

# Intelligences et apprentissages dans les villes numériques

---

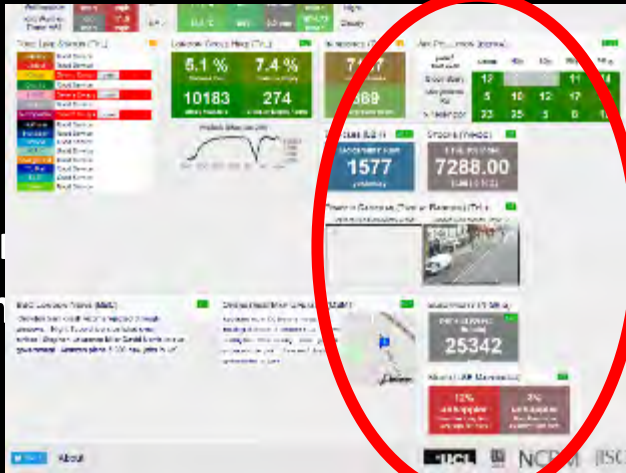
**Dominique BOULLIER**

Digital Humanities Institute  
EPFL

Dijon  
Juillet 2019

# **1. PLURALISME DES DIMENSIONS DE LA VILLE ET DES SMART CITIES**

# La boussole historique des villes



com  
et n

certitude

Quelle quatrième ville  
cosmopolitique?  
Re-composer les autres villes

Détachement

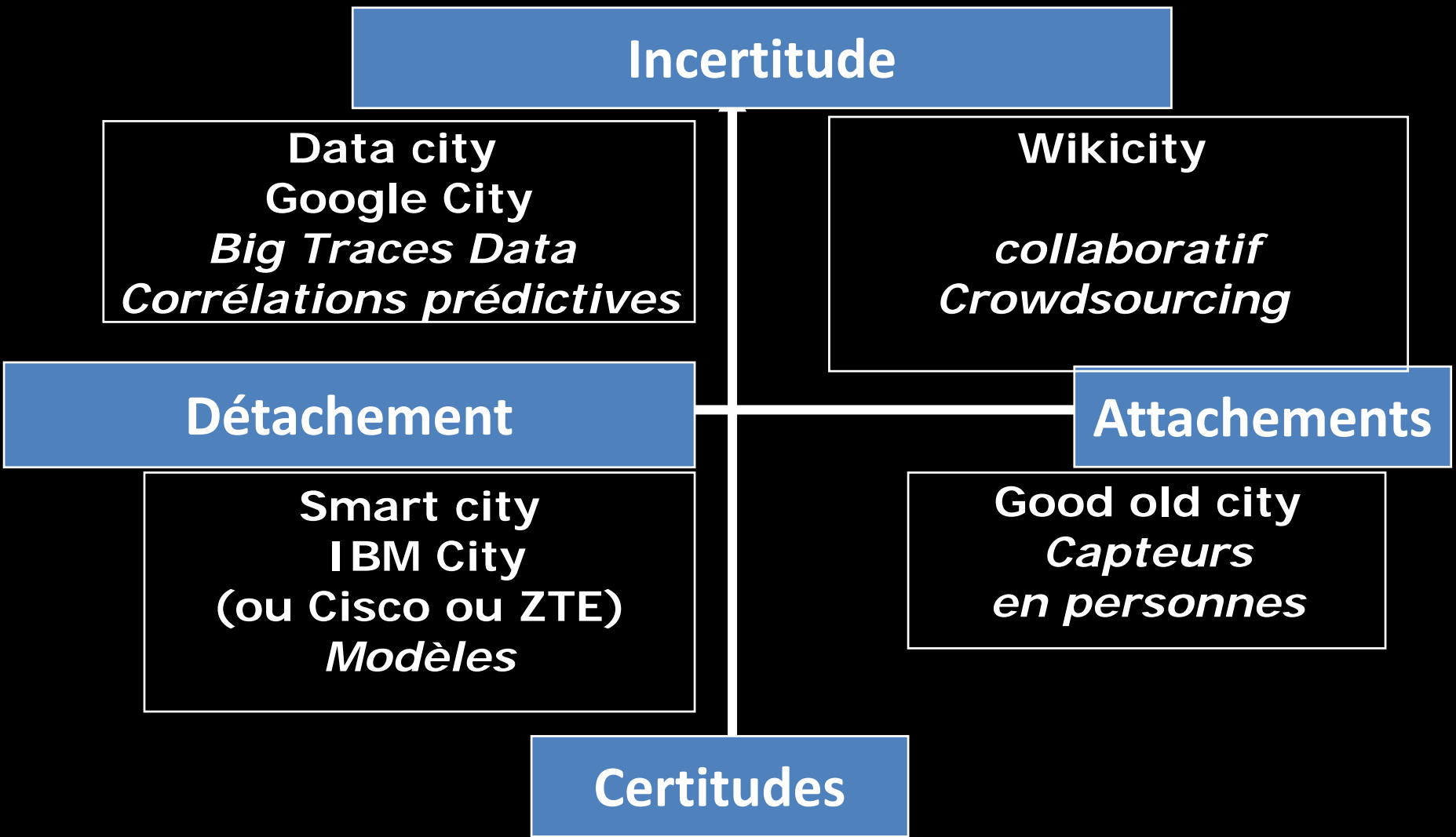
Attachements



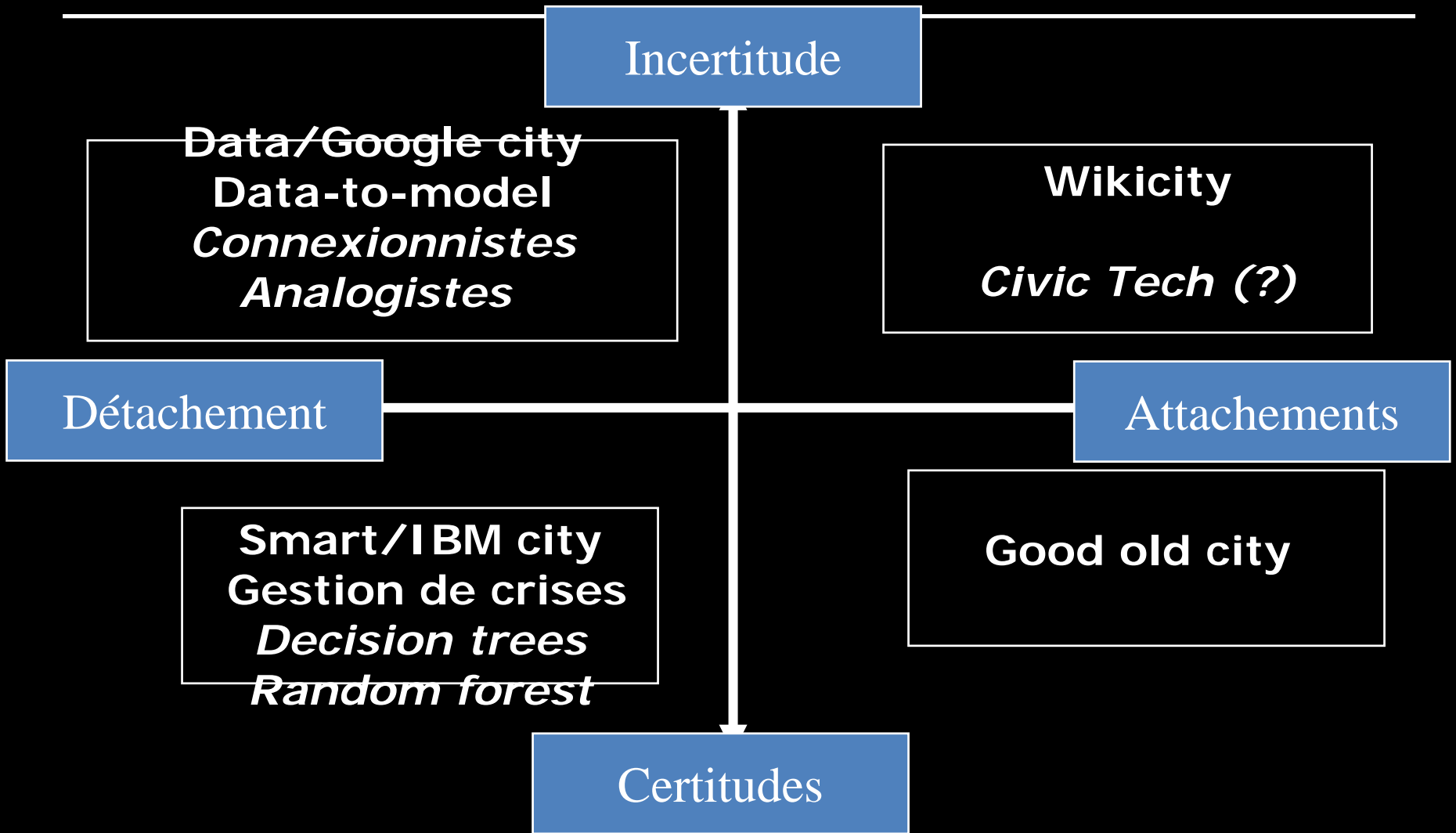
certitude



# Politiques des données urbaines



# Politique des algorithmes des données urbaines et choix de Machine Learning



## **2. IBM CITY : LES MODÈLES**

# City Command Center IBM

Rome

City-wide
Transportation
Public Safety
Facilities

Mayor Antonio Di Pietro

### CITY STATUS

OPTIMAL
  CAUTION
  TAKE ACTION

PUBLIC SAFETY	FIRE	CIVIL AFFAIRS	POLICE
TRANSPORTATION	AIRPORTS	MANAGEMENT	ROADS/TRAFFIC
WATER	FLOOD CONTROL	MANAGEMENT	QUALITY
BUILDINGS	EFFICIENCY	PUBLIC BUILDINGS	PUBLIC HOUSING
ENERGY	DISRUPTIONS	MAINTENANCE	SUSTAINABILITY
GOVERNMENT	ECONOMIC DEV.	SERVICES	PUBLIC SCHOOLS
HEALTH	DISRUPTIONS	HOME VISITS	PREVENTION

### TOP NEWS

Headline	Severity
Riots erupt in Rome as Italian Premier Silvio Berlusconi wins confidence votes	Extreme
Foreign dignitaries arriving for Papal Beatification	Severe
Italians worry over crumbling heritage	Moderate
World War II undetonated bomb found downtown	Severe
Italy arrests hundreds in illegal immigrants swoop	Moderate
Downtown warehouse fires raging	Severe

### KEY CONTACTS


**Public safety**

- Police Chief - San Renato
- Chief Inspector - Luis Olmos
- Senior Supervisor - Heather Reeds


**Staff**

- Deputy Mayor - Raul Valencia

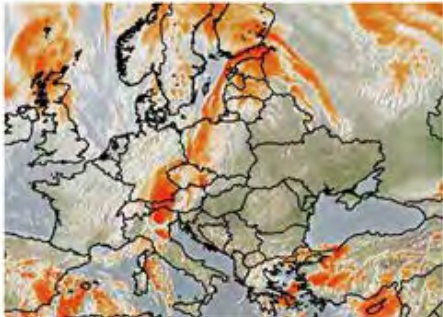
### KEY EVENTS



### PALAZZA



### WEATHER





# CENTRO DE OPERAÇÕES PREFEITURA DO RIO





# Les nouvelles villes nouvelles comme modélisation absolue

POPULAR SCIENCE PREMIUM  
WANT MORE?

POPSCI EXPEDITIONS

ENVIRONMENT

## Is Masdar City a ghost town or a green lab?

Tour Abu Dhabi's ambitious, and incomplete, eco-utopia.

By Molly McArdle April 24, 2018



About The Big Picture Events Programs & Research The Blog Newsroom [Subscribe](#)

