Who ~~governs~~ controls the Internet?

A case study on using data for the public good

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SIDN Labs and TU Delft

Studienstiftung des Deutschen Volkes Summer School
Driebergen, The Netherlands
2023-08-11

Today's Goals

- Understand how the Internet is governed
  - Is there an Internet government?
- Understand how governance differs from Internet control
- Understand how data is being **collected and used** for profit
- Showcase alternative usage of data for the public good
- extra: receive some unsolicited advice

img src: wallpaperflare

Text in red is clickable, you can get the slides later

Challenge

Diverse crowd:

- 76 students from everywhere:
  - CS, Political Science, Engineering, Intl. Relations, Philosophy, Physics, Math, Social Sciences, Economics, Medicine, Physics
- 26 from College d'Europe:
  - Political Science, International Relations, Law, Economics

Best students from Germany

img src: Unsplash

$whoami

- Data Scientist at SIDN Labs
  - research team of SIDN, `.nl` registry
- Assistant Professor at TU Delft
- Research focus on **operations**:
  - Internet Security
  - Networking
  - Systems
- PhD (2013, UTwente, NL)
- MSc (2008, UFRGS, BR)

Presentation @ RIPE86, Rotterdam, May 2023

Outline

Governance and Consolidation: end of privacy

Using data for the public good

Counterfeited webshops

Logo Misusue

Wrapping up

Internet Governance vs Consolidation

Internet Governance

- Processes and policies that shape the use, development, and operations of the Internet.
- Multi-stakeholder approach

Internet Consolidation

- Centralization of power/uses/data in few players
  - Datenkraken
- EU has no big-tech; US and China do

How did we get here?

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Internet History

Q: Who ***invented*** the Internet?

A: Vint Cerf?

Internet History

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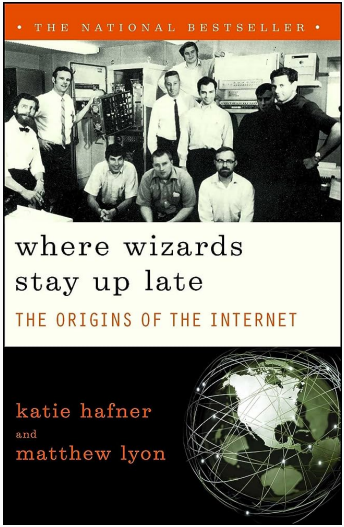
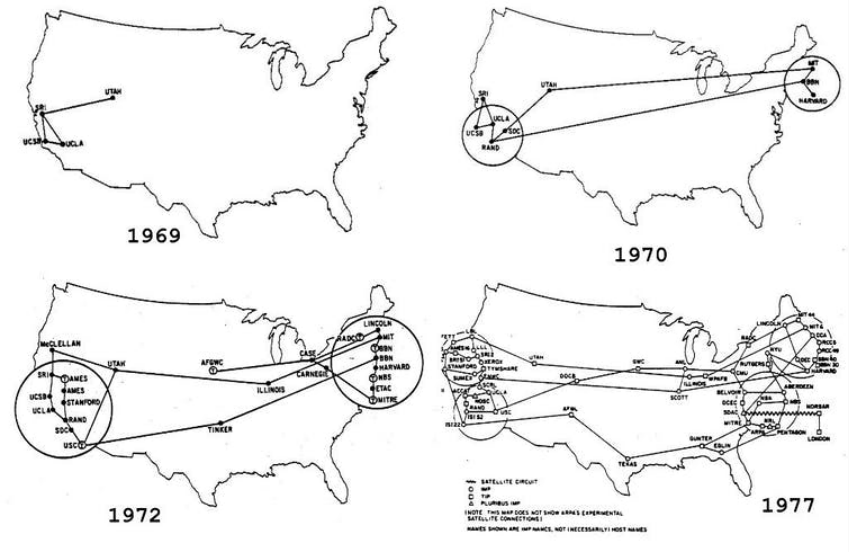
Internet History

- The Internet has many parents
- Original goal:
  - few uni/research center had their own supercomputers
  - they costed a fortune, were disconnected
  - each uni wanted its own
  - ARPAnet was proposed to connect them
    - **to save money**
  - BBN in Boston built it



ARPAnet (later became Internet)



