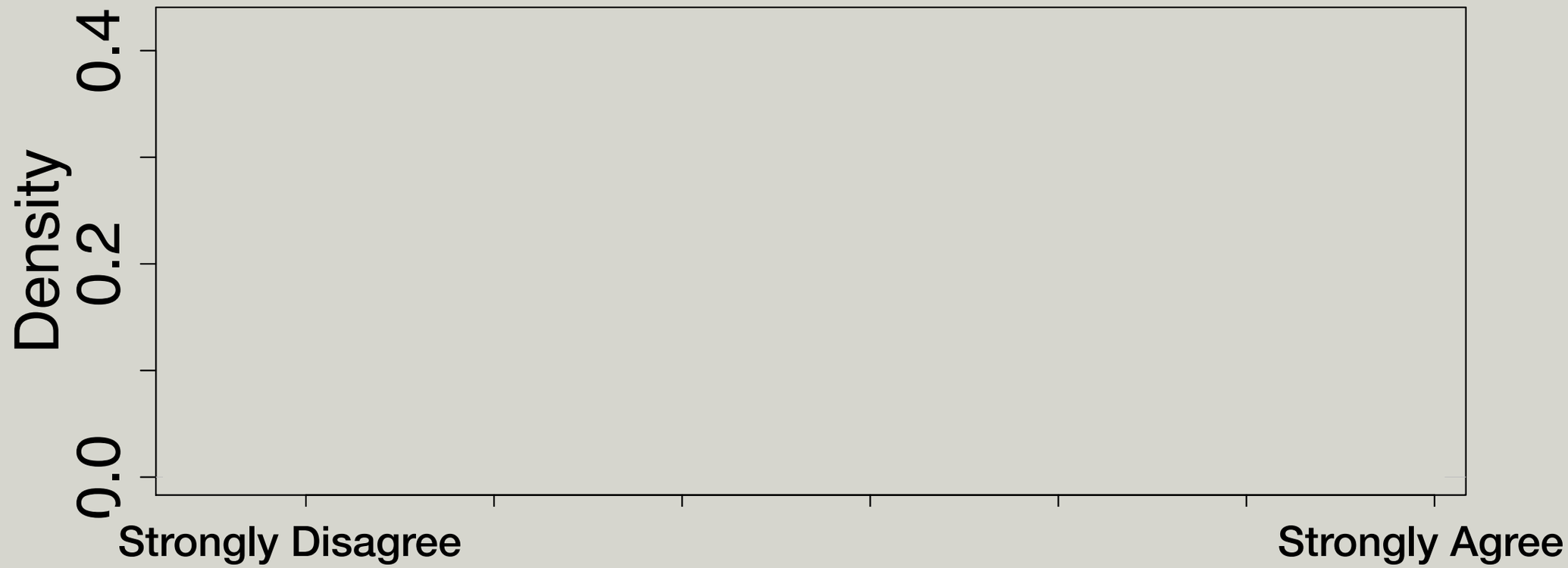
Describe your issue

# Personalized advertising policy principles

## Prohibited categories

- ✕ Personal hardships
- ✕ Alcohol
- ✕ Gambling
- ✕ Health
- ✕ Religious belief
- ✕ Sexual interests

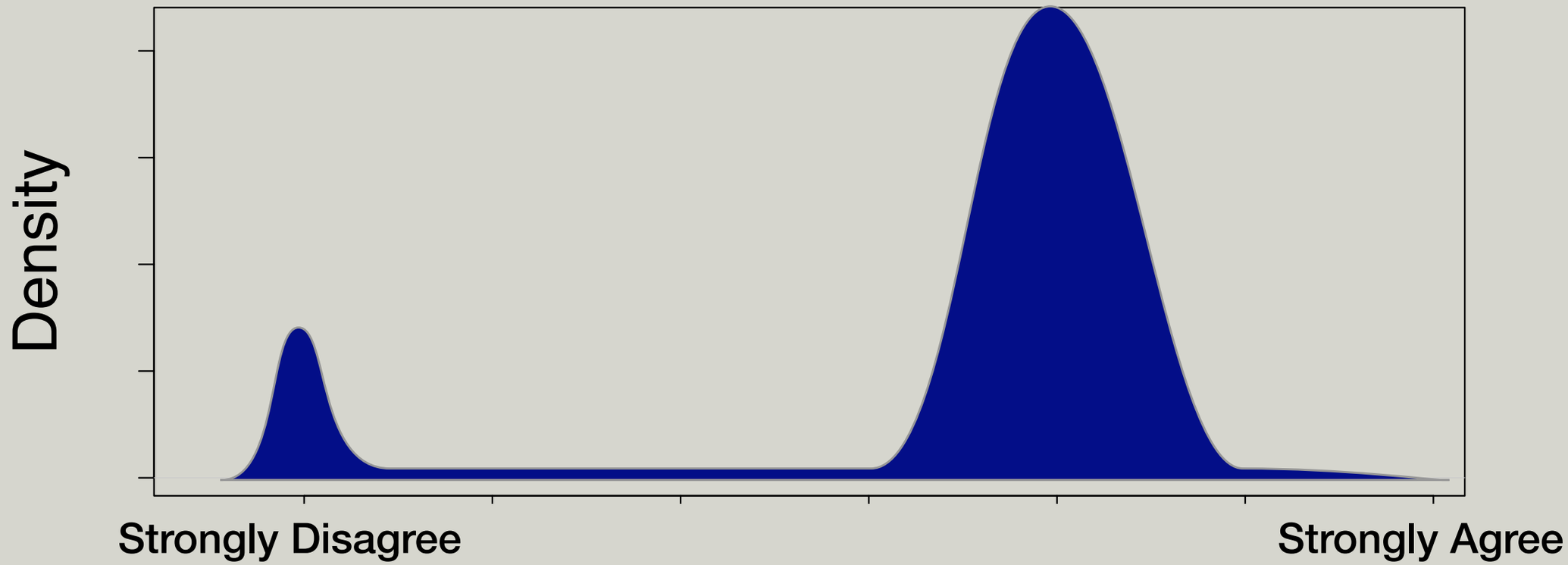
# Distribution of comfort with personalization




