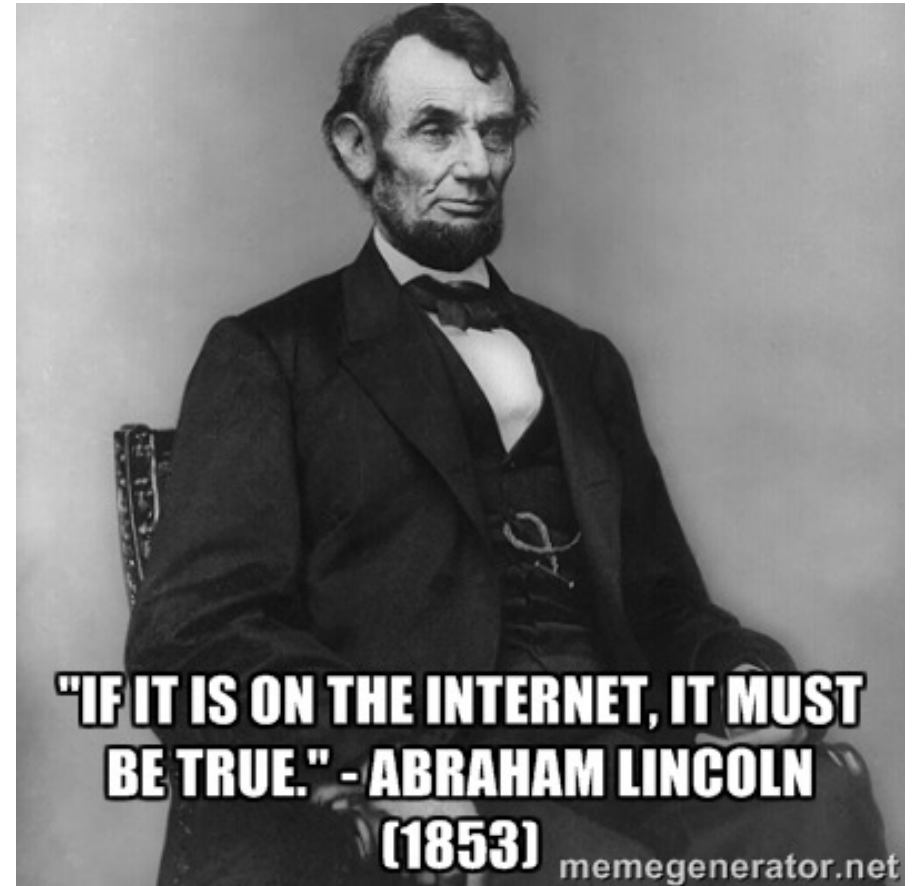
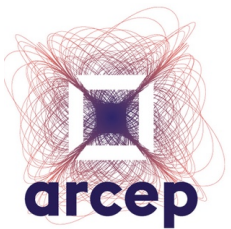


# Issues in Ethical Data Management

Serge Abiteboul



# Data out there



# Data is exploding

## Personal data

- Data and metadata we produce
- Data others (friends or not...) produce about us
- Data sensors produce about us
- Data programs produce about us
- 4V: Volume, veracity, velocity, variety

Individuals are losing control over all this data

# Promises and risks of data science

- Improve people's lives, e.g., recommendation
- Accelerate scientific discovery, e.g., medicine
- Boost innovation, e.g., autonomous cars
- Transform society, e.g., open government
- Optimize business, e.g., advertisement targeting

## Growing resentment

- Against bad behaviors: racism, terrorist sites, pedophilia, identity theft, cyberbullying, cybercrime
- Against companies: intrusive marketing, cryptic personalization and business decisions
- Against governments: NSA and its European counterparts

Increasing awareness of the dissymmetry between what these systems know about a person, and what the person actually knows

# Online price discrimination

## THE WALL STREET JOURNAL.

WHAT THEY KNOW

### Websites Vary Prices, Deals Based on Users' Information

By JENNIFER VALENTINO-DEVRIES,  
JEREMY SINGER-VINE and ASHKAN SOLTANI

December 24, 2012

It was the same Swingline stapler, on the same [Staples.com](http://Staples.com) website. But for Kim Wamble, the price was \$15.79, while the price on Trude Frizzell's screen, just a few miles away, was \$14.29.