PERSPECTIVES

## South Korea Conceptualizes the Ultimate Smart City

**Model to data:**

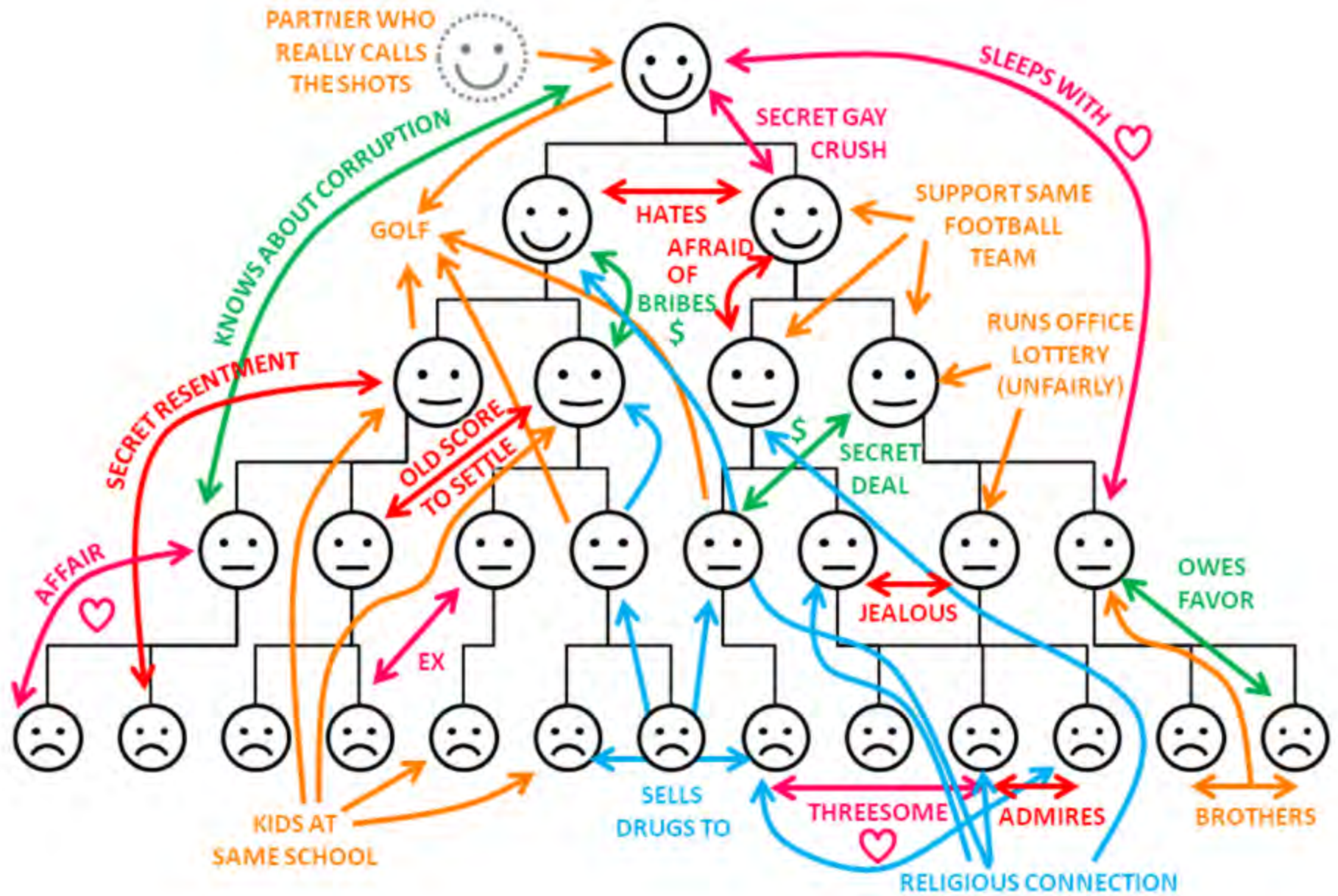
***Modèles du monde***

**Les ontologies**

**faciles à critiquer**

**par les sciences sociales**

**L'époque de l'image fixe**



**Model-to-data**

*Modèles d'apprentissage*

**L'apprentissage permet de réviser à partir de tout input**

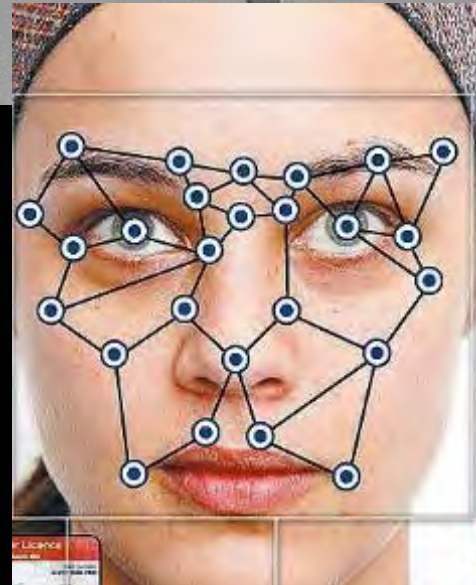
**L'époque de l'image animée**



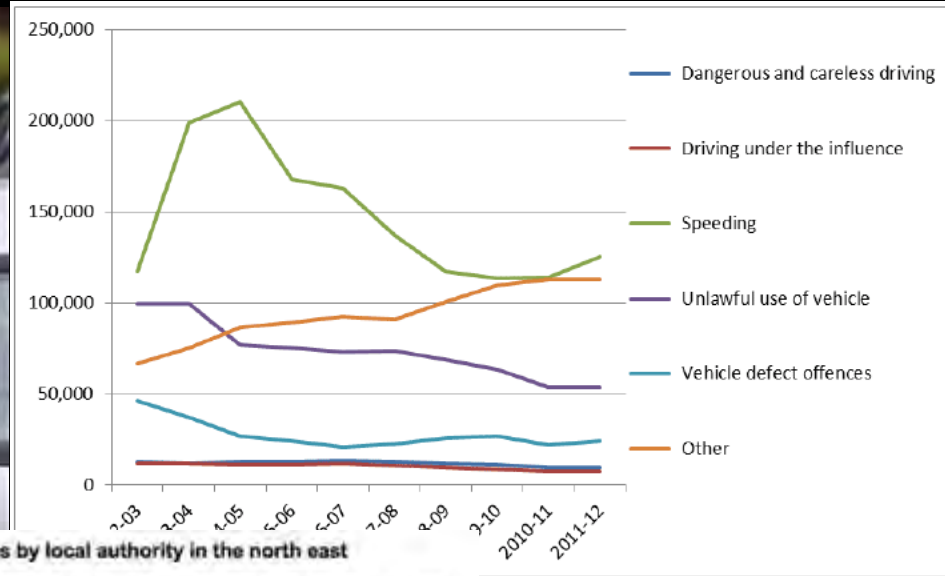
# Toujours plus de capteurs

## Des modèles toujours plus optimisés

### mais quel design organisationnel?



# Le *design organisationnel* du traitement des données dans la traffic police anglaise



Number and severity of young driver casualties by local authority in the north east

Local Authority	Fatal	Serious	KSI	Slight	Total
County Durham	16	102	118	789	907
Darlington	2	13	15	171	186
Gateshead	2	34	36	348	384
Hartlepool	0	18	18	115	133
Middlesbrough	0	20	20	225	245
Newcastle upon Tyne	0	45	45	471	516
North Tyneside	1	17	18	277	295
Northumberland	7	57	64	580	644
Redcar and Cleveland	3	34	37	159	196
South Tyneside	1	21	22	173	195
Stockton-on-Tees	1	40	41	230	271
Sunderland	5	39	44	433	477
<b>North East Total</b>	<b>38</b>	<b>440</b>	<b>478</b>	<b>3,971</b>	<b>4,449</b>

# **3. GOOGLE CITY : VÉLOCITÉ DES TRACES**

# L'empire de Google maps

## Data-to-model

### Approche par les flux de données

The image displays a Google Maps interface showing a route from Dijon to Lausanne. The left sidebar lists three travel options:

- Option 1:** 15:14 – 18:57, 3 h 43 min. Modes: IC5, RE, TER, TGV.
- Option 2:** 14:46 – 19:46, 5 h. Modes: IR90, FlixBus.
- Option 3:** 18:23 – 20:24, 2 h 1 min. Mode: Lyria. Includes a 1 min walk to the station at 18:23.

The map shows a blue route starting from Dijon - Gare and ending at Gare de Lausanne. Key locations along the route include Dole, Nans-Sous-Sainte-Anne, Yverdon-les-Bains, and Vevey. A 'Connexion' button is visible in the top right corner of the map area.

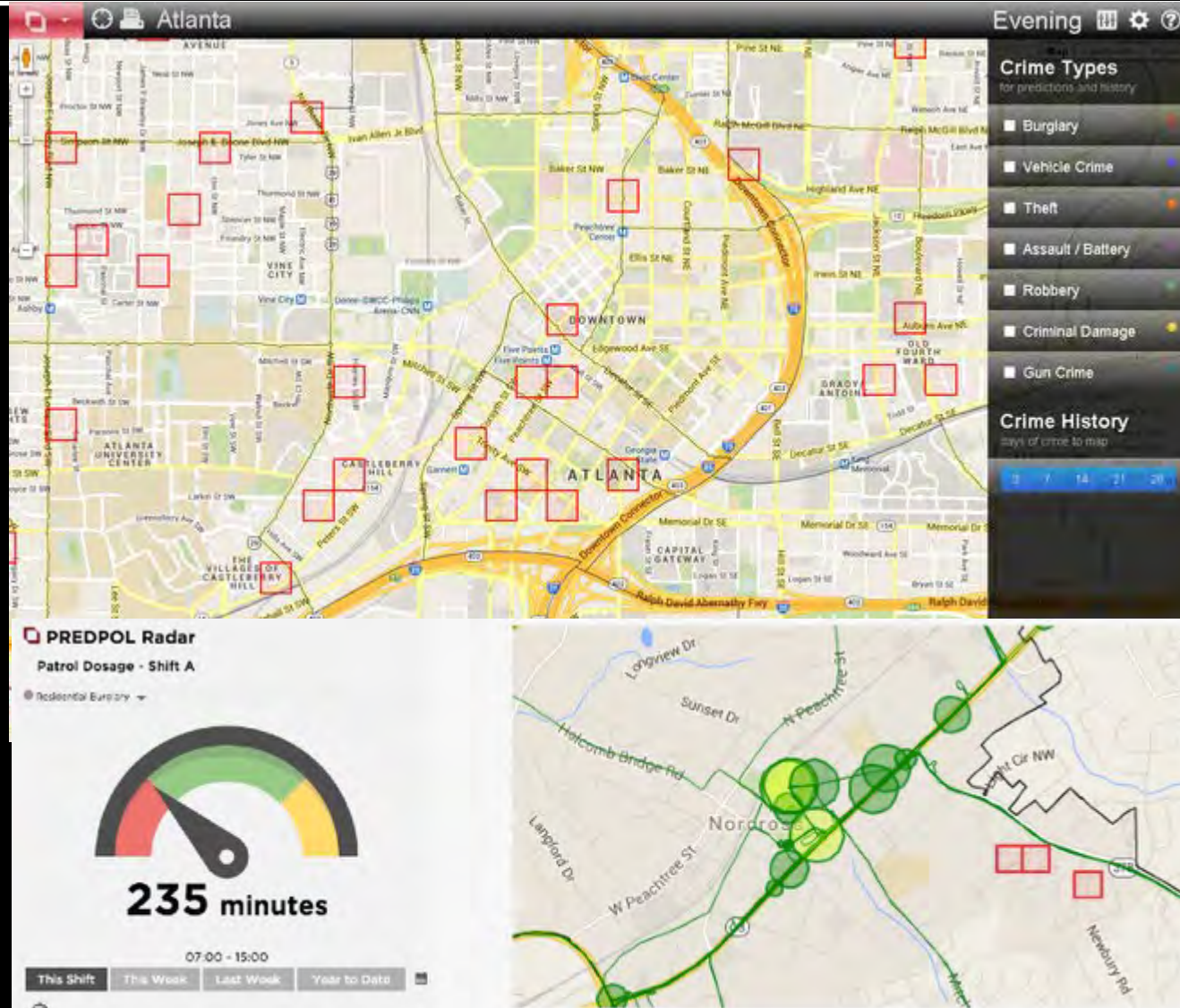


# Mais qui apprend et qui désapprend?

---



# Police prédictive: boîte noire ou machine learning responsable





12:00:00-04:00	LARCENY (OTHER)	-83.116	42.3312	01/01/11T12:00:00
12:00:00-04:00	LARCENY (OTHER)	-83.1406	42.401	01/01/11T12:00:00
0:00:00-04:00	INFORMATION	-83.1484	42.4222	01/01/11T0:00:00
0:00:00-04:00	INFORMATION	-83.138	42.4134	01/01/11T0:00:00
0:00:00-04:00	TELEPHONE USED FOR HARASSM	-83.2257	42.3534	01/01/11T0:00:00
0:00:00-04:00	DAMAGE TO PROPERTY - PRIVAT	-83.1265	42.3706	01/01/11T0:00:00
0:00:00-04:00	INFORMATION	-83.0952	42.362	01/01/11T0:00:00

## HunchLab European Overview

Have you wanted to explore a crime forecasting tool but hesitated because you were unsure of how it could work for a European law enforcement agency? In this webinar our team discusses how HunchLab can support the European market by providing a translated user interface and data residency within the EU.