I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

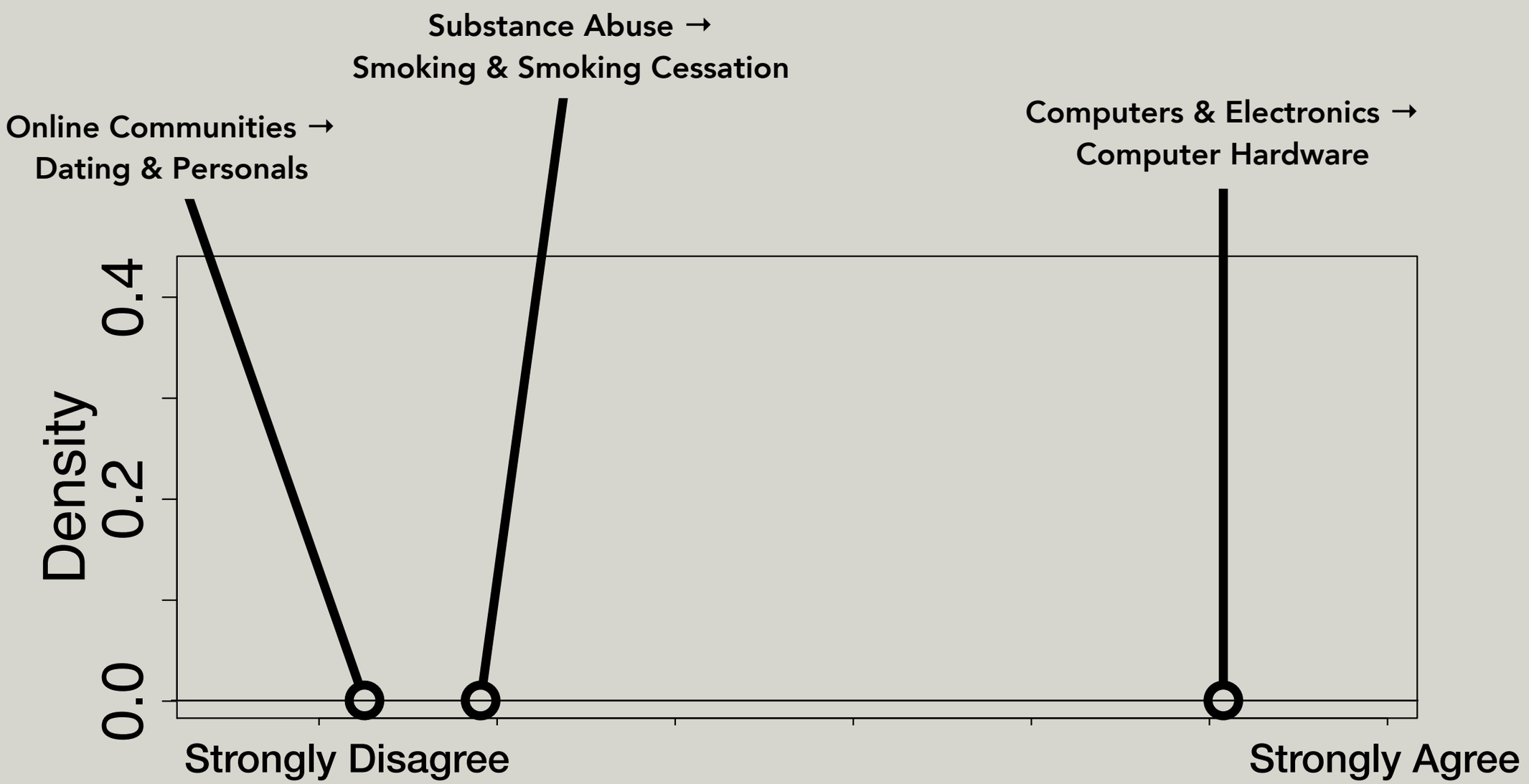
# Practice suggests bimodal distribution