A key difference: where Staples seemed to think they were located.

WHAT PRICE WOULD YOU SEE?



**lower prices offered to buyers who live in more affluent neighborhoods**

<https://www.wsj.com/articles/SB10001424127887323777204578189391813881534>

# Online job ads

**theguardian**

Samuel Gibbs

Wednesday 8 July 2015 11.29 BST

## Women less likely to be shown ads for high-paid jobs on Google, study shows

Automated testing and analysis of company's advertising system reveals male job seekers are shown far more adverts for high-paying executive jobs



One experiment showed that Google displayed adverts for a career coaching service for executive jobs 1,852 times to the male group and only 318 times to the female group. Photograph: Alamy

The AdFisher tool simulated job seekers that did not differ in browsing behavior, preferences or demographic characteristics, except in gender.

One experiment showed that Google displayed ads for a career coaching service for “\$200k+” executive jobs **1,852 times to the male group and only 318 times to the female group**. Another experiment, in July 2014, showed a similar trend but was not statistically significant.

<https://www.theguardian.com/technology/2015/jul/08/women-less-likely-ads-high-paid-jobs-google-study>

# Racial bias in criminal sentencing

## Machine Bias

There's software used across the country to predict future criminals. And it's biased against blacks.

by Julia Angwin, Jeff Larson, Surya Mattu and Lauren Kirchner, ProPublica

May 23, 2016

A commercial tool COMPAS automatically predicts some categories of future crime to assist in bail and sentencing decisions. It is used in courts in the US.



The tool correctly predicts recidivism **61% of the time.**

**Blacks are almost twice as likely as whites to be labeled a higher risk but not actually re-offend.**

The tool makes **the opposite mistake among whites**: They are much more likely than blacks to be labeled lower risk but go on to commit other crimes.

<https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>

# Google antitrust case

**theguardian**

## European commission announces antitrust charges against Google

Inquiry will focus on accusations that internet search and tech multinational has unfairly used its products to oust competitors

Sam Thielman in New York

[@samthielman](#)

Wednesday 15 April 2015 07.27 EDT



📷 Ruth Porat replaces Patrick Pichette as Google's chief finance officer. Photograph: Georges Gobet/AFP/Getty Images

The [European Union](#) accused Google on Wednesday of cheating competitors by distorting Internet search results in favour of its Google Shopping service and also launched an antitrust probe into its Android mobile operating system.



# The 'Filter Bubble' Explains Why Trump Won and You Didn't See It Coming

By Drake Baer

Lack of  
diversity in  
Social networks  
such as FB and  
Twitter



Photo: Mark Wilson/Getty Images

Donald Trump's victory is blindsiding, like stepping into a crosswalk and getting slammed into by a delivery guy cycling the wrong way down a one-way street. This is because, as media scholars understand it, we increasingly live in a "filter bubble": The information we take in is so personalized that we're blind to other perspectives. It simultaneously explains why Trumpism has flourished and why so many of us are insulated from it.

# Various ethical aspects

- Fairness: justice, staplers case
- Neutrality: Google search
- Transparency: Google Ads setting
- Diversity: filter bubble
- Privacy
- Explicability
- Accountability
- Loyalty
- Truth
- ...

# Future challenges in data management

An opinion:

- In the past, the field was driven by
  - Company data
  - Data model & performance & reliability
- In the future
  - **Personal and social data**
  - **Ethical issues**

**Ethics:** concepts and principles that guide us in determining what behavior helps or harms us

# “Ethics is the new ACID”

Julia Stoyanovich

We know how to do things in data management,

- Good data models
- Acceptable performance
- Acceptable reliability

Now is time to question what we are doing

- Many societal issues today are related to data
- Just look at the news: fake news, privacy, information bubble...

