Investigating ad transparency mechanisms in social media

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In this talk

Explanations for social media targeted advertising

Ad explanations

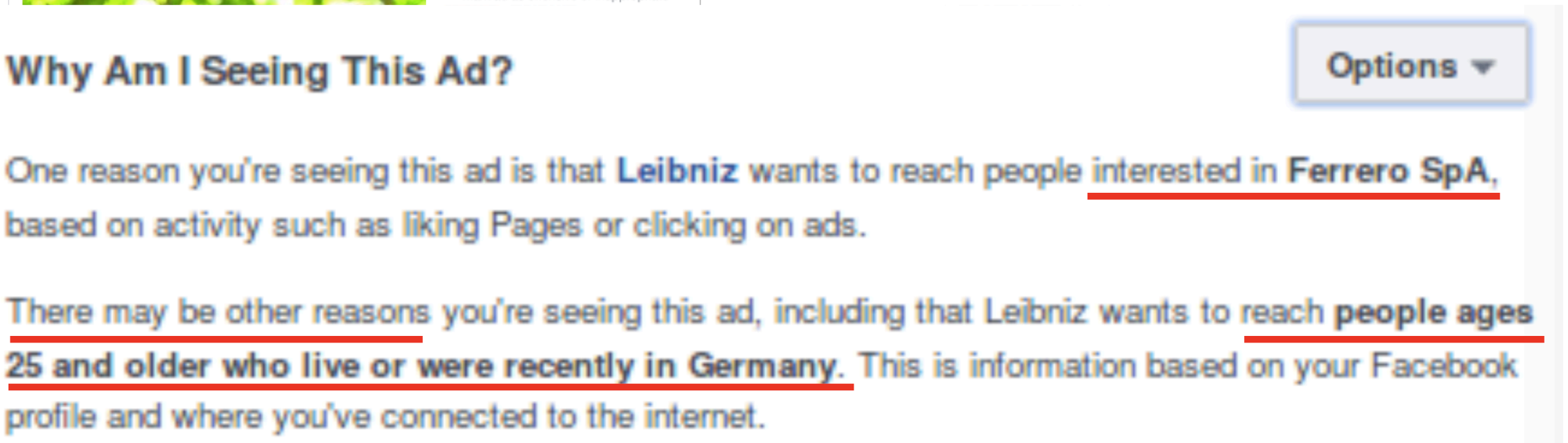
Why am I being shown this ad?

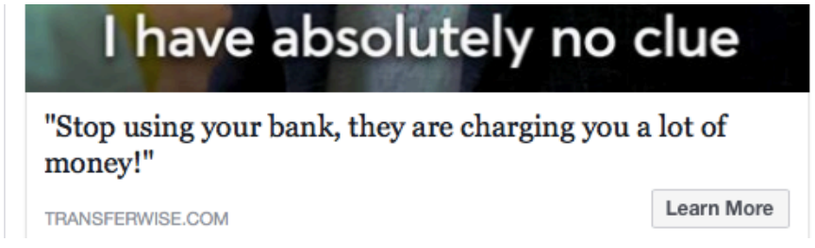
Data explanations

What data the ad platform knows about me?

[NDSS'18]

Facebook provides explanations





Explications are voluntary or to satisfy law

But explanations are not trivial

- The systems they have to explain are complex
- Many design choices
  - Format, length, amount of details …
- What is a good explanation?
  - Improve control
  - Satisfies curiosity
  - Detect malicious or deceiving advertising
  - Verify compliance

Why did I received this ad?

Ad explanations

… it’s complicated

Targeted advertising is a complex system

- Facebook inferred some attributes
- Advertiser used attributes to select audience
- Facebook matched the ad to me through auctions

Desired properties of explanations

- Do explanations show all the attributes? (completeness)
- Were the attributes showed actually used by the advertisers? (correctness)
- Are explanations specific to each user? (personalization)
- Are explanations consistent across time? (consistency)

We need standards for explanations

To protect against adversarial explanations :

- Insufficient / unsatisfactory
  - That offer no insightful/actionable information to consumers
- Misleading / fake
  - Designed to gain consumer acceptance for a service
  - Misled consumers about the process

Measurement methodology

- Chrome extension to collect ads from Facebook timeline
  - 35 users for 5 months
  - 26K unique ads and explanations
- Controlled experiments targeting users with ads:
  - We targeted users
  - We collected explanations

  } Ground truth
  - 96 successful campaigns

Are Facebook explanations complete?

