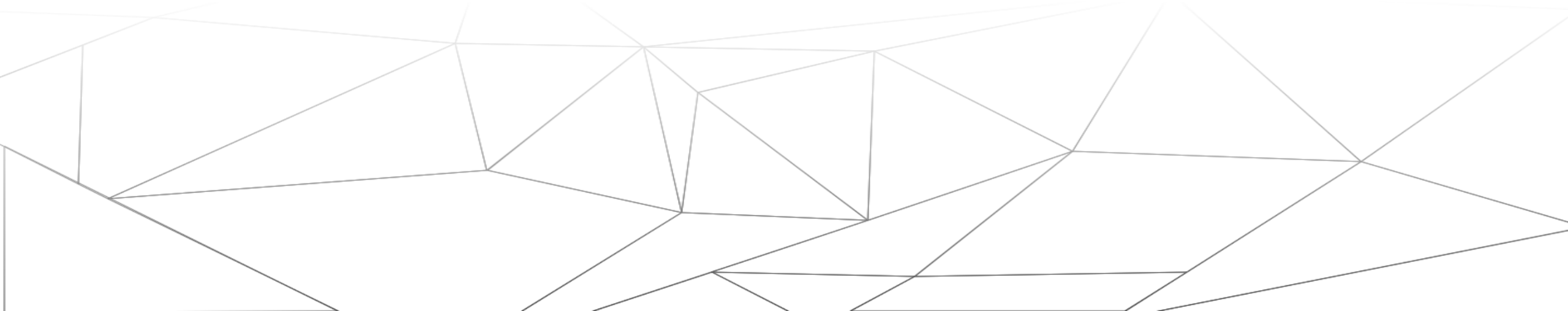
Dark Data

Svea Eckert – Andreas Dewes



Who we are

Svea Eckert

Journalist NDR/ ARD

@sveckert

Andreas Dewes

(data) scientist

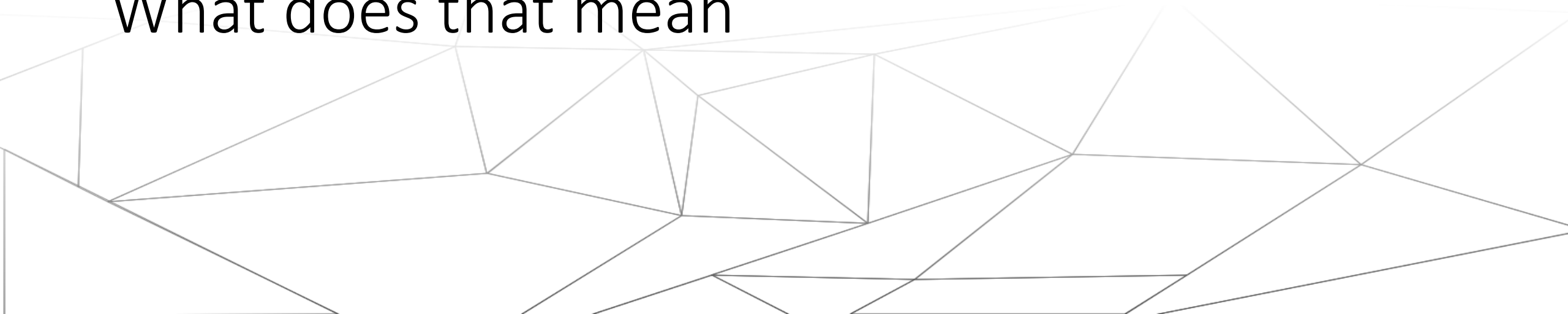
@japh44

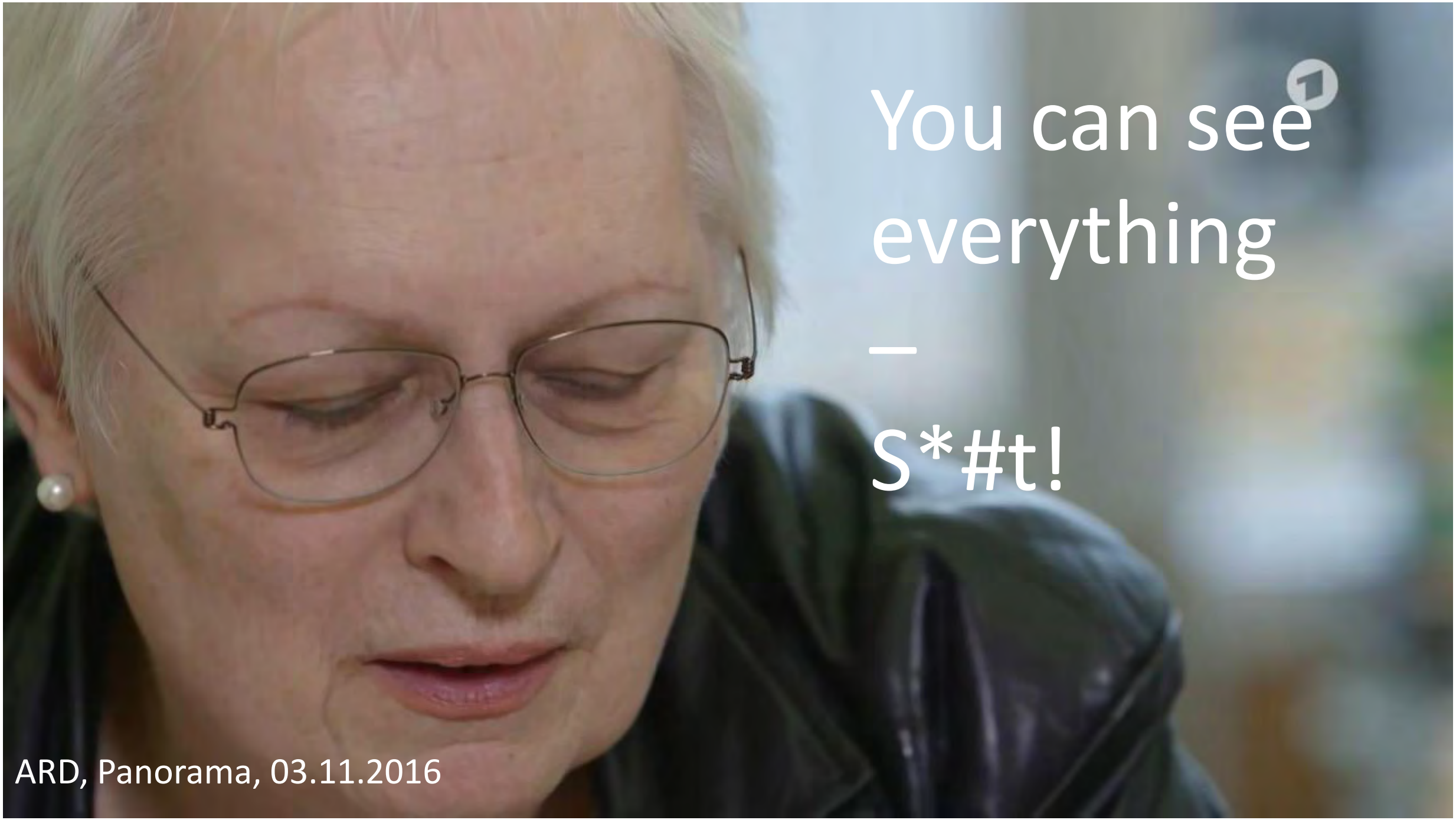
Why we are here

*“US Senate voted to eliminate **broadband privacy rules** that would have required ISPs to get consumers' explicit consent before selling or sharing **Web browsing** data (...)“*

3/23/2017
https://arstechnica.com

What does that mean




You can see
everything
–
S*#t!
ARD, Panorama, 03.11.2016

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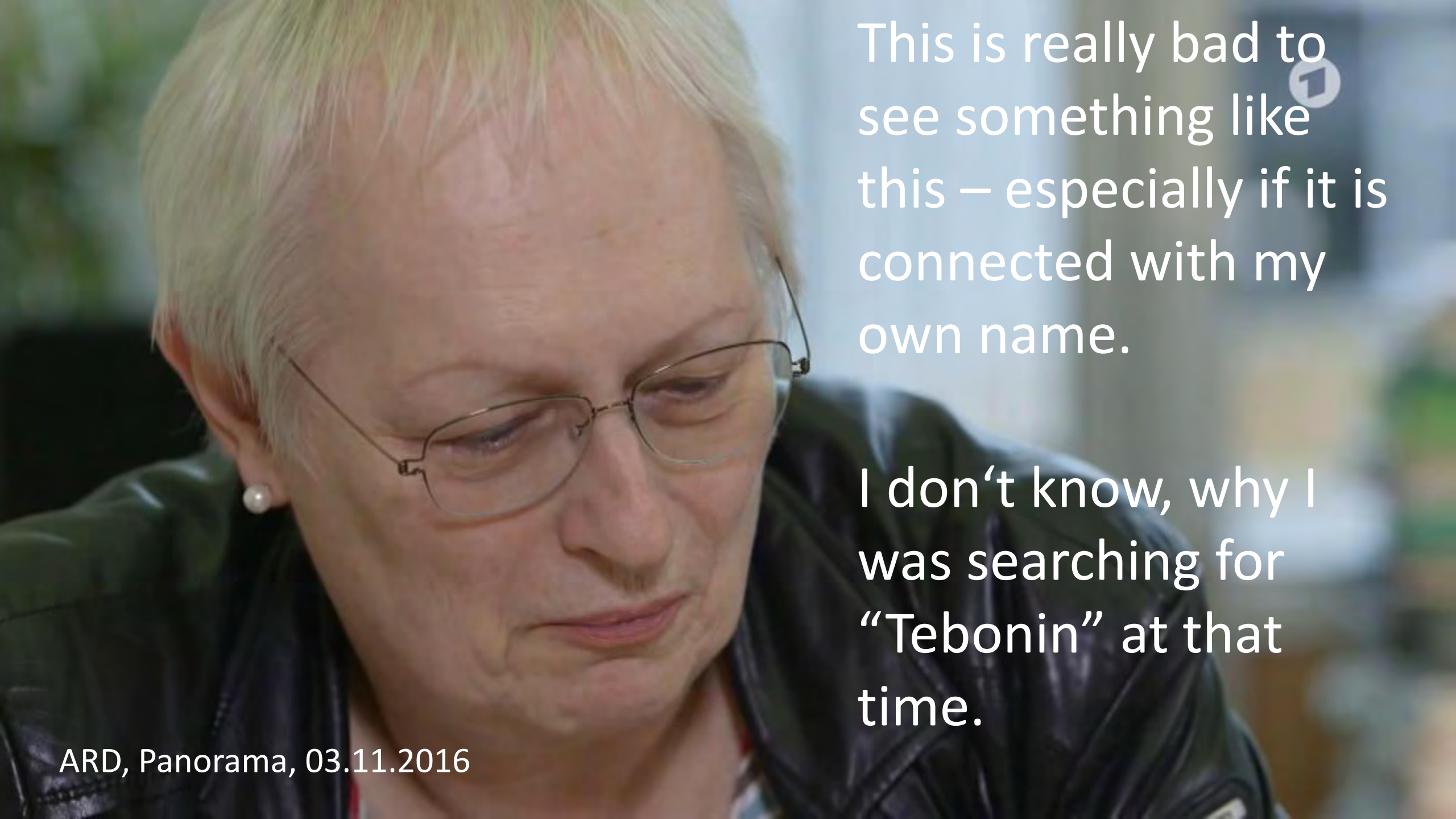
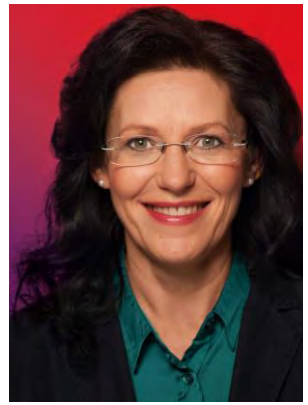
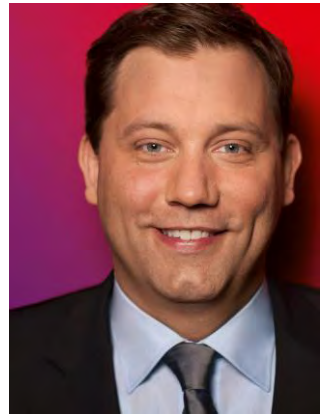
http://www.sanego.de/Medikamente/Tebonin/


This is really bad to see something like this – especially if it is connected with my own name.
I don‘t know, why I was searching for “Tebonin” at that time.
ARD, Panorama, 03.11.2016