**And for other fields, e.g., verification?**

# Based on works with Julia Stoyanovich, Amélie Marian, and many others

- *Data responsibly*, with Julia Stoyanovich (Drexel), **Sigmod Blog** (in French, **Le Monde**), 2016
- *Data responsibly*, with Julia Stoyanovich (Drexel) & Gerome Miklau (U. Mass), **EDBT Tutorial 2016**, Summer school 2017
- *Managing your digital life with a Personal information management system*, with Benjamin André (Cozy Cloud) & Daniel Kaplan (Fing), **CACM 2015**
- *Personal information management systems*, with Amélie Marian (Rutgers), **EDBT Tutorial 2015**
- *Personal analytics and privacy*, Workshop, Skopje, 2017
- *Platform Neutrality*, **French Digital Council**, Report, 2015

# Organization

- ✓ Motivation
- Privacy
- Data analysis
- Data quality evaluation
- Data dissemination
- Data memory



*“I think you’ll find that mine is bigger...”*

1. Data privacy
2. The PIMS

# PRIVACY



# Data privacy



- More and more concerns about privacy
- Limitations on what data companies can do
  - Laws to force companies to request authorization to build a DB with of personal information (France)
- Rules about what users should be able to do
  - Laws that compel companies (e.g., credit reporting agencies) to let users see and correct information about them (US)
- Laws in Europe, US...
  - The laws depend on the country (the ethics also of course)
  - Their enforcement is difficult
- This is progressing



# Data privacy: usability

- There are means to protect data but people often don't use them because too complicated and/or not understandable
  - Tools for cryptography
  - Access rights
  - Unreadable EULA
    - End-User license agreement
  - Difficulty to change service
    - Vendor lock in

# Research issues

- Easier to use tools
- Automatic specification
- Portability...

# An alternative business model for data protection: The PIMS



*A Personal Information Management System is a cloud system that manages all the information of a person*

**Many Web services**  
**Each one running**

- On some unknown machines
- With your data
- Some software

**Your PIMS**

- **Your machine**
- **With your data**
  - possibly replica of data from systems you like
- On your software or
- Wrappers to external services

# It's first about data integration

	m	i	m	i	A	L	I	C	E	I	u	u	z	a	z	a
localization					X											
webSearch					X											
calendar					X											
mail					X											
contacts					X											
Facebook					X											
tripadvisor					X											
banks					X											
whatsap					X											

Integration of the services of a user

Integration of the users of a service

# Many R&D issues

## Old problems revisited

- Personal information integration
- Personalization and context awareness
- Personal data analysis
- Epsilon-principle (epsilon-user-administration)
- Synchronization/backups & Task sequencing
- Access control & Exchange of information
- Security (e.g. works @ INRIA Saclay)
- Connected objects control

1. Fairness
2. Transparency
3. Diversity
4. Privacy

# DATA ANALYSIS



# Getting knowledge out of data

- Finding statistical correlations
- Publishing aggregate statistics
- Detecting outliers
- Detecting trends
- Popular technology
  - statistics, data mining, big data, machine learning

# Data analysis: Fairness



- Origins of bias
  - data collection
    - E.g., a crime dataset in which some cities are under-represented
  - data analysis
    - E.g., search engine skewing recommendations in favor of advertising customers
- The bias may be unexpected
  - Staplers more expensive for low income families
- The bias may even be illegal
  - Less advantageous financial products to members of minority groups

The issue is well-known in science

- Scientists are expected to explain how data was obtained, which analysis was carried on it



# Effect on sub-populations

## Simpson's paradox

disparate impact at the full population level disappears or reverses when looking at sub-populations!

		grad school admissions	
		admitted	denied
gender	F	1512	2809
	M	3715	4727

**positive  
outcomes**

35%  
of women

44%  
of men

UC Berkeley 1973: women applied to more competitive departments, with low rates of admission among qualified applicants.