Growing too fast: need some sort of governance

- It was growing too fast
- Need a way to make sure it kept working
  - Protocols
  - Name space (DNS)
  - IP addresses
- Open governance models were implemented

- For example, who should manage the `.de` TLD?
  - Bundesregierung?
  - Siemens?
  - Answer: denic.de
- BTW, DDR had its `.dd` TLD
  - you could `uni-jena.dd`

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Internet Governance

- ICANN and RIRs: preside over IP address space and domain name space
  - in Europe: RIPE NCC handles IP addresses (Amsterdam)
  - in Germany: DENIC does `.de`
  - Netherlands: SIDN does `.nl`
- IETF: standardize Internet protocols
  - open, compatibility
- Many other bodies

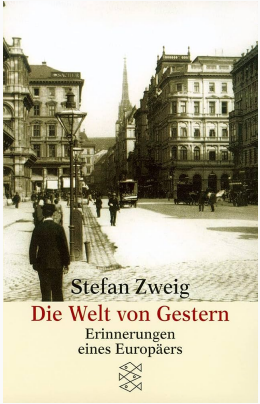
My personal thoughts:

- What would have happened if ArpaNET remained with the DoD?
- Built by other country?
- Current model it is not perfect but it works
- Thanks to open spirit of pioneers
  - Read: HEISE.de

Speaking of openness

- Great reading about what happens when group identify is hijacked for evil
  - Specially for College d'Europe folks
- "We live in space age with stone age brains"
- Jared Diamond "The world until yesterday" book
  - how they hate their neighbors

Masterclass of Humanism



Philosophically speaking

My grandfather (1913)
Offline folks

Generation X
Digital Migrants

Sabrina Parlatore,
MTV Brazil
(I wrote a handwritten
letter to this show)

Generation Z
Digital Natives

TikTok

Internet consolidation and centralization

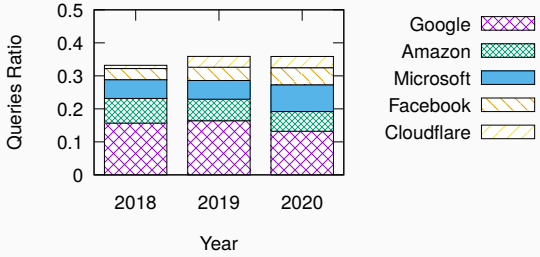
- The Internet was very open in the beginning
- Commercial used allowed; emergence of ISPs
- Network effects
  - more users $\rightarrow$ more value for the websites/platforms
- Economies of scale
  - bigger is cheap – see Amazon cloud AWS
- Buyouts and merges
- Lack of regulatory and laws

Margrethe Verstager

Internet centralization

- Big tech buys smaller companies
  - prevent innovation
  - Eg: Google/Youtube, Fbook/Instagram
- Network effects
- Traffic/user concentration
  - Sandvine: Google, Facebook, Microsoft, Apple, Amazon & Netflix generate almost 57% of Internet traffic

- Research paper: 1/3 of `.nl` traffic from US big tech



Big tech business model

Surveillance Capitalism


Society books

Interview

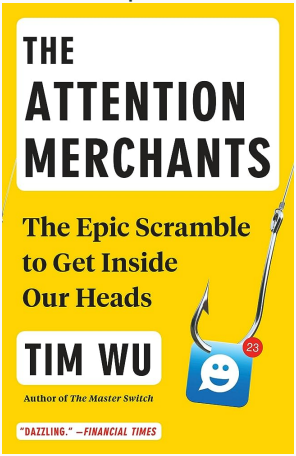
Shoshana Zuboff: 'Surveillance capitalism is an assault on human autonomy'

Joanna Kavenna

What began as advertising is now a threat to freedom and democracy argues the author and scholar. Time to wake up - and fight for a different digital future