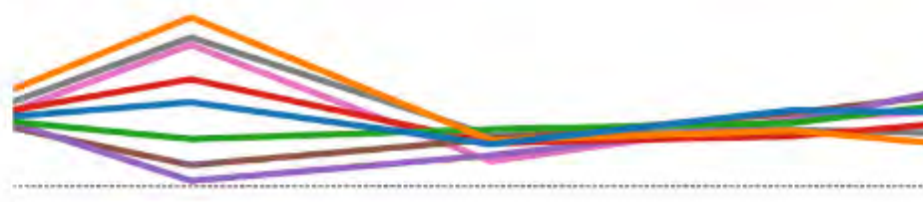
[Recording](#)

## Guidelines for Data Sets in HunchLab

Given that HunchLab can use many different types of data within its models, how do you prioritize the data to use? This webinar outlines the types of data that HunchLab can use and ways to think about prioritizing data sets.

[Recording](#)

101	100	2	75	30	2	80	60	2
2	2	50	2	2	60	2	2	40
1	1	1	1	1	1	1	1	1



## Allocation Engine

Is the best allocation of resources always going to the highest risk locations? This introduces the concept of metered dosage to improve HunchLab recommendations.

[Recording](#)

## Insights from HunchLab: Comparing Crime Correlates Across Four US Cities

What can we learn from the variables used to predict high risk? This webinar uses HunchLab to build predictive models across four U.S. cities using the same data sets and then compares the resulting models.

### Arrival Time (avg)



**6m49s**  
Agency Value

**6m12s**  
Local Value

### Total Time (avg)



### Response Time (avg)



**58m3s**  
Agency Value

**43m30s**  
Local Value

### Scene Time (avg)

**47m23s** ▲9.3%

**48m32s**  
Agency Value

### Event Count



**3.7K**  
Agency Value

**1.3K**  
Local Value

### Dispatch Time (avg)

**37m19s** ▲3.6%

**51m16s**  
Agency Value

## What modeling methods does HunchLab use to generate forecasts of crime?

In some ways, the model building process in HunchLab mimics the thought process of an experienced analyst. For instance, consider asking an analyst to decide where to place patrol resources for a given upcoming time period. She may start by looking at where crimes have occurred in concentration previously and delineate hotspots of activity. Based on her past experience, she may know that during this particular time period, schools dismiss their students, which increases petty crimes around the schools in the neighborhood. She builds up many such layers of knowledge and balances these various concerns to form a plan. After the time period concludes, she may go back and look at where activities occurred to see if she can determine additional insights into the crime patterns to include in future plans. HunchLab incorporates machine learning concepts to help the software “think” like a crime analyst by imitating years of experience drawn from a police department’s own data.

The primary model HunchLab currently uses is a stochastic gradient boosting machine (GBM) comprised of decision trees trained using the AdaBoost loss function. This model is built to forecast whether a crime event will occur or not in a given space-time raster cell (a binary outcome). The general way this model works is as follows:

- Begin by selecting a random portion of the training examples.
- Build a decision tree that separates examples of where crimes occurred from ones that didn't based upon the variables.
  - For instance, the first decision within the tree might be interpreted as: "if no event happened in the last year in this location, it is very unlikely for a crime to occur today". The decision tree then splits the examples into two sets: (1) where a crime occurred during the past year and (2) where no crimes occurred during the past year.
  - Within each set, the process repeats. For example, the next decision for the set of locations with crimes in the past year might be interpreted as: "if an event happened in the last week, it is more likely for one to occur today". This set of examples would again be split based upon this decision rule.
  - This process continues to build out a decision tree that describes why crimes occur where they do.
- The decision tree is then used to make predictions of how likely crimes are for each observation in the entire training data set.
- This completes one training iteration within the boosting machine.

- The modeling process then begins again.
  - We start by selecting another random portion of the training examples. This random sampling process is why the model is stochastic.
  - In this next iteration, we build another decision tree (in the same manner as above). This time, however, we build the tree to predict the errors from applying the first decision tree model to this new sample of observations. In this way we are attempting to correct our mistakes. This concept is called boosting.
  - We then use these two trees to make predictions across the entire data set.
  - As we conduct this process, we can keep track of how many training iterations within the machine have made incorrect predictions for each training example. We increase the importance (via weights) of observations that we continue to get wrong and decrease the importance of observations that we continue to get correct. This process is called adaptive boosting (AdaBoost). When we build the next decision tree, we tell it to focus on the observations that we continue to get wrong via these weights.
- Training iterations continue several hundred times. The resulting model represents tens of thousands of decision rules of why crimes occur where they do.
- We conduct this entire process several times, each time holding back a portion of the example data. We can then use each of these models to make predictions for this held-out set of data to

# Mais l'interprétabilité est possible et rend le Deep Learning plus performant !

*The Annals of Applied Statistics*

2015, Vol. 9, No. 3, 1350–1371

DOI: 10.1214/15-AOAS848

© Institute of Mathematical Statistics, 2015

## INTERPRETABLE CLASSIFIERS USING RULES AND BAYESIAN ANALYSIS: BUILDING A BETTER STROKE PREDICTION MODEL

BY BENJAMIN LETHAM<sup>\*,1</sup>, CYNTHIA RUDIN<sup>\*,1</sup>, TYLER H. MCCORMICK<sup>†,2</sup>  
AND DAVID MADIGAN<sup>‡,3</sup>

*Massachusetts Institute of Technology*<sup>\*</sup>, *University of Washington*<sup>†</sup>  
*and Columbia University*<sup>‡</sup>

We aim to produce predictive models that are not only accurate, but are also interpretable to human experts. Our models are decision lists, which consist of a series of *if...then...* statements (e.g., *if high blood pressure, then stroke*) that discretize a high-dimensional, multivariate feature space into a series of simple, readily interpretable decision statements. We introduce a generative model called Bayesian Rule Lists that yields a posterior distribution over possible decision lists. It employs a novel prior structure to encourage sparsity. Our experiments show that Bayesian Rule Lists has predictive accuracy on par with the current top algorithms for prediction in machine learning. Our method is motivated by recent developments in personalized medicine, and can be used to produce highly accurate and interpretable medical scoring systems. We demonstrate this by producing an alternative to the CHADS<sub>2</sub> score, actively used in clinical practice for estimating the risk of stroke in patients that have atrial fibrillation. Our model is as interpretable as CHADS<sub>2</sub>, but more accurate.