# Group versus individual fairness

## Group fairness

demographics of the individuals receiving any outcome are the same as demographics of the underlying population

		credit score	
		good	bad
race	black	⊕	⊖ ⊖ ⊕ ⊖
	white	⊕ ⊖ ⊕	⊖ ⊖

**positive outcomes** offered credit

40%  
of black

40%  
of white

## Individual fairness

any two individuals who are similar w.r.t. a particular task should receive similar outcomes

# Data analysis: Diversity



- Relevance ranking (for recommendation) is typically based on popularity
  - Ignores less common information (in the tail) that constitutes in fact the overwhelming majority
  - Lack of diversity can lead to discrimination, exclusion.
- Examples
  - on-line dating platform like Match.com
  - a crowdsourcing marketplace like Amazon Mechanical Turk
  - or a funding platform like Kickstarter

The rich get richer, the poor get poorer

# Data analysis: Transparency



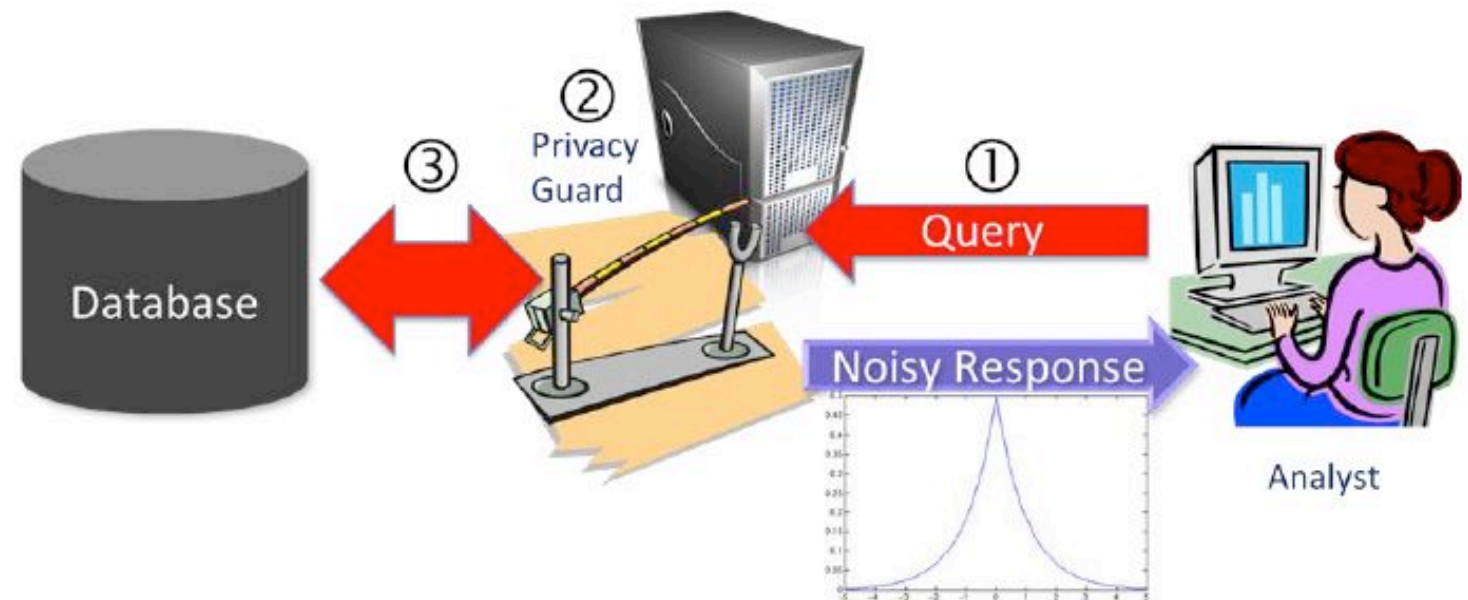
- Example: lack of transparency in Facebook data processing
  - In general, unreadable End-user license agreement
- Users want to control what is recorded about them, and how that information is used
- Transparency facilitates verification that a service performs as it should, as is promised
- Also allows a data provider to verify that data are well used as it has specified.