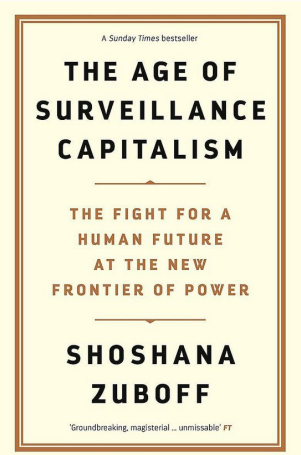
Article: The Guardian

Advertisement: psychological manipulation



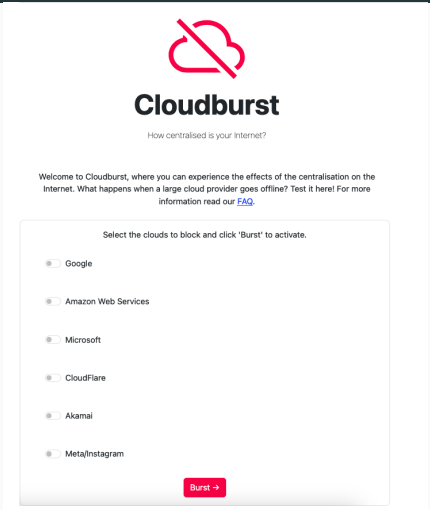
Surveillance Capitalism

- **New Economic System**: companies extract and monetize vast amounts of personal data
- **Behavior Prediction**: spy on you to **predict** your next steps
- **Selling predictions**: they sell predictions about your behavior
- **Manipulation**: can influence people thoughts and feelings
- **Erosion of democracy**: unchecked power of tech companies influence and shape human behavior could undermine democratic processes, autonomy, and individual agency.



Cloudburst demo tool

- My colleagues at SIDN Labs developed a tool just to raise awareness
- You can connect to their wifi and choose which cloud you want to disable
- You see tons of stuff stop working



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Not these

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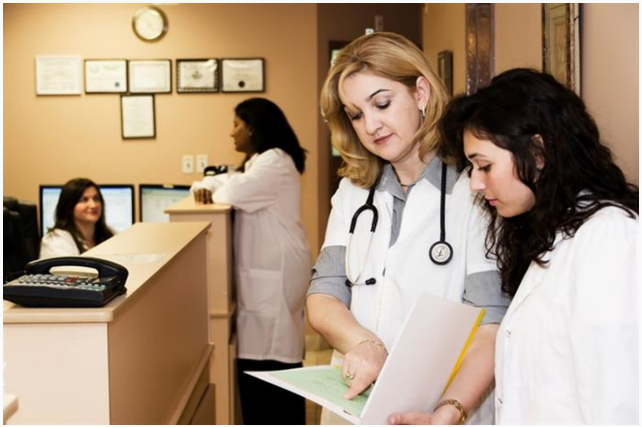


What about Die Ärzte?

- Amazon bought OneMedical for US$ 3.9B
- 200 clinics; 815k patients (mostly online)
- What will they do with the data?

Forbes

FORBES > INNOVATION > HEALTHCARE

EDITORS' PICK

Amazon's Latest Healthcare Expansion: Virtual Clinics In All 50 States

Bruce Japsen Senior Contributor ⓘ

I write about healthcare business and policy

Follow

Aug 1, 2023, 08:11am EDT

Medical data is strictly controlled

- True, but.
- Google Nest microphone: “ it was a error”

Previous Examples

- Google Maps collected Wi-Fi network names AND data
- Discovered by by Germany's data protection authority
- Google: "It was a mistake"

Google admits collecting Wi-Fi data through Street View cars

German request for data audit reveals the web giant 'accidentally' stored payload information from open networks

Link: The Guardian

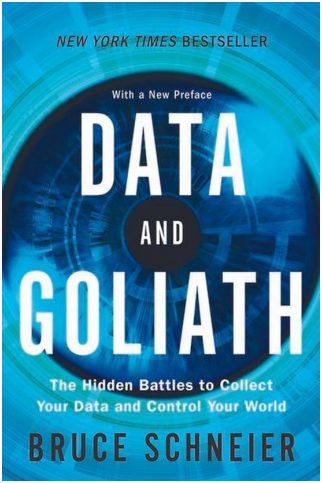
GDPR and Spotify

1. Who here uses Spotify?
2. Who knows what GDPR is?
3. Who knew you could ask them for your data?

link: here

We live in the privacy dark ages

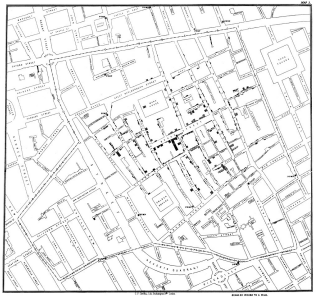
For those interested in the topic



Data is the new oil

- Surveillance capitalism erodes privacy in spying people for profit
- They (can) manipulate peoples feelings and emotions
- Are there alternative models to that, of using data for the public good?

