

GEOM90042

Applications of GIS

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Ethical considerations and GIS

2

Learning objectives

- Understand how Ethics and GIS relate;
- Understand that maps inherently have an agenda;
- Be able to reason about ethical and unethical use of GIS;
- Understand technical means to protect individual data (privacy);
- Critically evaluate what is ethical and what is unethical data analysis.

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But hold on, GIS is ...

- Just a tool
- Data are always objective
- Methods are always impartial
- Maps just display data

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But hold on, GIS is ...

□ Just a tool

- Yes, but it is who handles it, and for what

□ Data are always objective

- Now, data always reflect bias of their collectors

□ Methods are always impartial

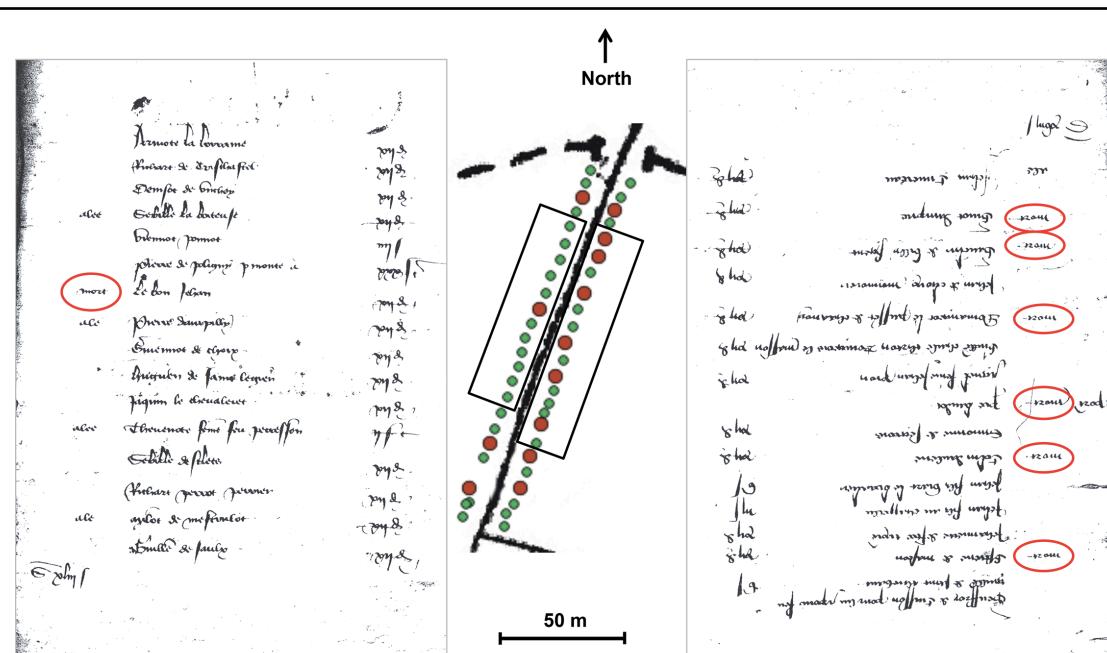
- Yes, but methods are always parametrized by people and reflect their needs/attitudes

□ Maps just display data

- Visual variables (symbols, colours, styles) are chosen by people to communicate their agenda

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5



Fermerot Street in 1400 in Dijon, showing the contrasting mortality between the western and the eastern sides of the street, based on tax collector's data. Galanaud P, Galanaud A, Giraudoux P (2015) Historical Epidemics Cartography Generated by Spatial Analysis: Mapping the Heterogeneity of Three Medieval "Plagues" in Dijon. PLoS ONE 10(12): e0143866. doi:10.1371/journal.pone.0143866

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3

From samples ...

