SEMINAIRE « INTELLIGENCE ARTIFICIELLE, ALGORITHMES ET MONDE PUBLIC »
« L'Intelligence artificielle va-t-elle superviser et orienter le travail des forces de sécurité » ?

Chaire Transformation de l'action publique
Science Po Lyon
3 mars 2021

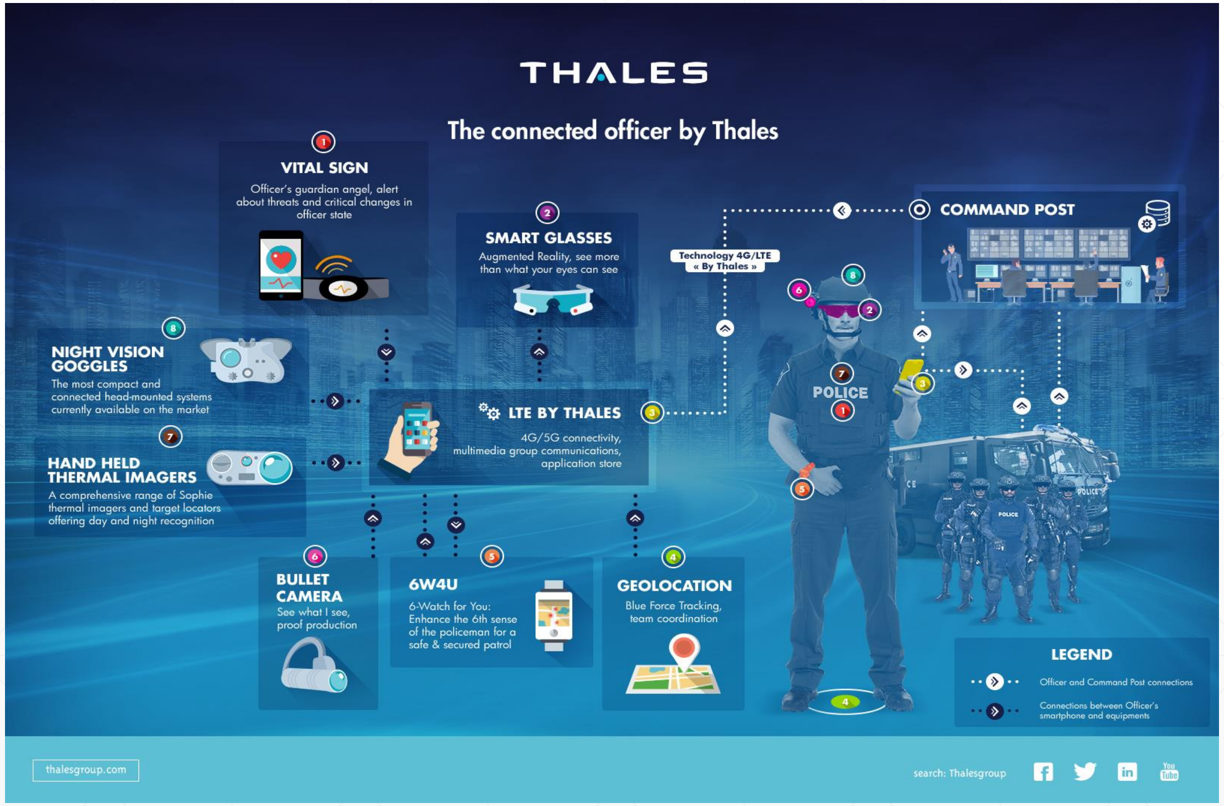
Predictive policing

Imaginaire cybernétique, moralisation des mathématiques et mathématisation de la morale

Plan de la présentation

- Imaginaire cybernétique : la sécurité dans un flux de données
- La réalité gestionnaire : une police productiviste
- Moralisation des mathématiques : critique des discriminations et interruption
- Mathématisation de la morale : l’équité dans la machine

