

# Drones, GIS and crime: Opportunities and challenges

Prof Gregory Breetzke

18/11/2016

Make today matter



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

Faculty of Natural and  
Agricultural Sciences

Fakulteit Natuur- en Landbouwetenskappe  
Lefapha la Disaense tša Tlhago le Temo

# Overview

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- My background
- Opportunities
- Challenges
- Questions
  - Who benefits?
  - Whose mandate?
  - What does the future hold?
- Final observations



# My background

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- Lecturer (University of Pretoria) (2008-2009)
- Lecturer- Senior Lecturer (University of Canterbury) (New Zealand) (2009-2014)



- Research Professor (UNISA) (2014-2016)
- Associate Professor (University of Pretoria) (2016- )

# My background

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- Environmental criminology
  - Spatial distribution of offenders and offences
- Spatial crime research
  - Crime and delinquency (patterns, distributions, associations, periodicity)
  - Crime, fear of crime, and health
  - Crime and alcohol
- Consultancy
  - South African Police Services
  - New Zealand Police
  - New Zealand Ministry of Health
  - New Zealand Ministry of Justice



# ...but first

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*“Scientists should be on tap, but not on top”*

Winston Churchill (1964)

# Opportunities

Active shooter

Hostage negotiation

Public unrest situations

Search operations

Crime surveillance and pursuit

Drug interdiction

Crime scene analysis



# Opportunities

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## Hostage standoff in Pretoria complex turns deadly

Sipho Mabena | 13 October, 2016 08:08



- 'Quadcopter'
- Biomimetic design
- Telepresence technology



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## Student protests throughout SA – the lowdown

**University of the Witwatersrand**  
Who has completed its lecture schedule for the 2018 academic year, despite student protests.  
Kwame Obeng-Mensah said the final step would be to make sure means were provided for a refund from the university registrar detailing the examination procedures for students, including changes to venues and starting times and application processes for deferred examinations, was sent to all students, followed by detailed communication from faculties.

**Nor West University**  
Officials said the situation remained relatively calm at its Mafeking campus this week with some catch-up tests written and exams scheduled to start tomorrow.

**University of the Free State**  
Teaching is expected to resume next week, but there will be no regular face teaching. This will be replaced by the distribution of printed and recorded lectures, study material and learning aids.

**Rhodes University**  
At Rhodes, where students clashed with police again this week and torched some of the buildings in the Grahamstown campus, university students were given an option to either write their exams next month or in January next year. Those who chose to write in January are expected to leave campus as soon as possible.

**University of Cape Town**  
All undergraduate face-to-face classes at UCT have been suspended since Monday, October 17. Academic activities have been continuing mostly via online and digital platforms.

**University of Cape Town**  
All face-to-face classes on campuses suspended for the rest of this year. Deferred, outstanding and re-assessments will take place in January next year.

Sources: Various university websites and calls to their communications units.

**Tshwane University of Technology**  
Students resolved this week not to stop sitting for free education in their discipline and will continue with the academic year. There were disruptions during the week when students claimed the university had decided to increase the fees by 9%. The university's senate resolved on Wednesday to waive the more expensive by two weeks to enable students to complete 2018 academic year and the exams.

**University of Johannesburg**  
The university has called on staff and students to remain focused and resolved on the successful completion of the 2018 academic programme.

**University of Limpopo**  
The university has called on staff and students to remain focused and resolved on the successful completion of the 2018 academic programme.

**University of Zululand**  
The university has called on staff and students to remain focused and resolved on the successful completion of the 2018 academic programme.

**University of the Western Cape**  
Classes have been suspended until tomorrow after protests earlier on in the week.

**Cape Peninsula University of Technology**  
All face-to-face classes on campuses suspended for the rest of this year. Deferred, outstanding and re-assessments will take place in January next year.

Sources: Various university websites and calls to their communications units.

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- ISS
- Facial recognition software



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Crime scene analysis

Abducted Soweto toddler reunited with his mom  
after being found in KZN

October 28, 2016 Julia Madibogo 465 Views KwaZulu-Natal, Mpande Khoza, Protea Glen, Siya Mlambo



- Cameras
- License-plate readers
- 'Real time intelligence'



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- Facial recognition software
- CCTV



# Opportunities

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News > World > Europe

## Melting snow being used by police to find cannabis farms in the Netherlands

Snow-free roofs can indicate the high temperatures needed to grow the drug



- Thermal cameras
- Spectroscopic sensors
- Cape Town experimenting



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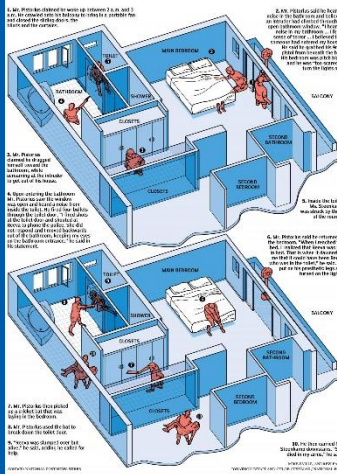
Crime scene analysis

## Oscar cops accused of scene contamination

CRIME & COURTS / 20 February 2013, 2:46pm

### PISTORIUS: HOW I KILLED REEVA

In an affidavit, Oscar Pistorius, the double-amputee track star, has told how he accidentally killed his girlfriend Reeva Steenkamp.