# Privacy in data analysis



- When publishing statistics,  
protect individuals
- Anonymization
- Differential privacy

Already studied a lot  
Many open issues



# Issues: Verifying these properties

- Tools to collect data and analyze it responsibly
- Tools to verify that some analysis was performed responsibly
- Easier if responsibility is taken into account as early as possible, *responsibility by design*
- To check the behavior of a program, one can
  - Analyze its code  $\approx$  proof of mathematical theorems
  - Analyze its effect  $\approx$  study of phenomena (such as climate or the human heart)

# Verification: code analysis

- Possible if open-source - otherwise auditing
- Easier with open-source
  - not sufficient: bug in the SSL library of Debian
  - Weak secrecy of keys for 2 years
- Specify properties that should be verified
- Verification based on static analysis, in the spirit of theorem proving
- Lots of work in different areas
  - security, safety, optimization, privacy
- Little on responsibility

# Verification: analysis of effects

- Statistical analysis
  - Detect biases
  - Detect illegal use of protected attributes
- Verify transparency
- Verify “loyalty”
  - The system behaves like it says it does
- Example: Google Ads Settings & AdFisher



# Google Ads Settings



## Control your Google ads

You can control the ads that are delivered to you based on your Google Account, across devices, by editing these settings. These ads are more likely to be useful and relevant to you.

### Your interests

- Action & Adventure Films
- Cooking & Recipes
- History
- Hygiene & Toiletries
- Mobile Phones
- Phone Service Providers
- Reggaeton
- Vehicle Brands
- Cats
- Fitness
- Hybrid & Alternative Vehicles
- Make-Up & Cosmetics
- Parenting
- Recording Industry
- Search Engine Optimization & Marketing

+ ADD NEW INTEREST

WHERE DID THESE COME FROM?

These interests are derived from your activity on Google sites, such as the videos you've watched on YouTube. This does not include Gmail interests, which are used only for ads within Gmail. [Learn more](#)

# Transparency and accountability

- Analysis by AdFisher
- Doesn't behave how it says
  - Choice of ads is based on more data than it says
    - E.g., protected attributes
    - Eg: males were shown ads for higher-paying jobs significantly more often than females
- Some control on the ads
  - Removing an interest decreases the number of ads related to that interest
  - Eg: cats

# Verification: provenance

- Provenance helps verifying the analysis
- Common for scientific data, essential for verifying that data collection and analysis were performed responsibly

Issue: provenance and verification

Issue: reproducibility



# DATA QUALITY EVALUATION

# Stuff we don't want to see on the web

- Fake news, alternative facts
- Nazi sites
- Terrorist sites
- Pedophilic content
- Bogus health content
- Conspiracy theory content
- Cybercrime
- Cyberbullying ...

# Web-scale data analysis

## About human data

- Errors, omissions, inconsistencies, biases, incompleteness
- Typically subjective (taste, opinions...)
- Quality assessment
  - Of facts
  - Of data sources
  - Assess correctness/legality/...
- Truth finding
  - Fake news detection



# On line data analysis

- 2013: A tweet from The Associated Press Twitter account claiming the White House had been bombed
- the Dow dropped more than 100 points in two minutes
- Automatic Web scale content monitoring



# Difficulty of countermeasures

- Typical situation in France
  - Terrorist site detected and reported
  - Long legal process
  - Condemnation – the site is closed
  - A mirror reopens in a very short time, and is quickly referenced on the web
- The URL has been prohibited when it should have been the content
- Technically, it is possible to detect the content and block it





1. Protecting data out there
2. Open data access
3. Neutrality

## DATA DISSEMINATION

# Protecting data out there



- For the data we have on the Web,  
we would like to control
  - By whom it is read
  - How is transmitted
  - How it is modified
  - How it is and will be used
- We would like to keep some control in this  
distributed setting
  - Web-scale access control