Imaginaire cybernétique : la sécurité dans un flux de données



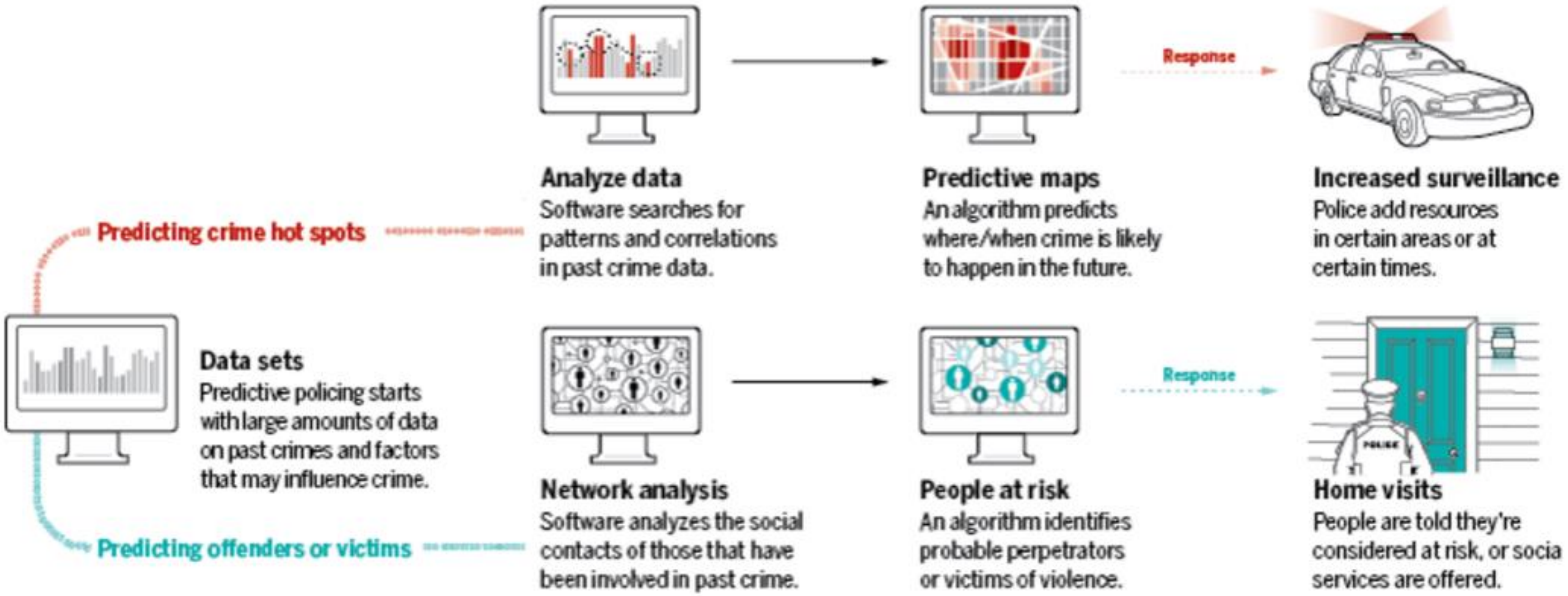


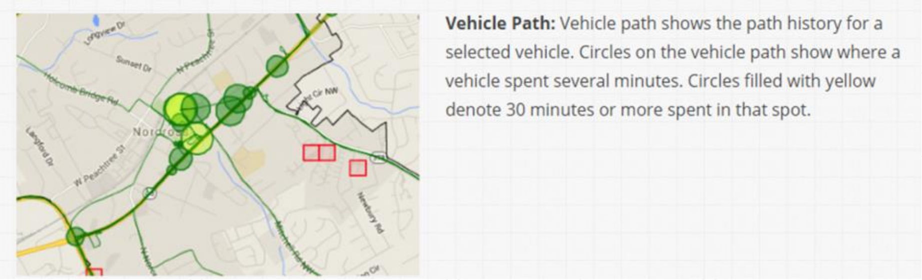
Diagram: G. Grullón/*Science*

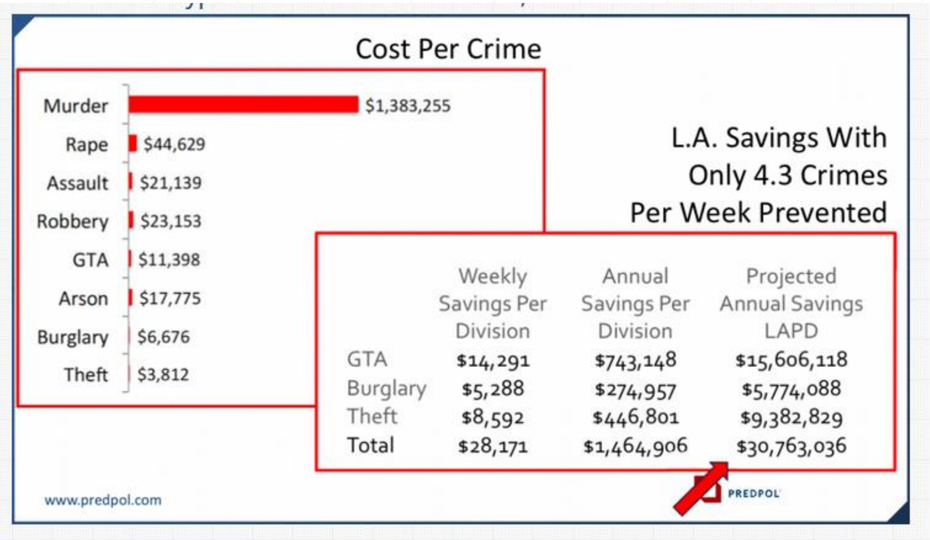
La réalité gestionnaire : une police productiviste

- Un « dosomètre »

- ROI = $\dfrac{Gains - Investment\ costs}{Investment\ costs}$

- Métriques d’équité





	Weekly Savings Per Division	Annual Savings Per Division	Projected Annual Savings LAPD
GTA	$14,291	$743,148	$15,606,118
Burglary	$5,288	$274,957	$5,774,088
Theft	$8,592	$446,801	$9,382,829
Total	$28,171	$1,464,906	$30,763,036