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BUT WAIT....



# Challenges

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Regulatory and legal issues

Technical issues

Practical issues

Nature of crime

1. Should the SAPS obtain warrants to use UAVs where subjects have a reasonable expectation of privacy?
2. Should the SAPS retain images captured by UAVs if they are not relevant to a crime?
3. Should the SAPS give the public meaningful notice of UAV use?
4. Should the use of UAVs by the SAPS be subject to tracking and audits, with accountability for misuse?
5. Should the SAPS use weaponised UAVs?



# Challenges

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Regulatory and legal issues

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Practical issues

Nature of crime

1. UAVs have operating limitations
  - height
  - time
  - speed
  - day/night
2. What to do with the data?



# Challenges

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Technical issues

Practical issues

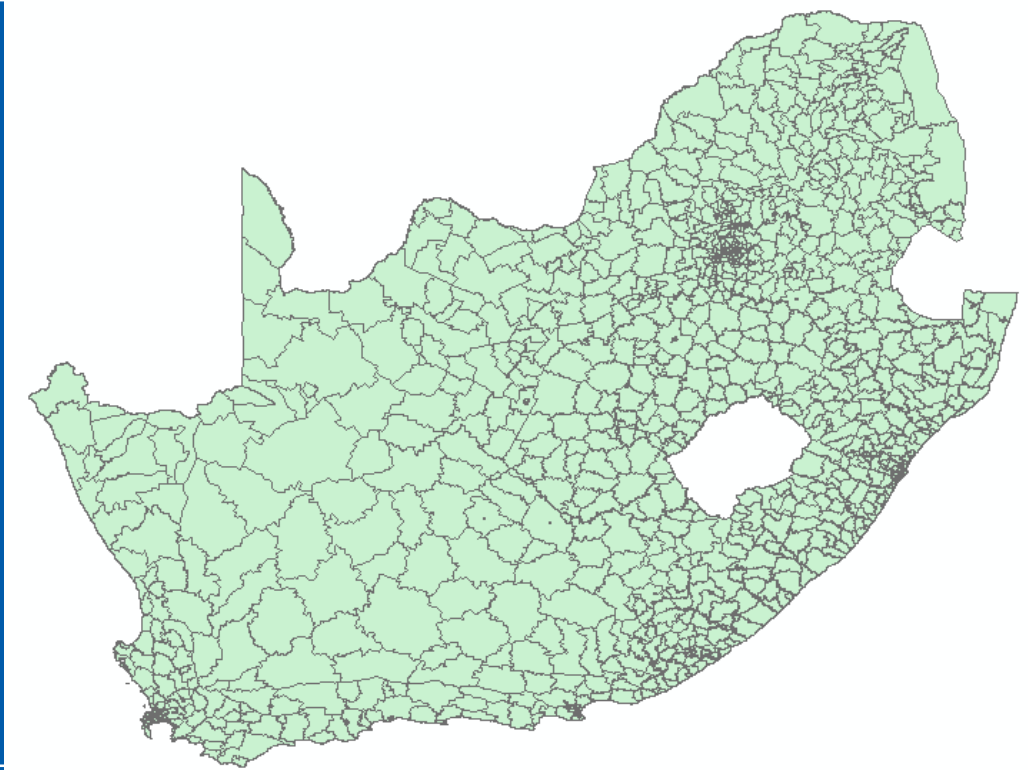
Nature of crime

1. Cost
2. Training
3. Maintenance
4. CAASA regulations
5. Warrants (Time)?
6. Buy-in from national and local government





# Challenges



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Nature of crime

1. Cost
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# Challenges

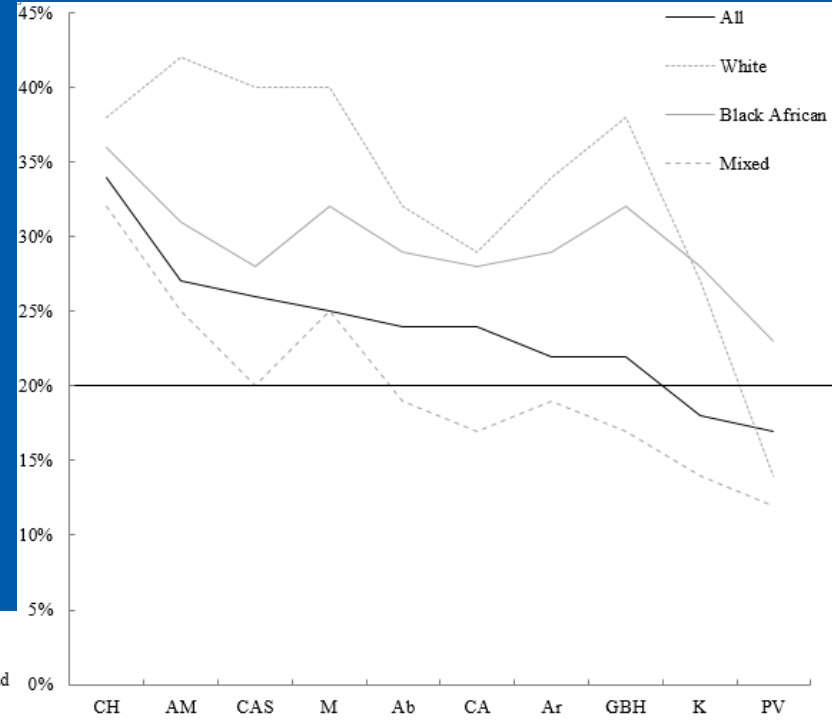
## 1. Space

Regulatory and legal issues

Technical issues

Practical issues

Nature of crime



### Application of the Pareto principle for violent crime in Tshwane

Note: CH: Culpable homicide; AM: Attempted murder; CAS: Common assault; M: Murder; Ab: Abduction; CA: Child abuse; Ar: Arson; GBH: Assault GBH; K: Kidnapping; PV: Public violence