More members of parliament and their employees



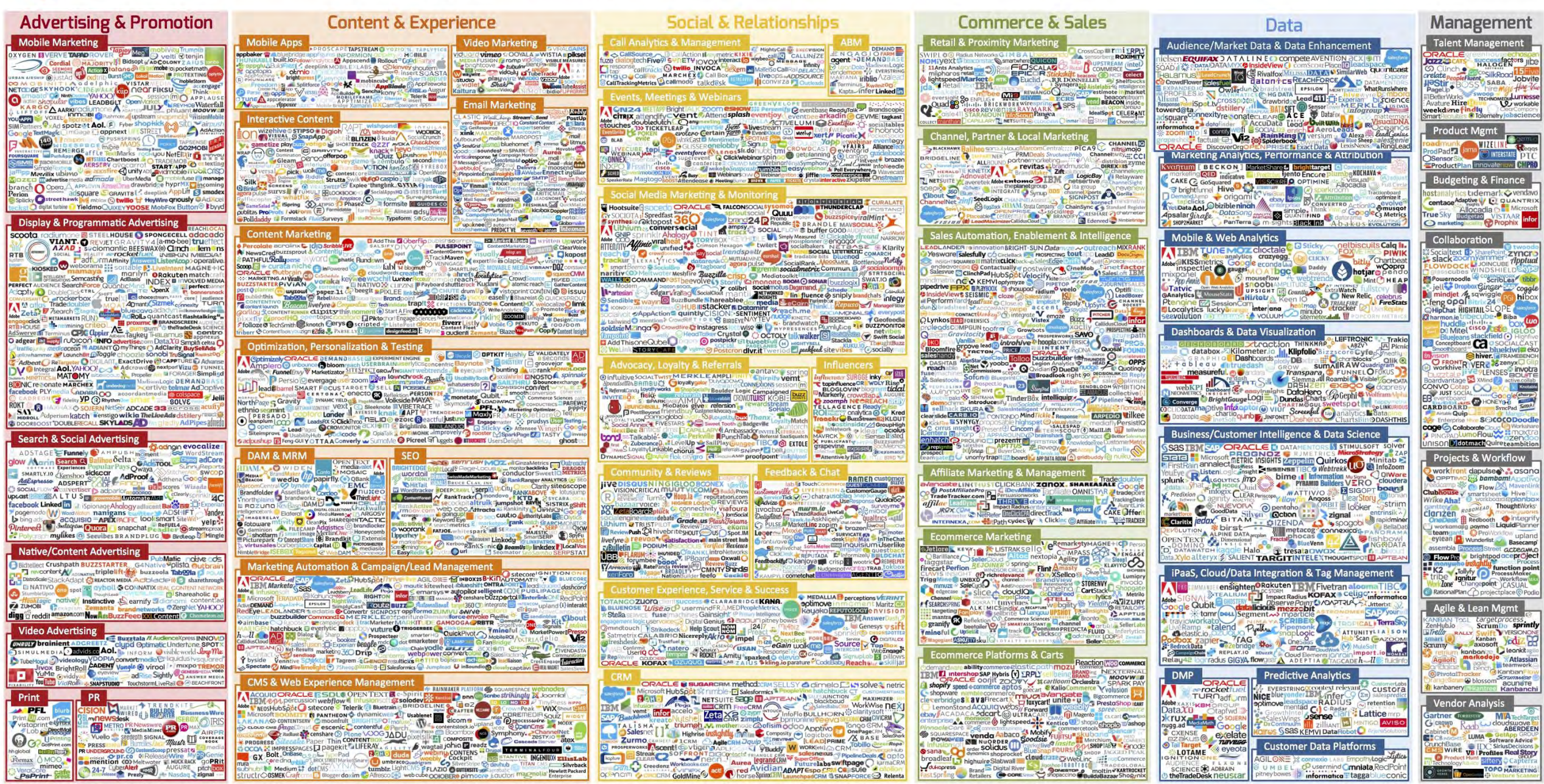


Employee of Helge Braun, CDU – Assistant Secretary of the German Chancellor

How we did it – the “hacking” part

chiefmartec.com Marketing Technology Landscape

March 2016



Sources: CabinetM (http://cabinetm.com), Capterra, G2 Crowd, Google, Growthverse, LUMA Partners, Siftery, TrustRadius, VBProfiles — see http://chiefmartec.com/2016/03/marketing-technology-supergraphic-2016/ for details.

Created by Scott Brinker (@chiefmartec).

Social engineering

Search for people, jobs, companies, and more... Advanced

Home Profile My Network Learning Jobs Interests Business Services Try Premium for free

Edit Background

Anna Rosenberg

Senior Consultant bei Meez Technology

Tel Aviv - Jaffa, Tel Aviv District, Israel | Marketing and Advertising

Current Meez Technology

Education Universität Hamburg

View profile as

104 connections

Update your public profile settings

Contact Info

No, do not publish an update to my network about my profile changes. No

Add a section to your profile – be discovered for your next career step.


MEEZ
technology + creativity
HOME
ABOUT
CONTACT
technology meets creativity
DATA DRIVEN
CONSULTING
LEARN MORE

About

WHAT WE DO

PRODUCTS

technology meets creativity

MEEZ
technology + creativity

HOME ABOUT CONTACT

PRODUCTS

About

WHAT WE DO

PRODUCTS

CUSTOMIZED CAMPAIGNS

About
WHAT WE DO
PRODUCTS

CAREER AT MEEZ

We are constantly looking for creative minds, analysts and dedicated doers for our team. We can

MEEZ
technology + creativity

HOME ABOUT CONTACT

CONTACT US

If you are just as excited about the potential of technology and creativity, then we'd love to hear from you. We are a small, international team, based in beautiful and prospering Tel Aviv.

Mail: mail@meez.tech

What we have discovered

14 days (live) access

3 million (German) User Ids

Browsing data **for one month**

```
cat *.csv | grep "%40polizei.de"
```

01.08.16 05:17	https://www.google.de/
01.08.16 05:17	https://www.google.de/
01.08.16 05:18	https://navigator.web.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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http://fahrzeuge.autoscout24.de/?atype=C&make=74&model=20338&

Zurück

Volkswagen Passat Variant × | von 500 € × | bis 17.500 € × | Erstzulassung von 2012 ×

bis zu 70.000 km × | ab 103 kW × | Kraftstoff: Diesel × | Deutschland × | Alle Filter entfernen

Preis

500 € | 17.500 €

MwSt. ausweisbar

Erstzulassung

2012 | bis

Kilometerstand

von | 70.000 km

Suche speichern | Neue Angebote per E-Mail

Volkswagen Passat Variant 2.0 TDI DSG Trendli...

€ 14.777,- ** | 42.796 km | 09/2013 | 103 kW 140 PS

Gebraucht, Diesel

Suchen Fertig

01.08.16 05:17	https://www.google.de/
01.08.16 05:17	https://www.google.de/
01.08.16 05:18	https://navigator.web.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
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01.08.16 05:36	http://ww3.autoscout24.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Sehr geehrte Damen und Herren, im Rahmen eines hier bearbeiteten **Ermittlungsverfahrens wegen Computerbetrug** (**Aktenzeichen**) benötige ich gem. § 113 TKG i.V.m. § 100j StPO eine Auskunft zu Bestandsdaten zu folgender **IP-Adresse: xxx.xxx.xxx.xxx** Zeitstempel: **xx.xx.2016, 10:05:31** MESZ

Die Daten werden für die Ermittlung des Täters benötigt. Bitte übersenden Sie Ihre Antwort per Email an die Adresse

Vorname.Nachname@polizei.Bundesland.de oder per Telefax.

Vorname Nachname

Kriminalhauptkommissar

Kriminalpolizeidirektion, **Ort**

CyberCrime

Telefonnummer

Ladies and Gentlemen, because of an **investigation concerning computer fraud** (file number), which I have dealt with here, § 113 TKG i.V.m. § 100j StPO I need information on following **IP address**: xxx.xxx.xxx.xxx **Time stamp:** xx.xx.2016, 10:05:31 CEST

The data is needed to identify the offender. Please send your answer by e-mail to the following address

Firstname.lastname@police.state.de or by fax.

first name
Last Name
Detective Chief Place of **county**
Cybercrime
phone number

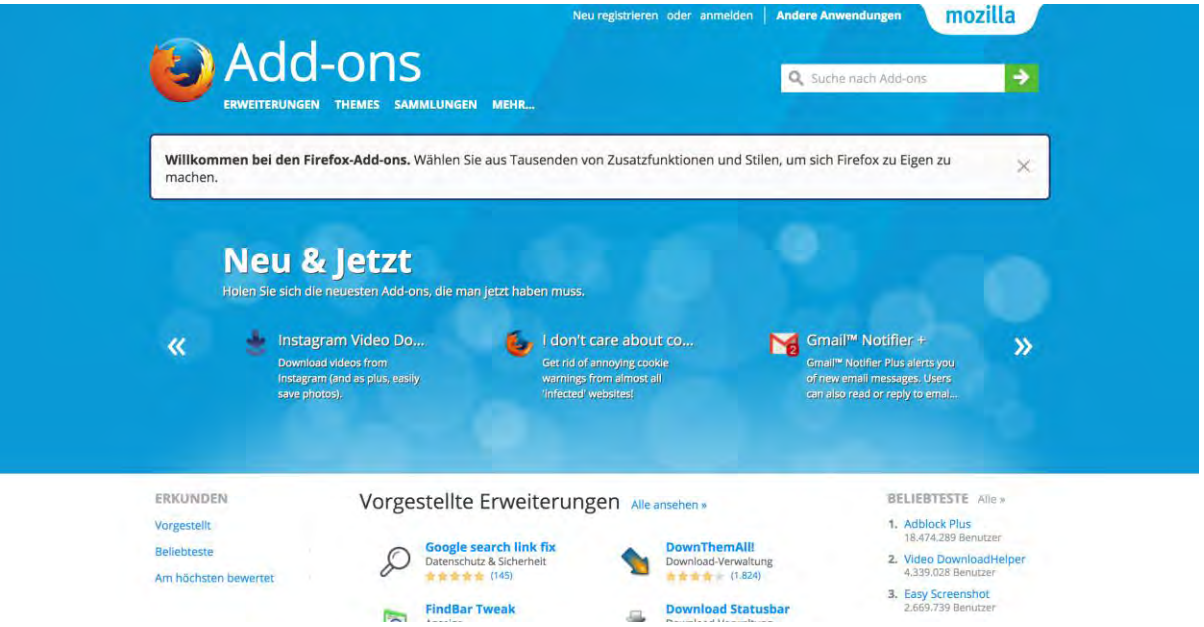
Where do I find tilde on my keyboard

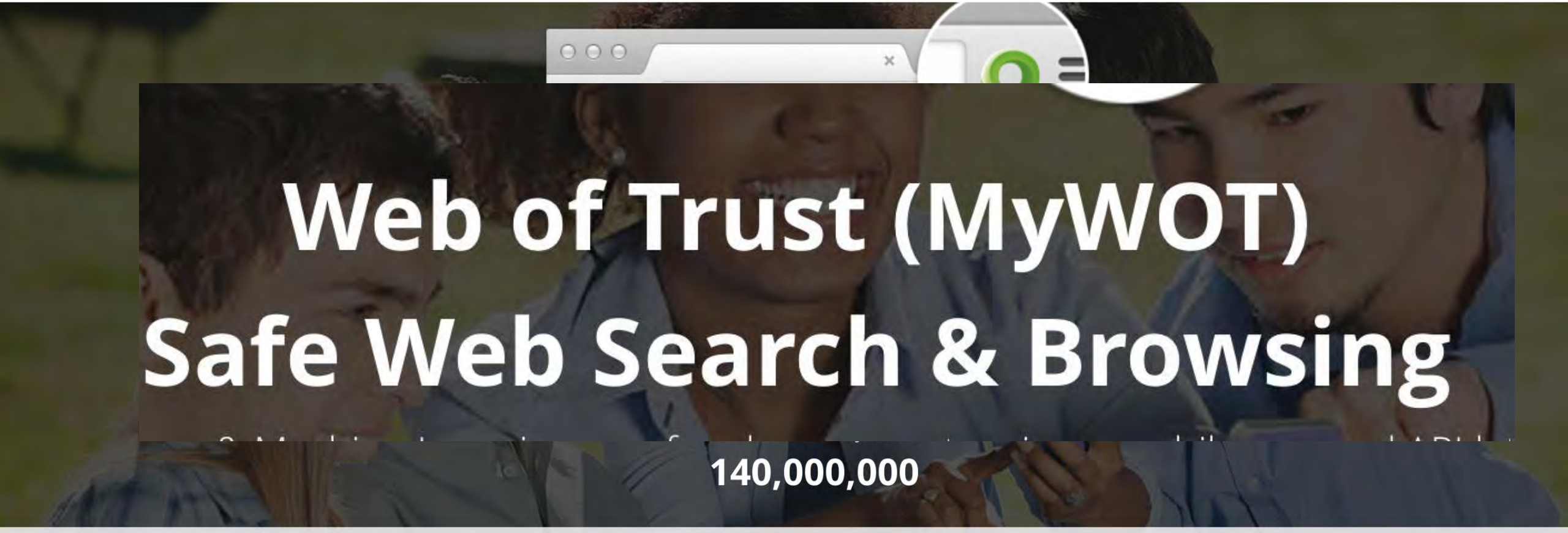
08.08.16 05:26	https://www.cruiseandride.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:27	https://www.cruiseandride.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:27	https://www.cruiseandride.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:28	https://www.cruiseandride.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:28	https://www.google.de/
08.08.16 05:33	https://www.google.de/xxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:33	https://www.google.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:33	http://www.mainz.de/
08.08.16 05:34	http://www.mainz.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:34	http://www.mainz.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:34	http://www.mainz.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:34	http://www.mainz.de/xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 05:47	https://www.google.de/
08.08.16 05:47	https://www.google.de/
08.08.16 05:48	https://translate.google.de/xxxxxxxxxxxxx
08.08.16 05:48	https://translate.google.de/?hl=de&tab=wT#en/de/Sehr%20geehrte%20Damen%20und%20Herren%2C%0A%0Aim%20Rahmen%20eines%20hier%20bearbeit
08.08.16 10:34	http://rio.sportschau.de/xxxxxxxxxxxxx
08.08.16 10:39	https://www.google.de/
08.08.16 10:39	https://www.google.de/xxxxxxxxxxxxx
08.08.16 10:39	http://ping.eu/xxxxxxxxxxx
08.08.16 10:40	https://www.google.de/
08.08.16 10:40	https://www.google.de/xxxxxxxxxxxxxxxxxxxxxxxxxx
08.08.16 10:40	http://www.ip-adresse-ermitteln.de/
08.08.16 10:41	http://www.ip-adresse-ermitteln.de/xxxxxxxxx
08.08.16 10:42	https://www.google.de/
08.08.16 10:43	https://www.google.de/xxxxxxxxxxxxxxxxx
08.08.16 10:43	https://www.google.de/xxxxxxxxxxxxxx
08.08.16 10:43	http://www.utrace.de/
08.08.16 10:43	http://www.utrace.de/xxxxxxxxxxxxxxxxxxxx

What is IP 127.0.0.1

Who did this

Browser Plugins





Web of Trust (MyWOT)

Safe Web Search & Browsing

140,000,000

[DATUM] 11:15:04 **http://what.kuketz.de/**

[...]