Moralisation des mathématiques : critique des discriminations et interruption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Over 450 academics reject Predpol

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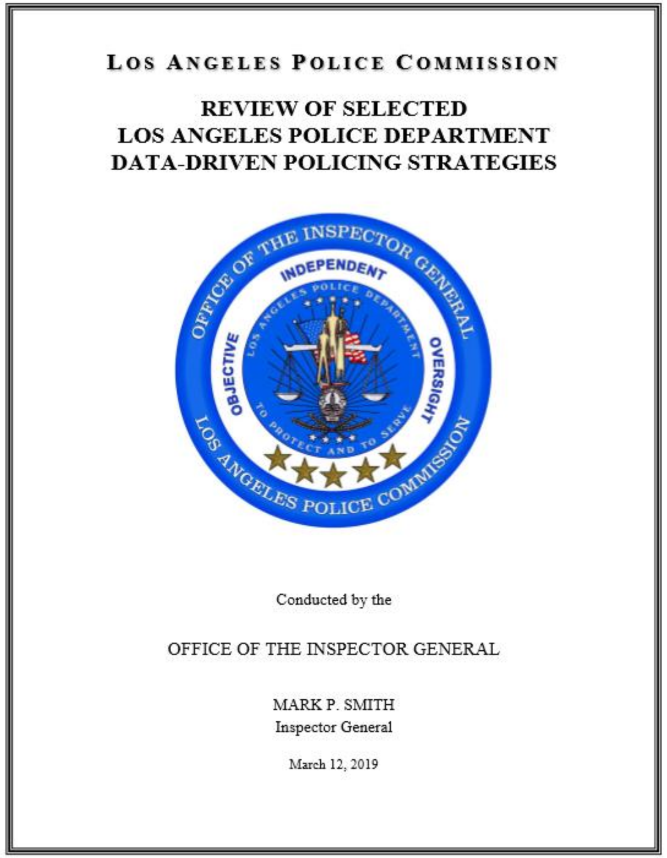
Oct 9, 2019 · 12 min read

Over 400 academics, faculty and students, from universities across the United States and abroad join 65 UCLA faculty and students rejecting the merits and ethics of UCLA Professor Jeff Brantingham's research behind Predpol and other algorithm and location-based policing, calling it "troubling legacies of anthropology and the social sciences."