- For ads targeting customer PIIs
  - “One reason you're seeing this ad is that Booking.com added you to a list of people they want to reach on Facebook. They were able to reach you because you’re on their customer list or you’ve provided them with your contact information off of Facebook. This is based on customer information provided by Booking.com..”
- Does not show what PII booking.com used!
  - Email ? Telephone ? Name+address? etc.

Are Facebook explanations complete?

- For ads targeting data broker attributes
  - “One reason you're seeing this ad is that Peugeot wants to reach people who are part of an audience created based on data provided by Acxiom. Facebook works with data providers to help businesses find the right audiences for their ads. Learn more about data providers.”
- Does not say what Acxiom provided attributes were used!
  - Financial data ? Purchasing habits ? etc.

Are Facebook explanations complete?

- For ads targeting Facebook attributes:
  - “One reason you're seeing this ad is that Peek & Cloppenburg wants to reach people interested in Shopping and fashion, based on activity such as liking Pages or clicking on ads.”
  - “There may be other reasons why you're seeing this advert, including that Acer wants to reach people aged 18 to 45 who live or have recently been in Germany. This is information based on your Facebook profile and where you've connected to the Internet.”

- Picks exactly one attribute (besides gender, location, age)

Validation of incompleteness

- Ran several controlled ads targeting ourselves using a custom list and selecting millennial & expats
  - “One of the reasons why you're seeing this advert is because we think that you may be in the Millennials audience. This is based on what you do on Facebook..”

- Only one features, millennial (not expats), shown!

Do explanations need to be complete?

- Should they specify all attributes in ad targeting?
- Arguments for:
  - Avoid misleading and insufficient explanations:
    - Designed to gain consumer acceptance for a service
  - Builds trust and incentivizes cooperation
- Arguments against:
  - Targeting formula may be a business secret
  - Overloads users with information (need succinct explanations)

Selecting attributes for explanations

"One reason you're seeing this ad is that Peek & Cloppenburg wants to reach people interested in Shopping and fashion, based on activity such as liking Pages or clicking on ads."

- Are the explained attributes the most important?
  - Is Shopping and fashion the most important of all the user' attributes that Facebook and the advertised used to target the user?

How Facebook selects attributes

- Ran controlled ads to reverse-engineer Facebook's feature selection strategy
- Facebook appears to prioritize attributes based on
  - Their type: Demographic > Interest > PII > Behavioral
  - Their prevalence: Most prevalent first
- Unclear, if this is the right prioritization for users

Are Facebook explanations (at least) correct?

- Experiment : Ran a controlled ad targeting ourselves using a custom list and selecting millennials & expats
  - “There may be other reasons why you're seeing this advert, including that Vacations in Saarbücken wants to reach people aged 18 and above who live or have recently been in Germany. This is information based on your Facebook profile and where you've connected to the Internet.”
- Never used attributes shown in explanations!

Need for rigorous explanations

Incomplete explanations:

- Malicious advertiser can conceal sensitive/discriminatory attributes by adding a common popular attribute to the targeting audience