ANTICIPATED



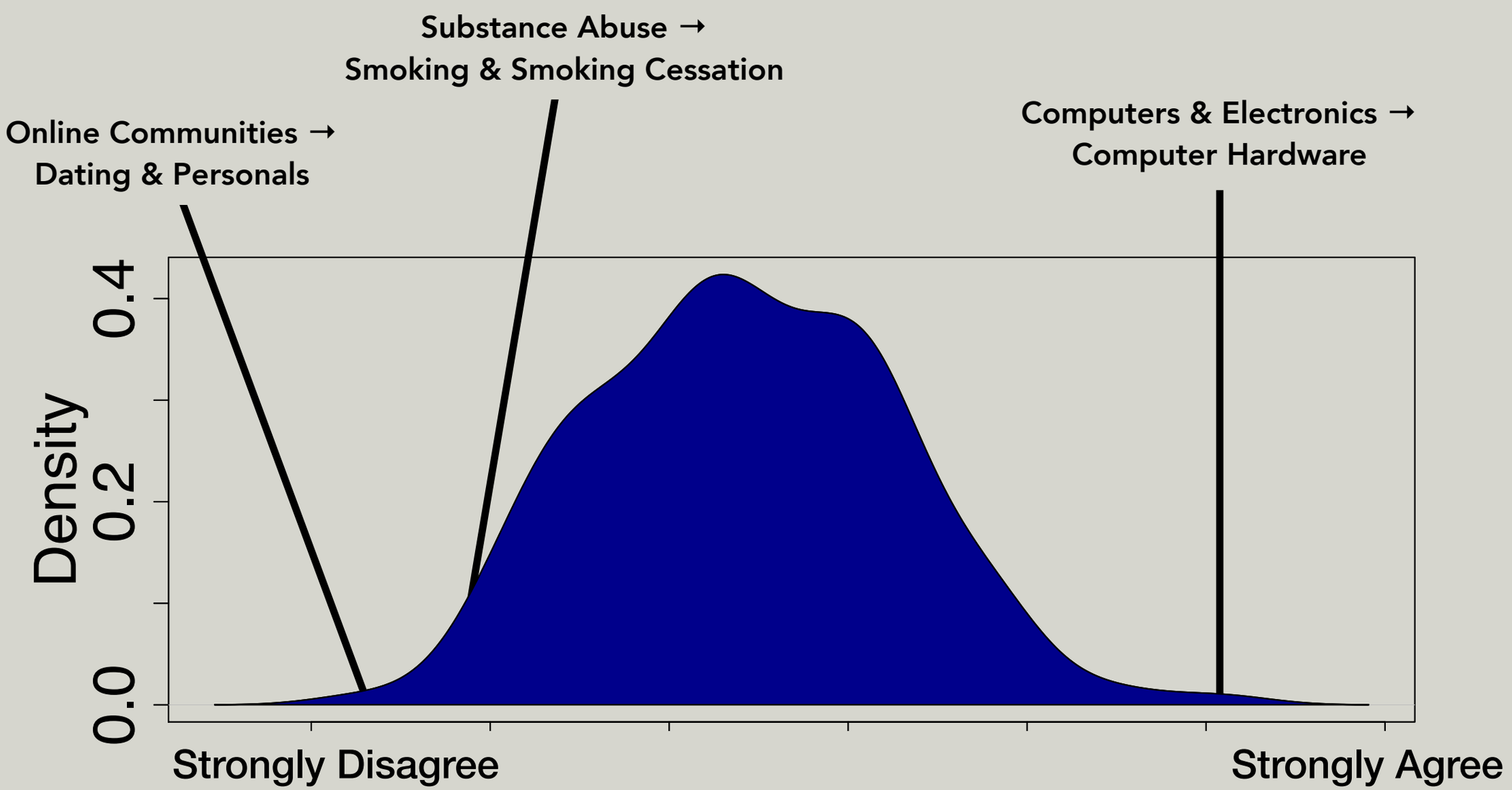

I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

# Some categories at extremes of comfort



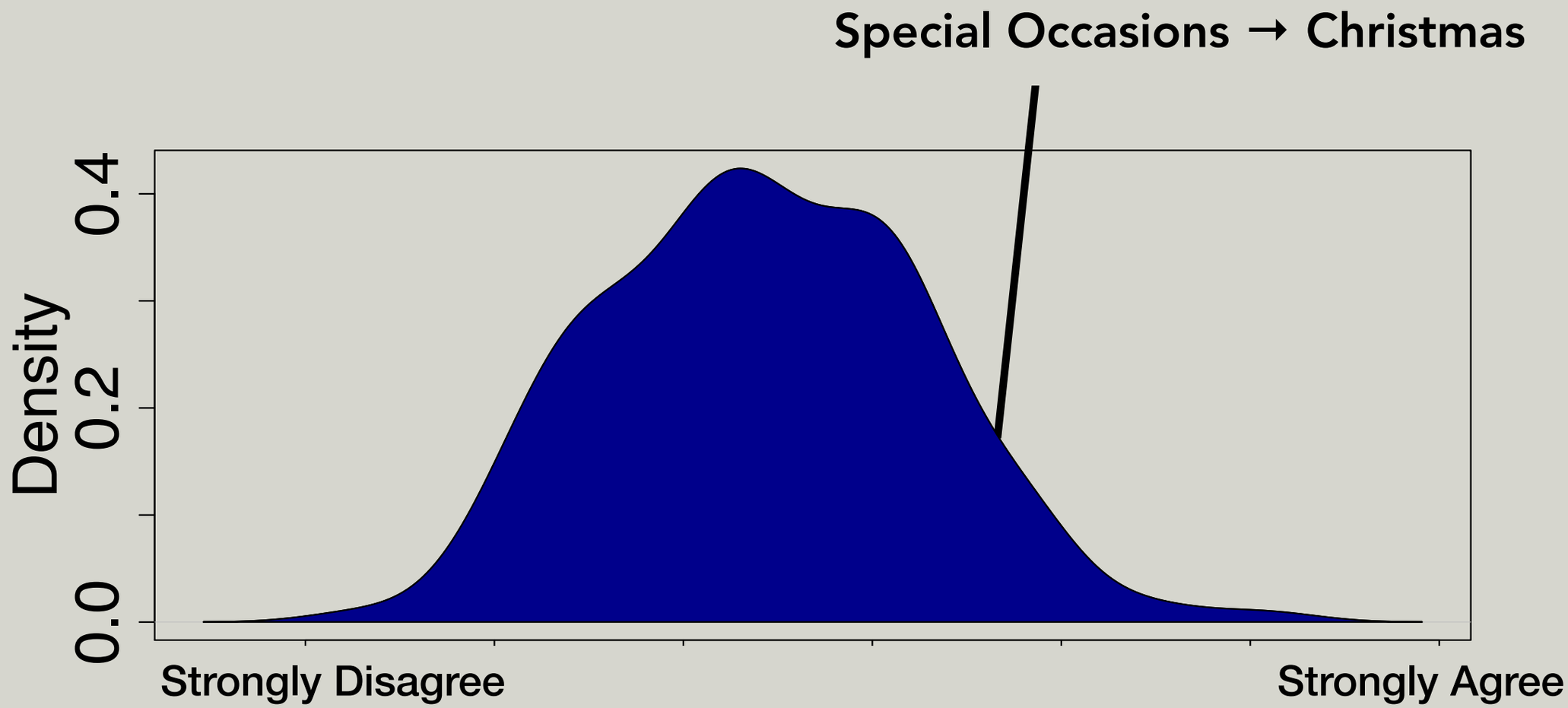

I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

# Broad spectrum of comfort across categories




I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

# Related categories can vary in sensitivity




I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

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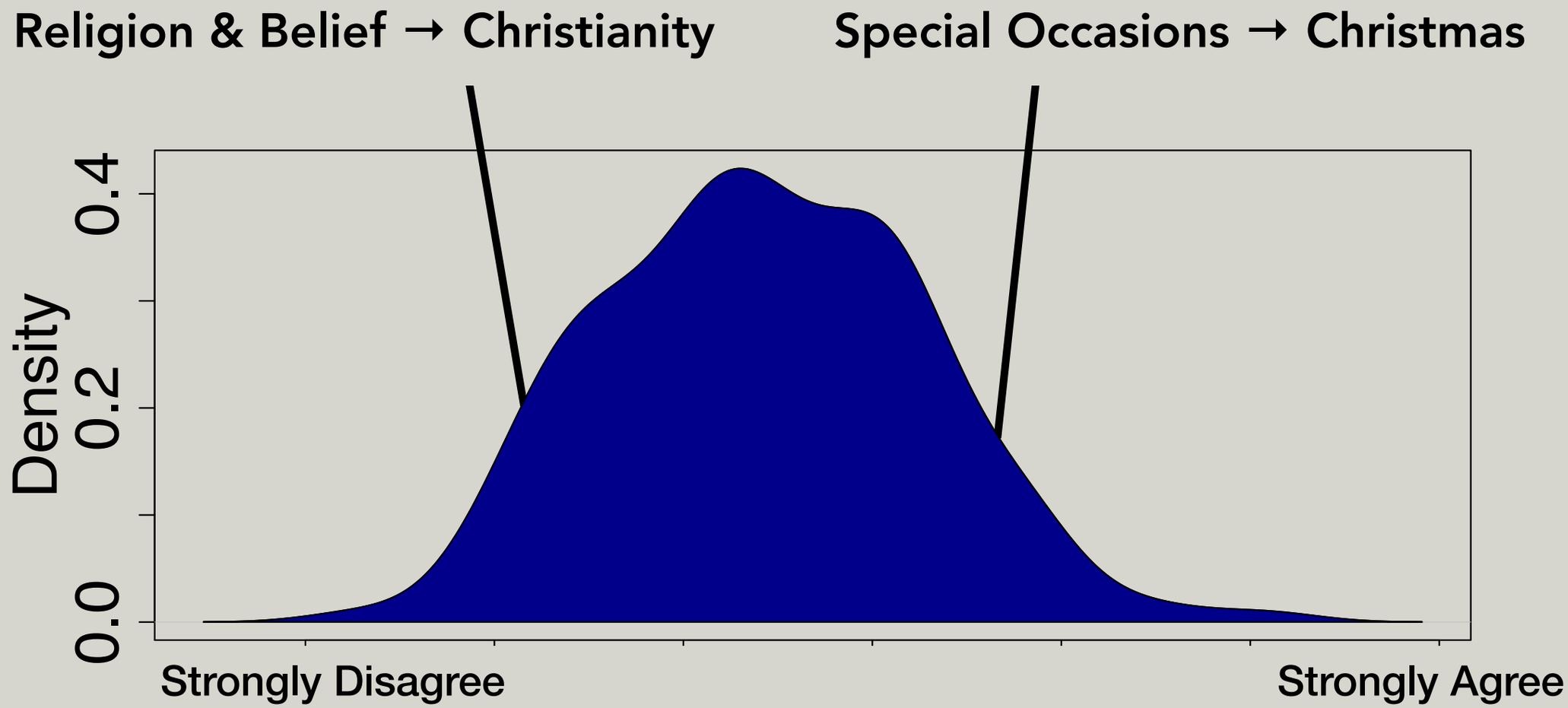