LOS ANGELES POLICE COMMISSION

REVIEW OF SELECTED
LOS ANGELES POLICE DEPARTMENT
DATA-DRIVEN POLICING STRATEGIES

Conducted by the

OFFICE OF THE INSPECTOR GENERAL

MARK P. SMITH
Inspector General

March 12, 2019

NEWS · 19 JUNE 2020

Mathematicians urge colleagues to boycott police work in wake of killings

More than 1,400 researchers have signed a letter calling on the discipline to stop working on predictive-policing algorithms and other models.

Davide Castelvecchi

RELATED ARTICLES

What the data say about police brutality and racial bias — and which reforms might work

Reform predictive policing

Mathématisation de la morale

“Corbett-Davies et Goel (2018) proposent trois définitions formelles de l’équité, à savoir:
- « anticlassification »,
- « parité de classification »
- « calibration ».

L’anti-classification fait référence aux algorithmes qui ne prennent pas en compte les attributs protégés dans les méthodes de classification ou de prédiction; la probabilité d’un résultat est égale pour tous les individus, indépendamment de leur appartenance à un groupe.

Une autre classe d’algorithmes est appelée parité de classification, ou parité démographique; la probabilité d’un résultat est égale pour tous les individus appartenant à un même groupe.

Enfin, la troisième définition est connue sous le nom de calibration. Elle requiert que les résultats soient indépendants des attributs protégés après un contrôle du risque estimé. Par exemple, parmi les demandeurs de crédit qui ont 10% de chances de ne pas rembourser le crédit demandé, la méthode de calibration requiert que les taux de défaut de paiement soient les mêmes à travers plusieurs groups”.

Name	Closest relative	Note
Statistical parity	Independence	Equivalent
Group fairness	Independence	Equivalent
Demographic parity	Independence	Equivalent
Conditional statistical parity	Independence	Relaxation
Equal opportunity	Separation	Relaxation
Equalized odds	Separation	Equivalent
Conditional procedure accuracy equality	Separation	Equivalent
Disparate mistreatment	Separation	Equivalent
Balance for positive class	Separation	Relaxation
Balance for negative class	Separation	Relaxation
Predictive equality	Separation	Relaxation
Conditional use accuracy equality	Sufficiency	Equivalence
Predictive parity	Sufficiency	Relaxation
Calibration	Sufficiency	Equivalence

Patrice Bertail, D. Bounie, Stéphan Clémençon, Patrick Waelbroeck. Algorithmes : Biais, Discrimination et Équité. 2019. ⟨hal-02077745⟩

Solon Barocas; Moritz Hardt; Arvind Narayanan, *Fairness and Machine Learning*. Retrieved 15 December 2019.

The effect of differential victim crime reporting on predictive policing systems

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ABSTRACT

Police departments around the world have been experimenting with forms of place-based data-driven proactive policing for over two decades. Modern incarnations of such systems are commonly known as hot spot predictive policing. These systems predict where future crime is likely to concentrate such that police can allocate patrols to these areas and deter crime before it occurs. Previous research on fairness in predictive policing has concentrated on the ... models are trained on discov... plications for models trained ... demonstrate how differential ... geographical areas can lead to ... e hot spot prediction models. ... [1] patterned after district-level ... vey data for Bogotá, Colombia. ... crime reporting rates can lead ... pots from high crime but low ... rime and high reporting areas. ... in the form of over-policing

... d Alexandra Chouldechova. 2021. ... orting on predictive policing sys- ... tability, and Transparency (FAccT ... nada. ACM, New York, NY, USA, ... 3445877

... ld have been experimenting

modern incarnations of predictive policing date back to 2008, when the Los Angeles Police Department (LAPD) began its explorations of these systems, followe... New York Police Depart... including Azavea, KeySta... US-centric phenomenon, ... Europe, the UK, and Chi...