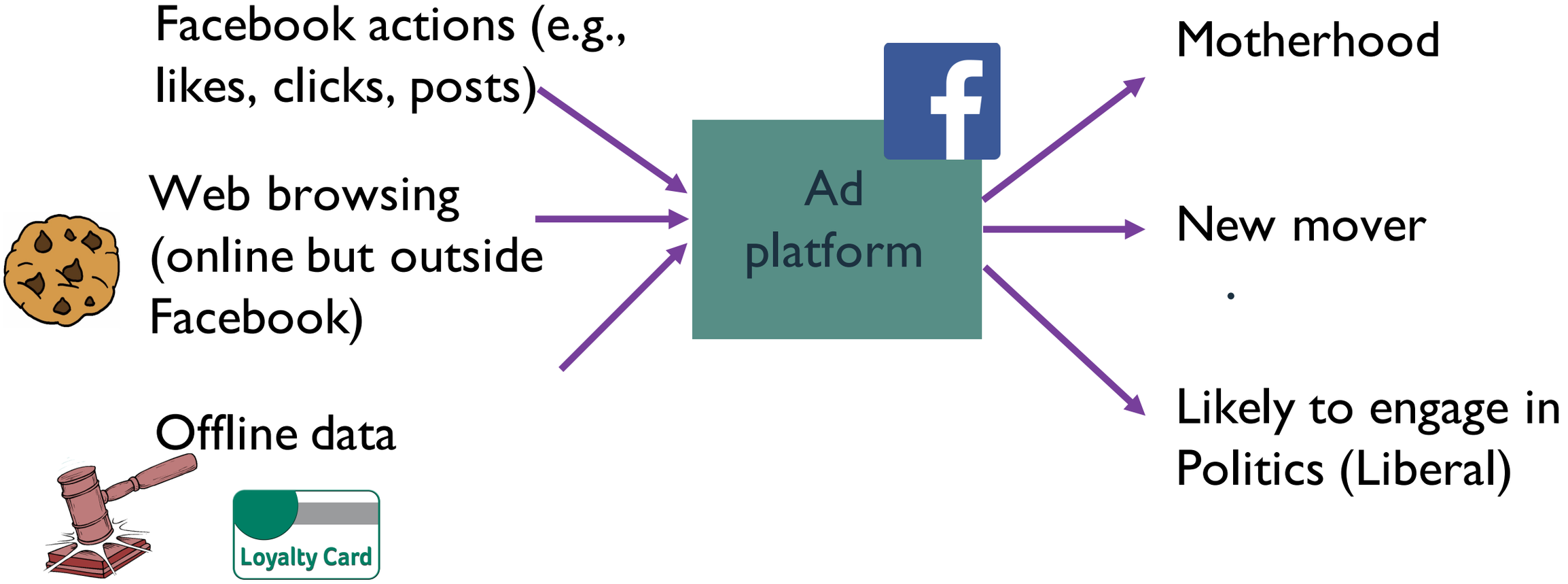
Misleading explanations:

- Fail to capture accurately the reasons why a user is targeted —> induce false sense of trust

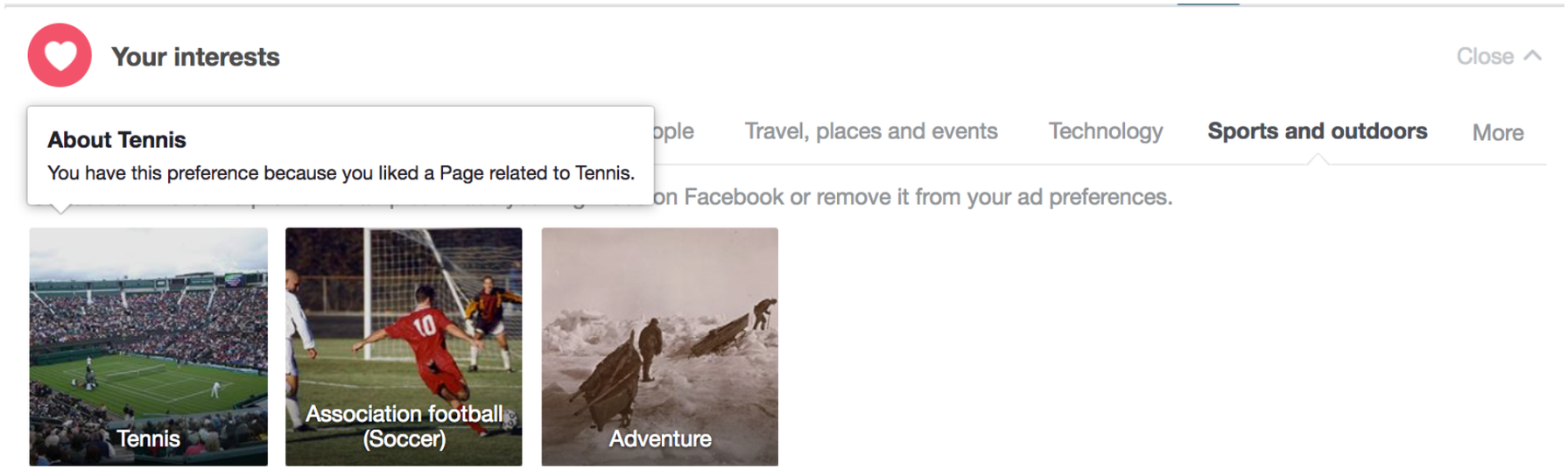
What data the ad platform knows about me?