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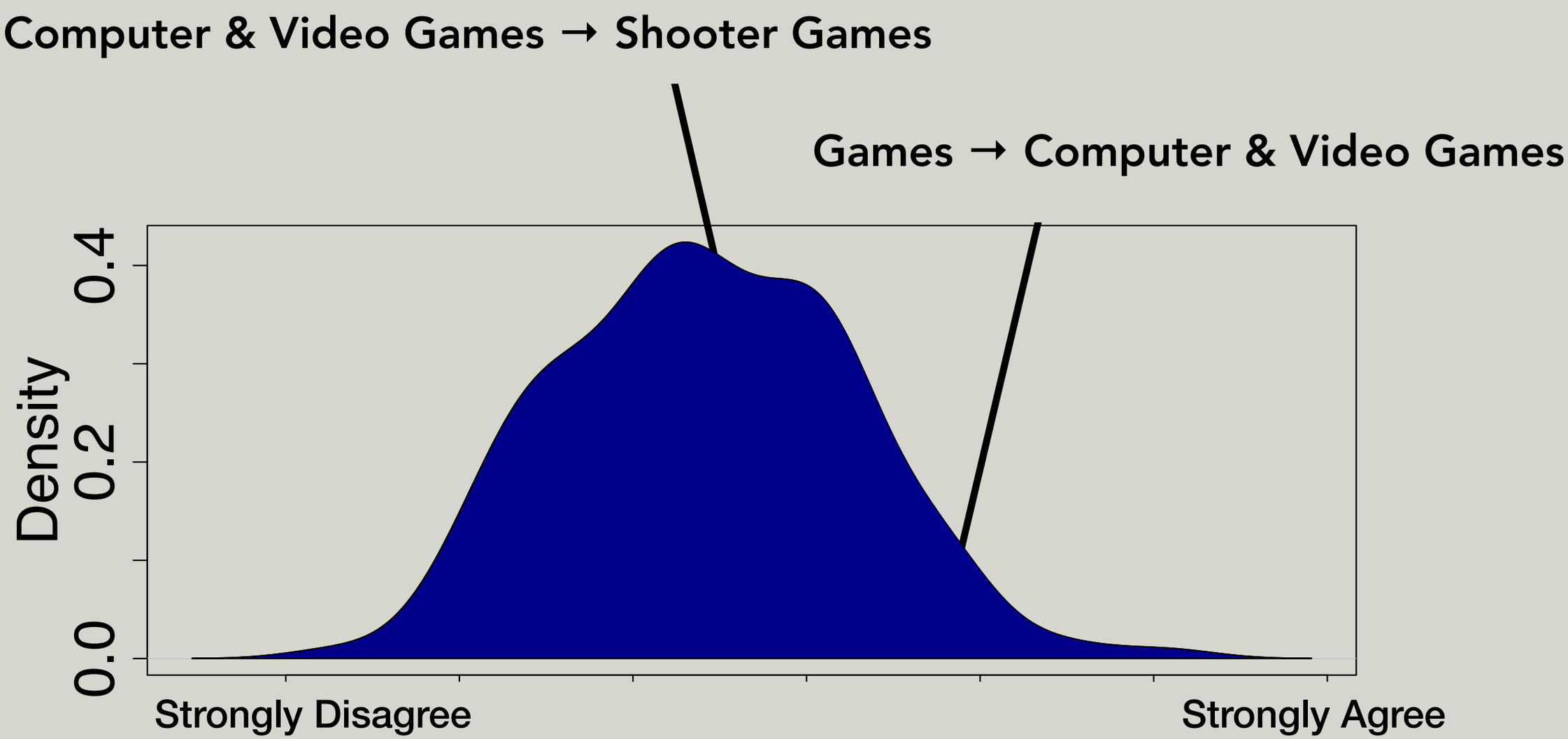
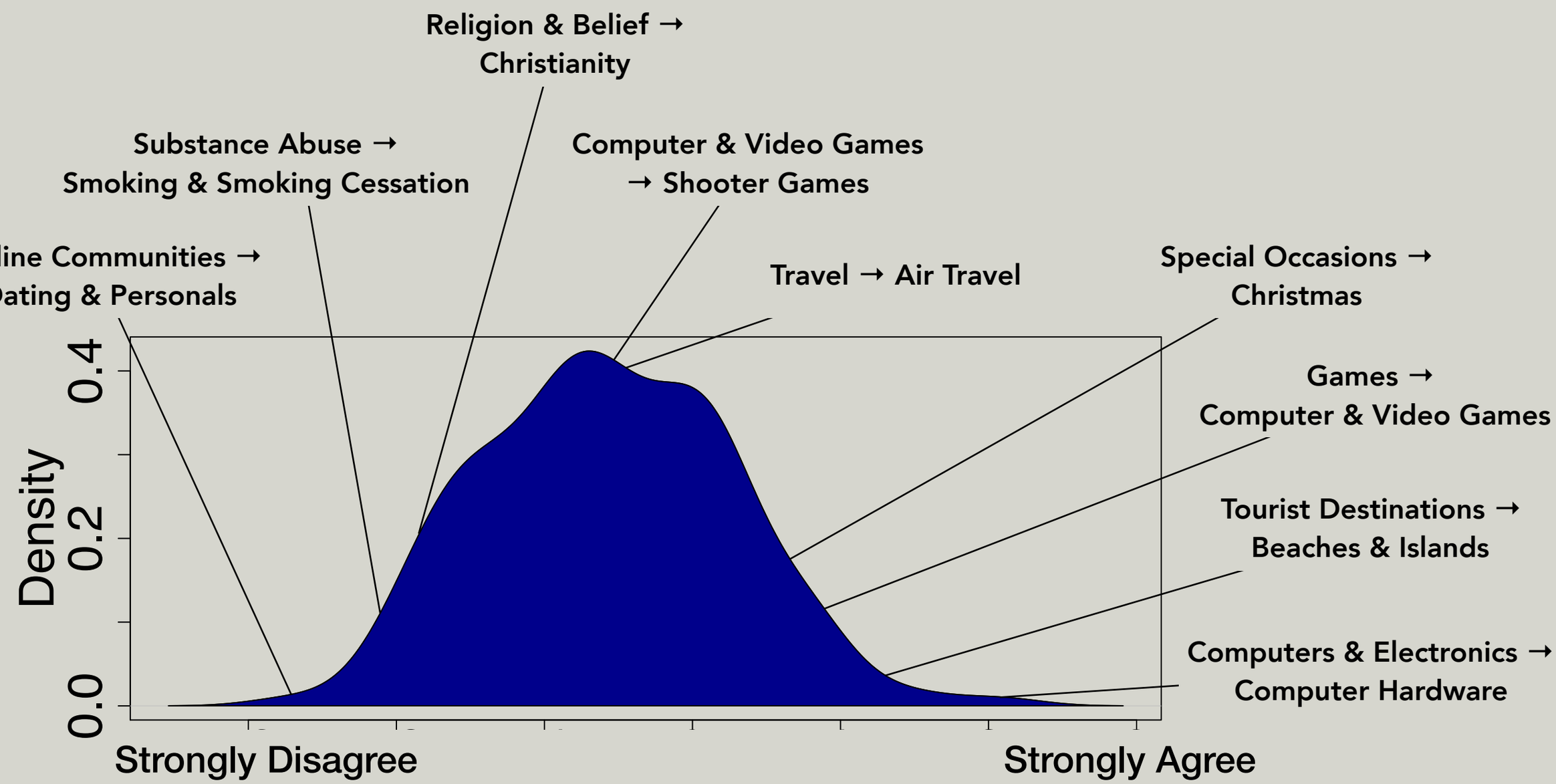



I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

# Broad spectrum of comfort across categories

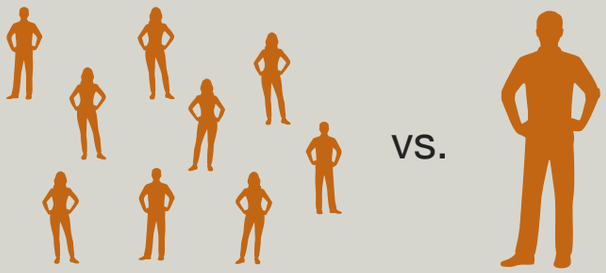



I would be **comfortable with a company personalizing my web experience** based on an inference about my level of interest in *topic*.

# Results Summary

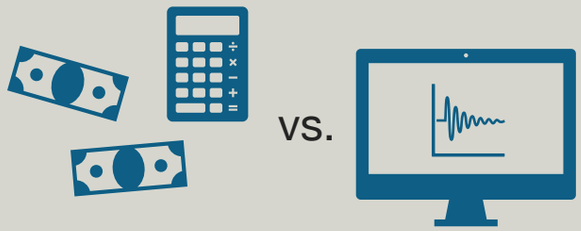
## How does the method of targeting impact privacy attitudes?