Table 1. Characteristics of the study sample

Variable	Total sample		Urban sites				Rural sites			
			Dhaka		Maharashtra		Kerala		Kerala	
	Men (n=133)	Women (n=107)	Men (n=107)	Women (n=136)	Men (n=96)	Women (n=144)	Men (n=151)	Women (n=89)	Men (n=108)	Women (n=132)
Age (%)										
<70 years	54	54	71	46	68	45	63	48	53	31
70–79 years	32	32	21	40	28	39	27	33	33	36
≥ 80 years	14	14	8	14	4	17	10	19	15	33
Mean ± SD	70 ± 8	70 ± 9	67 ± 7	71 ± 7	67 ± 7	71 ± 8	69 ± 7	71 ± 9	70 ± 8	74 ± 9
69 ± 8										
Education (%)										
≥ 10 years of schooling	15	33	1	22	15	43	21	6	3	4
Marital status (%)										
Currently married	61	86	26	85	55	88	39	91	38	87
Smoking history (%)										
Current smokers	14	32	2	15	2	19	0	43	3	44
Past smokers	19	47	2	23	0	43	1	40	4	48
Diabetes mellitus (%)										
Self-reported diabetics	13	14	12	9	14	33	19	15	15	1
Physical activity (%)										
Sedentary	66	75	86	56	67	63	69	79	66	57
Mild	28	15	12	40	32	37	31	19	34	51
Moderate	6	10	2	4	1	1	0	2	1	38
Body mass index (kg/m^2) ^a (%)										
<18.09	33.3	34	36	14	19	19	11	39	26	69
18.09–22.25	33.3	42	36	40	29	37	28	42	31	27
>22.25	33.4	24	27	46	52	44	61	19	43	4
Mean ± SD (kg/m^2)	21 ± 5	20 ± 3	20 ± 4	22 ± 4	23 ± 5	22 ± 3	24 ± 5	19 ± 3	22 ± 6	17 ± 2

^a Teniles of BMI from our study sample

Table: <http://dx.doi.org/10.1590/S0042-96862001000600003>

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... to corpora, ...

PROXY DATA & HARVESTING

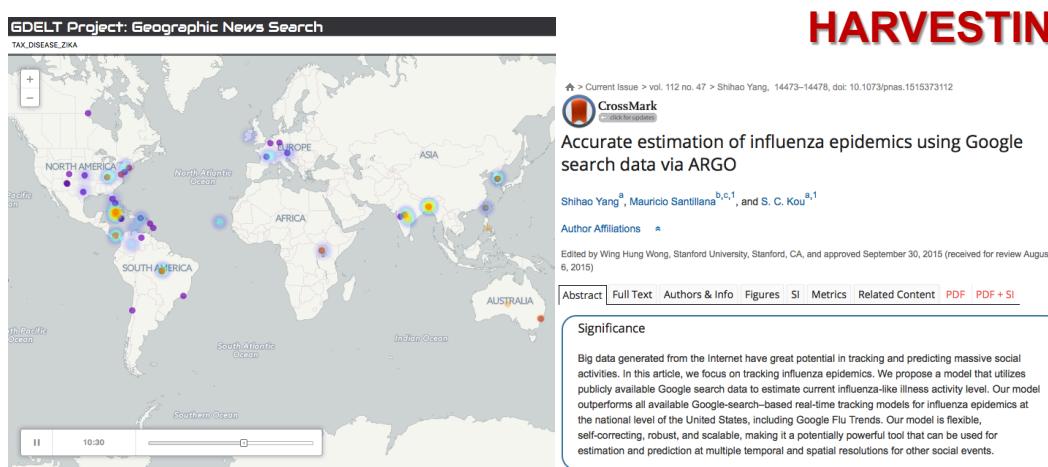


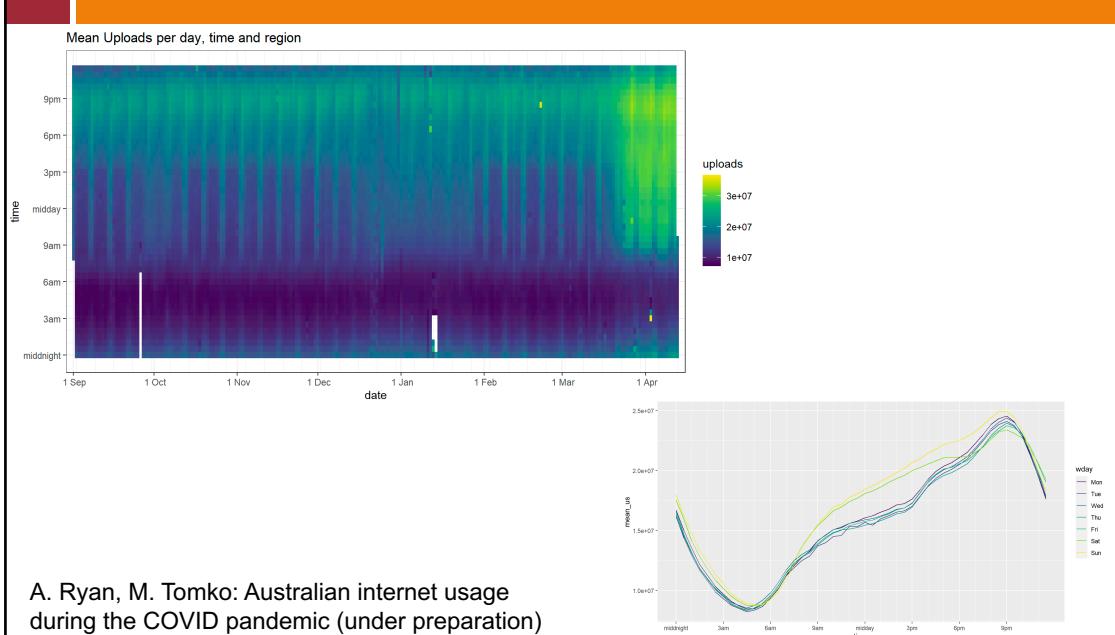
Figure: Tomko using http://gns.gdeltproject.org/?QUERY=TAX_DISEASE_ZIKA

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...to populations...