# Interprétabilité technique sans interprétabilité sociale?

---

## Interpretable Machine Learning



@ChristophMolnar

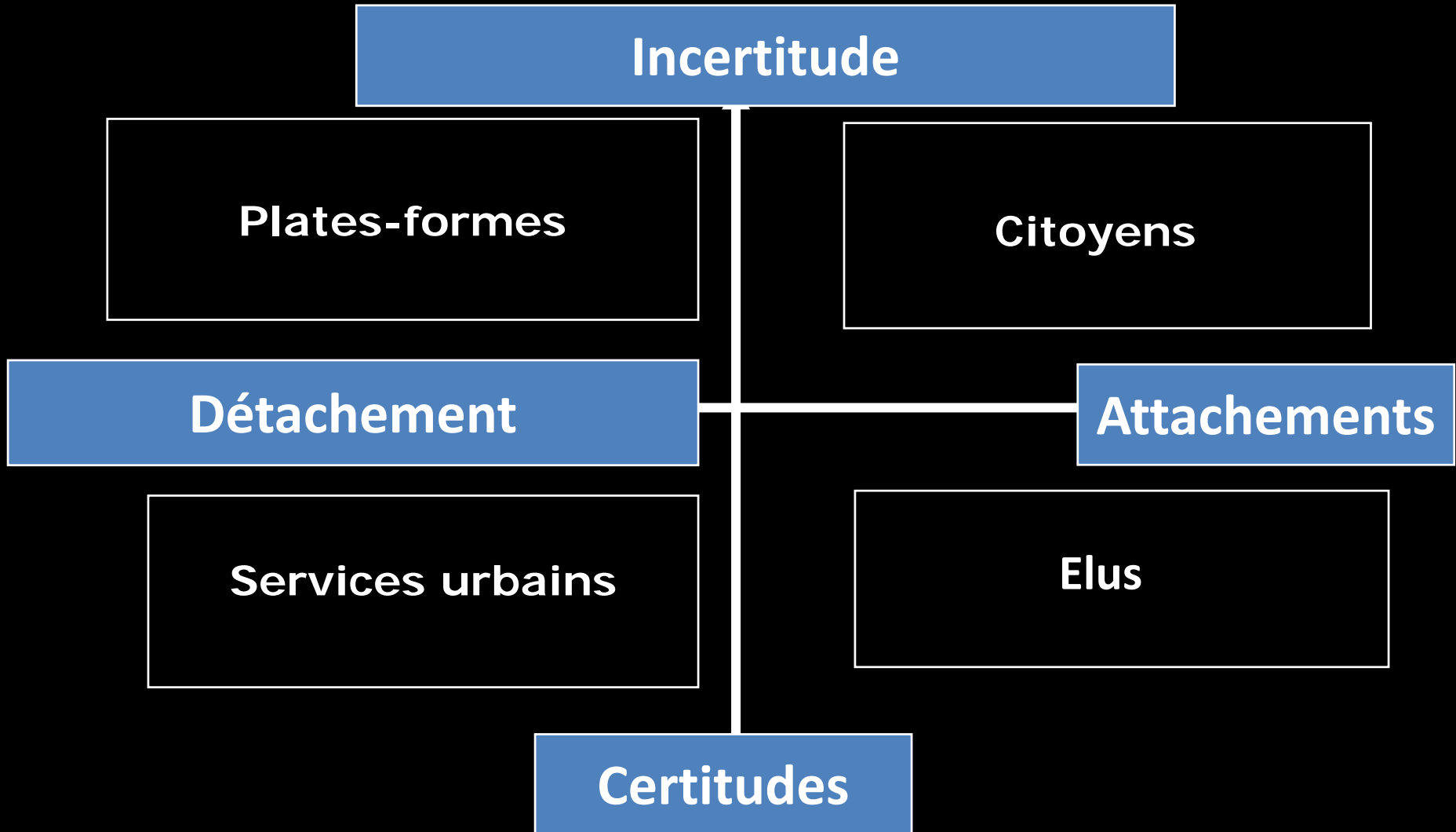


# Apprentissages

« Division of learning » (Zuboff)

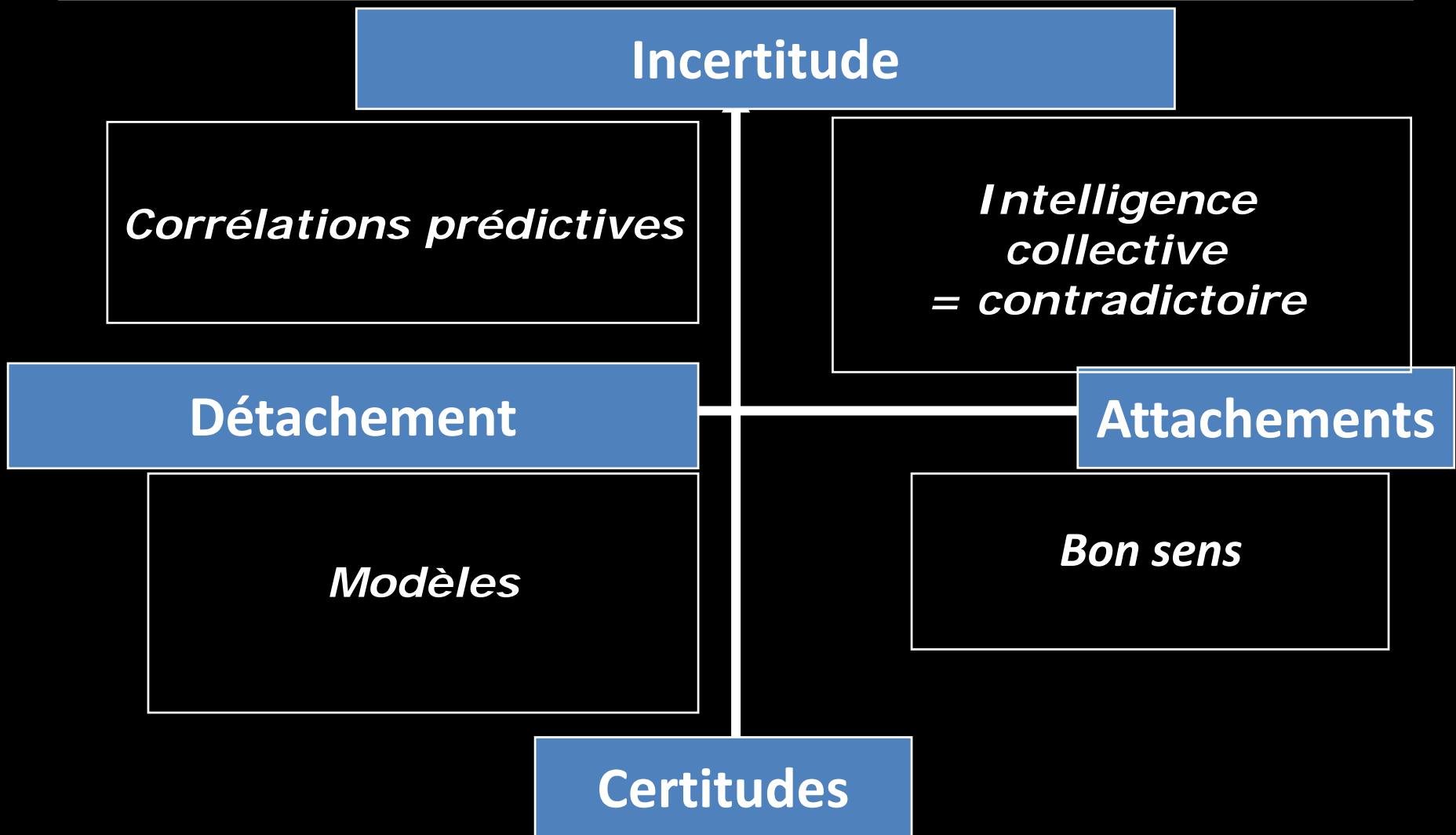
Les effets de dépossession (cf. PPP)