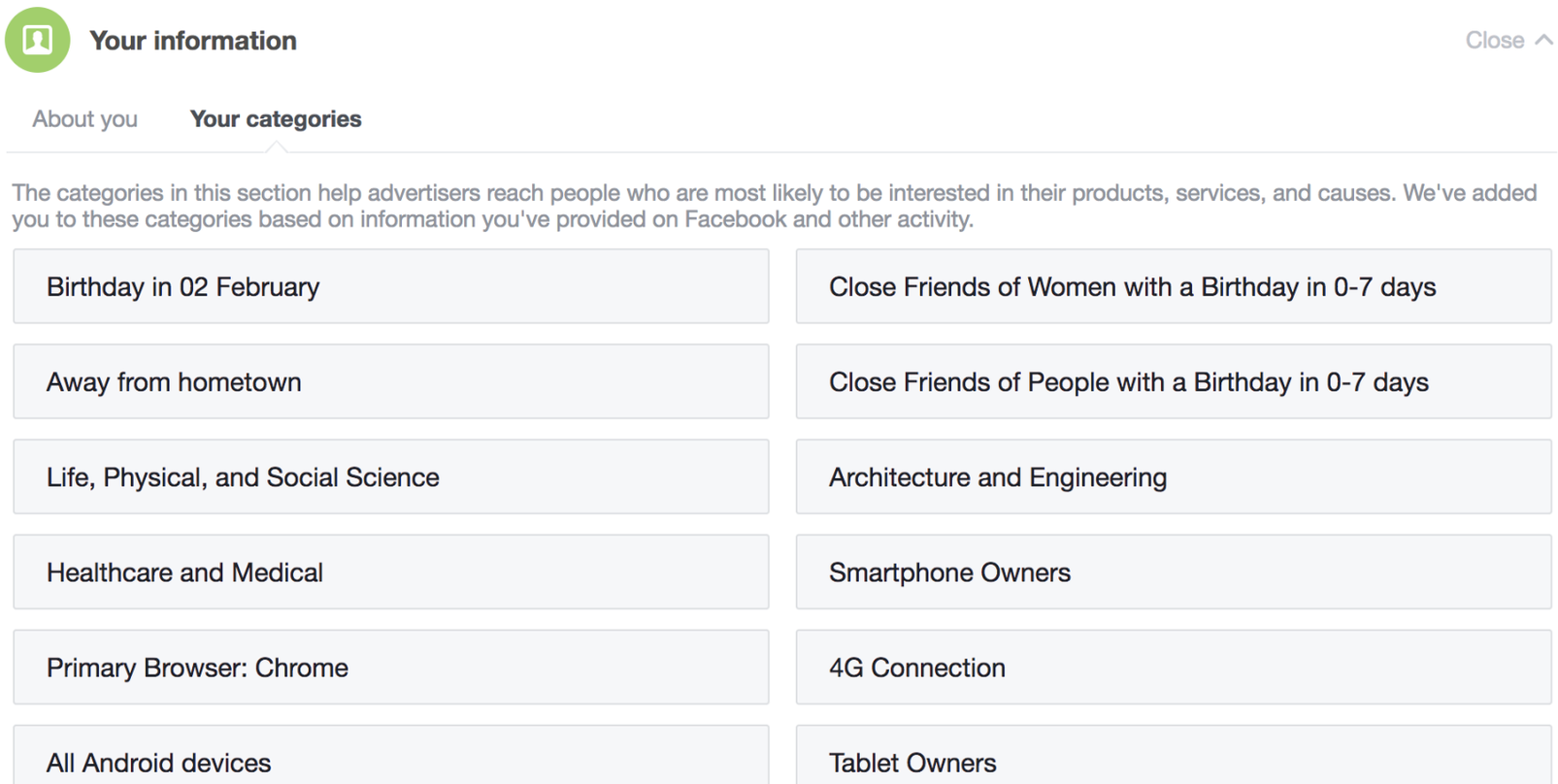
Data explanations

How is the data inferred?



Explanations of the data inference process





Ad Preferences Page

Desired properties of a data explanation

- Specificity
- Completeness
- Correctness

Measurement methodology

- Build tool that collects the Ad Preference Page daily
  - Collection of real-world data
  - Controlled ad campaigns

Evaluation of properties

- Most explanations are vague

Pattern	No explanations
You have this preference because you liked a Page related to $interest$	2,866
You have this preference because you clicked on an ad related to $interest$	2,095
You have this preference because we think it may be relevant to you based on what you do on Facebook, such as pages you've liked or ads you've clicked	785
You have this preference because you installed the app $app-name$	107
This is a preference you added.	2

- Explanations are incomplete
  - No data broker attributes appear

Need for rigorous explanations

Incomplete explanations:

- Does not show the full picture to the user
- Provides a false sense of trust

Vague explanations:

- Does not allow users to control the outputs in the future

Takeaways

- Just mandating explanations is not enough!
- Badly designed explanations can be dangerous
  - Easily exploitable by malicious advertisers
- Designing good explanations is complicated
  - Different purposes ask for different properties

Open challenges

- How to pick a few (K) features for explanations?
- How to determine the importance of a user attribute?
  - Does it reveal privacy sensitive information?
  - Is it a rare (or low prevalence) attribute in population?
  - Does it exert the most influence?
- What properties explanations need to protect against malicious advertisers?