[DATUM] 15:49:27 https://www.ebay-kleinanzeigen.de/p-anzeige-bearbeiten.html?adId=xxx
[DATUM] 13:06:23 **http://what.kuketz.de/**

[...]

[DATUM] 11:22:18 **http://what.kuketz.de/**
[DATUM] 14:59:30 http://blog.fefe.de/

[...]

[DATUM] 14:59:36 **http://what.kuketz.de/**
[DATUM] 14:59:44
https://www.mywot.com/en/scorecard/what.kuketz.de?utm_source=addon&utm_content=rw-viewsc

[...]

[DATUM] 13:48:24 **http://what.kuketz.de/**

[...] test by Mike Kuketz / www.kuketz-blog.de

Privacy Policy

3. **Automatically Collected Information** – When you install and use the WOT app or WOT extension, we also automatically collect information from you related to your use of the WOT Services and your web browsing activity. This information may include, without limitation, the following:

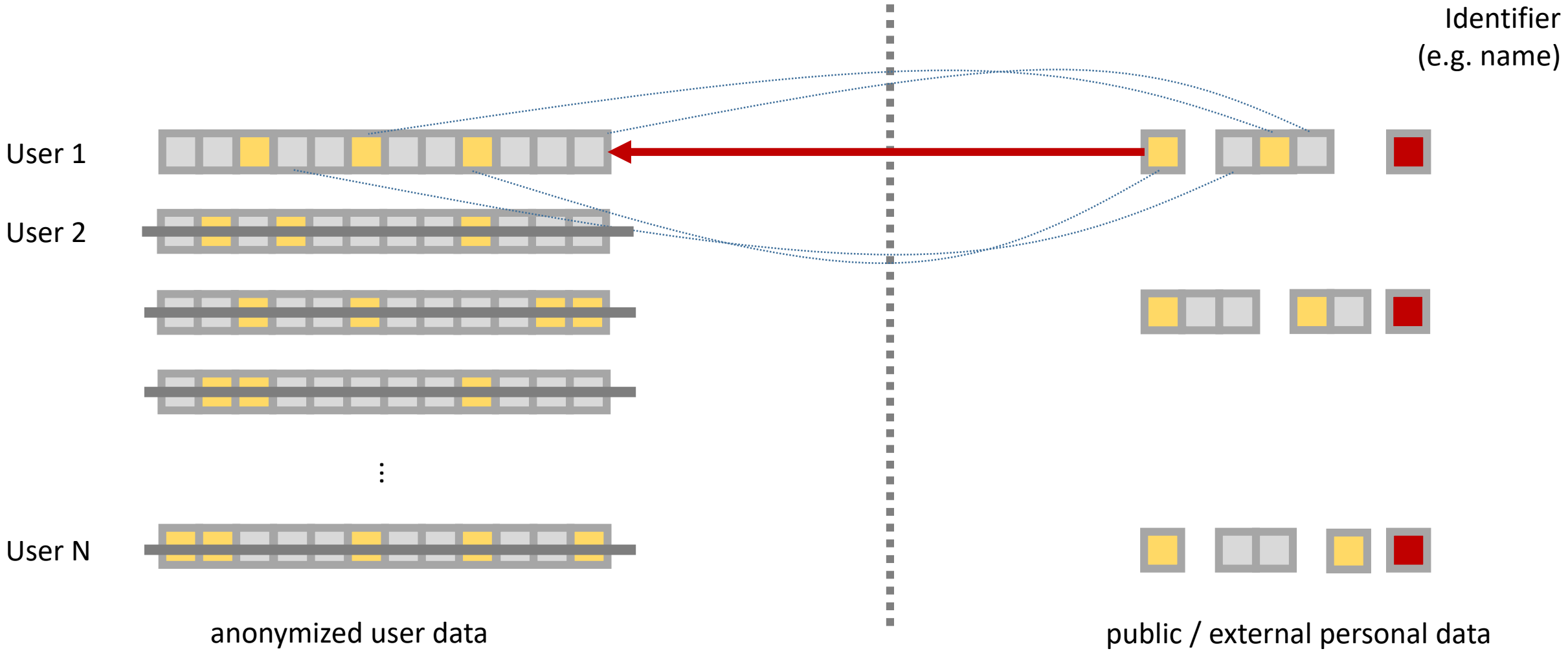
- From WOT desktop/mobile extension and desktop app - Internet Protocol Address; device type; operating system and browser; web pages visited and time stamp of the visit; automatically-generated GUID and WOT user ID.

intended to make our users fully aware of the data we collect, the way it is stored, used, and shared, and our users' rights in relation to such data and practices. We greatly value our users and their privacy rights, and we encourage all of our users to read and become familiar with this

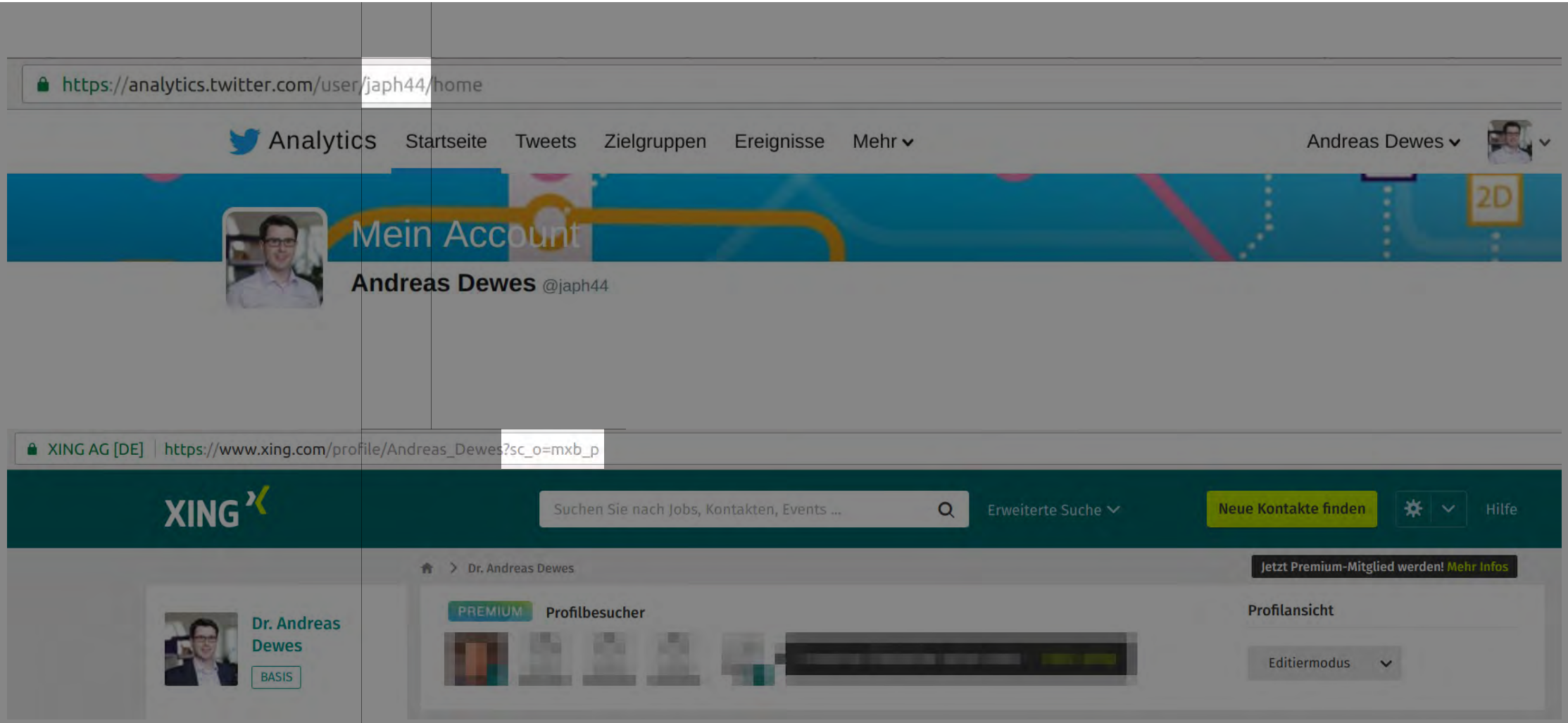
or de-identified information that is not collected together, or otherwise associated by us, with any Registration Information or other Personal Information, if any, that we hold about you. When we automatically collect information, we go to great lengths to make sure that Non-Personal Information remains anonymous, as further described below.

Information and Non-Personal Information in accordance with the terms of this Privacy Policy. **IF YOU DO NOT ACCEPT THE TERM OF THIS PRIVACY POLICY, PLEASE DO NOT ACCESS OR USE THE WOT PRODUCTS OR WOT SERVICES.**

How does deanonymization work?

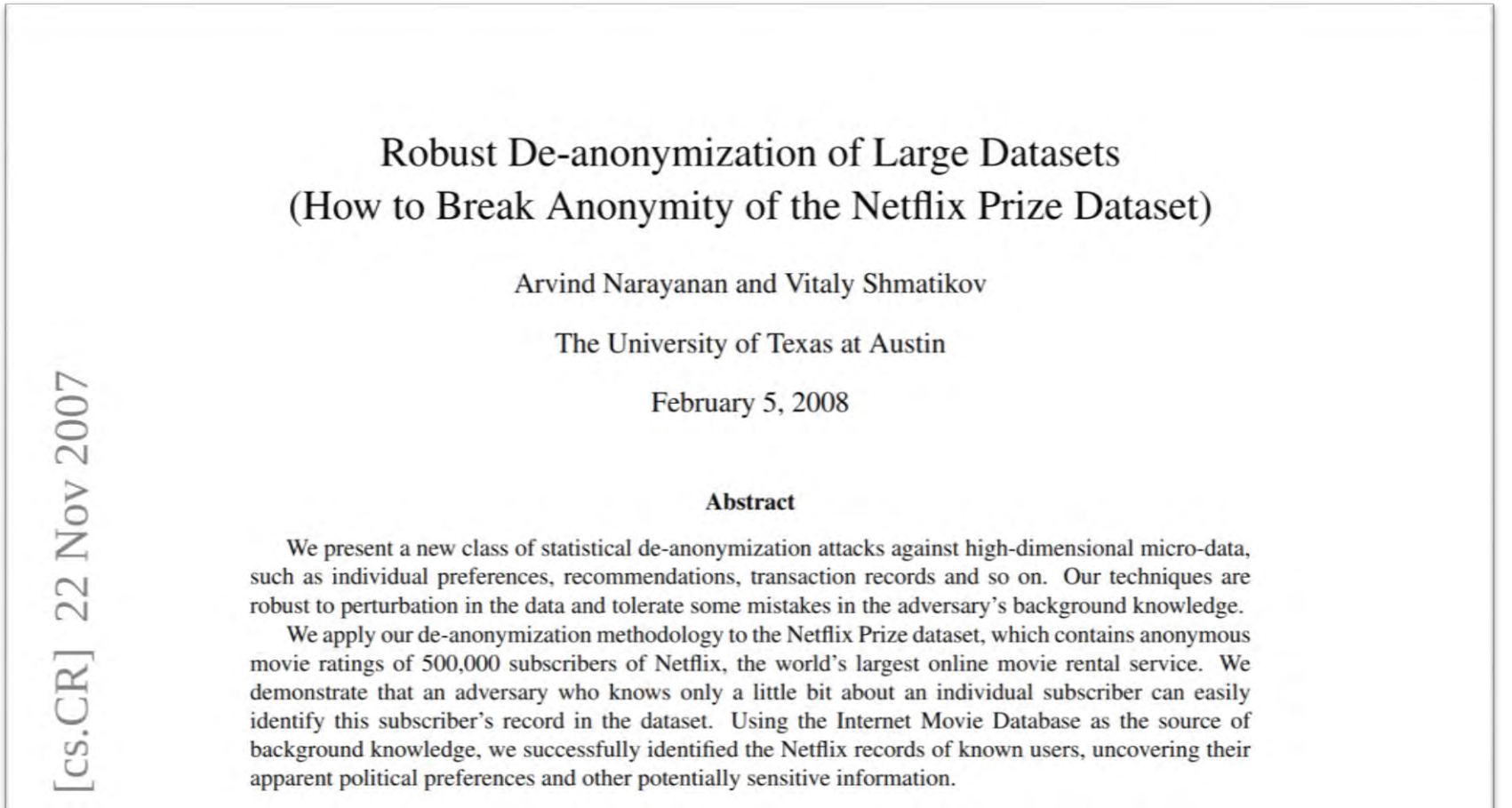


"Instant" deanonymization via unique URL



Combinatorial deanonymization

https://www.cs.cornell.edu/~shmat/shmat_oak08netflix.pdf



Robust De-anonymization of Large Datasets
(How to Break Anonymity of the Netflix Prize Dataset)

