

Sam Clifford

Bayesian statistics | environmental health | problem-based learning



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languages

proficient English
literary, written, & oral
skills

programming

use: R, MATLAB

defining attributes

maths, stats and
science background;
passion for teaching;
hungry for
new science; excited
to collaborate; patient
communicator

Bio and interests

I'm a Bayesian statistician working at Queensland University of Technology (Brisbane, Australia) where I also teach mathematics and statistics to first year science students.

My undergraduate background is in applied and computational mathematics and applied physics, and my PhD studies focussed on statistical modelling of air pollution.

My research interests lie in developing and applying Bayesian spatio-temporal, generalised additive, and hierarchical models to solve a variety of environmental and epidemiological problems such as jaguar conservation, reef conservation, and air pollution and its health impacts.

Employment

2017/07-

Research Associate in Statistical Modelling

QUT/Queensland Institute for Medical Research

Statistical and cellular automata modelling of dengue fever dynamics in the presence of defective interfering particles (INTERfering and Co-Evolving Prevention and Therapy, INTERCEPT)

2016-2017/07

Postdoctoral Research Fellow

QUT/ARC Centre of Excellence for Mathematical Statistical Frontiers

Spatio-temporal modelling of coral cover on the Great Barrier Reef and jaguar conservation in Peru using citizen science data

2013-2015

Postdoctoral Fellow

QUT/International Laboratory for Air Quality and Health

Statistical modelling of air pollution exposure and its health effects in home, school, office and outdoor environments

2013/07-2017

Associate Lecturer

QUT/School of Mathematics Sciences

Responsible for developing and delivering first year mathematics and statistics unit for BSc students *Quantitative Methods in Science*. Topics include: data wrangling and visualisation in R/RStudio, calculus, linear algebra, hypothesis testing and linear regression. As of 2018 I continue to be Unit Coordinator.

Education

PhD at the International Laboratory for Air Quality and Health, October 2013

QUT – Chemistry Physics and Mechanical Engineering

Spatio-temporal modelling of ultrafine particle concentration

B Sc (Hons) in Mathematics, June 2008, Div II A, with electives in applied physics

QUT – Mathematical Sciences

An Analysis of Shear-Augmented Dispersion with Analytical and Numerical Methods

Grants

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|-------------------|--|
| 2017 \$445,000 | Establishing advanced networks for air quality sensing and analyses Australian Research Council, LP160100051 Deployment of low cost sensors in an urban and suburban environment to provide real-time measurement of air pollutants |
| 2015 \$315,778 | Revolutionising protection against air pollution Australian Research Council, DP150101828 Using mobile sensors to determine personal exposure to air pollution |
| 2014 \$24,600 | Children's exposure to airborne nanoparticles at school ATN-DAAD Joint Research Cooperation Scheme Comparison of multiple sources of air pollution and their health impacts |
| 2013 \$29,000 | Collaborative Research Development Grant Institute for Health and Biomedical Innovation (QUT) Comparative risk assessment analysis of personal exposure to ultrafine particles over four continents |
| 2013 \$20,000 | Seed funding Centre for Air quality and health Research and evaluation (an NHMRC CRE) Australian Burden of Disease of Air Pollution |

Awards

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| 2015 | Vice Chancellor's Performance Award , QUT Science and Engineering Faculty Innovation in redesigning SEB113 – Quantitative Methods in Science |
| 2007 | Dean's Award for Academic Excellence , QUT School of Mathematical Sciences |

Outreach, Organisation

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|------|--|
| 2017 | Organiser, ACEMS ECR Retreat |
| 2012 | Video segments on children's TV shows 'Scope' and 'Totally Wild' |
| 2012 | President, Student Committee, Healthy Buildings Conference |

Referees

| | |
|--------------------------|---|
| Supervisor | Professor Kerrie Mengersen, QUT Deputy Director, ARC Centre of Excellence for Mathematical and Statistical Frontiers ☎: +61 7 3138 2063, ✉: k.mengersen@qut.edu.au |
| Former supervisor | Professor Lidia Morawska, Queensland University of Technology Director, International Laboratory for Air Quality and Health ☎: +61 7 3138 2616, ✉: l.morawska@qut.edu.au |
| PhD Supervisor | Dr Sama Low Choy, Griffith University Senior Statistician, Social Science and Behavioural Research College ☎: +61 7 3735 5825, ✉: s.low-choy@griffith.edu.au |
| Former colleague | Dr Mandana Mazaheri, NSW Office of Environment and Heritage Atmospheric Scientist, Climate and Atmospheric Science branch ☎: +61 4 3773 4962, ✉: Mandana.Mazaheri@environment.nsw.gov.au |

Selected Publications

Full list of publications available at Google Scholar

Spatial statistics for citizen science

- T. Bednarz, et al. Virtual reality for conservation. In *Proceedings of the 21st International Conference on Web3D Technology*, pages 177–178. ACM, 2016. doi: 10.1145/2945292.2945319.
- S. Clifford et al. Combining citizen science and traditional monitoring data in modelling coral cover on the Great Barrier Reef. in prep.
- K. Mengersen, et al. Modelling imperfect presence data obtained by citizen science. *Environmetrics*, 28(5), 2017. ISSN 1099-095X. doi: 10.1002/env.2446/. e2446 env.2446.
- J. Vercelloni, et al. Understanding aesthetic attributes of coral-reefs: using virtual reality to support conservation of ecosystem services. *Nature Scientific Reports*, submitted, 2017.