A step towards more transparency

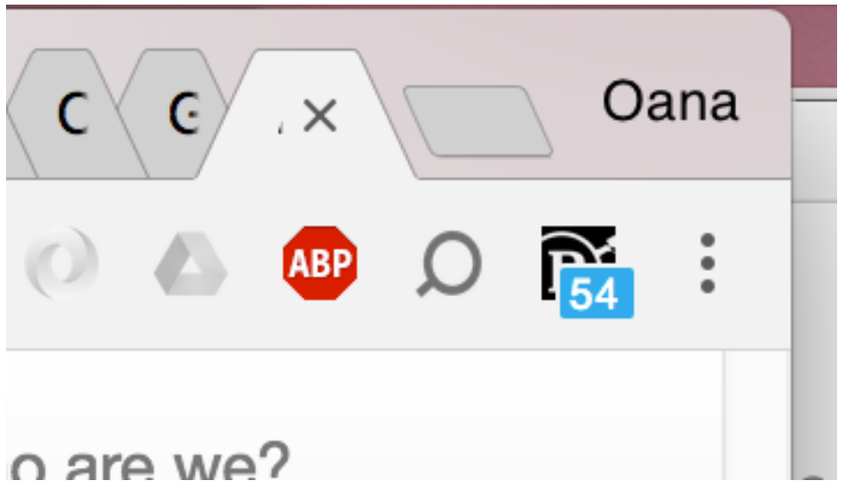
AdAnalyst

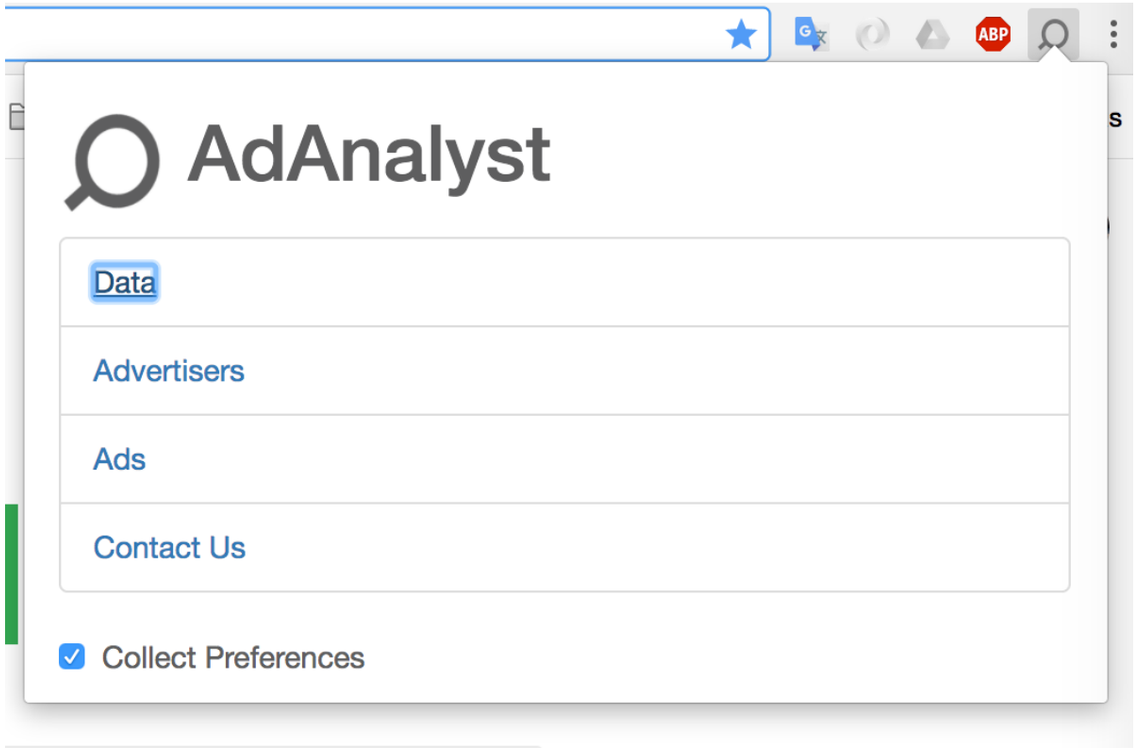
Make sense of the ads you receive on Facebook

- Enhance transparency by aggregated statistics
- Enhance transparency in a collaborative way

http://adanalyst.mpi-sws.org/

Disable/pause AdBlockPlus on Facebook!