Data use for public good: John Snow's maps of cholera outbreak in London: showed germ-contaminated water was the source



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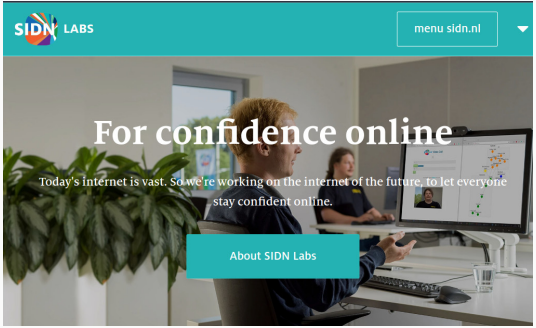
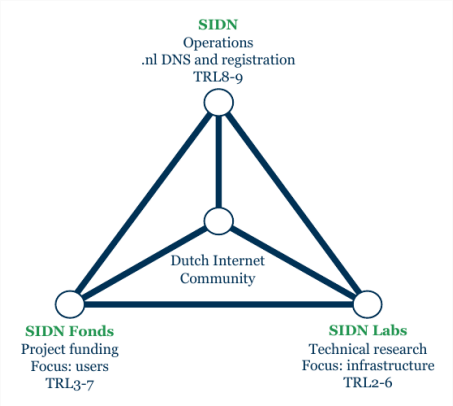
Using data for the public good

- Data can also be used for the public good
- I will show one example of how we do it at SIDN Labs



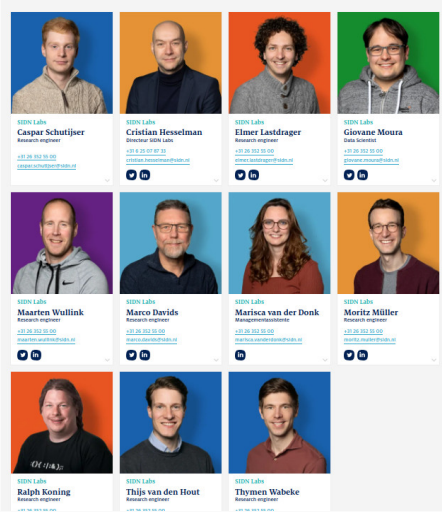
Background on SIDN

- SIDN operates the `.nl` TLD
- Not-for-profit private organization for the benefit of Dutch society (public role)
- Services we provide:
  - domain name registration
  - domain name lookups (DNS servers)



SIDN Labs

- Research arm of SIDN
- Goal: increase Internet infrastructure security through technical research
  - Focus on the Netherlands but also globally
- Three main areas:
  - Domain name security
  - Infrastructure security
  - New technologies
- Deliverables: academic papers, systems, software, standardization
- Bridge between industry and academia



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Back in 2016 ... strange websites

- We stumbled on these websites while looking for phishing
- They were rather *odd*
- We had many questions:
  1. does anyone even *buy* from them?
  2. what is their *business model*?
  3. how many they were (on .nl)?
  4. what can we do about it?

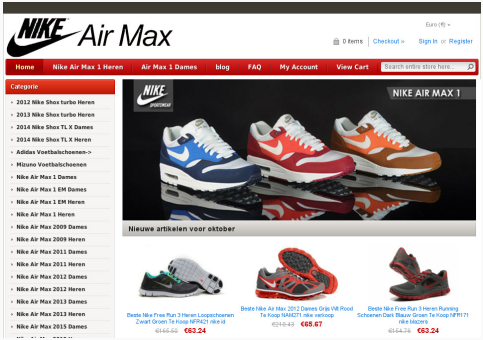

Figure 1: Screenshot of 2016 `.nl` website

Does anyone even buy from them?

- Yes, they were
- Scam: getting fake or no product
- Dealing with financial losses

Figure 2: NOS news (2018)

OK, so what to do about it

- SIDN is a Internet registry, not police
- But we have a mission to make the .nl zone safer for users
- And we were sitting on the data

- Ethical dilemma:
  - Turn the blind eye OR
  - Do something about it
- We talked to our lawyers
- We need to conform to our mandate and EU and NL laws

We decided to go ahead and measure it

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What is their *business model*?