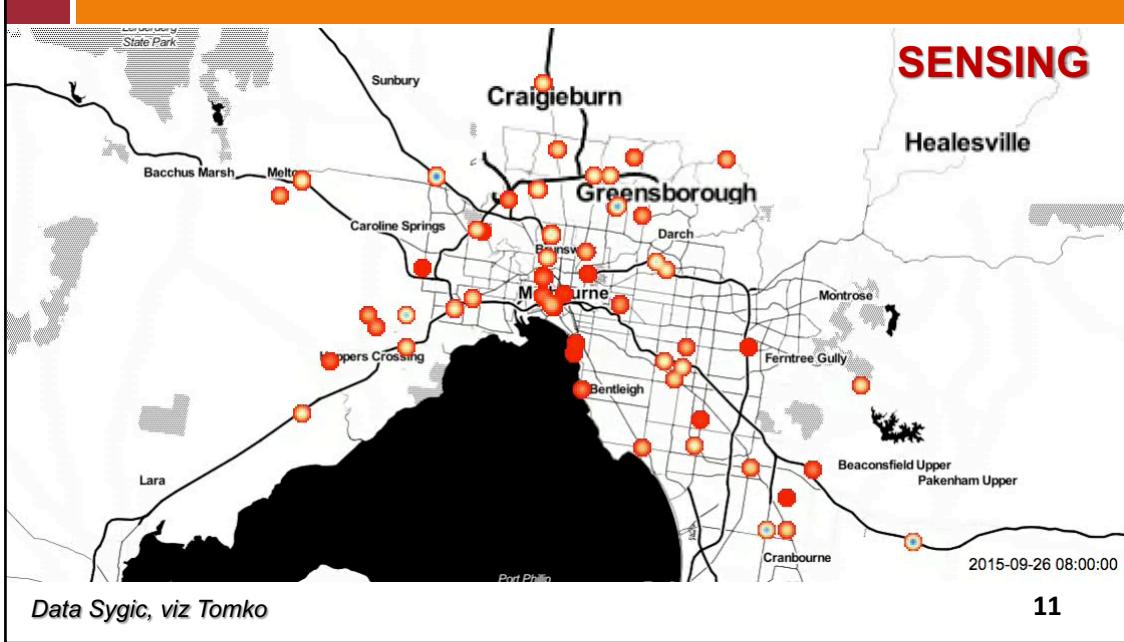
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Use case - tracking

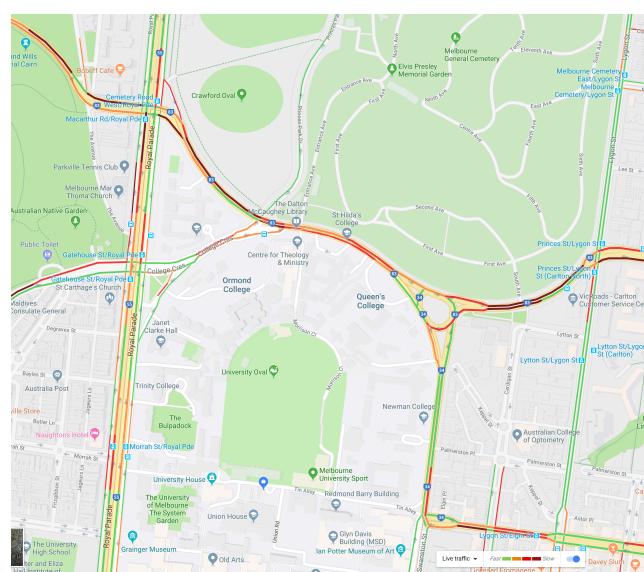
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Tracking



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Tracking



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Tracking

<https://www.smh.com.au/politics/federal/telstra-gave-abs-mobile-data-to-track-canberrans-locations-20180424-p4zbf8.html>

POLITICS FEDERAL PUBLIC SERVICE

Telstra gave ABS mobile data to track Canberrans' locations

By Sally Whyte
April 24, 2018 – 7:18pm



f t e A A

TODAY'S TOP STORIES

POLICE

'Beautiful soul': tributes flow for 21-year-old killed in head-on crash



MASS SHOOTING

The 19-year-old synagogue shooter tried to livestream his deadly rampage



UNPREDICTABLE ELECTION

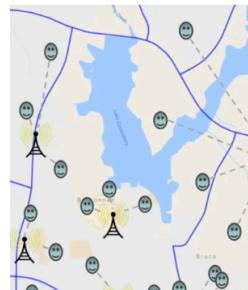
Incitelet.net

The Australian Bureau of Statistics used people's mobile phones in order to track their location hour by hour for a study on population movement.