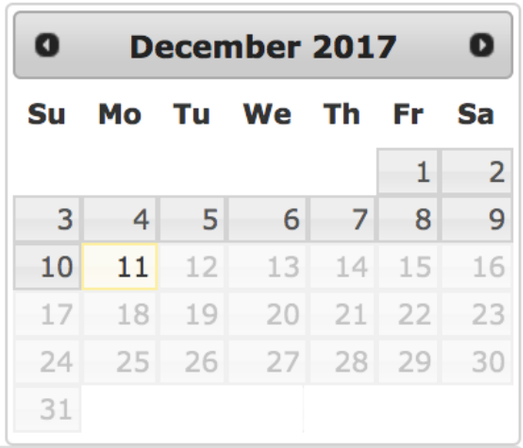

Oana
ABP
54


AdAnalyst
Data
Advertisers
Ads
Contact Us
Collect Preferences

Ads view

Ads

Check your daily unique ad consumption, by clicking on any date in the calendar!



Download this machine learning eBook to learn basic concepts and explore advanced algorithms.

Time: 11/12/2017 00:11

Advertiser: MATLAB

Advertiser category: Software

Explanation: One reason you're seeing this ad is that MATLAB wants to reach people who may be similar to their customers. Learn more. There may be other reasons you're seeing this ad, including that MATLAB wants to reach people ages 25 to 55 who live in France. This is information based on your Facebook profile and where you've connected to the internet.

Compact explanation: Lookalike Audience

Users also received this ad for: Lookalike Audience

The advertiser targeted other users with: Lookalike Audience, Computer vision (Interests), Data science (Interests), Machine learning (Interests)

Wish www.wish.com What other products are on sale under 5€ today?

Time: 11/12/2017 00:09

Advertiser: Wish

Advertiser category: App Page

Explanation: You're seeing this ad because Wish wants to reach women ages 16 to 60 who live in Germany. This is information based on your Facebook profile and where you've connected to the internet.

Compact explanation: 16-60 (Age/Gender/Location)

The advertiser targeted other users with: English (US) (Biographical Data)

Data view

Latest data Facebook has inferred about you

Latest interests:

Diane Kruger
People
You have this preference because you clicked on an ad related to Diane Kruger.
Added on: 08/12/2017

Term of endearment
Business and industry
You have this preference because you clicked on an ad related to Term of endearment.
Added on: 04/12/2017

Photograph
Hobbies and activities
You have this preference because you clicked on an ad related to Photograph.
Added on: 04/12/2017

Telephone
Business and industry
You have this preference because you clicked on an ad related to Telephone.
Added on: 04/12/2017

Short Message Service
Technology
You have this preference because you clicked on an ad related to Short Message Service.
Added on: 03/12/2017

Latest demographics:

Anniversary within 31-60 Days

People with a relationship anniversary (marriage, domestic partnership, etc.) occurring wi...

Added on: 08/12/2017

Life, Physical and Social Sciences

People with roles in life, physical and social sciences. Examples include: professor, chem...

Added on: 04/12/2017

Close Friends of Women with a Birthday in 0-7 days

Close Friends of Women with a Birthday in 0-7 days

Added on: 04/12/2017

Close friends of people with a birthday in 0-7 days

Close friends of people with a birthday in 0-7 days

Added on: 04/12/2017

Architecture and Engineering

Includes Software Engineer, Technician, Electrician, Technical Engineer, Machinist, Archit...

