GHENT UNIVERSITY

FACULTY OF LAW AND CRIMINOLOGY

IRCP Institute for International Research on Criminal Policy
Ghent University

HPC for Crime Science

Big Data in Police & Crime Research

Speaker: Philipp M. Dau
*@**FOSDEM**'22 (February 6th 2022)*
HPC, Big Data, and Data Science devroom

CONTENTS

01 Police Patrol Project

FACULTY OF
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Effects of Proactive Patrol

- Where and when are officers patrolling?
- Do patrols prevent crime?
- How much patrol is needed to prevent crime and how long do these effects last?

FACULTY
OF SCIENCES

Improving Patrol Routing

- What are the spatiotemporal patterns of 911 calls?
- How to optimally route patrol cars with an optimized routing algorithm?

(see Dewinter et al. 2020)

Evidence-based policing:

Crime Concentration

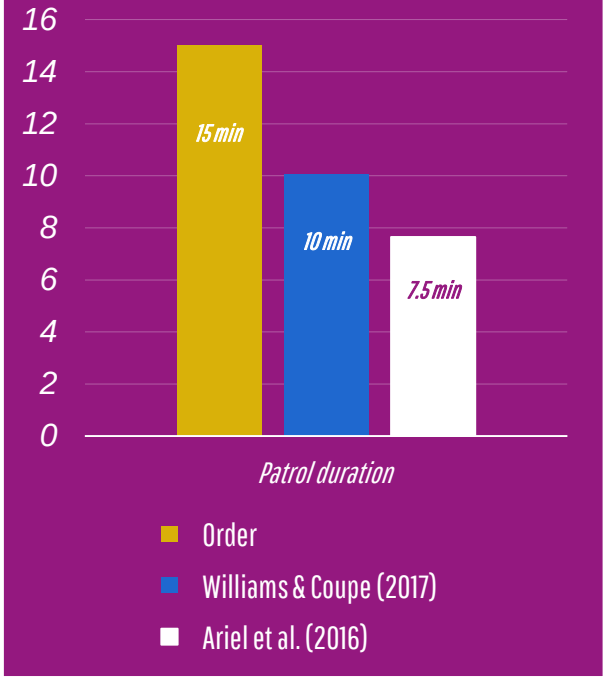
↓

Hot Spots Policing

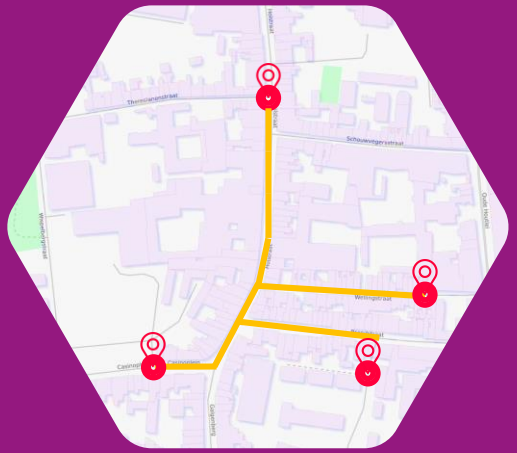
↓

Crime Reduction

Compliance



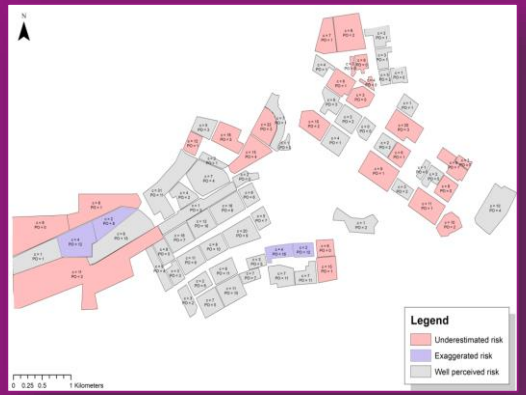
En route



Up to **57%** of patrol time potentially spent traveling

estimated based on *Ariel et al. (2016)*

Perception

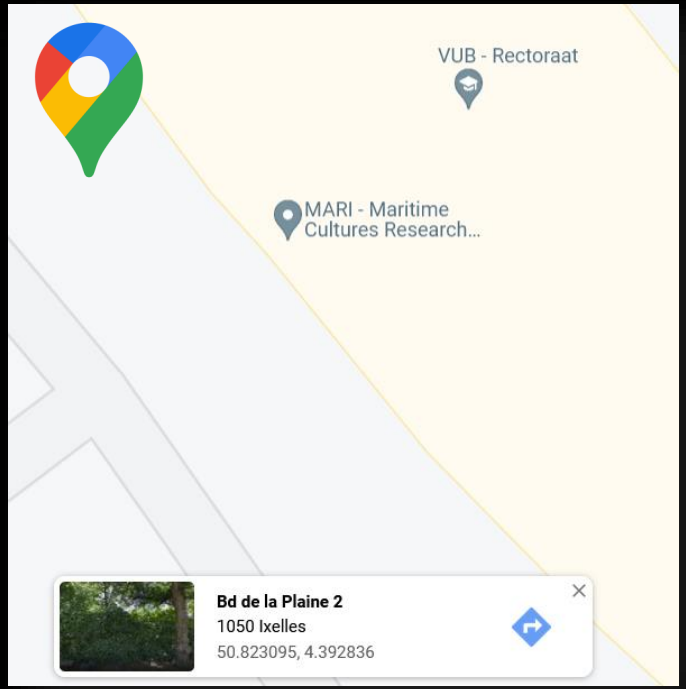