- Counterfeit (fake) industry is **huge**: books, computers, shoes, bags
  - EU borders seizures 2016: 670 miliion EUR
  - US 2017: US$ 1.2 Billion
- Luxury goods have a massive demand

If you buy a fake from the street, you know it

- but not online
- so we got involved

What is their *business model*?

- The business model goes like this:
  1. Consumer demand [4]
  2. Manufacturing in China [1]
  3. These webshops connect both of them
- It's not only a .nl problem:
  - .de, .be, .com, and many others have the same issue
- We are dealing with *pros* here

How many were on the .nl zone?

- Back to 2016: we stumbled on them
- We realized they all share a similar pattern:
  1. long `html` `<title>` tags

```
<title>Vans Schoenen On Sale 70% OFF |Geen
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  2. tags listing many brands (Nike, Reebok, Gucci, you name it..)
- **Question: Why this tactic?**
  - Search Engine optimization → more clicks, more money [5]

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Our measurements

1. Get all `.nl` domain names (5.8M)
   - private data
2. Scrape their websites (if they have)
   - We used DMap [6]
3. We deployed “state-of-the art” ML to detect
   - simply count the number of brands on `<title>`

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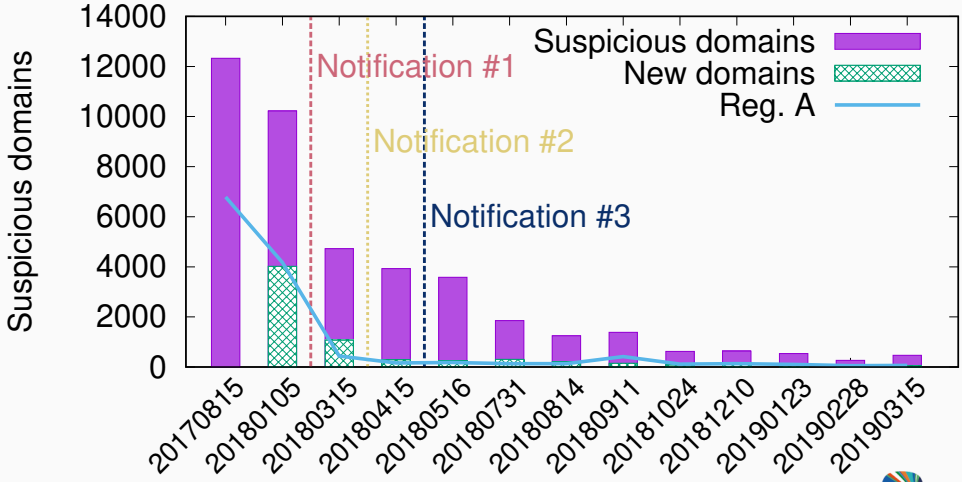
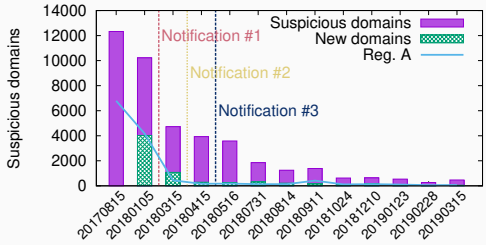
What did we find?



How to take them down it?

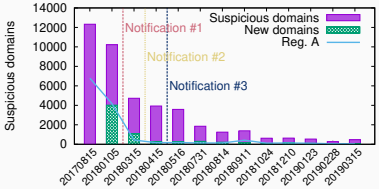
- We could not take them down
- But there was a way to validate them:
  1. Notify a registrar that registered the domain
  2. Ask them to verify the ID of the registrant
  3. If it fails, then they can suspend the domain



Lessons

1. How come does this even work?
   - This is to show they suffered little pressure
2. Why so many of these webshops?
   - it's unlikely there are that many counterfeiters