Arvind Narayanan and Vitaly Shmatikov

The University of Texas at Austin

February 5, 2008

Abstract

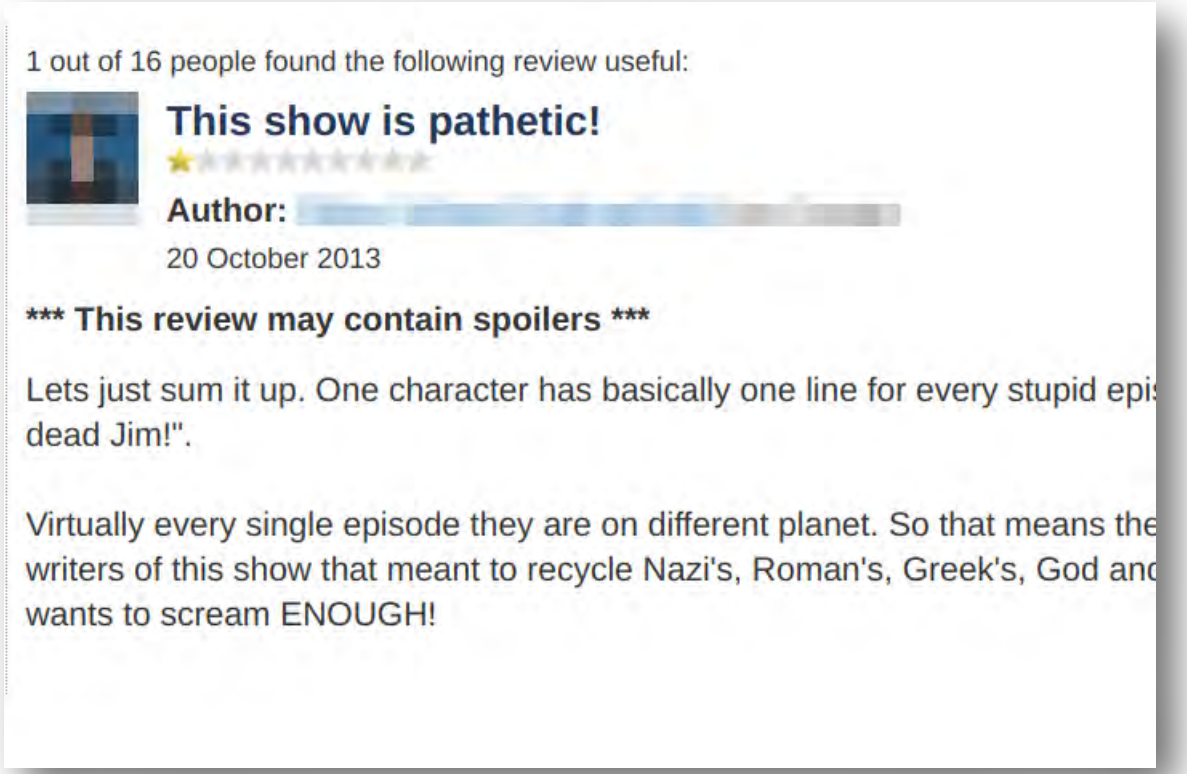
We present a new class of statistical de-anonymization attacks against high-dimensional micro-data, such as individual preferences, recommendations, transaction records and so on. Our techniques are robust to perturbation in the data and tolerate some mistakes in the adversary's background knowledge.

We apply our de-anonymization methodology to the Netflix Prize dataset, which contains anonymous movie ratings of 500,000 subscribers of Netflix, the world's largest online movie rental service. We demonstrate that an adversary who knows only a little bit about an individual subscriber can easily identify this subscriber's record in the dataset. Using the Internet Movie Database as the source of background knowledge, we successfully identified the Netflix records of known users, uncovering their apparent political preferences and other potentially sensitive information.

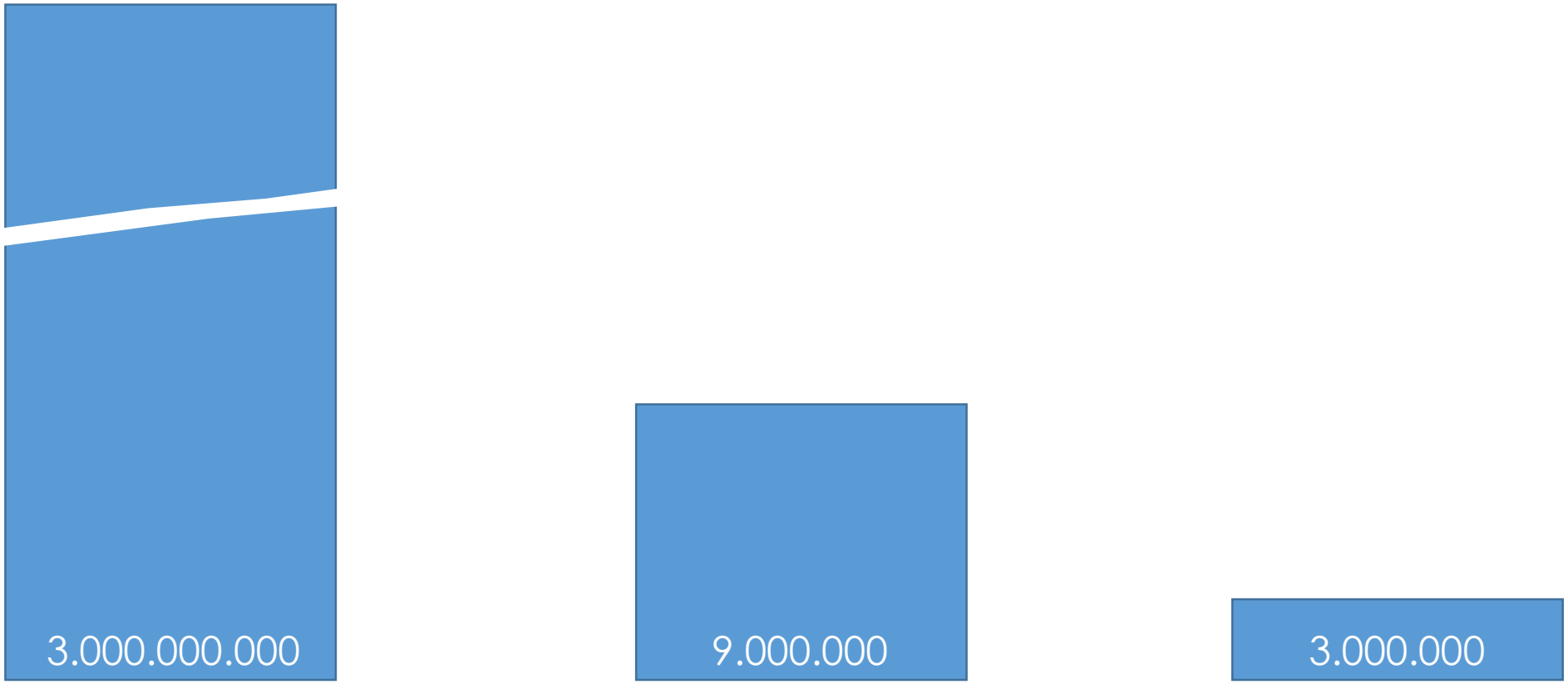
Netflix Data vs. IMDB Data

Provided anonymized

ratings associated with user name / real name



Our data set



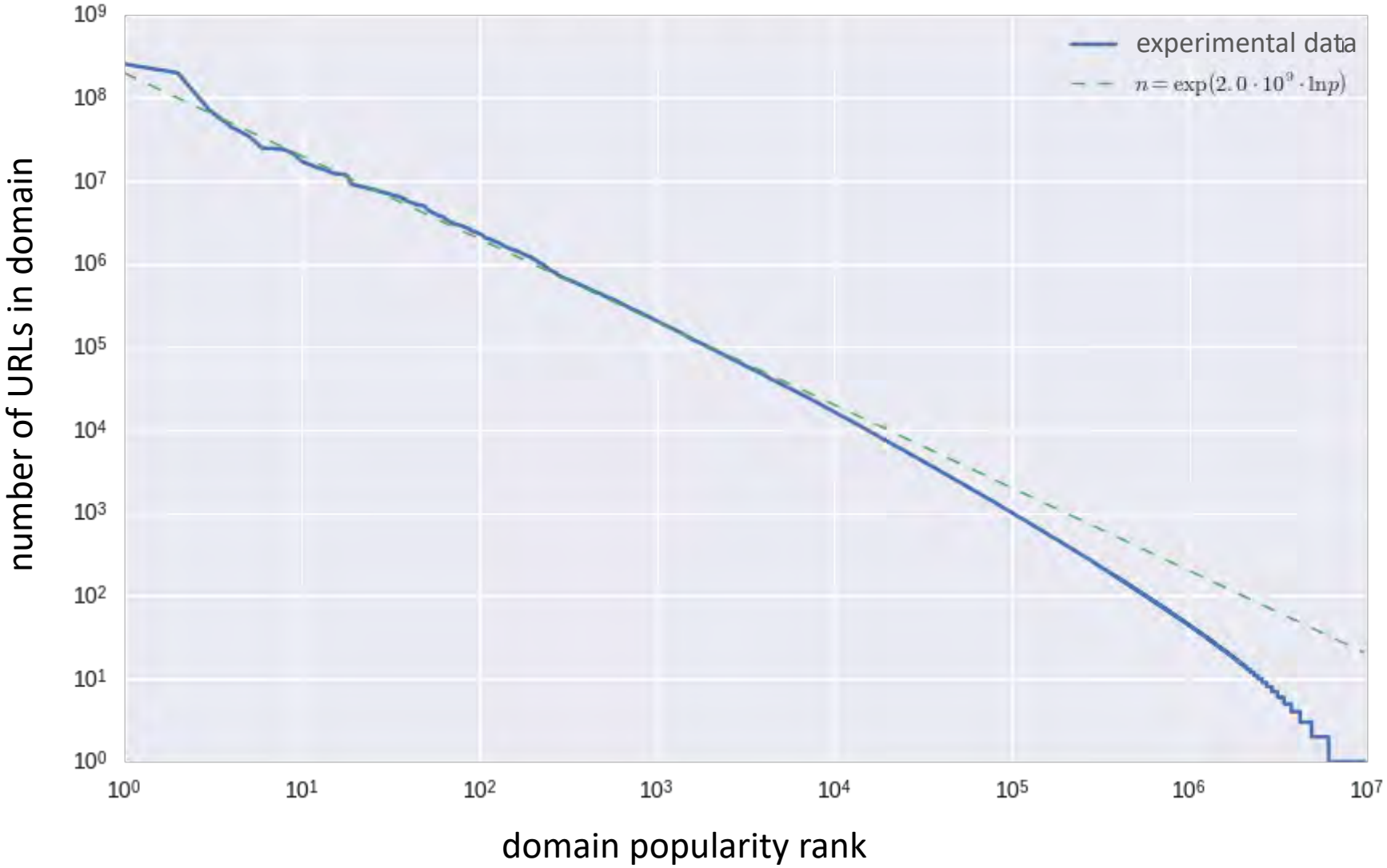
URLs
(insufficiently anonymized)

Domains

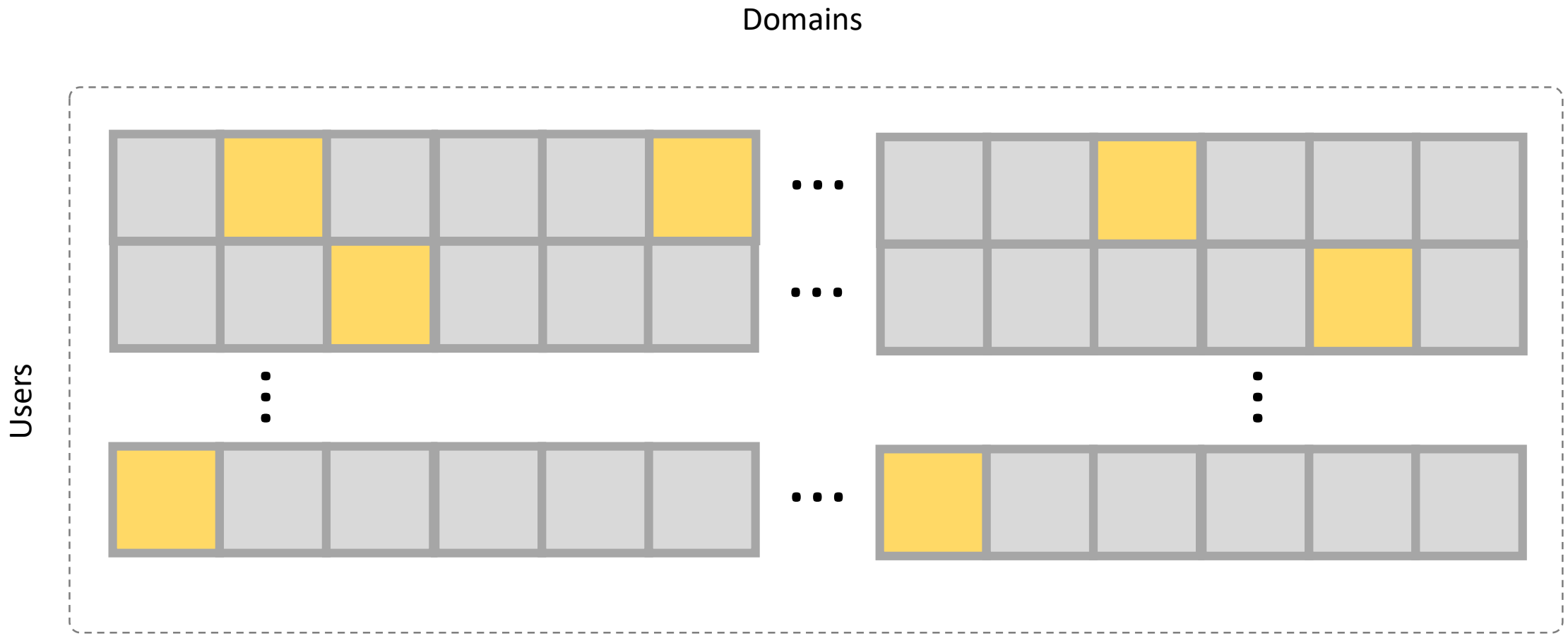
Users

- We remove everything but the **domain** and user Id
- „Did this user visit this domain?" (yes / no)
- We investigate how easy it is to reidentify a user given his/her domain data
- We only look at users that have visited at least ten domains