Air pollution and health

- S. Clifford, et al. Estimation of inhaled ultrafine particle surface area dose in urban environments. *ANZIAM Journal*, 55:C437–C447, 2014. doi: 10.21914/anziamj.v55i0.7819.
- S. Clifford, et al. Effects of exposure to ambient ultrafine particles on respiratory health and systemic inflammation in children. *Environment International*, Under revision.
- M. Mazaheri, et al. School children's personal exposure to ultrafine particles in the urban environment. *Environmental Science and Technology*, 48(1):113–120, 2014. doi: 10.1021/es403721w.
- L. Morawska, et al. Airborne particles in indoor environment of homes, schools, offices and aged care facilities: The main routes of exposure. *Environment International*, 108(Supplement C):75 – 83, 2017. ISSN 0160-4120. doi: 10.1016/j.envint.2017.07.025.
- M. M. Rahman, et al. Estimate of main local sources to ambient ultrafine particle number concentrations in an urban area. *Atmospheric Research*, 194:178–189, 2017a. doi: 10.1016/j.atmosres.2017.04.036.
- M. M. Rahman, et al. Development of a land use regression model for daily NO₂ and NO_x concentrations in the Brisbane metropolitan area, Australia. *Environmental Modelling and Software*, 95:168–179, 2017b. doi: 10.1016/j.envsoft.2017.06.029.
- T. Salthammer, et al. Children's well-being at schools: impact of climatic conditions and air pollution. *Environment International*, 94:196–210, 2016. doi: 10.1016/j.envint.2016.05.009.
- L. Toms, et al. Brominated flame retardants in primary schools: sources and exposures. *Environmental Research*, 142:135–140, 2015. doi: 10.1016/j.envres.2015.06.007.
- B. Yeganeh, et al. A satellite-based model for estimating PM_{2.5} concentration in a sparsely populated environment using soft computing techniques. *Environmental Modelling & Software*, 88:84–92, 2017. doi: 10.1016/j.envsoft.2016.11.017.

Conference Items

- G. Buonanno, et al. Alveolar dose comparison of ultrafine particles for Australian and Italian children. In *12th Biennial National Conference*. Metrology Association of Australia, 2013.
- S. Clifford. Plenary presentation: Standing on the Shoulders of Giants. In *10th International Conference on Healthy Buildings 2012*, Brisbane, QLD, 2012.
- S. Clifford, et al. Uncertainty in exposure estimates and imputation of missing aerosol data in an epidemiological study. Poster – European Aerosol Conference, September 2015.
- S. Clifford, et al. Semi-parametric modelling of ultrafine particle number concentration. Poster – ISBA World Meeting, June 2012a.
- S. Clifford, et al. Estimation of inhaled ultrafine particle surface area dose in urban environments. In *Engineering Mathematics and Applications Conference*. Australian Mathematical Society (Australian and New Zealand Industrial and Applied Mathematics), December 2013.
- S. Clifford, et al. A method for non-parametric cluster analysis of the health impacts of air quality. In *10th International Conference on Healthy Buildings 2012*, pages 775–777, Brisbane, QLD, 2012b. ISIAQ.
- I. Czaplinski, et al. A blended learning model for first year science student engagement with mathematics and statistics. July 2016.

Theses

- S. Clifford. *An analysis of shear-augmented dispersion with analytical and numerical methods*. Honours thesis, School of Mathematical Sciences, Queensland University of Technology, 2008.
- S. Clifford. *Spatio-temporal modelling of ultrafine particle number concentration*. Doctoral thesis, School of Chemistry, Physics and Mechanical Engineering, Queensland University of Technology, 2013.

Others

- S. Clifford. *An analysis of shear-augmented dispersion with analytical and numerical methods*. Honours thesis, School of Mathematical Sciences, Queensland University of Technology, 2008.
- S. Clifford. *Spatio-temporal modelling of ultrafine particle number concentration*. Doctoral thesis, School of Chemistry, Physics and Mechanical Engineering, Queensland University of Technology, 2013.
- S. Clifford. *mgcv.helper: Helper Functions for mgcv*, 2017. R package version 0.1.8.
- S. Clifford et al. *Case Studies in Bayesian Statistical Modelling and Analysis*, chapter 12, “Bayesian Splines”, pages 197–220. Wiley Series in Probability and Statistics. Wiley, 2012.
- S. Clifford, et al. Bayesian semi-parametric forecasting of particle number concentration: penalised splines and autoregressive errors. *arXiv*, (1207.0558), September 2012.
- S. Clifford, et al. A Bayesian spatio-temporal model of panel design data: particle number concentration in Brisbane, Australia. *arXiv*, (1206.3833), February 2013.
- N. Tierney et al. *mmcc: tidy mcmc.list using data.table*, 2017. R package version 0.0.5.9001.