   - *Domains are cheap and disposable*
   - automation heavily used
   - 10 down does not even make a difference
3. Why 6K were registered with only one registrar?
   - API for automatic registration & good price

Take downs were effective, in partnership with our registrars



- Later they changed strategy, we had a new system
- See PAM2020 [3]

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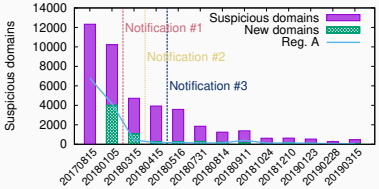

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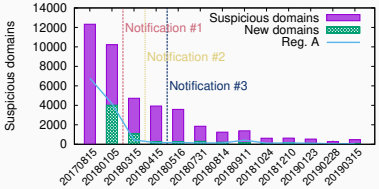

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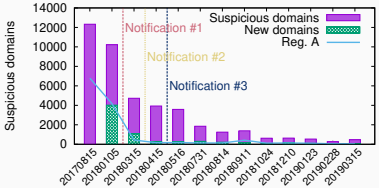

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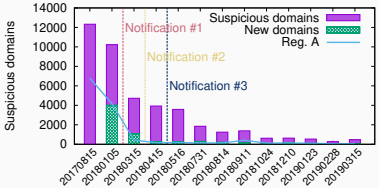

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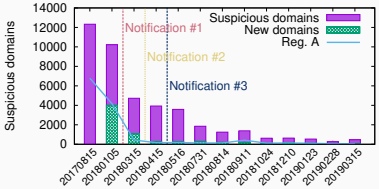
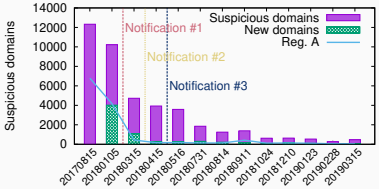


- Later they changed strategy, we had a new system
- See PAM2020 [3]

Lessons

1. How come does this even work?
   - This is to show they suffered little pressure
2. Why so many of these webshops?
   - it's unlikely there are that many counterfeiters
   - *Domains are cheap and disposable*
   - automation heavily used
   - 10 down does not even make a difference
3. Why 6K were registered with only one registrar?
   - API for automatic registration & good price

Take downs were effective, in partnership with our registrars



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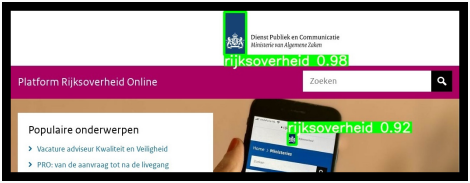
Logo Misusue

Wrapping up

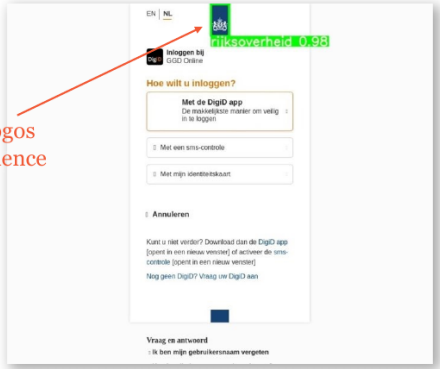
From text to logo detection: LogoMotive

- My colleagues did a study evaluating misuse of Dutch government logo
- It became a brand protection service
- See PAM2022 [2] paper

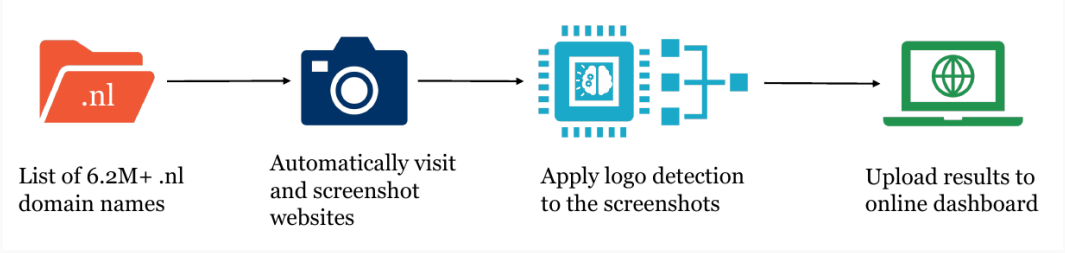


Detecting logos misuse with ML

Detected logos with confidence



How does LogoMotive work?



Generating training datasets