The risk level of **43%** of the policing area was underestimated by Serbian police officers (see, *Ilijazi et al. 2019*)

02 Geodata & HPC

Boulevard de la Plaine 2, 1050 Ixelles

4.392836, 50.823095
(long(*x*), *lat(y) in decimal degrees*)



Geodata & HPC - Geocoding

```r
#Created on Fri Dec 09 10:24:00 2021

#@author: Philipp M. Dau

rm(list = ls())

library(tidygeocoder)


Crime.df = data.frame('id' = 1:3,
                      "address" =
                        c("Thika Road, Nairobi,Kenya",
                          "Ronald Ngala Street, Nairobi, Kenya",
                          "Mombasa Road, Nairobi, Kenya"))

Crime.df$address = as.character(Crime.df$address)

geo_coordinates = geocode(Crime.df,address = address,method = "osm",
                          lat = latitude, long = longitude)

geo_coordinates
```

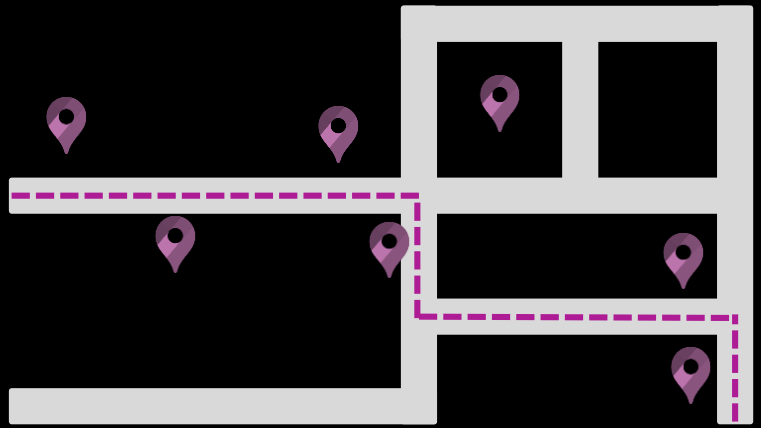
Google API

OSM API

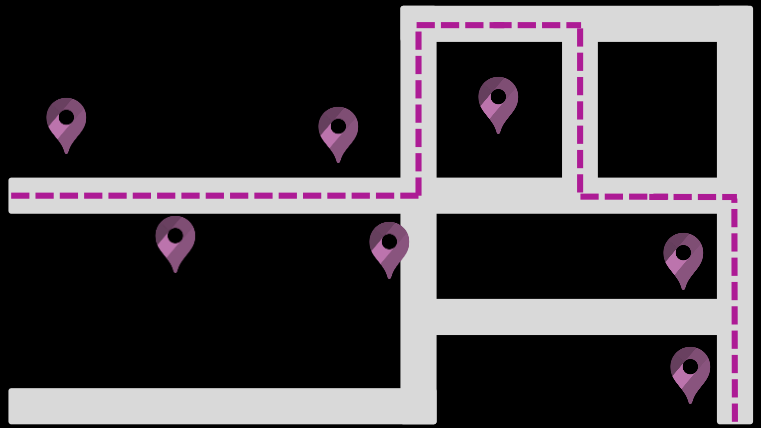
@Google & OSM

id	address	latitude	longitude
1	Thika Road, Nairobi,Kenya	-1.192294	36.92828
2	Ronald Ngala Street, Nairobi, Kenya	-1.286377	36.82662
3	Mombasa Road, Nairobi, Kenya	-1.331429	36.86055