**Visitors** vs. **You**



More fair to target
More comfortable

**Control** vs. **Algorithm**



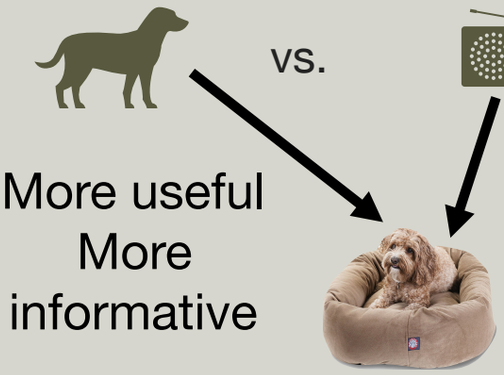
More fair to target

More useful

**Interest** vs. **Algorithm**

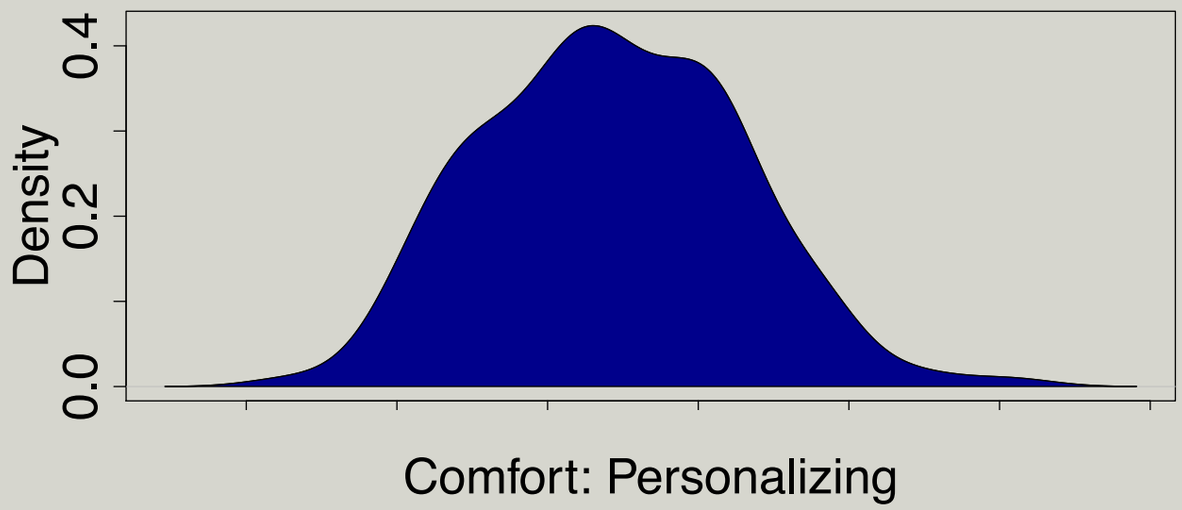
More informative

**Interest** vs. **Unrelated Interest**




More useful
More informative

## How do particular inferences and their accuracy impact privacy attitudes?




Interest in topic →
- Comfort with personalization
- Perceived usefulness

# Proposal: advertising network transparency

## Your ad preferences

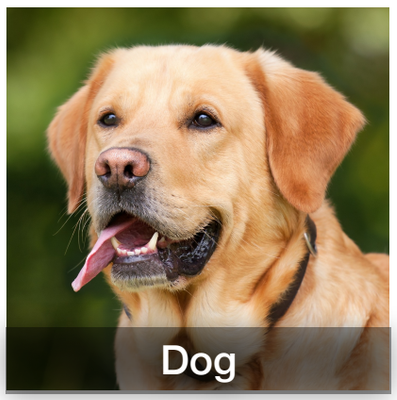
Learn what influences the ads you see and take control over your ad experience.

### Your interests

Close

Business and industry | News and entertainment | Technology | Travel, places and events | **Hobbies and activities** | More

Choose an interest to preview examples of ads you might see on Facebook or remove it from your ad preferences.




### Advertisers you've interacted with

Close

**With your contact info** | Whose website or app you've used | Whom you've visited | More

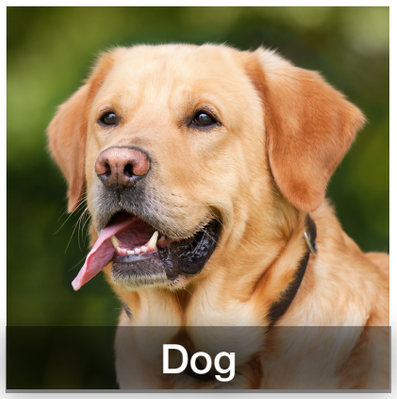
# Proposal: advertising network transparency

## Your ad preferences

Learn what influences the ads you see and take control over your ad experience.

We inferred you are interested in **dogs** because you visited web pages related to this topic, including:

- “Here are the Most Dog-Friendly Restaurants in the United States” on Southern Living




**Your interests** Close

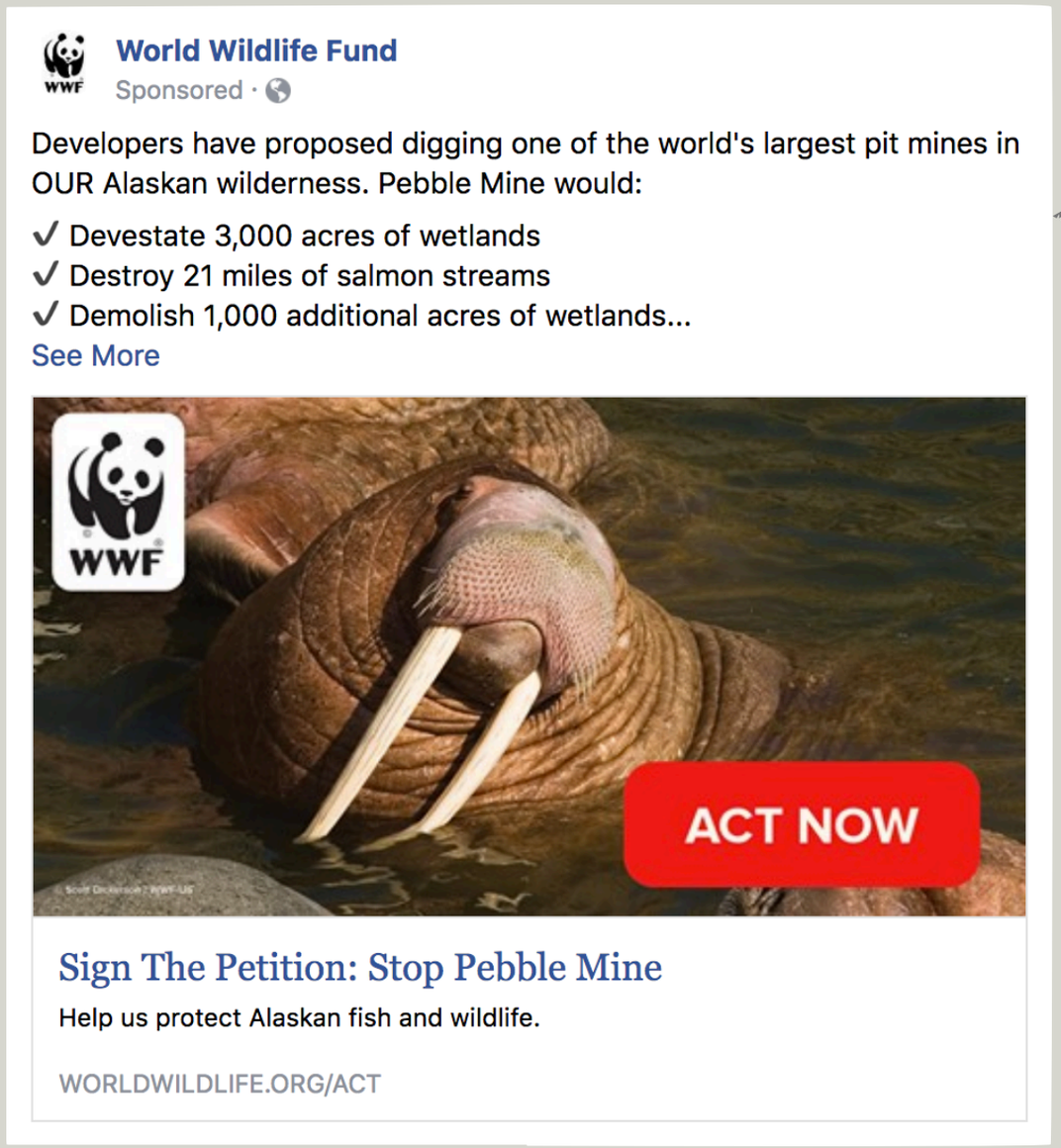
Business and industry … **Hobbies and activities** More

Choose an interest to previ… …ad preferences.