- We've used Yolo for image recognition
- It requires labeled data
- So we've generated it

	Value
Screenshots generated	64,893
Synthetic training samples	100,000
training set	95,000
validation set	5,000

Table 1: Datasets used for raining and validation.

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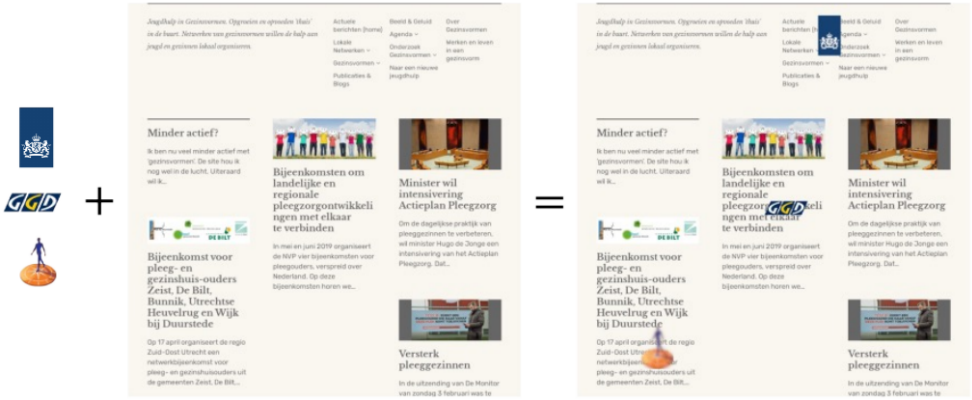

Random screenshot

Resulting datapoint

Evaluating the model

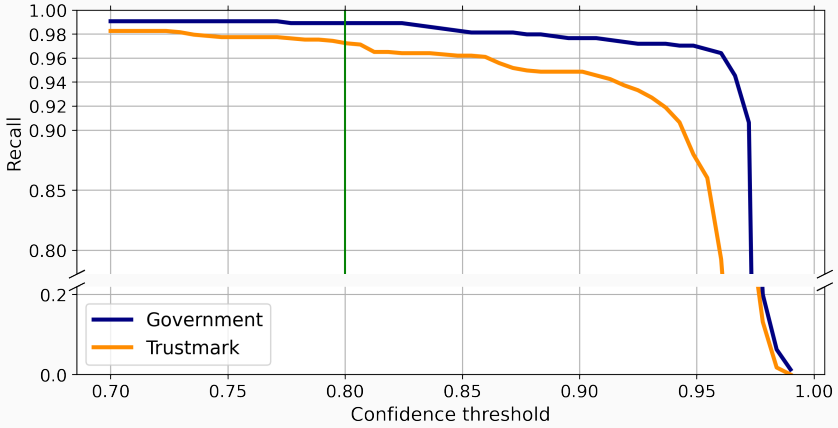

Figure 3: Recall performance of LogoMotive at confidence thresholds. The vertical line denotes our chosen threshold.

Results

Label	Full-Zone	Newly-Registered
Total	12862 (100.00%)	53
Without gov. logo (FP)	1164 (9.05%)	0 (0.00%)
With gov. logo (TP)	11698 (90.95%)	53 (100.0%)
Benign	10595 (82.37%)	32 (60.38%)
Government impersonation	151 (1.17%)	17 (32.09%)
Phishing	3 (0.02%)	3 (5.66%)
Potential threat	73 (0.57%)	9 (16.98%)
Other (false endorsements, satire, etc.)	75 (0.58%)	5 (9.43%)
Government domains	952 (7.40%)	4 (7.55%)
In portfolio	636 (4.94%)	2 (0.00%)
Not in portfolio	316 (2.46%)	2 (3.77%)
Added	109 (0.85%)	1 (1.89%)
Pending	207 (1.61%)	1 (1.89%)

Table 2: Manual validation results for government impersonation case study.

On the paper

- See PAM2022 [2] paper for more details
- There was a second case study
- It became a brand protection service

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Conclusions

- We are living in the dark ages of privacy
- Internet consolidation is increasing
  - less competitivity
  - the US and EU are moving slowly to fix it
- Data can still be used for the public good
  - business models that DO NOT rely on surveillance
- We showed two case studies
- Hope you folks help to address these issues

US Spy Satellite logo

Slides: https://tinyurl.com/sidn23

Contact: giovane.moura@sidn.nl https://sidnlabs.nl/en

References i

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