The agency has defended the study because it did not track people in real time, with a spokesman saying "the ABS has not tracked or conducted surveillance on any Australian".

The study used mobile phone data from two weeks in April 2016, with suburbs across the ACT and surrounding areas in NSW targeted to show the ways populations move throughout the day and at different times in the week.

[First reported](#) by freelance journalist Asher Wolf, the study has been made public through presentations given



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Tracking

<https://www.smh.com.au/politics/federal/telstra-gave-abs-mobile-data-to-track-canberrans-locations-20180424-p4zbf8.html>

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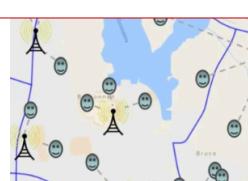


The ABS spokesman said individuals could not be identified from the data.

"The ABS received aggregate level telecommunications data from a telecommunications company to inform estimates of temporary populations. No individual information was provided to the ABS. Only aggregated counts of mobile telephone transactions were supplied in broad geographical areas," the ABS spokesman said.

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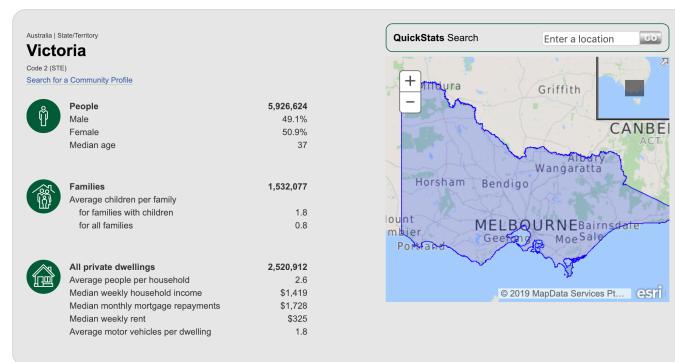
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Use case: Census

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... to populations?

2016 Census QuickStats



People

includes demographics & education | cultural & language diversity | employment >

People — demographics & education

demographics & education | cultural & language diversity | employment

People tables are based on a person's place of usual residence on Census night

People	Victoria	%	2011	%	Australia	%
<i>Persons count based on place of usual residence on Census night</i>						
Male	2,908,077	49.1	2,632,617	49.2	11,546,638	49.3
Female	3,018,549	50.9	2,721,423	50.8	11,855,248	50.7
Aboriginal and/or Torres Strait Islander people	47,788	0.8	37,992	0.7	649,171	2.8

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... to populations?

If you're worried about privacy, you should worry about the 2016 census

OPINION

By [Chris Berg](#)

Posted 15 Mar 2016, 6:35am

The debate over warrantless mandatory data retention was just the tip of the iceberg, as the ABS's removal of census anonymity demonstrates, writes Chris Berg.

If you blinked, you missed it. On December 18 last year, the Australia Bureau of Statistics announced that at the 2016 census in August it would, for the first time, retain all the names and addresses it has collected "to enable a richer and dynamic statistical picture of Australia".

Keeping names and addresses, we were quietly told, would enable government planners to do more rigorous studies of social trends.