---

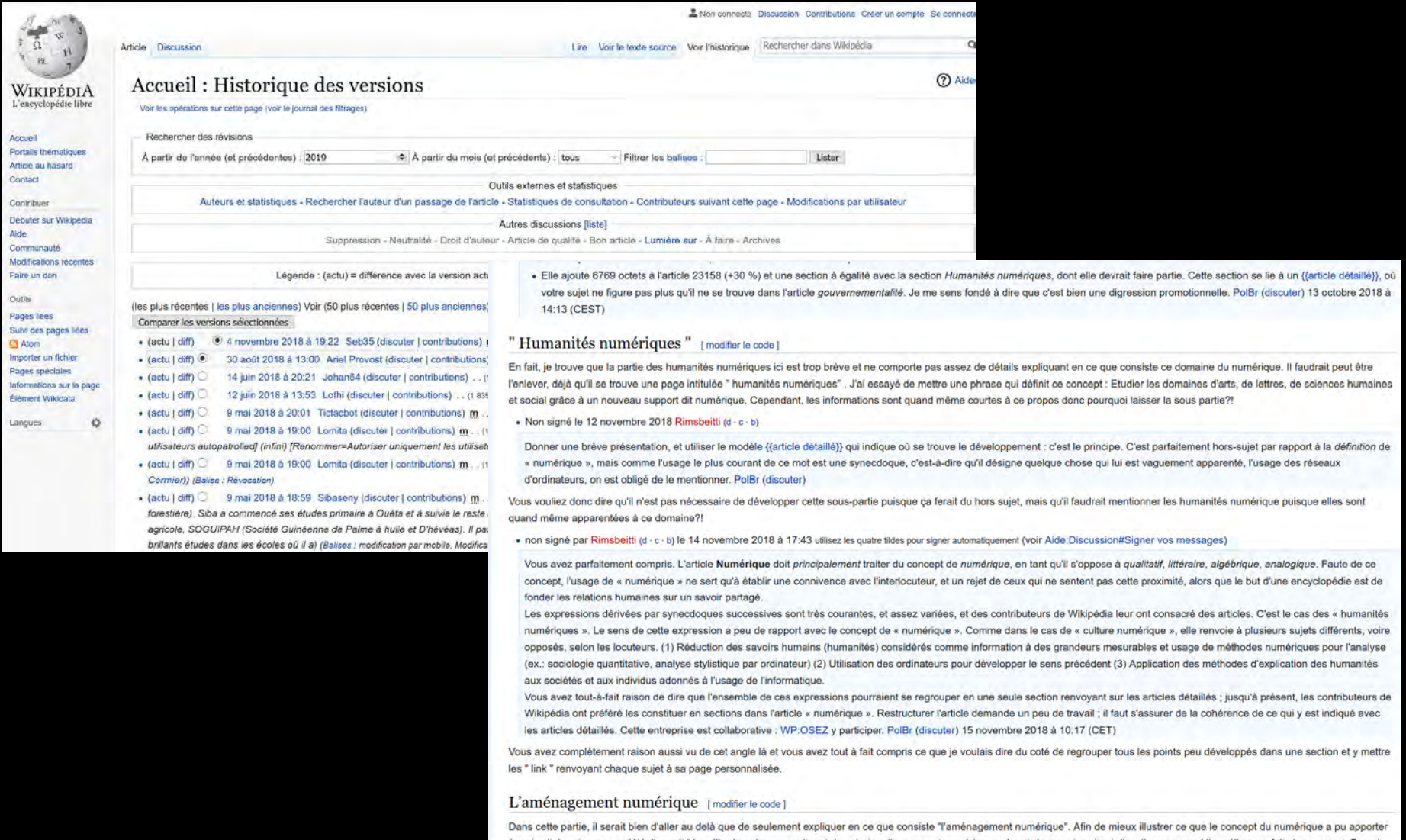


# **4. WIKI CITY : L'INTELLIGENCE COLLECTIVE**

# IntelligenceS



# L'importance de l'historique et de la discussion: le contradictoire!



WIKIPÉDIA L'encyclopédie libre

Article Discussion Lire Voir le texte source Voir l'historique Rechercher dans Wikipédia

## Accueil : Historique des versions

Rechercher des révisions

À partir de l'année (et précédentes) : 2019 À partir du mois (et précédents) : tous Filtrer les balises : Lister

Outils externes et statistiques

Auteurs et statistiques - Rechercher l'auteur d'un passage de l'article - Statistiques de consultation - Contributeurs suivant cette page - Modifications par utilisateur

Autres discussions [liste]

Suppression - Neutralité - Droit d'auteur - Article de qualité - Bon article - Lumière sur - À faire - Archives

Légende : (actu) = différence avec la version actuelle

(les plus récentes | les plus anciennes) Voir (50 plus récentes | 50 plus anciennes) Comparer les versions sélectionnées

- (actu) | diff) 4 novembre 2018 à 19:22 Seb35 (discuter | contributions) m...
- (actu) | diff) 30 août 2018 à 13:00 Ariel Provost (discuter | contributions) m...
- (actu) | diff) 14 juin 2018 à 20:21 Johan84 (discuter | contributions) m...
- (actu) | diff) 12 juin 2018 à 13:53 Lofhi (discuter | contributions) m... (1 835)
- (actu) | diff) 9 mai 2018 à 20:01 Tictacbot (discuter | contributions) m...
- (actu) | diff) 9 mai 2018 à 19:00 Lomita (discuter | contributions) m... (1 utilisateur autopatrouillé) [Renommer=Autoriser uniquement les utilisat...
- (actu) | diff) 9 mai 2018 à 19:00 Lomita (discuter | contributions) m... (1 Cormier) (Balise : Révocation)
- (actu) | diff) 9 mai 2018 à 18:59 Sibaseny (discuter | contributions) m... forestière) Siba a commencé ses études primaire à Ouésta et à suivre le reste agricole, SOGUIPAH (Société Guinéenne de Palme à huile et D'héveas). Il pa... brillants études dans les écoles où il a) (Balise : modification par mobile, Modific...

" Humanités numériques " [ modifier le code ]

En fait, je trouve que la partie des humanités numériques ici est trop brève et ne comporte pas assez de détails expliquant en ce que consiste ce domaine du numérique. Il faudrait peut être l'enlever, déjà qu'il se trouve une page intitulée "humanités numériques". J'ai essayé de mettre une phrase qui définit ce concept: Etudier les domaines d'arts, de lettres, de sciences humaines et social grâce à un nouveau support dit numérique. Cependant, les informations sont quand même courtes à ce propos donc pourquoi laisser la sous partie?!

- Non signé le 12 novembre 2018 Rimsbeitti (d · c · b)

Donner une brève présentation, et utiliser le modèle {{article détaillé}} qui indique où se trouve le développement : c'est le principe. C'est parfaitement hors-sujet par rapport à la définition de « numérique », mais comme l'usage le plus courant de ce mot est une synecdoque, c'est-à-dire qu'il désigne quelque chose qui lui est vaguement apparenté, l'usage des réseaux d'ordinateurs, on est obligé de le mentionner. PolBr (discuter)

Vous vouliez donc dire qu'il n'est pas nécessaire de développer cette sous-partie puisque ça ferait du hors sujet, mais qu'il faudrait mentionner les humanités numérique puisque elles sont quand même apparentées à ce domaine?!

- Non signé par Rimsbeitti (d · c · b) le 14 novembre 2018 à 17:43 utilisez les quatre tildes pour signer automatiquement (voir Aide:Discussion#Signer vos messages)

Vous avez parfaitement compris. L'article **Numérique** doit *principalement* traiter du concept de *numérique*, en tant qu'il s'oppose à *qualitatif*, *littéraire*, *algébrique*, *analogique*. Faut de ce concept, l'usage de « numérique » ne sert qu'à établir une connivence avec l'interlocuteur, et un rejet de ceux qui ne sentent pas cette proximité, alors que le but d'une encyclopédie est de fonder les relations humaines sur un savoir partagé.

Les expressions dérivées par synecdoques successives sont très courantes, et assez variées, et des contributeurs de Wikipédia leur ont consacré des articles. C'est le cas des « humanités numériques ». Le sens de cette expression a peu de rapport avec le concept de « numérique ». Comme dans le cas de « culture numérique », elle renvoie à plusieurs sujets différents, voire opposés, selon les locuteurs. (1) Réduction des savoirs humains (humanités) considérés comme information à des grandeurs mesurables et usage de méthodes numériques pour l'analyse (ex.: sociologie quantitative, analyse stylistique par ordinateur) (2) Utilisation des ordinateurs pour développer le sens précédent (3) Application des méthodes d'explication des humanités aux sociétés et aux individus adonnés à l'usage de l'informatique.

Vous avez tout-à-fait raison de dire que l'ensemble de ces expressions pourraient se regrouper en une seule section renvoyant sur les articles détaillés : jusqu'à présent, les contributeurs de Wikipédia ont préféré les constituer en sections dans l'article « numérique ». Restructurer l'article demande un peu de travail ; il faut s'assurer de la cohérence de ce qui y est indiqué avec les articles détaillés. Cette entreprise est collaborative : WP:OSEZ y participer. PolBr (discuter) 15 novembre 2018 à 10:17 (CET)

Vous avez complètement raison aussi vu de cet angle là et vous avez tout à fait compris ce que je voulais dire du coté de regrouper tous les points peu développés dans une section et y mettre les " link " renvoyant chaque sujet à sa page personnalisée.