# Challenges

**Descriptive statistics of violent crime in Tshwane by neighborhood type (2002-2007)**

	All neighborhoods ( <i>n</i> = 353)			White neighborhoods ( <i>n</i> = 113)			Black African neighborhoods ( <i>n</i> = 136)			Mixed neighborhoods ( <i>n</i> = 104)		
	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD
All violent crime	178509	505.7	1071.7	22813	201.9	230.3	103371	760.1	1268.4	52325	503.1	1253.8
Common assault	94342	267.3	620.4	15494	137.1	160.2	47058	346	697.4	31790	305.7	788.4
Assault GBH	62166	176.1	364.4	4513	39.9	48.9	42956	315.9	453.1	14697	141.3	367.1
Attempted murder	9171	26	53.9	1147	10.2	10.9	5964	43.9	74	2060	19.8	43.5
Murder	3765	10.7	22.9	324	2.9	3.1	2562	18.8	31.6	879	8.5	18
Culpable homicide	3038	8.6	16.7	644	5.7	6.3	1113	8.2	10.5	1281	12.3	27.2
Arson	2570	7.3	15.5	237	2.1	2.7	1758	12.9	20.6	575	5.5	13.4
Abduction	1522	4.3	9.6	212	1.9	2.5	788	5.8	9.5	522	5	13.4
Kidnapping	887	2.5	6.2	64	0.6	1	625	4.6	7.1	198	1.9	7.4
Child abuse	829	2.3	4.7	152	1.3	1.9	415	3.1	5.5	262	2.5	5.4
Public violence	219	0.6	1.5	26	0.2	0.5	132	1	1.9	61	0.6	1.5



# Challenges

Regulatory and legal issues

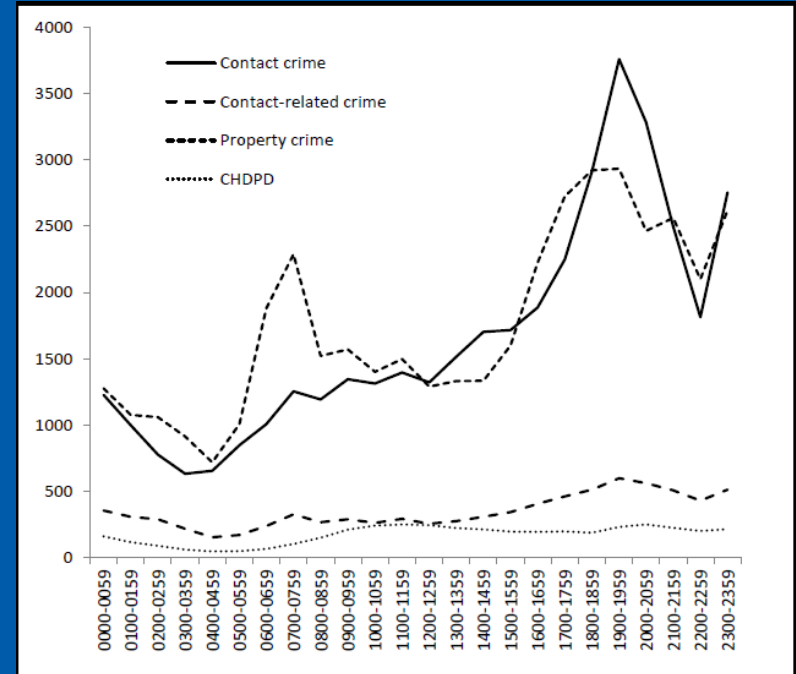
Technical issues

Practical issues

Nature of crime

1. Space

2. Time



# Challenges

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Regulatory and legal issues

Technical issues

Practical issues

Nature of crime

1. Space
2. Time
3. Modus operandi



# Who benefits?

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- Who should benefit...?
- Who could benefit...?
- Who will benefit...?
- Who won't benefit...?