Frequency analysis of domains



Let‘s categorize our users



=> sparsely populated matrix with **9.000.000 x 1.000.000** entries

Algorithm

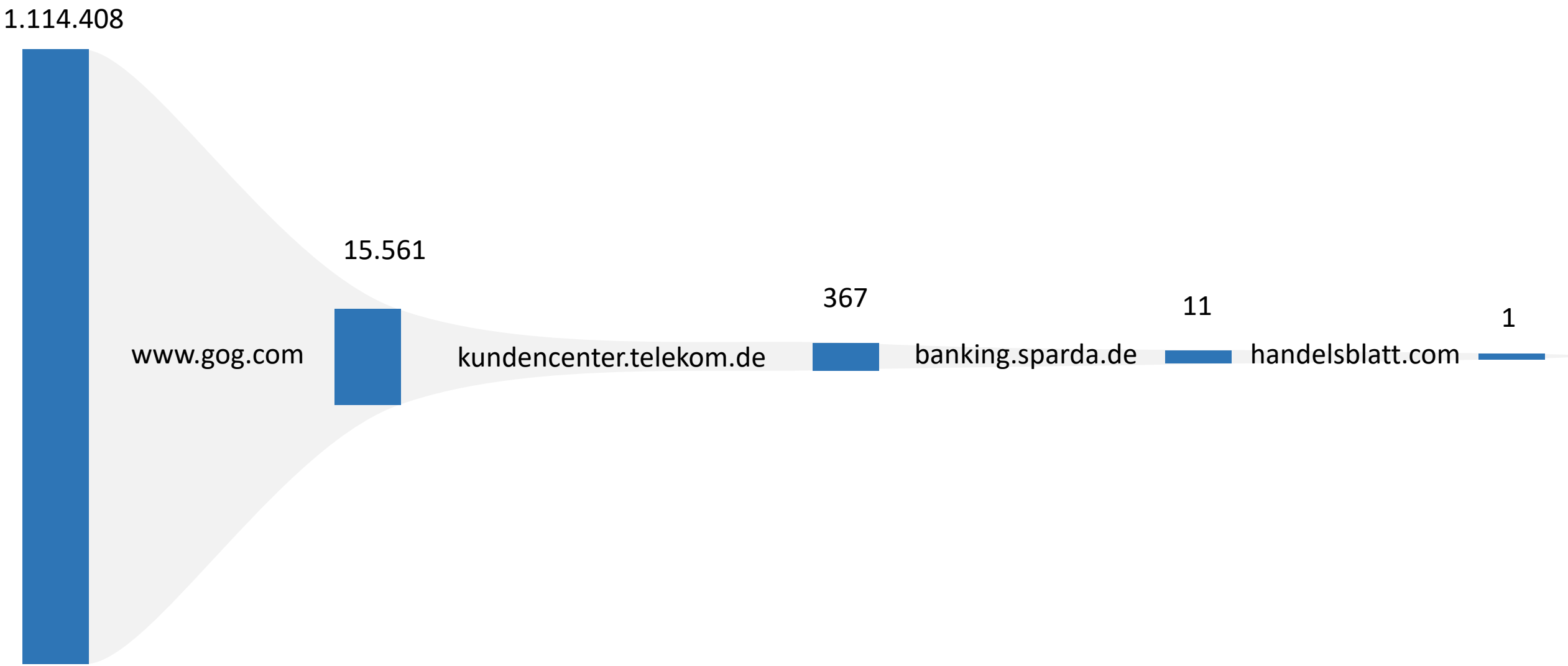
- Generate user/domain matrix $\boldsymbol{M}$
- Generate vector $\boldsymbol{v}$ with information about visited domains
- Multiply $\boldsymbol{M \cdot v}$
- Look for best match

$$\boldsymbol{M = (\ldots)}$$

$$\boldsymbol{w = M \cdot v}$$

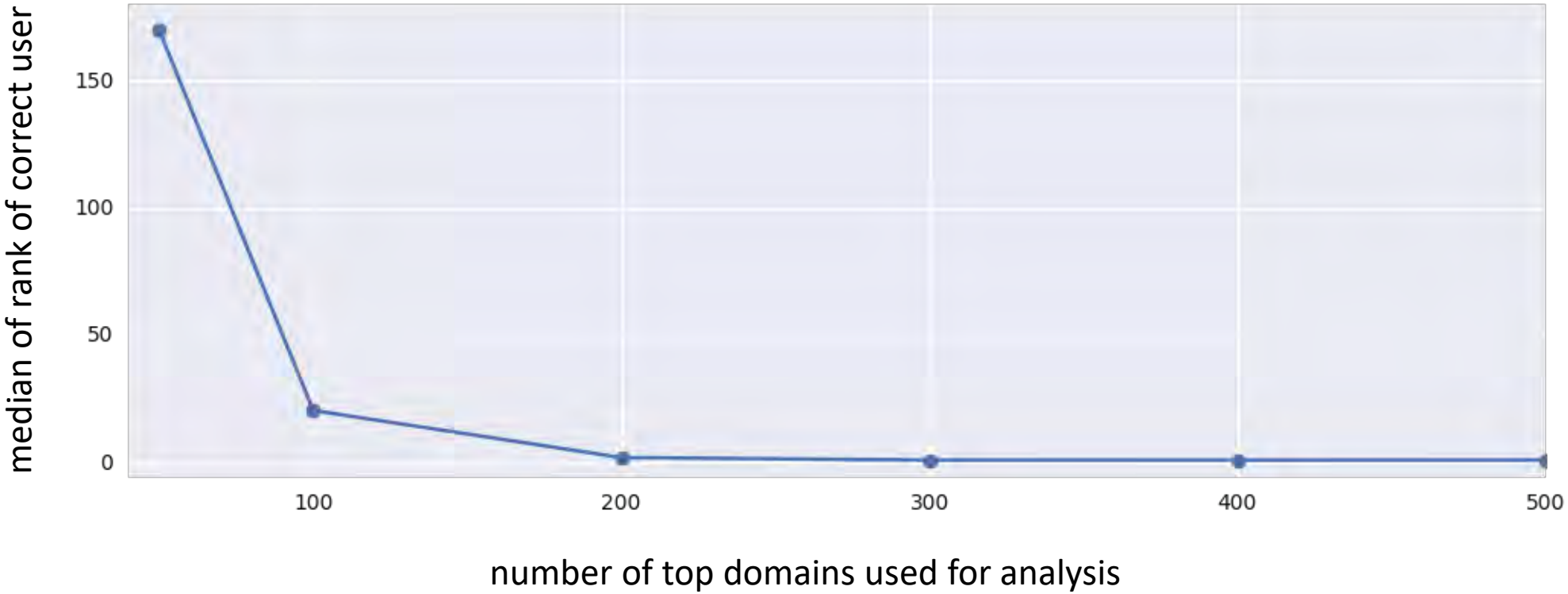
$$\boldsymbol{i = \mathrm{argmax}\,(w)}$$

How unique am I?



How well does this work?

Top-200 domains are already sufficient to identify
a large fraction of our users

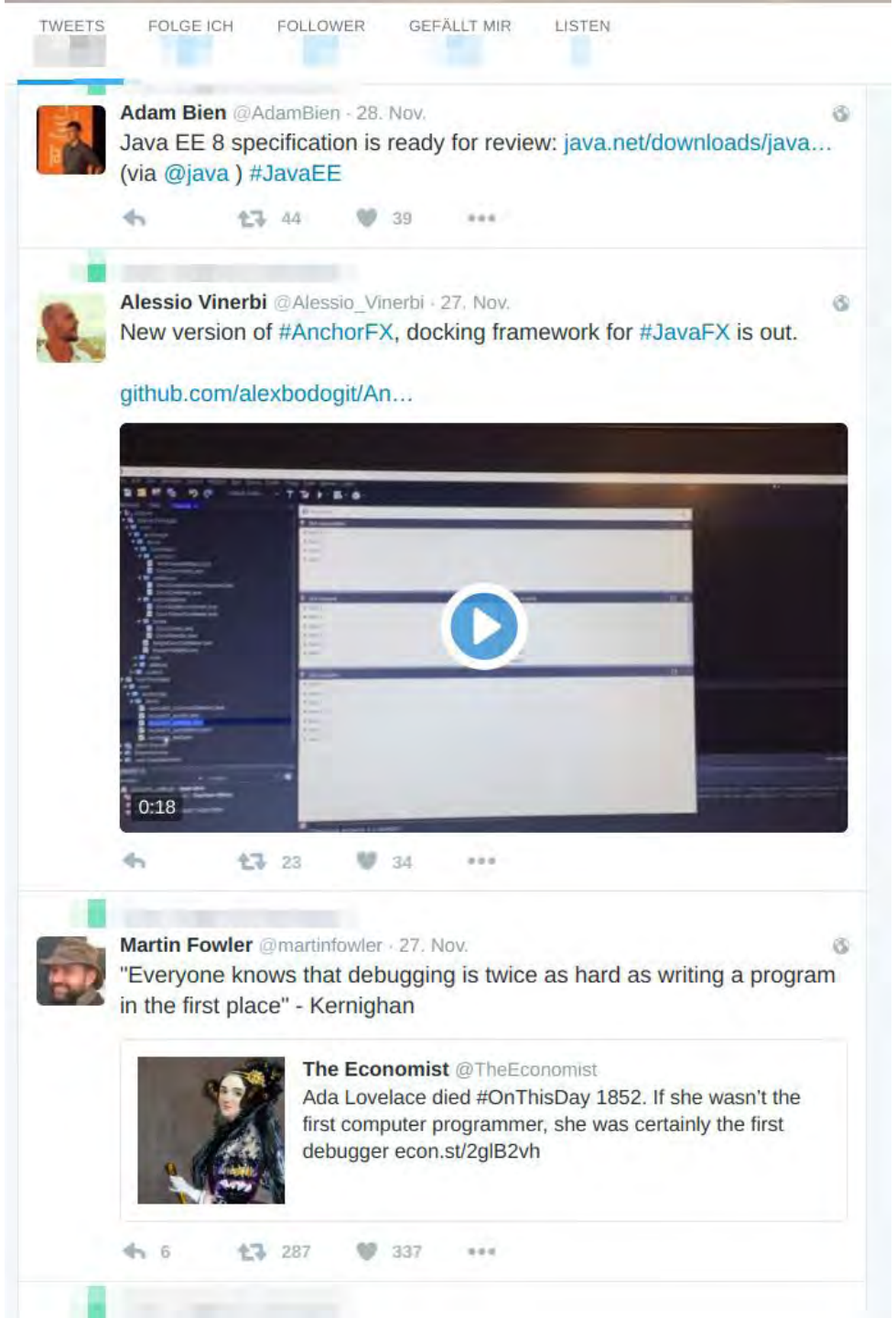


But how can public information be extracted?