## L'aménagement numérique [ modifier le code ]

Dans cette partie, il serait bien d'aller au delà de de seulement expliquer en ce que consiste "l'aménagement numérique". Afin de mieux illustrer ce que le concept du numérique a pu apporter

# Statut du public: utilisateurs-consommateurs



Tools to help **Communities** help **Themselves!**

[Login](#) | [Sign up](#)

[Citizens](#) | [community groups](#) | [government](#) | [media](#)

## Free Tools for Governing

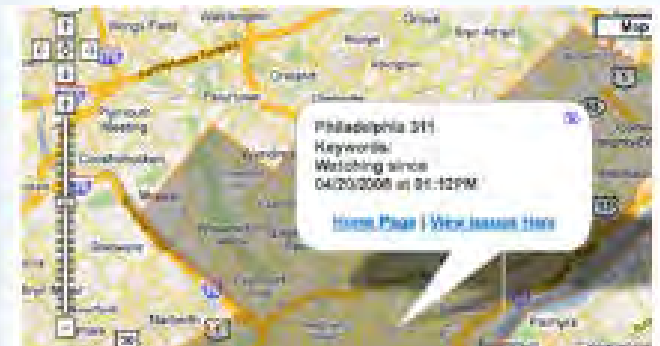
[More Tools for Governing](#)

- Transparent communication with citizens
- Speak to many once
- Free smartphone applications
- Open Data resources hosted by third party
- Deputize Citizen Inspectors
- Prioritize concerns by collective votes
- Facebook, Twitter and Blog Integration



## Create a Watch Area

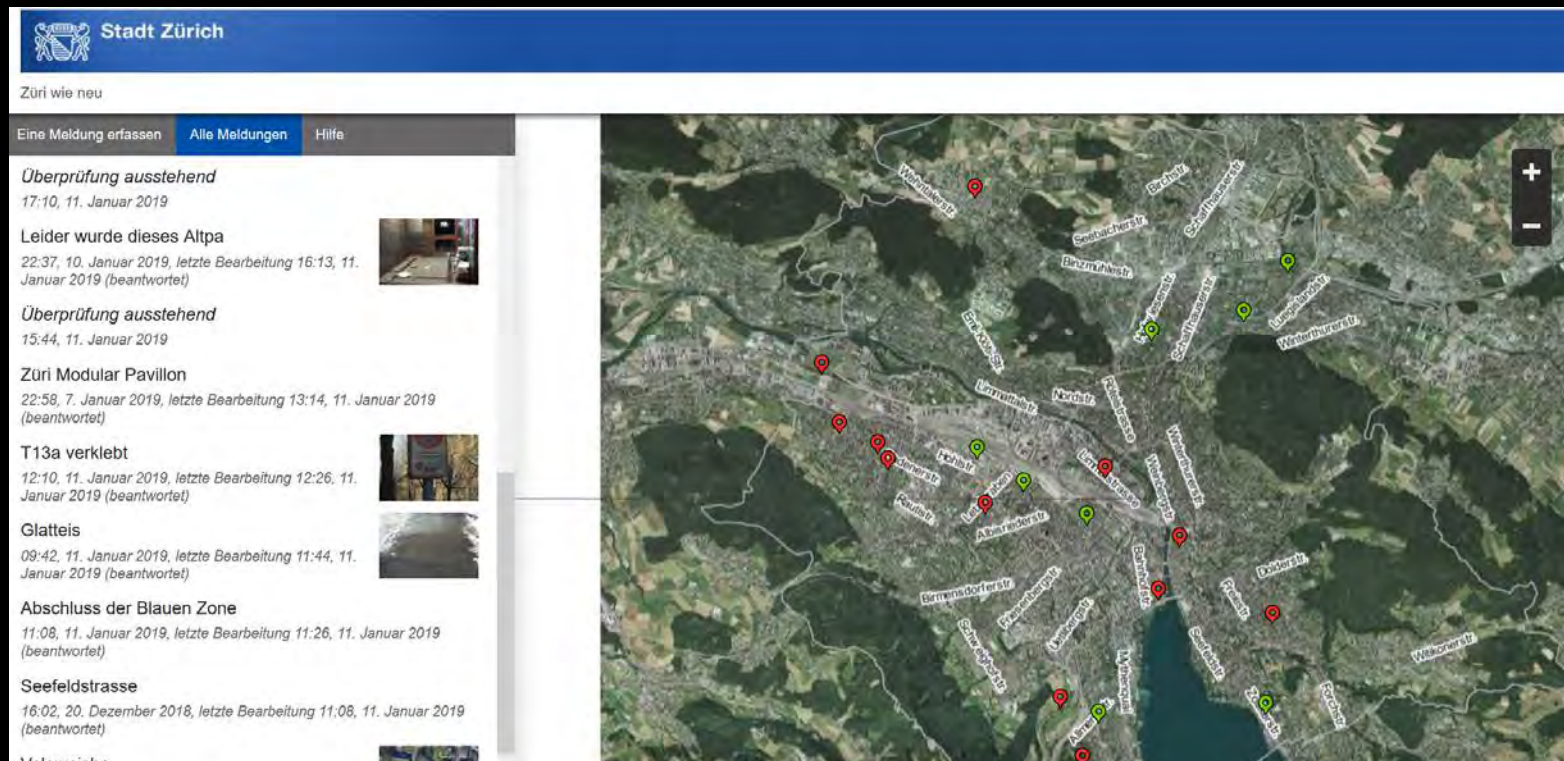
- Sign-up to receive alerts based on geography and keyword.
- Citizens can report to you by mobile web, iPhone app, SeeClickFix.com and from anywhere else SeeClickFix is embedded - like your website!
- Receive alerts by email or standard data resources such as GeoRSS, KML and JSON.



# Statut du public: lanceur d'alerte permanent

FixMyStreet, FixMaVille, Zueri wie neu, Signalez-nous Yverdon-les-Bains, ActivezMontreal, etc.

Format Open 311



The screenshot shows the 'Züri wie neu' website interface. At the top, there is a blue header with the 'Stadt Zürich' logo and name. Below the header, the page title 'Züri wie neu' is displayed. A navigation bar contains three buttons: 'Eine Meldung erfassen', 'Alle Meldungen', and 'Hilfe'. The main content area is divided into two columns. The left column lists several reports, each with a title, a timestamp, and a status. The right column shows a satellite map of Zurich with numerous red and green location markers indicating reported issues. The reports listed are:

- Überprüfung ausstehend**  
17:10, 11. Januar 2019  
Leider wurde dieses Altpa  
22:37, 10. Januar 2019, letzte Bearbeitung 16:13, 11. Januar 2019 (beantwortet)
- Überprüfung ausstehend**  
15:44, 11. Januar 2019
- Züri Modular Pavillon**  
22:58, 7. Januar 2019, letzte Bearbeitung 13:14, 11. Januar 2019 (beantwortet)
- T13a verklebt**  
12:10, 11. Januar 2019, letzte Bearbeitung 12:26, 11. Januar 2019 (beantwortet)
- Glatteis**  
09:42, 11. Januar 2019, letzte Bearbeitung 11:44, 11. Januar 2019 (beantwortet)
- Abschluss der Blauen Zone**  
11:08, 11. Januar 2019, letzte Bearbeitung 11:26, 11. Januar 2019 (beantwortet)
- Seefeldstrasse**  
16:02, 20. Dezember 2018, letzte Bearbeitung 11:08, 11. Januar 2019 (beantwortet)

# Statut du public: contributeur à la connaissance

## Quelques initiatives

- Observations de la flore



The image shows a collage of web pages related to invasive species mapping. The top page is 'EDD Maps' (Early Detection & Diagnostics Mapping System) with a navigation menu for 'Report Sightings', 'Distribution Maps', and 'Species'. It features a section titled 'Invasive Species Mapping Made Easy' with a list of benefits: 'Fast and easy to use', 'Real-time mapping of sightings to help take action', 'Facilitates Early Detection (notification with alerts and reduction of time)', 'One Database for both in- and out-of-country sightings', 'Data can be searched, in- and out-of-country', 'Compatible with and easy to integrate with existing systems', and 'Customized reports (reporting developed)'. Below this are 'Map It!' and 'Zap It!' buttons. The middle page is 'Map Invasives' with a search bar and a 'Maps and Data' section. The bottom page is the 'Invasive Plant Council of BC' website, featuring a 'Report Weeds!' call to action with the phone number '1-800-468-3333' and a 'What makes an invasive plant?' section.