# Examples of active data access

- Auto-deletion after some amount of time
  - Snapchat
  - Vanish <https://vanish.cs.washington.edu/>
- Deletion and right to be forgotten
- Active data (activexml)
  - Provenance is an extensional reference to a source
    - Active data is an intensional reference
    - Reflect modifications of data and/or access rights

# Example of distributed access control

- Webdamlog
- Specifies who can read some data based on its provenance
- Datalog (aka declarative) specification
- Data transmitted from peer to peer keeps its access rights

# The web

- We take it as granted
- But it is changing
  - Smart phones and apps
  - Presence of private companies: advertisement and hunt for private data
  - Presence of governments: China, Russia, intelligence everywhere
- Time for a new web?
- Lots of research issues & political aspects

# The future of the web

Organizations are working on it

- Internet Government Forum (UN)
- Global Internet Policy Observatory (EU)
- W3C Technology Policy Internet Group

Researchers should participate

# Commons

- The commons is the cultural and natural resources accessible to all members of a society, including natural materials such as air, water, and a habitable earth. These resources are held in common, not owned privately.
  - Free software
  - Creative Commons pictures, books
  - Open data, open access in research
- General movement to ease access to culture é education
- Free resources on the web: different?
  - E.g., Google search

# Power comes with responsibility

## Power

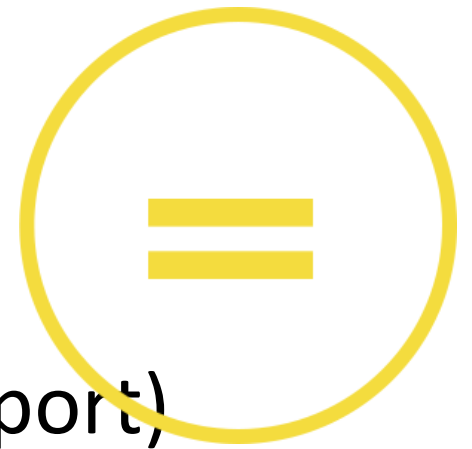
- A handful of big players command most of the world's computational resources and most of the data, including all of your personal data - an oligopoly

## Danger

- Threatens fair business competition
- Controls what information you receive
- Can guide your decisions
- Can infringe on your privacy and freedom
- Limits your freedom



# Neutrality



## Net and platform neutrality (CNNum report)

- net neutrality - the network is transporting data with no bias based on source, destination, content ...
- platform neutrality - big internet platforms should not discriminate in favor of their own services
- Related to fairness and diversity, verified with transparency tools

# Google antitrust case

**theguardian**

## European commission announces antitrust charges against Google

Inquiry will focus on accusations that internet search and tech multinational has unfairly used its products to oust competitors

Sam Thielman in New York

[@samthielman](#)

Wednesday 15 April 2015 07.27 EDT



Ruth Porat replaces Patrick Pichette as Google's chief finance officer. Photograph: Georges Gobet/AFP/Getty Images

The [European Union](#) accused Google on Wednesday of cheating competitors by distorting Internet search results in favour of its Google Shopping service and also launched an antitrust probe into its Android mobile operating system.