Three examples

Twitter

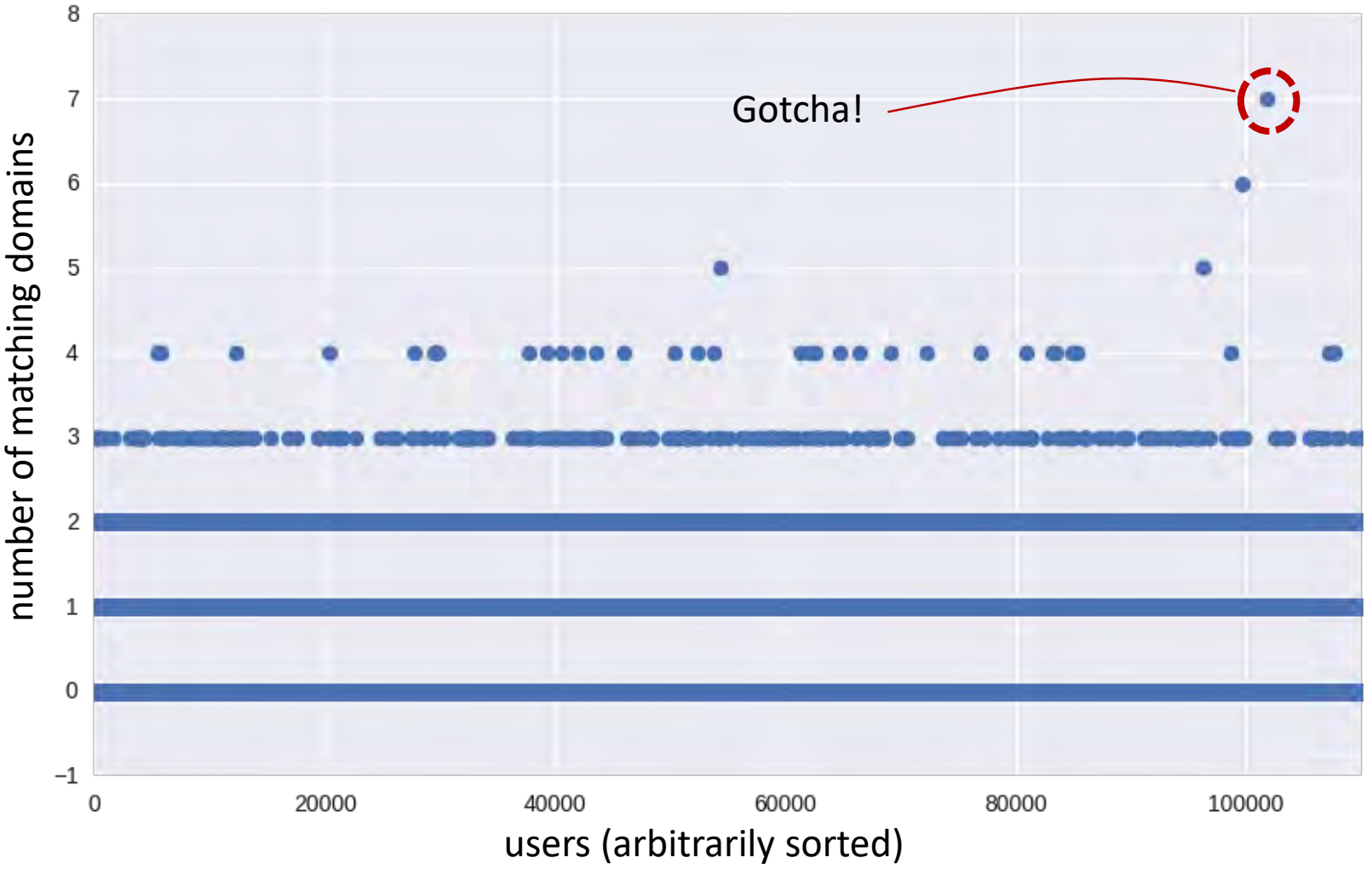
- We use the Twitter API to download tweets from the relevant time period (one month)
- We extract URLs from the tweets and generate the associated domain by following the links
- We feed the domain information into our algoritm



Examples

Visited Websites

github.com (**2.584.681**)
www.change.org (**124.152**)
fxexperience.com (**394**)
community.oracle.com (**5161**)
paper.li (**2689**)
javarevisited.blogspot.de (**525**)
www.adam-bien.com (**365**)
rterp.wordpress.com (**129**)

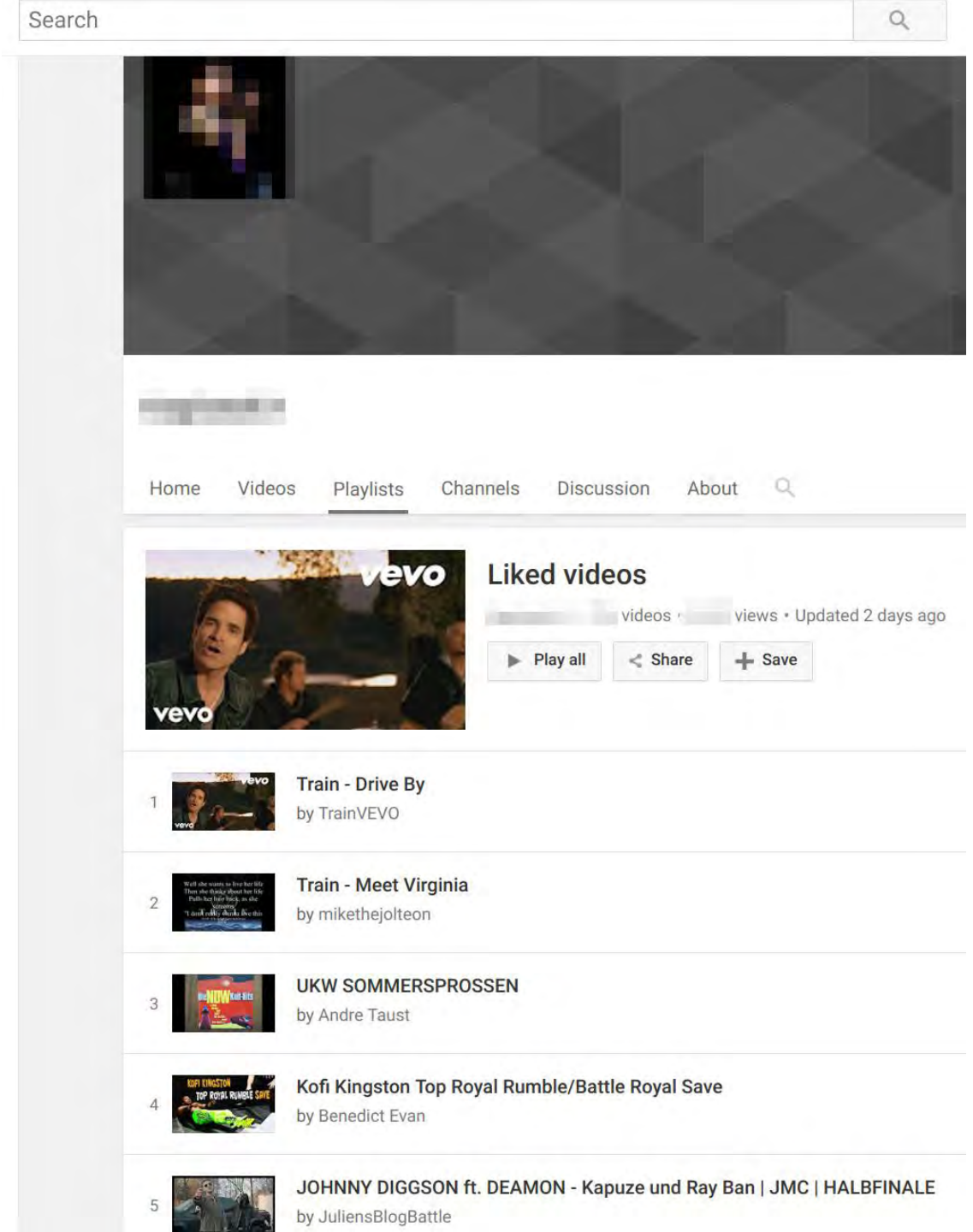


Seemingly harmless identifiers can betray you

https://www.youtube.com/watch?v=**DLzxrzFCyOs**

Youtube

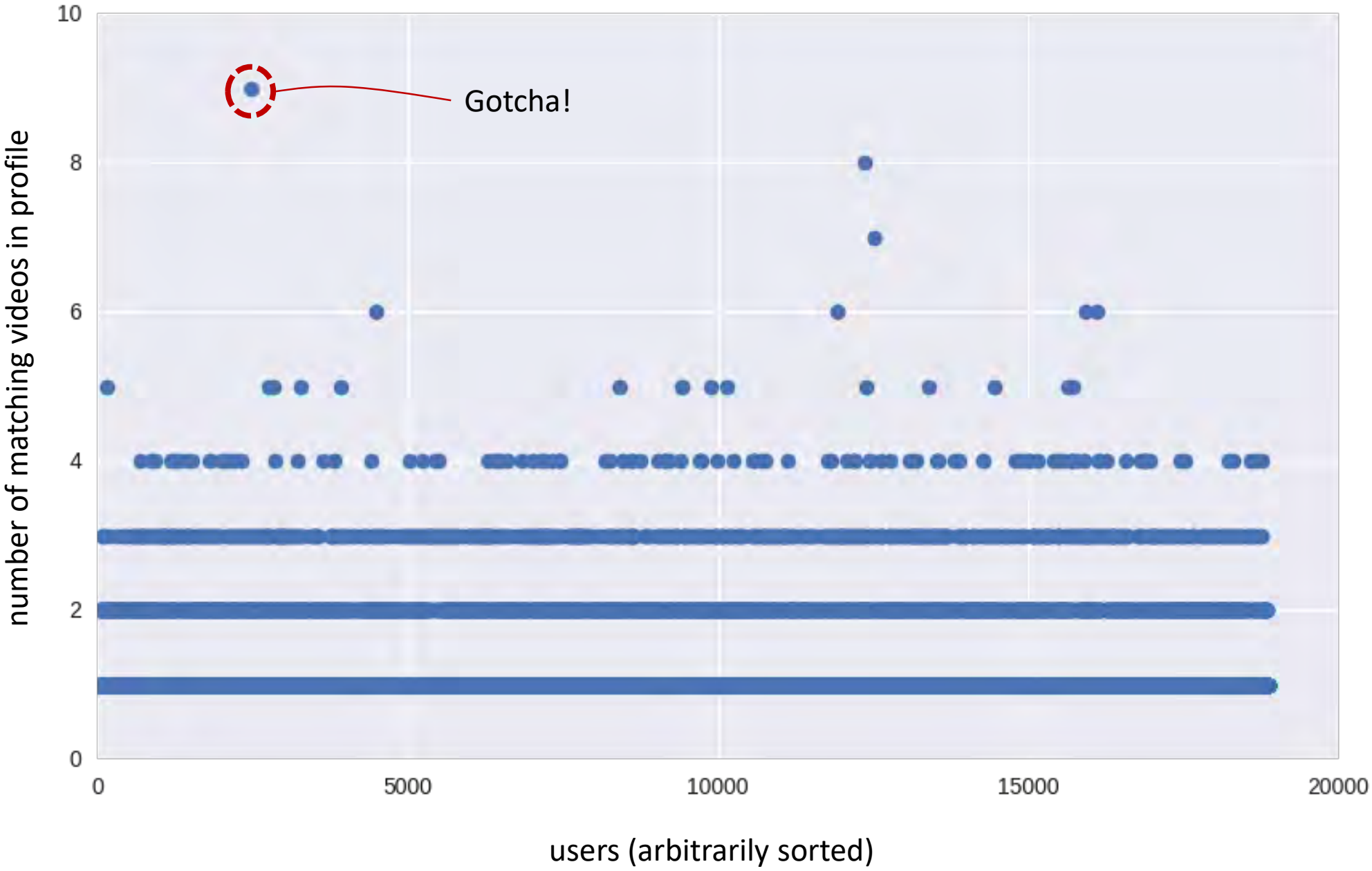
- We download public playlists from users (often linked via Google+)
- We extract the video IDs using the Youtube API
- We feed the resulting (full) URLs into our algorithm (this time with full URL info)



Example

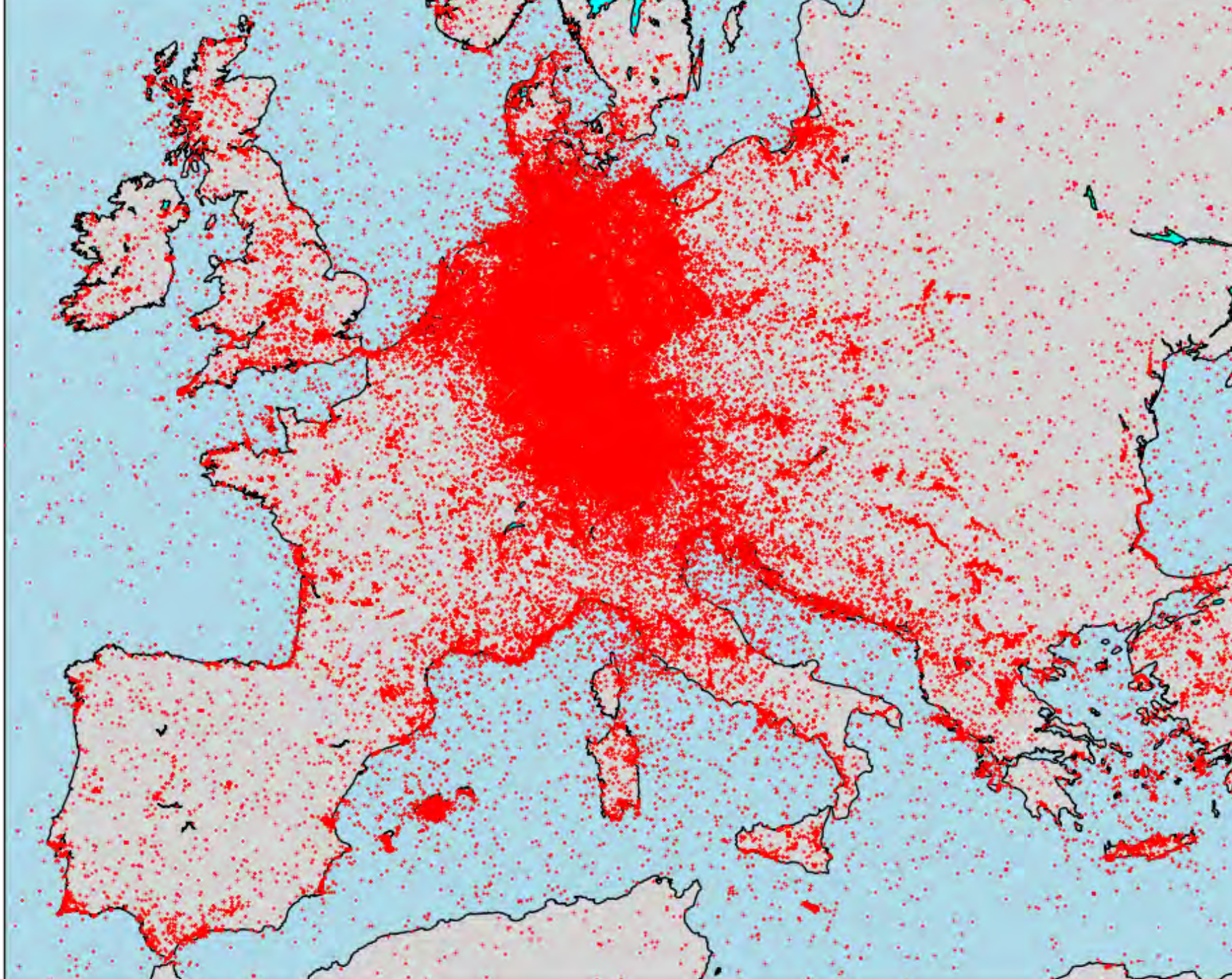
Video-IDs:

```
02Zm-Ayv-PA
18rBn4heThI
2ips2mM7Zqw
2wUvlTUi8kQ
34Na4j8AVgA
3VVuMIB2hC0
4fXvJHrbUTA
4ulaGjwiIbo
5BzkbSq7pww
5RDSkR8_AQ0
680R1Gq2YYU
6IHq9yv_qis
8d5QEWdHchk
...
```