# Who benefits?



<http://www.unequalscenes.com/>



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# Whose mandate?

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- South African Police Services (SAPS)?
- Private security companies?
- Private individuals?

*“There is no reason for the city to bear the cost of keeping up with technology. There are research and development companies only too happy to test their technology in the real-world environment.”*

## Drones over Cape Town could become a reality

**CRIME & COURTS** / 3 March 2016, 1:34pm

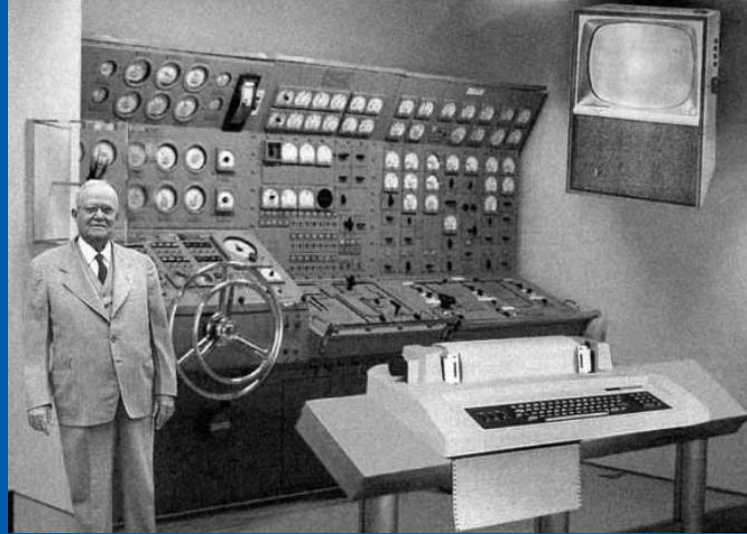
 Lindsay Dentlinger

Arne Purves,  
City of Cape Town's  
environmental compliance  
director



# What does the future hold?

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*Scientists from the RAND Corporation have created this model to illustrate how a "home computer" could look like in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.*

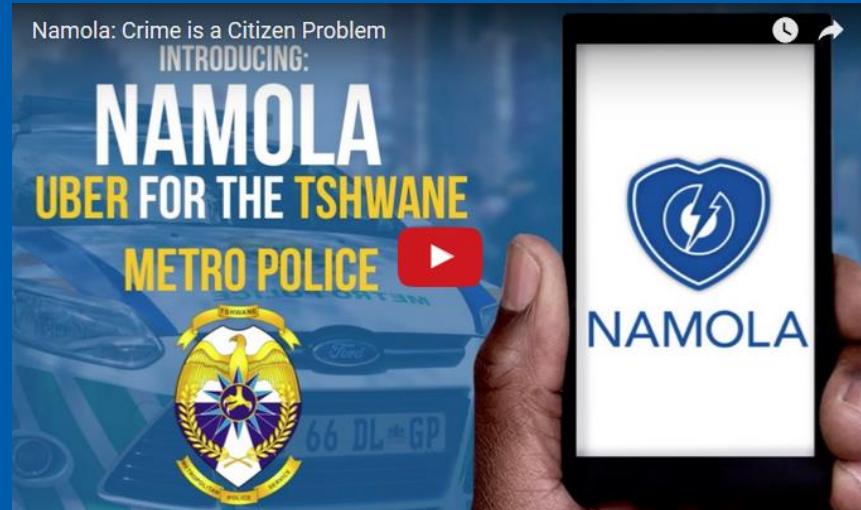
# What does the future hold?

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# What does the future hold?

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An "Uber for police" has been launched in South Africa

<http://namola.com/>

# What does the future hold?

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**Olaeris signs \$55 million  
in orders for unmanned  
AEVA aircraft**

Posted on July 18, 2016;



# Final observations

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- Not going to reduce crime in South Africa
- Reactive crime prevention technique
- Niche market and application area

# Thank You

**Gregory D. Breetzke, PhD**

Department of Geography, Geoinformatics and Meteorology

Faculty of Natural and Agricultural Sciences

University of Pretoria

T: +27 12 420 2318

E: [greg.breetzke@up.ac.za](mailto:greg.breetzke@up.ac.za)