EDD Maps  
Early Detection & Diagnostics Mapping System

Report Sightings | Distribution Maps | Species

### Invasive Species Mapping Made Easy

- Fast and easy to use
- Real-time mapping of sightings to help take action
- Facilitates Early Detection (notification with alerts and reduction of time)
- One Database for both in- and out-of-country sightings
- Data can be searched, in- and out-of-country
- Compatible with and easy to integrate with existing systems
- Customized reports (reporting developed)

Map It! | Zap It!

Map Invasives

### Invasive Plant Council of BC

Report Weeds!  
Call Toll Free: 1-800-468-3333

What makes an invasive plant?

# Un ancrage territorial défini par des pratiques

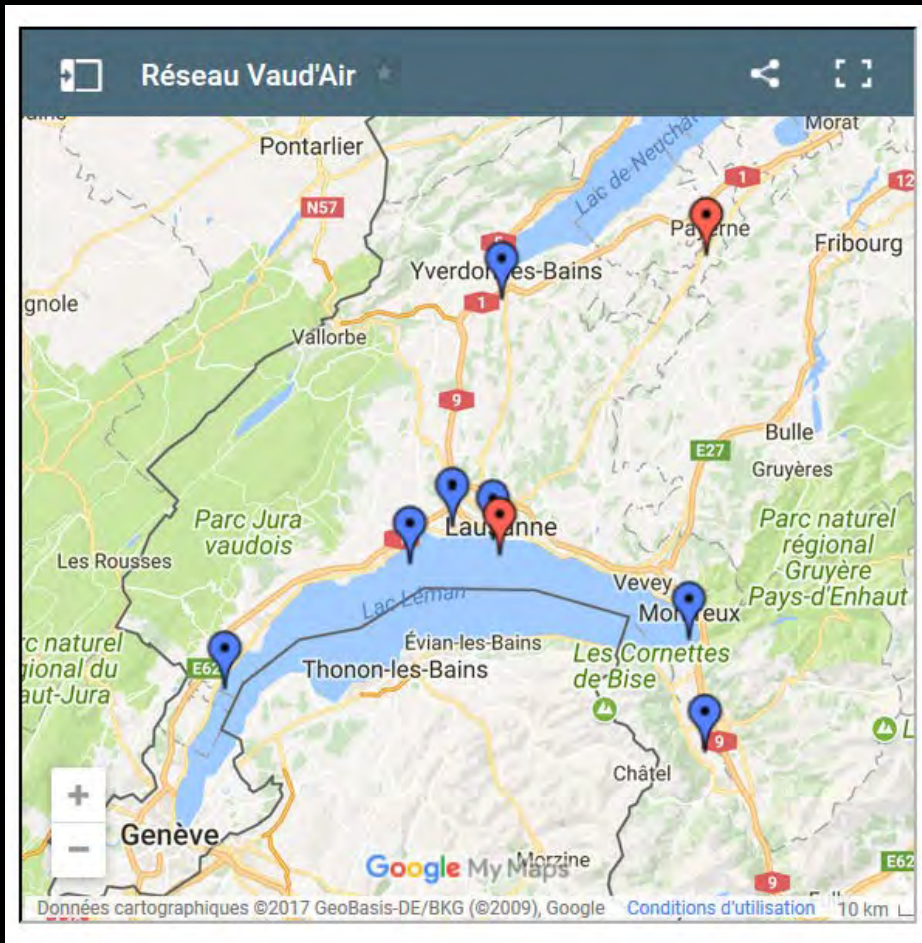
## Quelques initiatives

- Relevé de pollutions urbaines





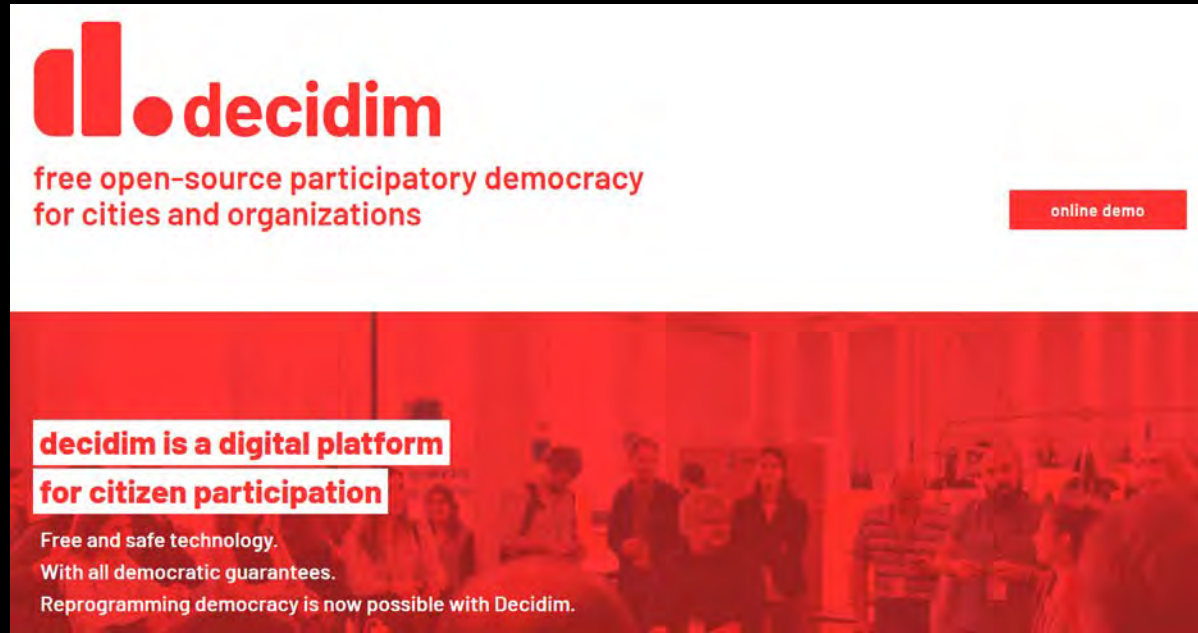
# Au-delà du règne des capteurs et des modèles/ systèmes de la démocratie des experts



# Statut du public: les citoyens débattent

---

- Decidim Barcelona, MeuRio, Decide Madrid,
- Neighborland, Stadt Nürtingen, Fluicity,
- EngagingPlan/ EngagingApps (Urban Interactive Studio)



The image shows a screenshot of the Decidim website. The top section is white and features the Decidim logo, which consists of three vertical bars of increasing height followed by the word "decidim" in a bold, lowercase sans-serif font. Below the logo, the text "free open-source participatory democracy for cities and organizations" is written in a smaller, lowercase sans-serif font. In the top right corner, there is a red rectangular button with the text "online demo" in white. The bottom section of the image is a red-tinted photograph of a group of people in a meeting or workshop setting. Overlaid on this image are two white rectangular boxes containing the text "decidim is a digital platform" and "for citizen participation" in bold, lowercase sans-serif font. Below these boxes, three lines of text are displayed in a smaller, lowercase sans-serif font: "Free and safe technology.", "With all democratic guarantees.", and "Reprogramming democracy is now possible with Decidim."

**decidim**  
free open-source participatory democracy  
for cities and organizations

online demo

**decidim is a digital platform  
for citizen participation**

Free and safe technology.  
With all democratic guarantees.  
Reprogramming democracy is now possible with Decidim.

# Civic Tech open source ou propriétaire = des apprentissages distribués différemment

---

- Open source

97Network, CaptainFact, Demodyne, Bluenove, Framaligue, Eurofordocs, Mieux voter, Collectif Tiriad, Tribute, Voxe (pour son comparateur), 7 Milliards d'Urbanistes.

## Propriétaires

- Cap Collectif, Citization, CitizenLab, Civocracy, D21, Datagora, Fluicity, ID City, Vooter, Zemus

**PROJETER UNE VILLE NUMÉRIQUE =>**

**PENSER:**

**1/ LE DESIGN ORGANISATIONNEL,**

**2/ LA DISTRIBUTION DES  
APPRENTISSAGES**

**3/ LES TYPES D'INTELLIGENCE MIS EN  
OEUVRE**