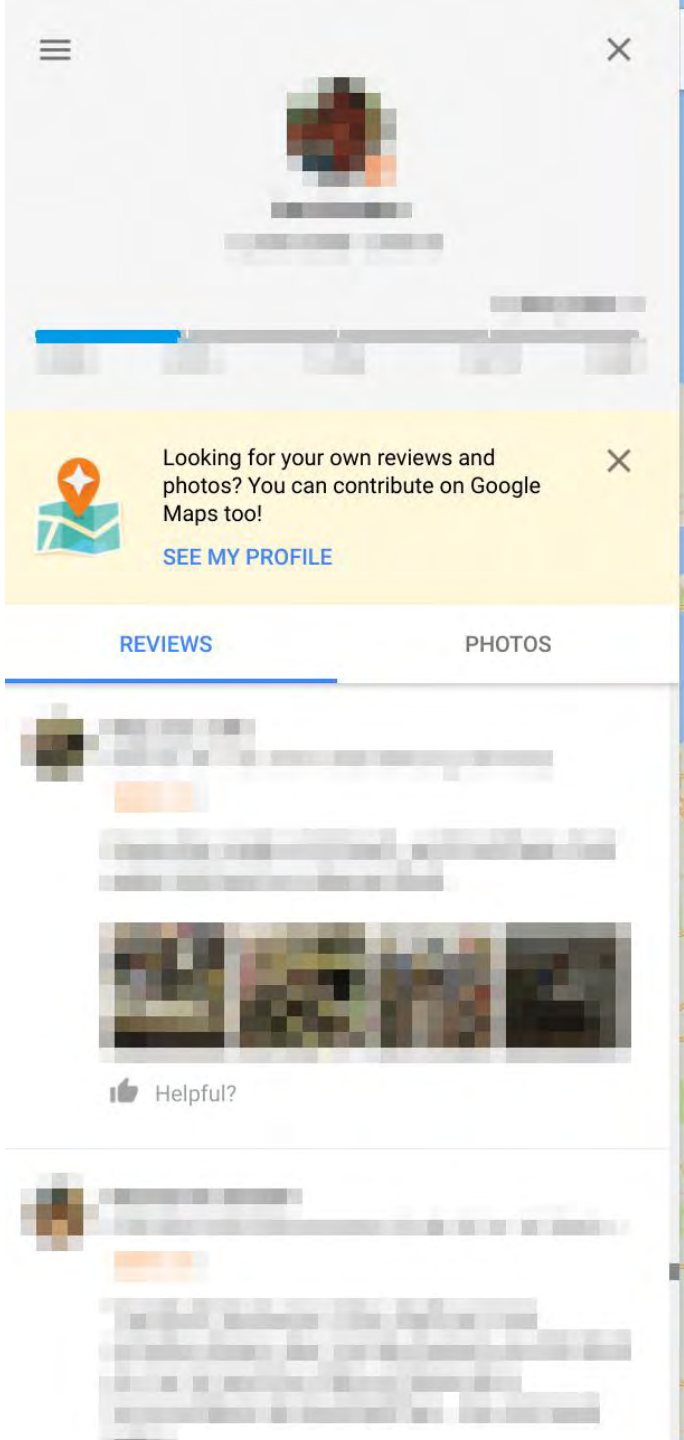
Geo-based identification

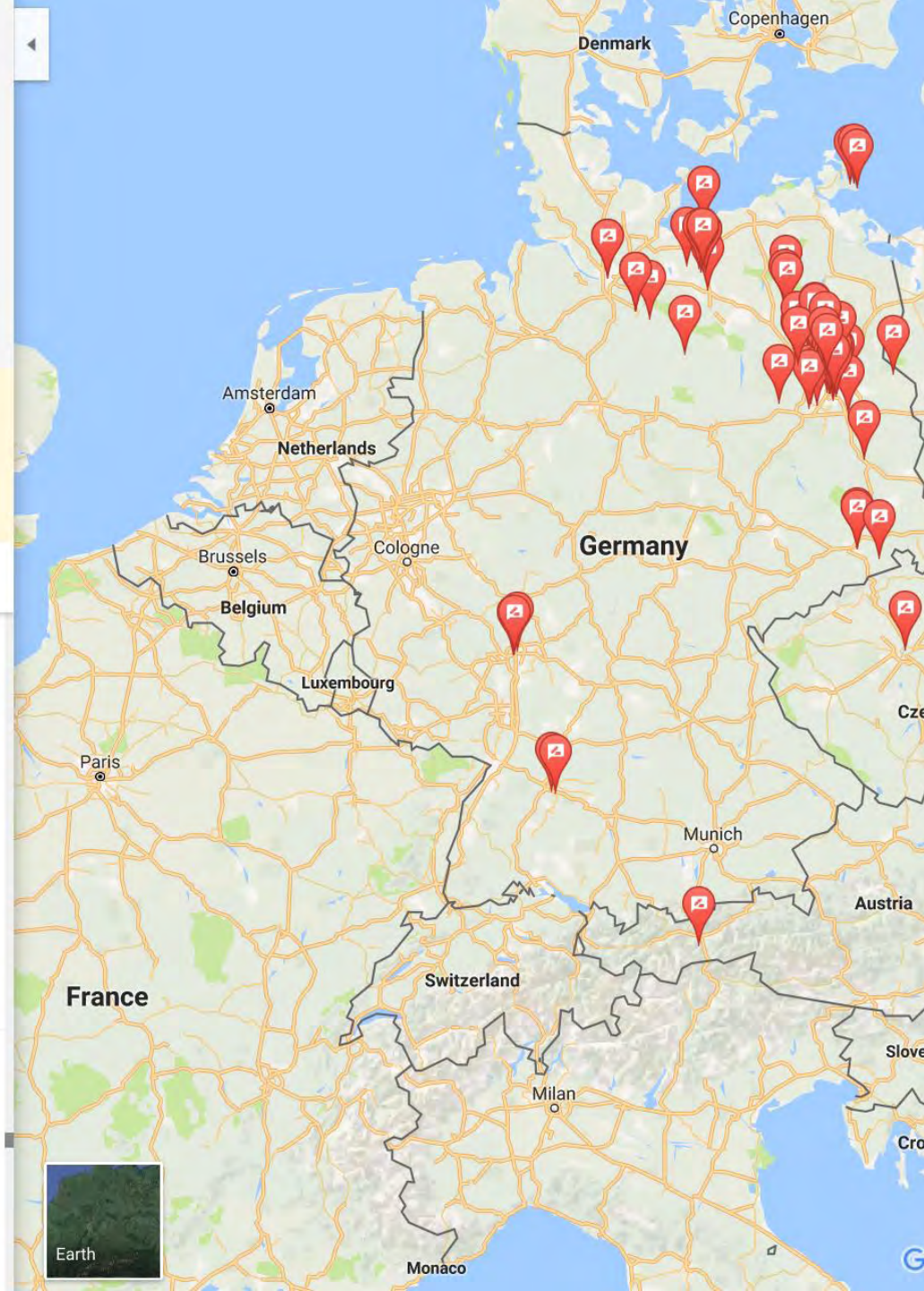
- We extract geo-data from Google Maps URLS (i.e. what coordinate was the user looking at)



Google Maps

- Ratings and photos are often publicly available (thanks again, Google+)
- Locations of interest could also be extracted from social media accounts
- A few data points are already enough to identify you





Can I hide in my data by generating noise?

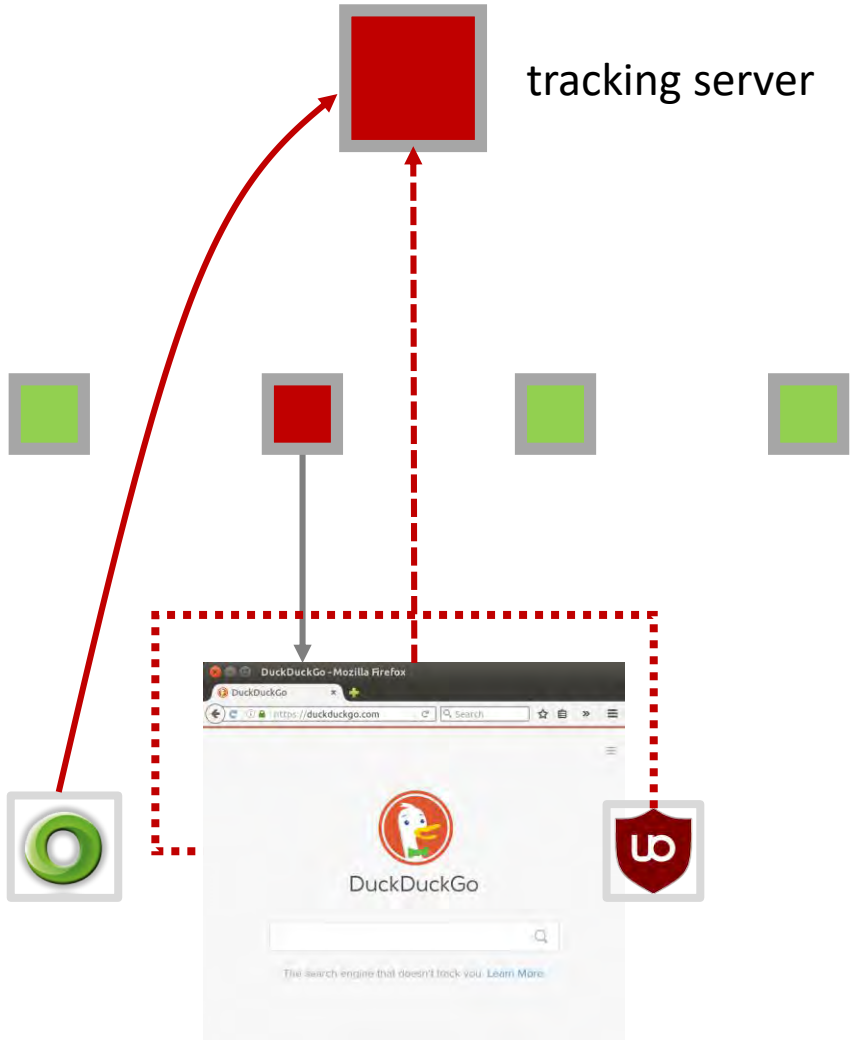
(e.g. via random page visits)