# Issues

Testing neutrality

Monitoring of neutrality

# Conclusion

Many societal and political fights today are related to computer science/data

The issues are clearly not only technical

Time to work on it

E.g.,

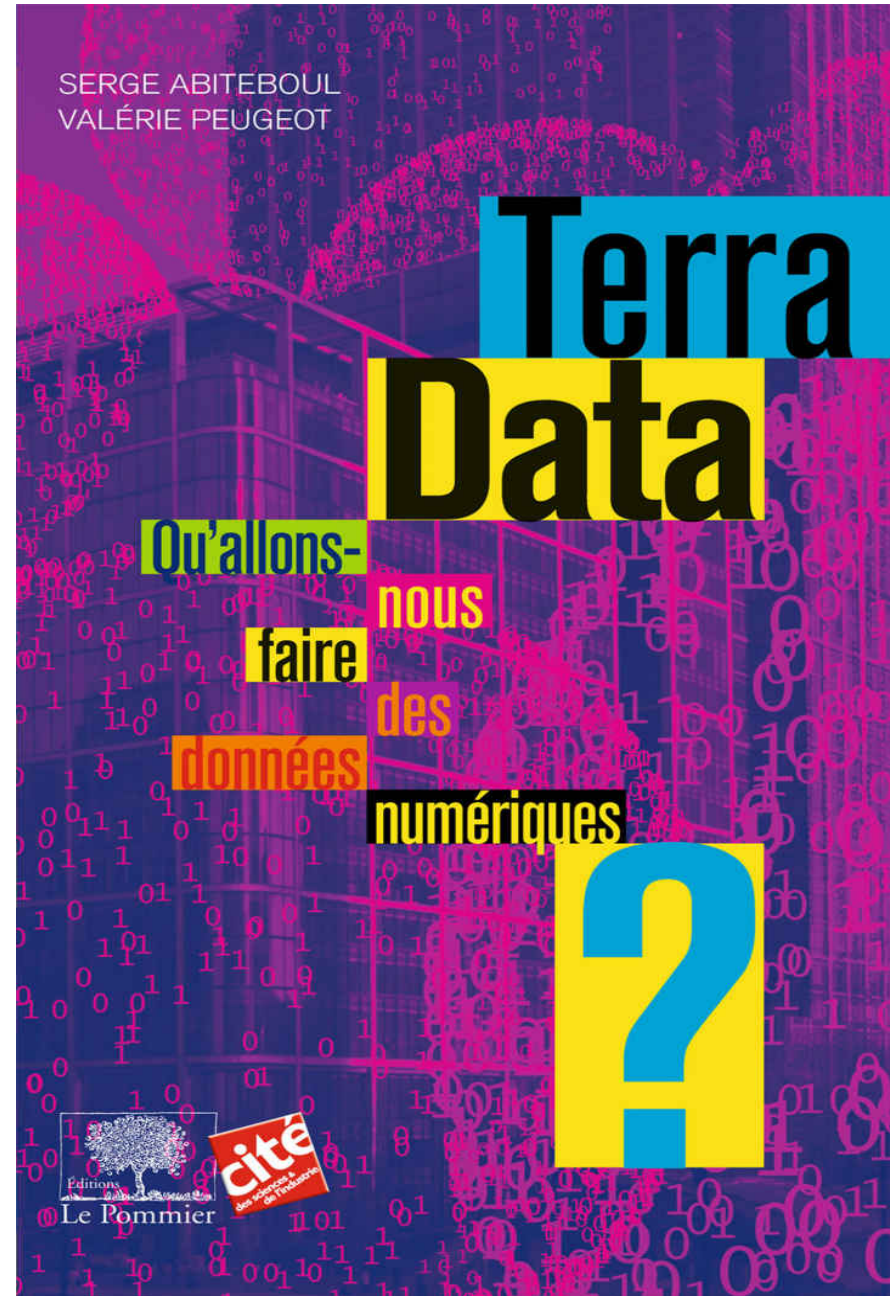
Time to change the way we manage personal data?

Time to change the web?

le temps des  
ILS TRANSFORMENT LES SCIENCES, L'INDUSTRIE, LA SOCIÉTÉ... ILS BOULE-  
algorithmes  
VERSENT LES NOTIONS DE TRAVAIL, DE PROPRIÉTÉ, DE GOUVERNEMENT,  
serge abiteboul  
DE VIE PRIVÉE... ET D'HUMANITÉ. QUI N'A PAS ENTENDU PARLER DES ALGORITHMES ? ILS  
et gilles dowek  
NOUS FACILITENT LA VIE, MAIS NOUS REDOUTONS ÉGALEMENT QU'ILS NOUS ASSERVISSENT...



[ESSAI LE POMMIER !]





<http://abiteboul.com>

<http://binaire.blog.lemonde.fr>