Added on: 03/12/2017

Infrequent attributes Facebook has inferred about you

Attributes that are shared by the smallest number of users on Facebook

Infrequent Interests:

The Interview (2014 film)
News and entertainment
You have this preference because you clicked on an ad related to The Interview (2014 film)...
Nb of facebook users sharing this attribute: 23.79k
Added on: 29/08/2017

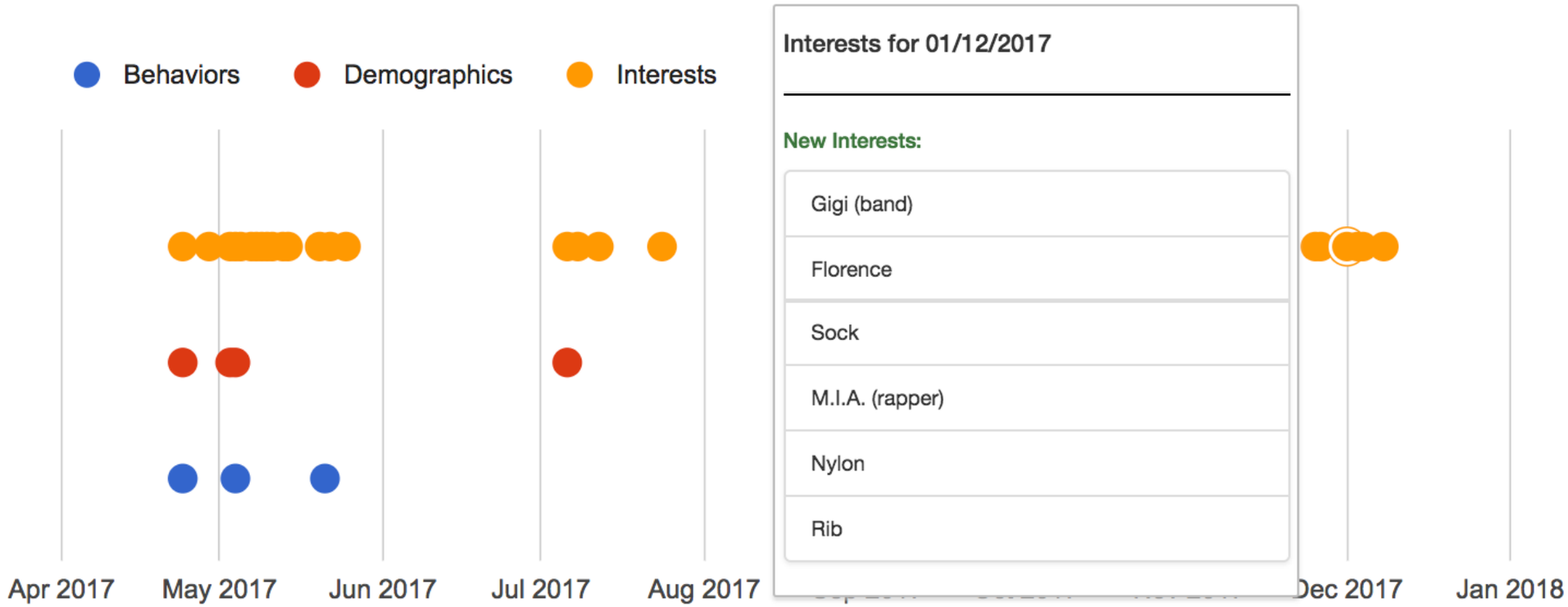
Riverbed Technology
Technology
You have this preference because you clicked on an ad related to Riverbed Technology.
Nb of facebook users sharing this attribute: 27.71k
Added on: 03/11/2017

Nicușor Dan
People
You have this preference because you liked a Page related to Nicușor Dan.
Nb of facebook users sharing this attribute: 152.56k
Added on: 24/04/2017

Cloud computing security
Business and industry
You have this preference because you clicked on an ad related to Cloud computing security.
Nb of facebook users sharing this attribute: 166.89k
Added on: 03/11/2017

Troll Tennis
News and entertainment
You have this preference because you liked a Page related to Troll Tennis.
Nb of facebook users sharing this attribute: 176.17k
Added on: 24/04/2017

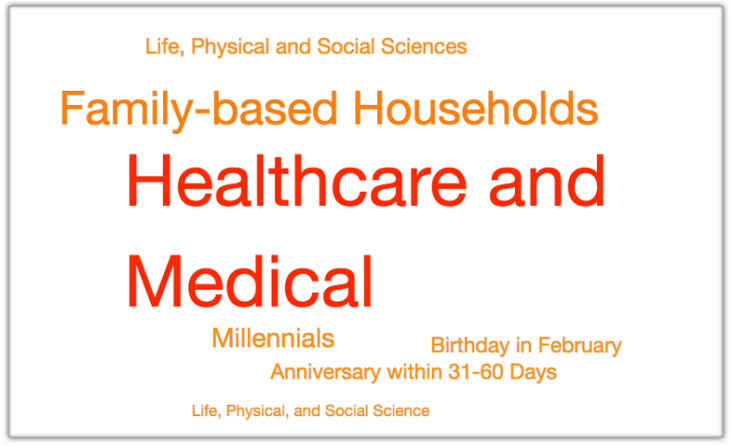
Timeline of when Facebook inferred each attribute:



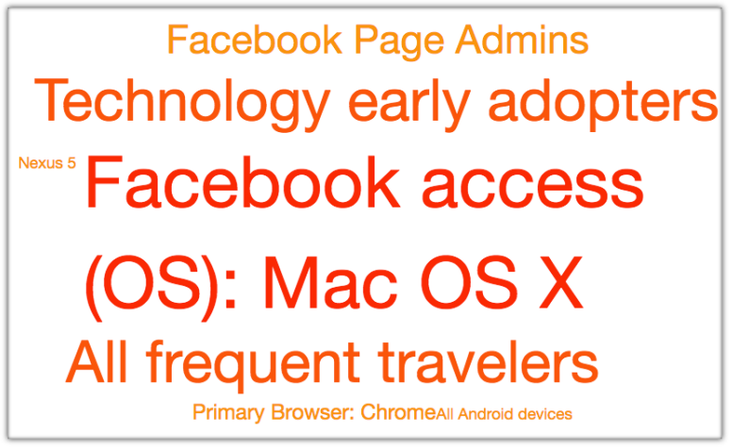
Top attributes used by advertisers to target you:

Interests

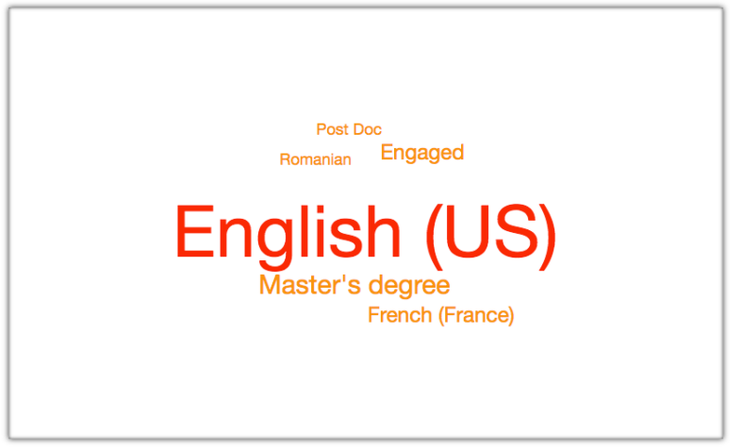
Demographics



Behaviours



Biographical details



Advertisers view

Latest advertisers targeting you

New advertisers that are targeting you:

Walk Off The Earth
10/12/2017

LE BHV MARAIS
10/12/2017

RED by SFR
09/12/2017

adidas Originals
08/12/2017

Gustave Roussy
07/12/2017

New advertisers that have Personally Identifiable Information about you (advertisers who have your name, phone number, email, address, or whose website or app you have used) that can directly target you:

Contact us if you didn't give your information to these advertisers

Panda Curioso
You used the advertiser's website/app.

05/09/2017

Plus.de
You used the advertiser's website/app.

05/09/2017

BuzzFeed Zach
You used the advertiser's website/app.

05/09/2017

Vogue
You used the advertiser's website/app.

03/09/2017

skatedeluxe
You used the advertiser's website/app.

03/09/2017

Unpopular advertisers targeting you

Malicious advertisers are rarely popular, here is a list of the advertisers with the lowest number of likes that targeted you

Vacation in Nice
Nb likes: 0

Voyages-Test
Nb likes: 0

Vacation in Saarbrucken
Nb likes: 34

Wordiness
Nb likes: 37

Ginsana Deutschland
Nb likes: 75

Advertisers that use the most unique targeting

Advertisers can target people using infrequent attributes in order to reach a very specific audience (such microtargeting has been used in political ads to influence voters)! These are the advertisers that have targeted you, using the most infrequent attributes.

UNTOLD
Number of users that have the targeting attributes: 342.63k
Targetting attributes: Dub FX

Nature
Number of users that have the targeting attributes: 350.26k
Targetting attributes: Max Planck Society

Chloé
Number of users that have the targeting attributes: 384.08k
Targetting attributes: Hôtel Meurice

Insight Health Apps
Number of users that have the targeting attributes: 487.67k
Targetting attributes: Biofeedback

Paradisia
Number of users that have the targeting attributes: 613.16k
Targetting attributes: Beirut (band)