¯_(ツ)_/¯

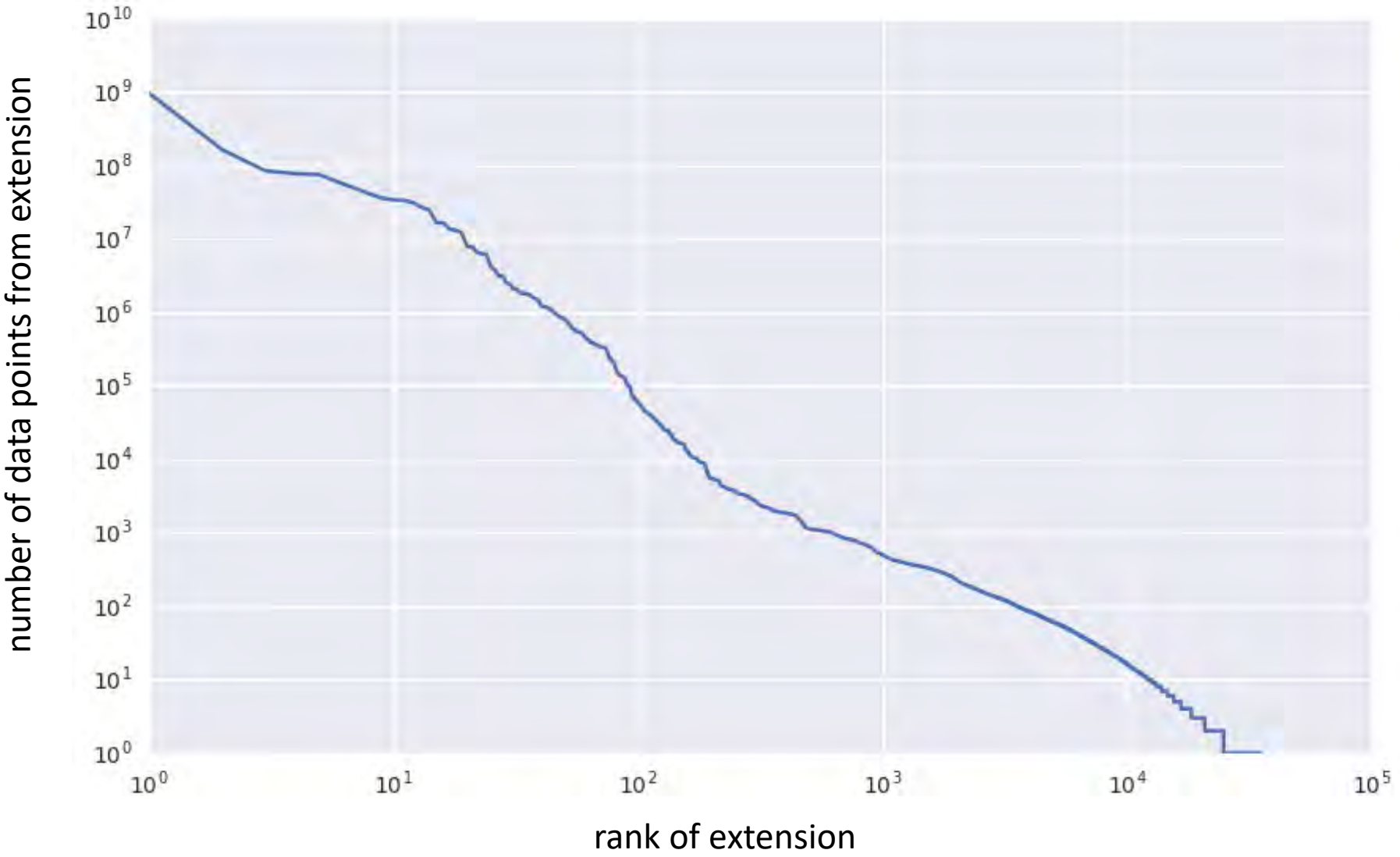
Usually not

argmax $||M \cdot v||$ is robust against isolated (additive) perturbation

Why use extensions for tracking?



Analysis of data points per extension



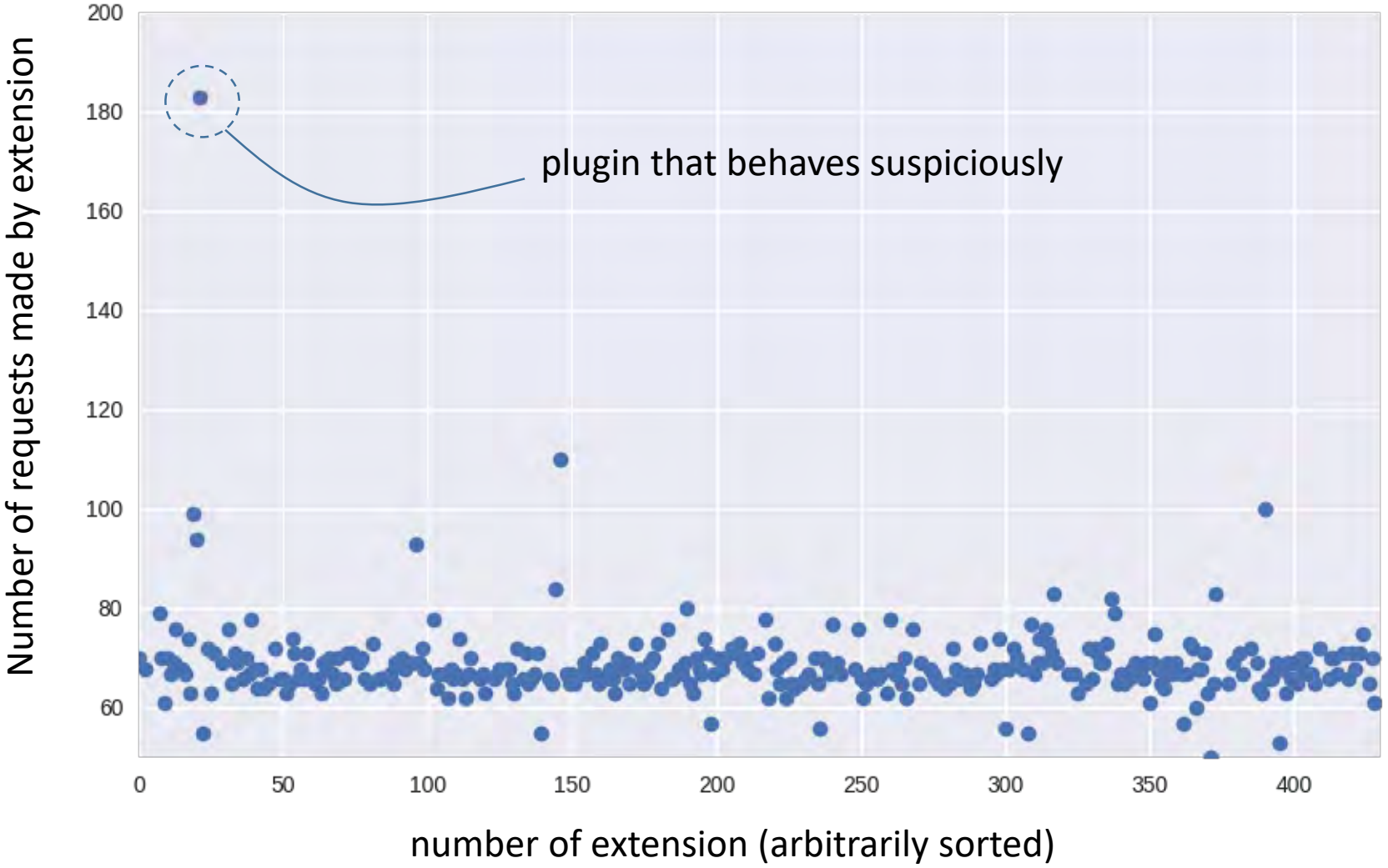
95 % of the data comes from only **10 extensions**.

Many more are spying on their users, but have a small installation base.

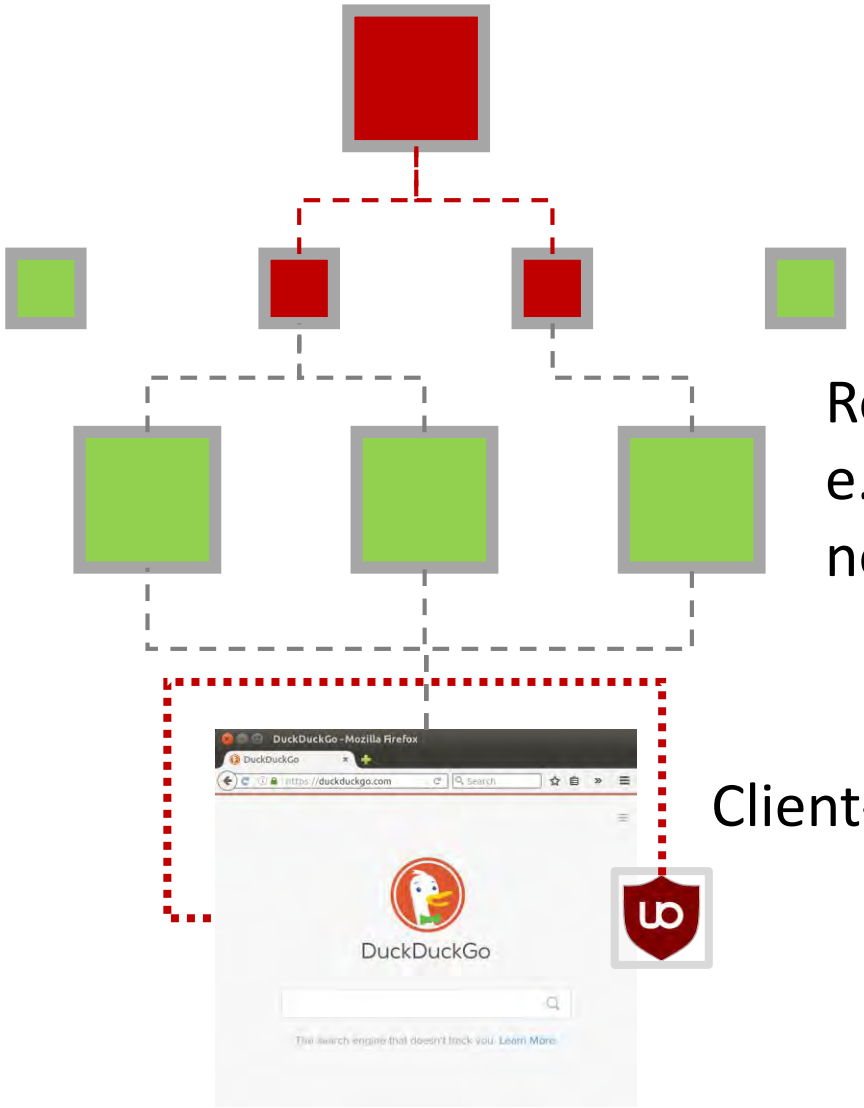
Up to **10.000 extension versions** affected (upper bound analysis via extension ID)

Behavior analysis of chrome extensions

(via Selenium Webdriver + Docker)



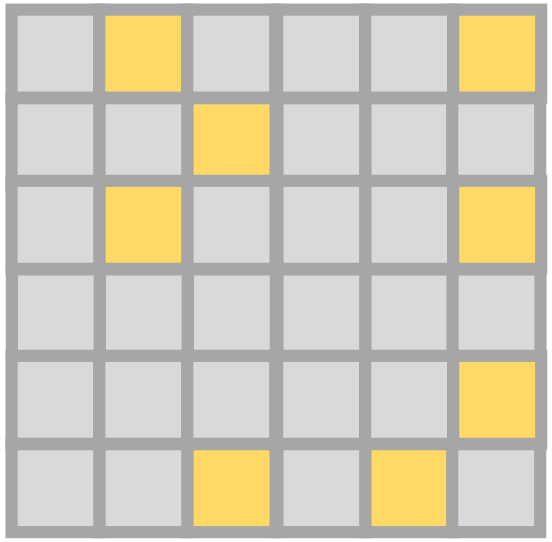
(How) can I protect myself?



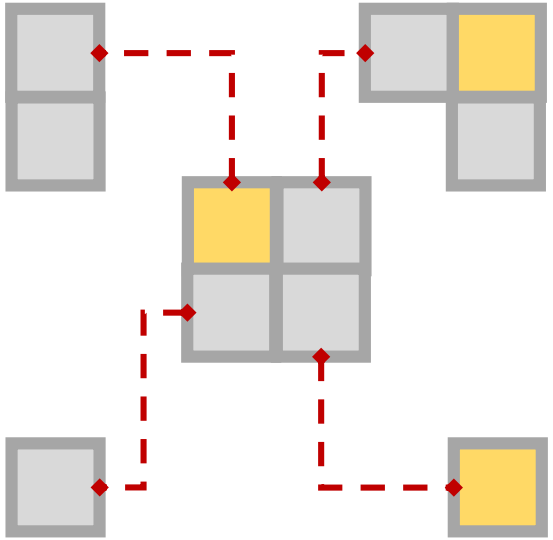
Rotating proxy servers (n >> 1)
e.g. TOR or a VPN with rotating exit nodes

Client-side blocking of trackers

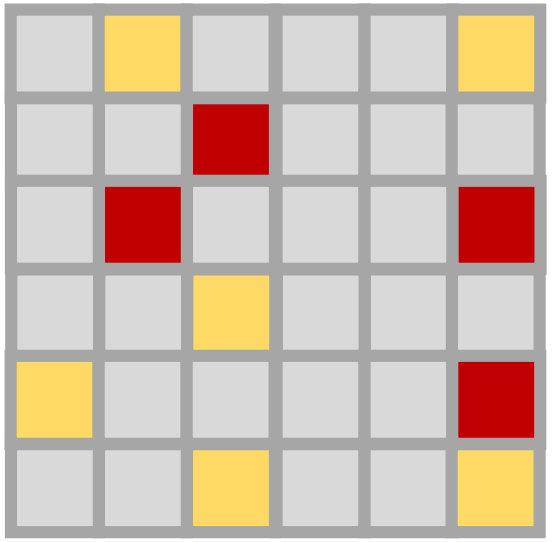
Takeaways



High-dimensional, user-related data is really hard to robustly anonymize (even if you really try to do so).



The increase in publicly available information on many people makes de-anonymization via linkage attacks easiert than ever before.



Often, only a few external data points (<10) are suffcient to uniquely identify a person.

Special thanks to

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TV shows ARD Panorama, Panorama3 und ZAPP

http://daserste.ndr.de/panorama/archiv/2016/Nackt-im-Netz-Intime-Details-von-Politikern-im-Handel,nacktimnetz110.html