Alfons Engelsstraat
Veldstraat
Street_GPS: Alfons Engelsstraat
Street_MapMatch: Alfons Engelsstraat
Name_Match: True



Probable path

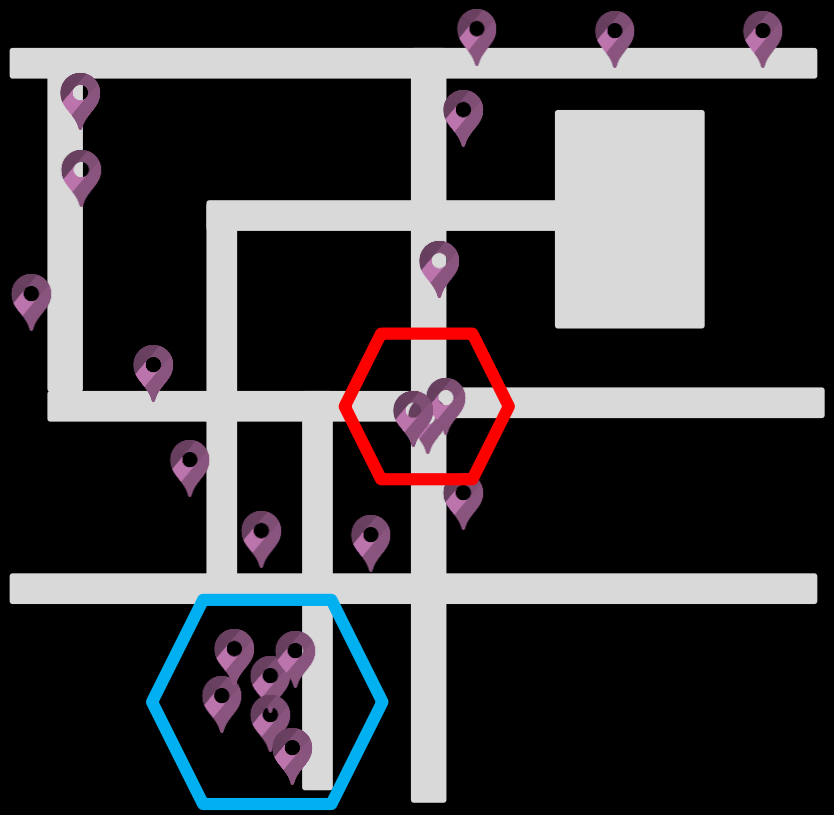


Less probable path

GPS-signal

calculated path

Geodata & HPC - Police Stop Algorithm (PSA)



Patrol stop

- location
- time
- purpose
- flash/siren

Random stop

- traffic light
- congestion
- encounter

Geodata & HPC - Big data analysis

Crime records

- 150,000

GPS data

- 400,000,000

Street segments

- 26,000

Time

- 1,095 days

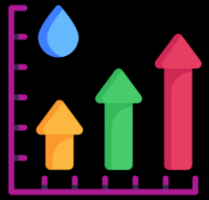
Place-days

- **28,470,000**

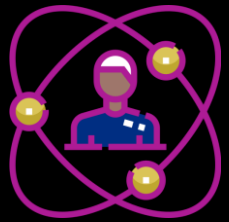
03 HPS Use in the Social Sciences

Focus on theory rather than data

Lack of skills & resources



Data collection complicated (test & track)