**Advertisers you've interacted with** Close

**With your contact info** Whose website or app you've used Whom you've visited More

# Proposal: advertising network transparency

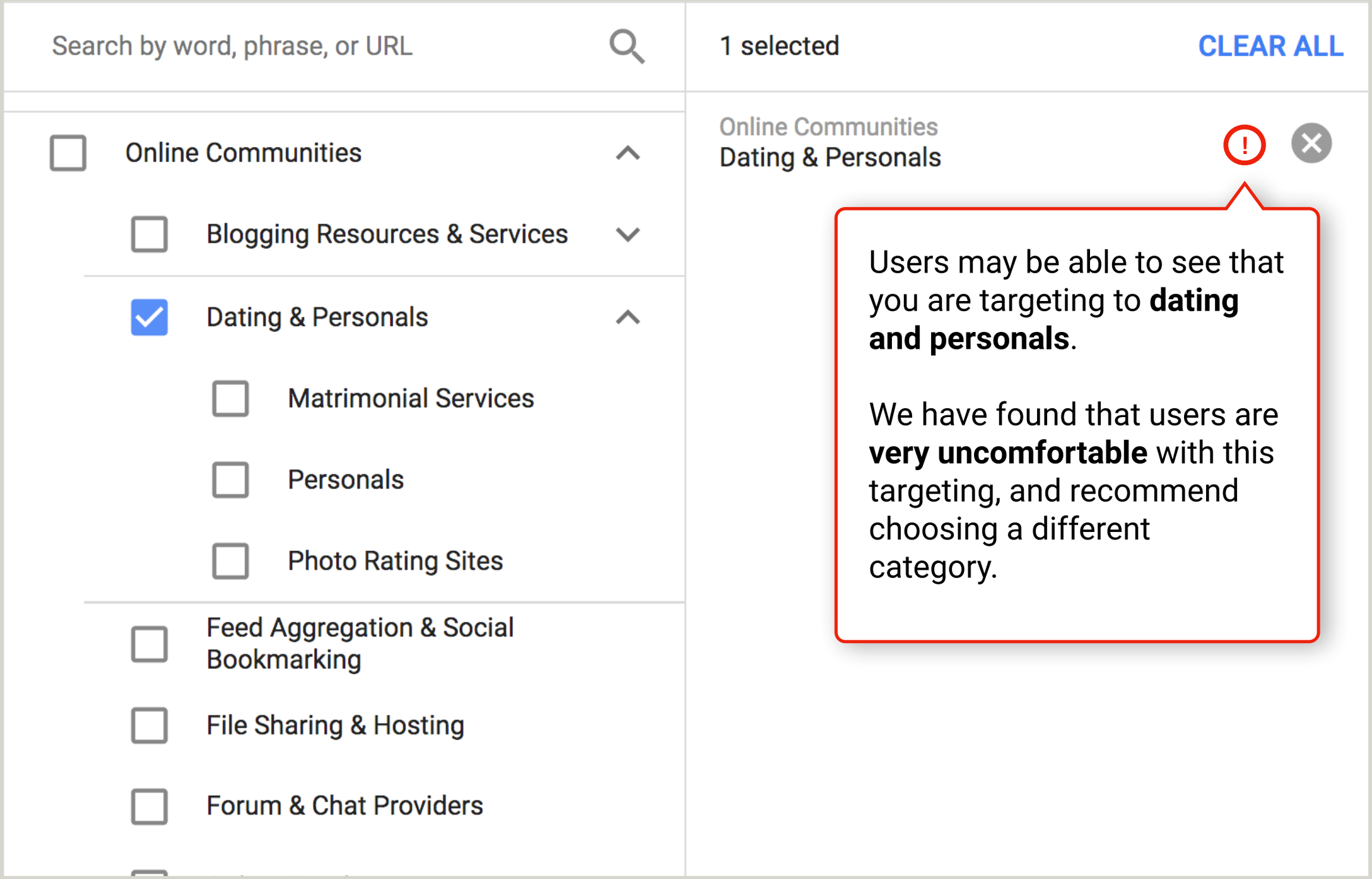



You're seeing this ad because **World Wildlife Fund** chose to target this ad towards people who may be interested in **dogs**.

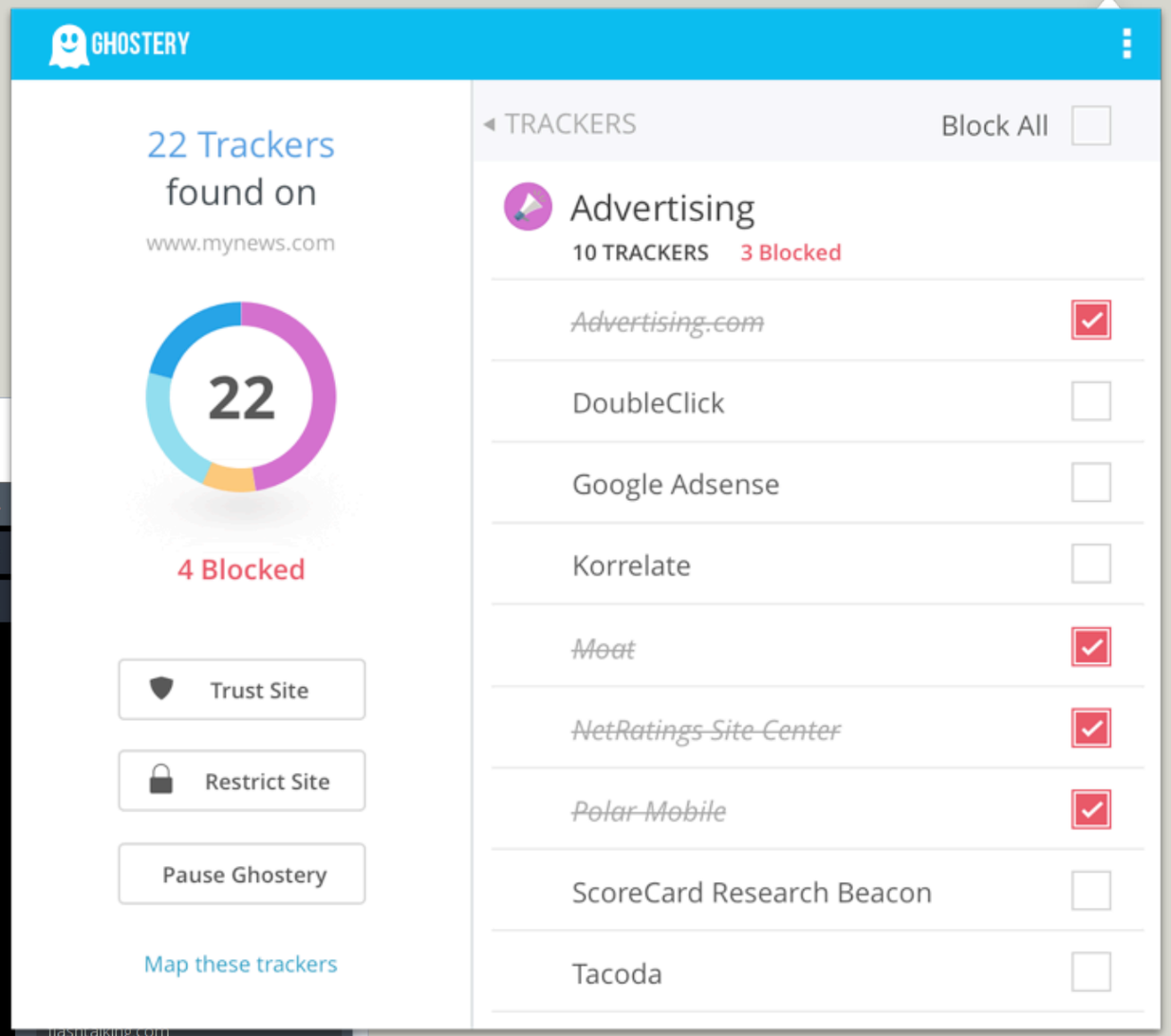
We inferred you are interested in **dogs** because you visited web pages related to this topic, including:

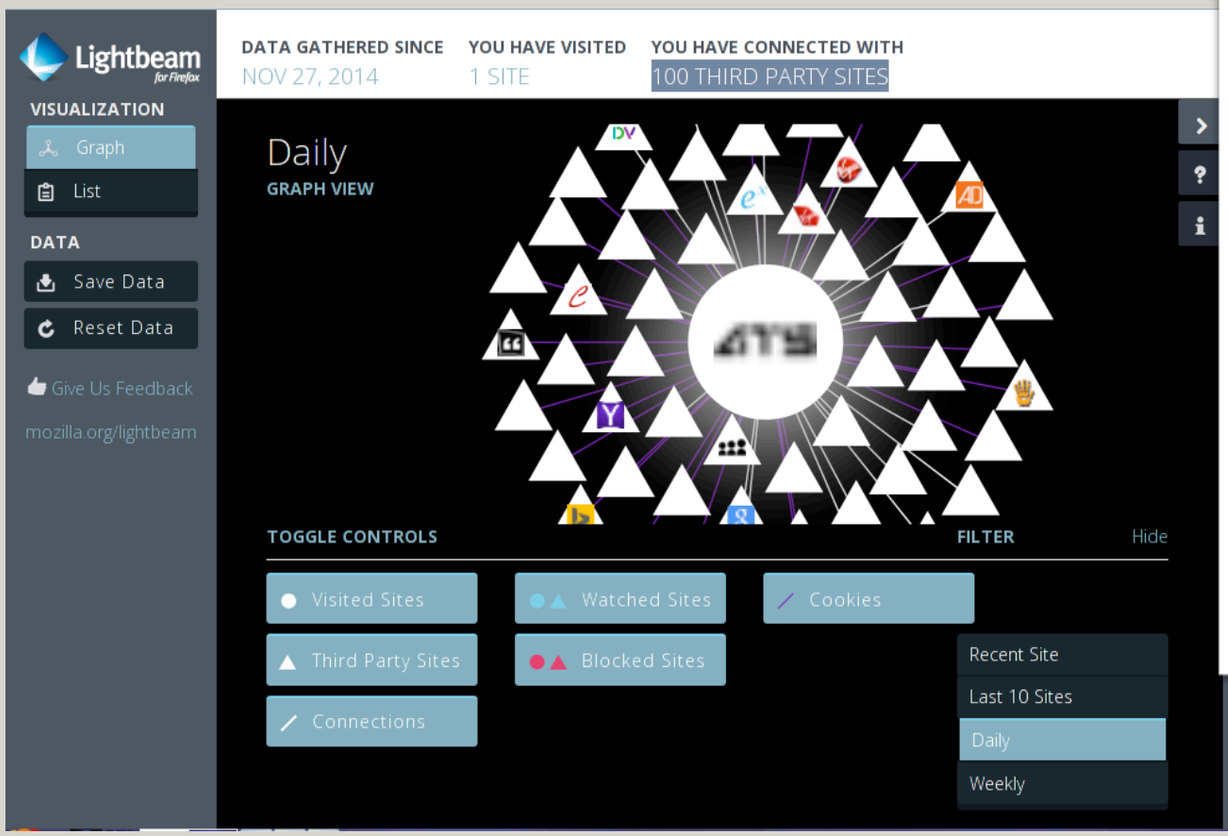
"Here are the Most Dog-Friendly Restaurants in the United States" on Southern Living

# Proposal: ad targeting interface with sensitivity



# Recommendations: user-installed tools



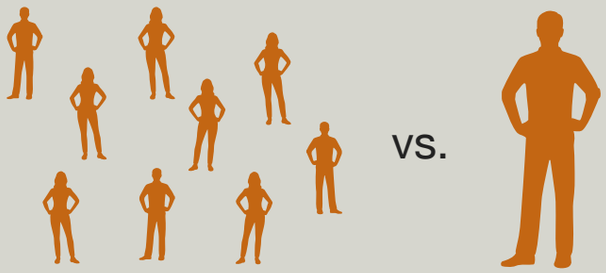



# Unpacking Perceptions of Data-Driven Inferences Underlying Online Targeting and Personalization

**Claire Dolin, Ben Weinshel,** Shawn Shan, Chang Min Hahn, Euirim Choi, Michelle L. Mazurek, Blase Ur

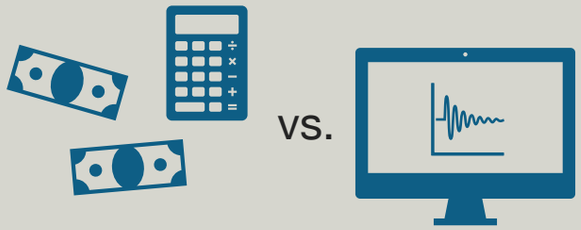
## How does the method of targeting impact privacy attitudes?

**Visitors** vs. **You**



More fair to target
More comfortable

**Control** vs. **Algorithm**



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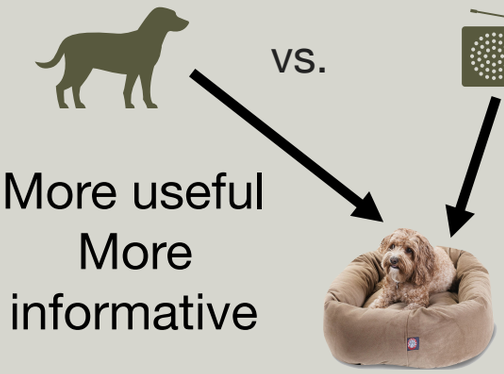
More informative