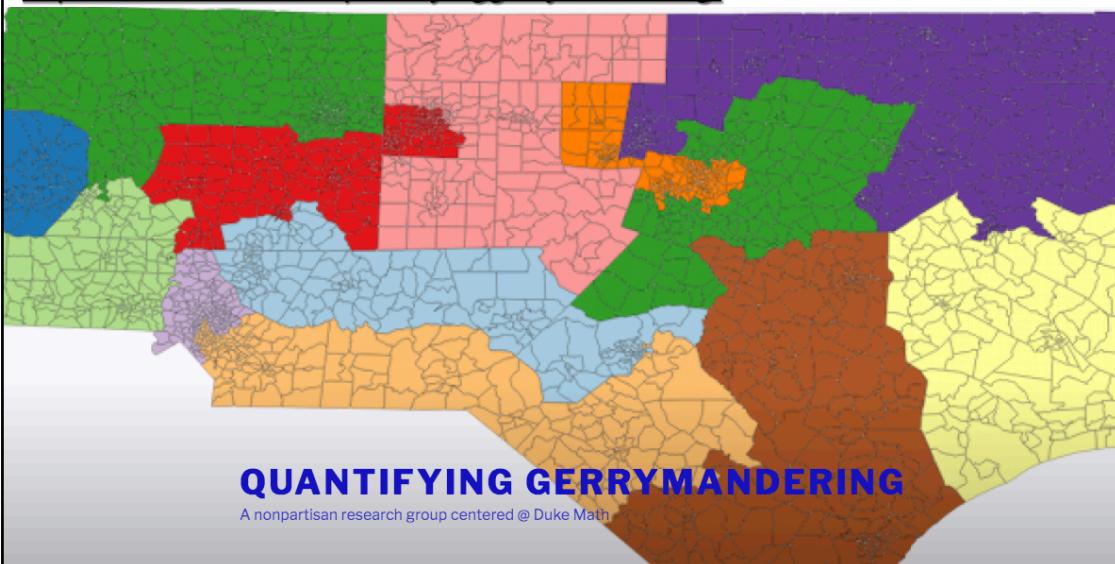
PHOTO: Any data that can be used usefully can also be used illegitimately. (7pm TV News VIC)

<http://www.abc.net.au/news/2016-03-15/berg-census-privacy-threat/7244744>

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Redistricting

<https://sites.duke.edu/quantifyinggerrymandering/>



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COVID Safe

COVIDSafe app

The COVIDSafe app speeds up contacting people exposed to coronavirus (COVID-19). This helps us support and protect you, your friends and family. Please read the content on this page before downloading.



On this page

- [Get the app](#)
- [COVIDSafe app help](#)
- [About the app](#)
- [Translated information](#)
- [Resources — COVIDSafe app](#)
- [What COVIDSafe is for](#)
- [How COVIDSafe works](#)
- [After the pandemic](#)
- [Deleting the COVIDSafe app](#)
- [Privacy](#)

Security analysis of the UK NHS COVID-19 App

Dr Chris Culnane, chris@culnane.org,
Independent Security and Privacy Consultant,
Honorary Fellow University of Melbourne,
Visiting Lecturer University of Surrey
Vanessa Teague, vanessa@thinkingcybersecurity.com,
CEO, Thinking Cybersecurity Pty. Ltd.,
A/Prof (Adj), Australian National University

10 May 2020

The following security analysis was conducted via a static analysis of the released source code for the UK's COVID-19 Contact tracing Android app and an evaluation of high-level design documents.

An earlier version of this report was shared with the NCSC on 12 May 2020. We would like to thank NCSC for their rapid response to our report and the constructive dialogue that has taken place since. We have refined the document to clarify a number of points and, where applicable, include a broad summary of their responses. A full response is now available.

This post is cross-posted at [StateOfIT.com](#) and <https://github.com/vteague/contactTracing>.

<https://github.com/vteague/contactTracing/blob/master/blog/2020-05-19UKContactTracing.md>

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Is tracking socially acceptable?

Social Licensing of Privacy-Encroaching Policies to Address COVID

[public health; privacy](#)

Authors: Simon Dennis, Yoshihisa Kashima, Amy Perfora, Josh White, Paul Garrett, Nic Gead, Daniel Little, Lewis Mitchel, Martin Tomko, Stephan Lewandowsky, Philipp Lorenz-Spreen

Summary of project (ongoing):

The nature of the COVID-19 pandemic may require governments to use big data technologies to help contain its spread. Countries that have managed to “flatten the curve”, (e.g., Singapore), have employed collocation tracking through mobile Wi-Fi, GPS, and Bluetooth as a strategy to mitigate the impact of COVID-19. Through collocation tracking, Government agencies may observe who you have been in contact with and when this contact occurred, thereby rapidly implementing appropriate measures to reduce the spread of COVID-19. The effectiveness of collocation tracking relies on the willingness of the population to support such measures, implying that government policy-making should be informed by the likelihood of public compliance. Gaining the social license - broad community acceptance beyond formal legal requirements - for collocation tracking requires the perceived public health benefits to outweigh concerns of personal privacy, security, and any potential risk of harm.

This project involves a longitudinal cross-cultural study to trace people's attitudes towards different tracking-based policies during the crisis. At present, we are planning 4 weekly waves in Australia, at least 1 wave in the UK (data collection currently under way), several waves in Germany, at least one wave in the U.S., and we are reaching out to collaborators and colleagues in other countries to broaden our scope.