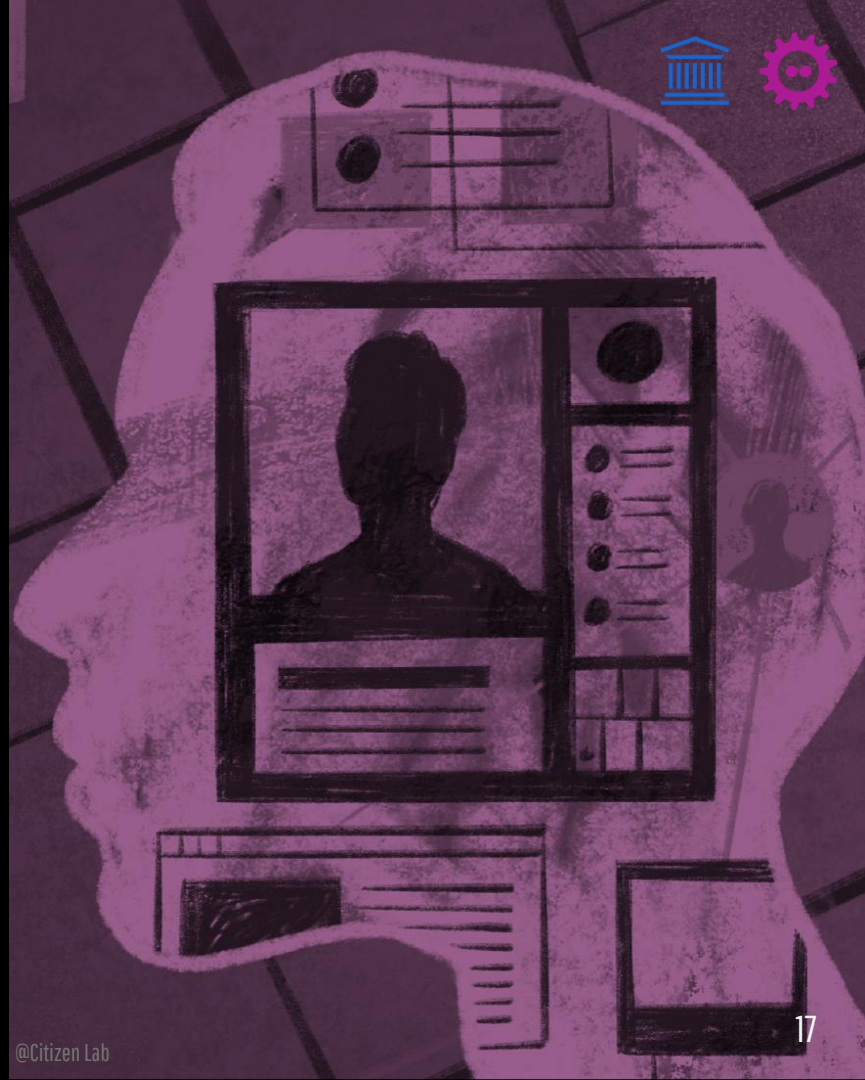
Personnel & expertise

04 Algorithms in Policing

Algorithms in Policing

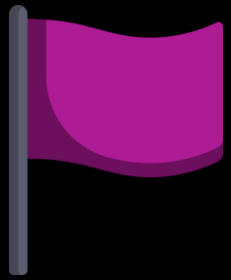
- Quality of police recorded data
- Underreporting of crime
- Predictive policing

Self-fulfilling prophecy



05 How can HPC support policing?

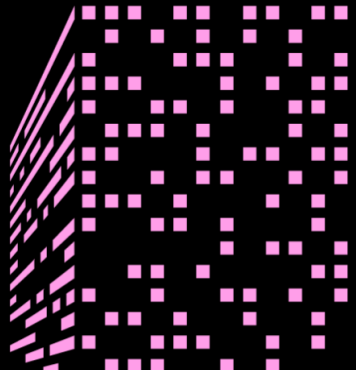
How can HPC support policing?

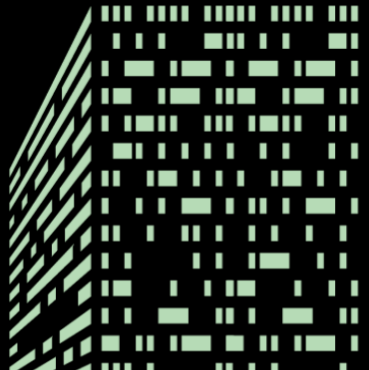


Support

Efficient

Safe





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