More recently, predic... scrutiny due to their lac... they may lead to further... by virtue of being train... Critics commonly point ... produce dangerous feedb... recent arrests is used to ... neighbourhoods where th... and conduct even more ... [33] and Ensign et al. [19... theoretically how such fe...

Proponents and devel... have argued that such an... policing that do not acc... inputs to such systems, n... dict. The analysis of Lum... demonstrates how using ... inputs to a self-exciting p... in PredPol would result i... and ethnic minority neig... they do not use data on ... in generating their predic...

ACM FAccT Conference 2021 2020 2019 2018 Network Connect Organization

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Algorithmic systems are being adopted in a growing number of contexts, fueled by big data. These systems filter, sort, score, recommend, personalize, and otherwise shape human experience, increasingly making or informing decisions with major impact on access to, e.g., credit, insurance, healthcare, parole, social security, and immigration. Although these systems may bring myriad benefits, they also contain inherent risks, such as codifying and entrenching biases; reducing accountability, and hindering due process; they also increase the information asymmetry between individuals whose data feed into these systems and big players capable of inferring potentially relevant information.

2018 IEEE International Conference on Systems, Man, and Cybernetics

A penalized likelihood method for balancing accuracy and fairness in predictive policing

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***Abstract*—Racial bias of predictive policing algorithms has been the focus of recent research and, in the case of Hawkes processes, feedback loops are possible where biased arrests are amplified through self-excitation, leading to hotspot formation and further arrests of minority populations. In this article we develop a penalized likelihood approach for introducing demographic parity into point process models of crime. In particular, we add a penalty term to the likelihood function that encourages the amount of police patrol received by each of several demographic groups to be proportional to the representation of that group in the total population. We apply our model to historical crime incident data in Indianapolis and measure the fairness and accuracy of the two approaches across several crime categories. We show that fairness can be introduced into point process models of crime so that patrol levels proportionally match demographics, though at a cost of reduced accuracy of the algorithms.**

***Index Terms*—Predictive Policing, Fairness, Hawkes Process, Maximum Penalized Likelihood Estimation, Demographic Parity**

I. Introduction

Crime events cluster in space and time forming "hotspots" where 25-50% of crime may be captured in only a few percent of the land area of a city [1]–[3]. Spatial-temporal predictive policing algorithms [4], [5] attempt to capture the space-time dynamics associated with hotspot formation and direct police patrols in response, which can then lead to crime rate reductions [4]. The predictive policing data cycle is shown in Figure 1, where input may be generated from victim reports or police initiated arrests (for example). This data enters the police database and is then used by a predictive algorithm to inform police activity and patrol. That activity may then influence future suspects and victims in the areas the algorithm selects for patrol, as well as in those areas that do not receive police attention.

algorithm leading to hotspot formation and further arrests of minority populations (see Figure 1). A similar concern is raised by Ferguson [11], who notes that arrests in a prediction area 'memorializes' that location as 'hot', which guarantees that it will show up again as a prediction area producing further arrests.

In this article we develop a penalized likelihood approach for introducing demographic parity into point process models of crime. Our goal is similar to the one developed in [12] where police patrols should match the "true" crime rate in an area, rather than crime rates that result from biased arrests. To achieve this goal, we add a penalty term to the likelihood function that encourages the amount of police patrol received by each of 1, ..., M demographic groups to be proportional to the representation of that group in the total population.

We note upfront that the introduction of a fairness penalty may lead to its own form of bias. Whereas biased arrests may result from interactions between police and suspects, bias may also adversely affect victims of crime [13]. Such bias may arise, for example, if an officer taking a report downgrades a burglary to a lesser crime as a result of the officer's implicit bias towards the victim's race/ethnicity. Fairness algorithms have the potential to operate in a similar manner. Consider the scenario for the predictive policing flow chart in Figure 1 characterized by a fairness algorithm being applied to crime reported by minority victims, leading to reduced hotspots in minority areas and less patrols, which then might lead to further crime rate increases in those areas.

In this paper we do not attempt, given a particular dataset and crime type, to distinguish between these forms of bias that may affect suspects or victims of crime differently. Instead, we explore the accuracy-fairness tradeoff when applying a fairness penalty to maximum likelihood estimation of point process

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