We aim to understand (1) the factors that influence the social license around governmental use of location tracking data in an emergency, (2) how this may change over time, and (3) how it may differ across cultures. We will present participants with one of two vignettes describing mild or severe Government tracking methods that may reduce the spread of COVID-19, and then question

https://www.reddit.com/r/BehSciResearch/comments/fq0rvm/social_licensing_of_privacyencroaching_policies/

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Use case: Spatial Analysis

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Spatial analysis

- Privacy and Ethics
 - *Exodus acta probat?*
[The end justifies the means]

Journal of Spatial Science

Volume 61, Issue 1, 2016

Select Language | ▾
Translator disclaimer



CrossMark

click for updates

Research Papers

Tagging Banksy: using geographic profiling to investigate a modern art mystery

DOI: 10.1080/14498596.2016.1138246

Michelle V. Hauge^a, Mark D. Stevenson^a, D. Kim Rossmo^b &

Steven C. Le Comber^{a*}

pages 185-190

Publishing models and article dates explained

Published online: 03 Mar 2016

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Alert me

Abstract

The pseudonymous artist Banksy is one of the UK's most successful contemporary artists, but his identity remains a mystery. Here, we use a Dirichlet process mixture (DPM) model of geographic profiling, a mathematical technique developed in criminology and finding increasing application within ecology and epidemiology, to analyse the spatial patterns of Banksy artworks in Bristol and London. The model takes as input the locations of these artworks, and calculates the probability of 'offender' residence across the study area. Our analysis highlights areas associated with one prominent candidate (e.g., his home), supporting his identification as Banksy. More broadly, these results support previous suggestions that analysis of minor terrorism-related acts (e.g., graffiti) could be used to help locate terrorist bases before more serious incidents occur, and provides a fascinating example of the application of the model to a complex, real-world problem.

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Spatial analysis

Rumi et al. EPJ Data Science (2016) 7:43
https://doi.org/10.1186/s13688-016-0171-7

EPJ.org
 EPJ Data Science
a SpringerOpen Journal

REGULAR ARTICLE Open Access

 CrossMark

Crime event prediction with dynamic features

Shakila Khan Rumi¹ , Ke Deng¹ and Flora Dilys Salim²

¹Correspondence: shakila.rumi@rmit.edu.au
School of Science, Computer Sciences and Digital Media, RMIT University, Melbourne, Australia

Abstract
Nowadays, Location-Based Social Networks (LBSN) collect a vast range of information which can help us to understand the regional dynamics (i.e. human mobility) across an entire city. LBSN provides unique opportunities to tackle various social problems. In this paper, we propose a dynamic crime prediction framework based on check-in data to short-term crime event prediction with fine spatio-temporal granularity. While crime event prediction has been investigated widely due to its social importance, its success rate is far from satisfactory. The existing studies rely on relatively static features such as regional characteristics, demographic information and the topics obtained from very few sources of information on exploring human mobility through social media. In this study, we identify a number of dynamic features based on the research findings in Criminology, and report their correlations with different types of crime events. In particular, we observe that some types of crime events are more highly correlated to the dynamic features, e.g., Theft, Drug Offence, Fraud, Unlawful Entry and Assault than others, e.g., Treason, Robbery Offence. A key challenge in this research is that there is little information to query against compared to the relatively static dimension. To address this issue, we develop a matrix factorization based approach to estimate the missing dynamic features across the city. Interestingly, the estimated dynamic features still maintain the correlation with crime occurrence across different times. We evaluate the proposed methods in

A mathematical modeling approach for geographical profiling and crime prediction

3 Author(s): Xianan Zheng ; Yang Cao ; Zhiyu Ma [View All Authors](#)

 2 Paper Citations  465 Full Text Views



Abstract
Criminal geographical profile is a methodology of investigation, which makes use of correlation between crime location and crime base of criminal to find out the most probable place of the crime base. We introduce a model to predict the future serial crime location with aid of criminal geographic profiling and the time and locations of past crime scenes. In this model, we take the effect of distance decay and the local geographic features into consideration and formulate a probability density function of the future serial crime site to realize the prediction.

Published in: 2011 IEEE 2nd International Conference on Software Engineering and Service Science

Authors: Date of Conference: 15-17 July 2011 INSPEC Accession Number: 12180011
Figures: Date Added to IEEE Xplore: 12 August 2011 DOI: 10.1109/ICSESS.2011.5982362

E
Location: Beijing, China

"Obviously the large majority of people in the city were not always using the app and those committing crimes were likely not posting on the app about it," she says. "So, we used recommender systems to fill in the gaps and predict other activities in any given scenario."