**Interest** vs. **Unrelated Interest**

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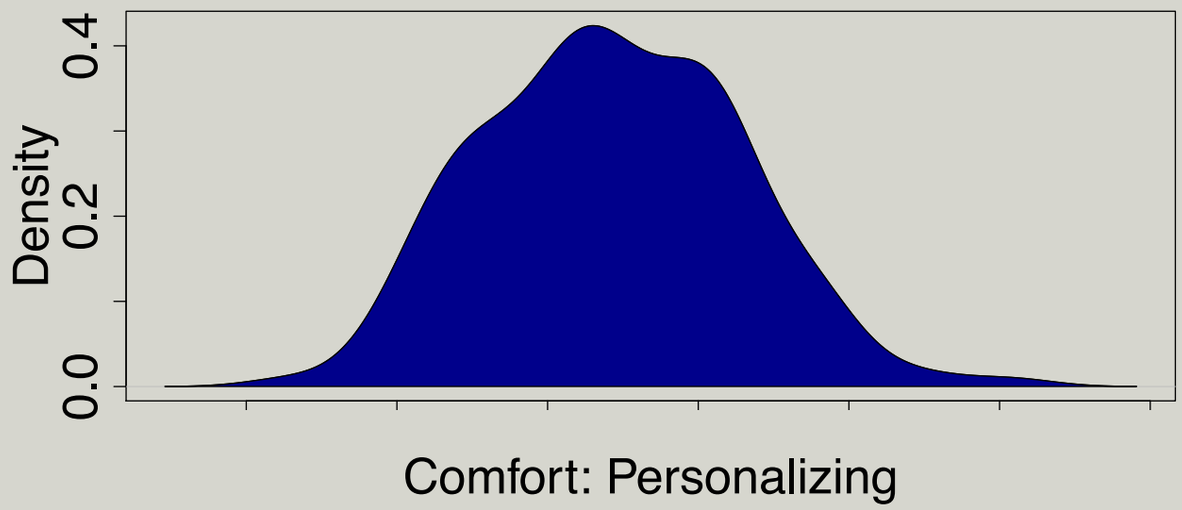
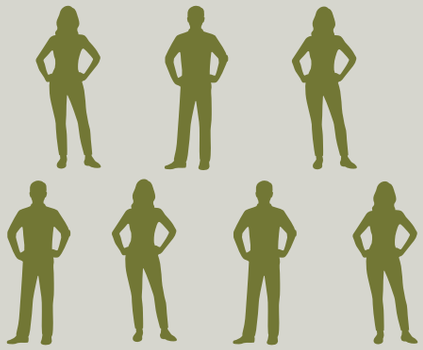



Interest in topic →
- Comfort with personalization
- Perceived usefulness

THE UNIVERSITY OF CHICAGO
UNIVERSITY OF MARYLAND
moz://a
DATA TRANSPARENCY LAB

# Extra Slides

# Methodology: Ad Targeting Explanations



*You are seeing this ad because the advertiser has inferred from general data that*

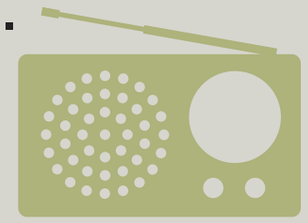
*visitors to this site…* ***(Visitors)***
*you…* ***(You)***

…are likely a man ages 18-24 and thinks men ages 18-24 are likely to be interested in buying this product. **(Demographic)**

…are likely interested in dogs and thinks people interested in dogs are likely to be interested in buying this product. **(Interest)**

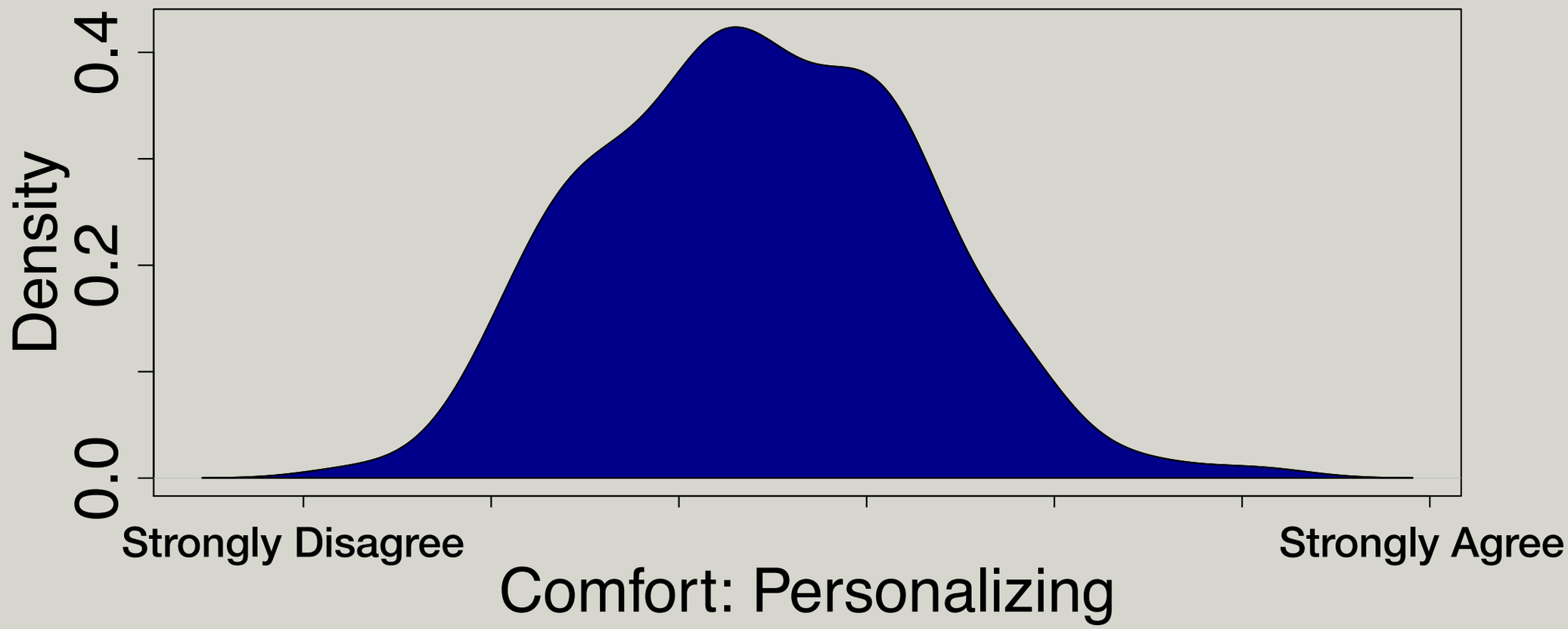
…are likely women ages 65-70 and thinks women ages 65-70 are likely to be interested in buying this product. **(Wrong Demographic)**

…are likely interested in Music Equipment & Technology and thinks people interested in Music Equipment & Technology are likely to be interested in buying this product. **(Unrelated Interest)**



# Results

We would expect some categories to be clearly sensitive or non-sensitive…



# Methodology: Inference Categories

Arts & Entertainment>Celebrities & Entertainment News
Arts & Entertainment>Comics & Animation
Events & Listings>Clubs & Nightlife
Events & Listings>Live Sporting Events
Movies>Action & Adventure Films
Movies>Documentary Films
Movies>Romance Films
Music & Audio>Podcasting
Music & Audio>Christian & Gospel Music
Music & Audio>Rap & Hip-Hop
Performing Arts>Broadway & Musical Theater
TV & Video>TV Comedies
TV & Video>TV Soap Operas
Autos & Vehicles>Bicycles & Accessories
Autos & Vehicles>Hybrid & Alternative Vehicles
Autos & Vehicles>Motorcycles
Vehicle Parts & Accessories>Engine & Transmission
Autos & Vehicles>Vehicle Shopping
Cosmetic Procedures>Cosmetic Surgery
Face & Body Care>Make-Up & Cosmetics
Face & Body Care>Unwanted Body & Facial Hair Removal
Fitness>Bodybuilding
Hair Care>Hair Loss
…