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24 GIS code of ethics

<https://www.urisa.org/about-us/gis-code-of-ethics/>

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URISA GIS Code of ethics

- The Code of Ethics is intended to provide guidelines for GIS professionals.
- It should help professionals make appropriate and ethical choices.
- It should provide a basis for evaluating their work from an ethical point of view.
- By heeding this code, GIS professionals will help to preserve and enhance public trust in the discipline.

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URISA/SSSI GIS Code of ethics

This code is based on the ethical principle of always treating others with respect and never merely as means to an end

- I. Obligations to Society
- II. Obligations to Employers and Funders
- III. Obligations to Colleagues and the Profession
- IV. Obligations to Individuals in Society

Ultimately, a professional must reflect carefully on such situations before making the tough decision.

<https://sssi.org.au/SSSI/files/b8/b86fa92b-7d73-4b68-8238-1053f589bd79.pdf>

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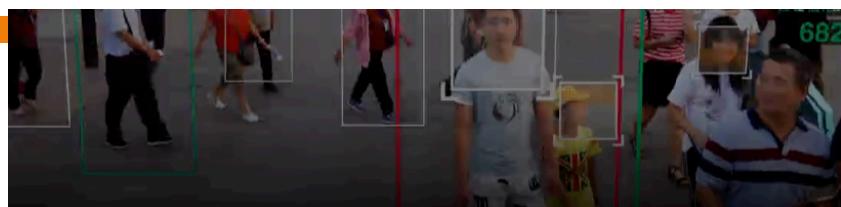
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Case study: Impartial Data

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China's Social Credit System



Leave no dark corner

China is building a digital dictatorship to exert control over its 1.4 billion citizens. For some, “social credit” will bring privileges – for others, punishment.

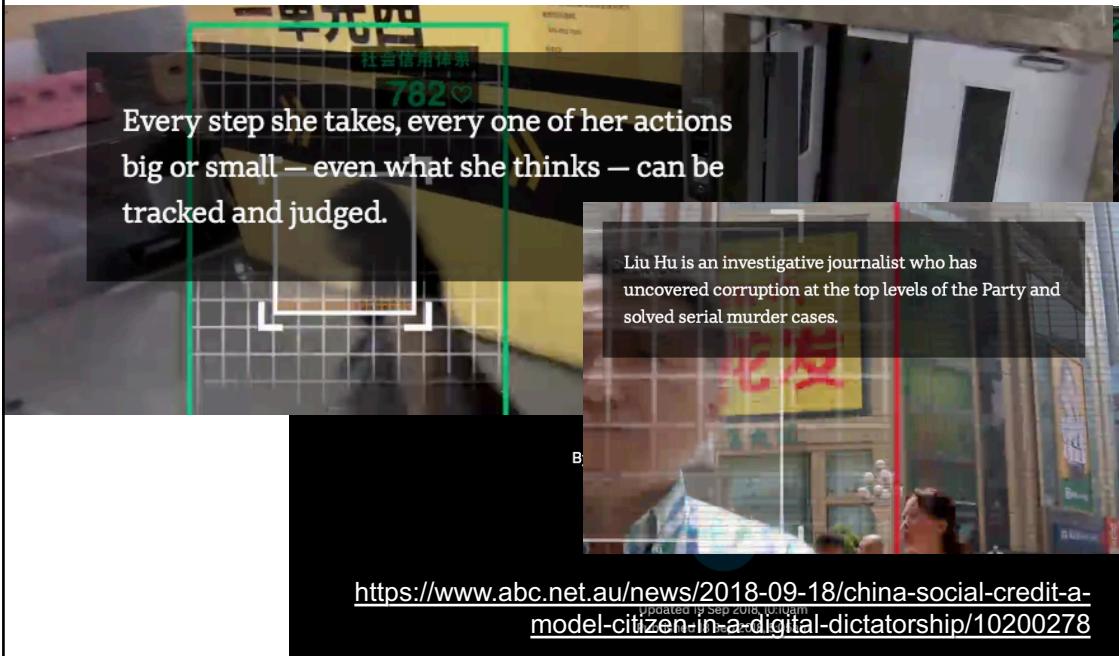
By China correspondent Matthew Carney



<https://www.abc.net.au/news/2018-09-18/china-social-credit-a-model-citizen-in-a-digital-dictatorship/10200278>

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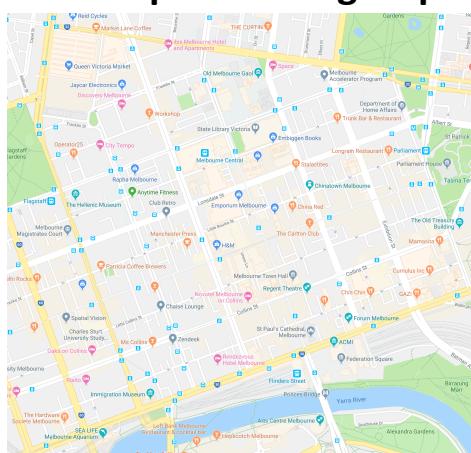
China's Social Credit System



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General datasets have bias

- Google maps – bias towards cars
- Underrepresented groups have no voice



Who Maps the World?

SARAH HOLLOWAY MAR 14, 2018

Too often, men. And money. But a team of OpenStreetMap users is working to draw new cartographic lines, making maps that more accurately—and equitably—reflect our space.

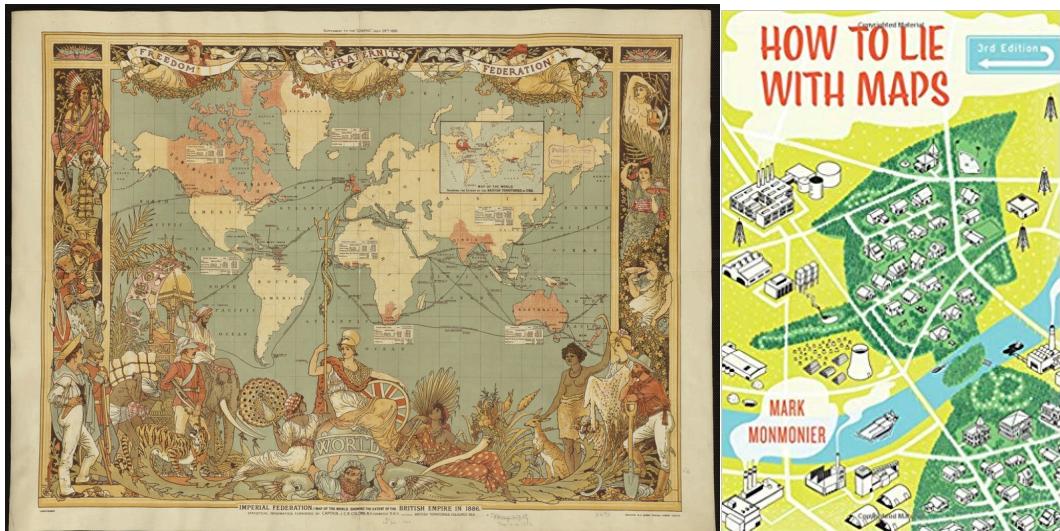
In 2011, the OSM community rejected an appeal to add the “childcare” tag at all. It was finally approved in 2013, and in the time since, it’s been used more than 12,000 times.

<https://www.citylab.com/equity/2018/03/who-maps-the-world/555272/>

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Maps have bias



https://www.carnegiecouncil.org/publications/ethics_online/politics-and-cartography-the-power-of-deception-through-distortion

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5 safes framework for data use

https://en.wikipedia.org/wiki/Five_safes

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Five safes framework

A framework to help make decisions about potentially confidential and sensitive data

- Relate to statistical disclosure control
- Originates from the UK Office for National Statistics
- Adopted by the ABS

Safe projects	Is this use of the data appropriate?
Safe people	Can the users be trusted to use it in an appropriate manner?
Safe settings	Does the access facility limit unauthorised use?
Safe data	Is there a disclosure risk in the data itself?
Safe outputs	Are the statistical results non-disclosive?

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Safe data

TABLE 1: FACTORS TO CONSIDER WHEN ASSESSING DISCLOSURE RISK

Factor	Effect on disclosure risk
Data age	Older data are generally less risky
Sample data (e.g. a survey)	Decreases risk
Population data (e.g. a census)	Increases risk
Longitudinal data	Increases risk
Hierarchical data	Increases risk
Sensitive data	Increases risk (sensitive data may be a more attractive "target")
Data quality	Poor quality data may offer some protection
Microdata	Main risk: re-identification
Aggregate data	Main risks: attribute disclosure and disclosure from differencing
Key variables	The variables of most interest to users are invariably the most disclosive

Source: UK Anonymisation Decision-making Framework

<https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/1160.0Main%20Features4Aug%202017?opendocument&tabname=Summary&prodno=1160.0&issue=Aug%202017&num=&view=>

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Summary

- You are now able to critically evaluate how your actions as GIS analysts impact on the perception of the whole spatial profession;
- You should have an awareness of how to behave as ethical spatial professionals;
- You know what guidelines can provide guidance if unsure;
- You are able to evaluate spatial data products critically.

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