Explaining spatial point patterns in animal health: An introduction to modelling point data

Workshop Proposal

Background

This workshop is designed to introduce participants to the principles, application and interpretation of models for spatial data where outcomes are recorded as points (i.e. individual case outcomes, not aggregated into geographic regions). Methods for the analyses of these spatial point data have been recently established, but are not yet being widely applied in the analysis of animal health data. This workshop will focus specifically on the relevance of these techniques for veterinary and animal health applications. Using real-world examples, this workshop aims to provide a foundation knowledge for the application of appropriate modelling techniques for spatial point data.

Instructors

Mark Stevenson BVSc MVS PhD
Mark is a veterinary epidemiologist with expertise in the area of spatial epidemiology, infectious disease epidemiology and simulation modelling of infectious disease spread. He is currently Professor of Veterinary Epidemiology (One Health) at The University of Melbourne where he leads a group working on the epidemiology of a range of bacterial, viral and parasitic zoonotic diseases including Q fever, highly pathogenic avian influenza, trichinellosis and brucellosis.
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Simon Firestone BVSc BSc MAppEpi PhD
Simon is a Senior Lecturer in Epidemiology at the University of Melbourne in Australia. Simon researches the spatio-temporal analysis of disease spread in populations and risk factor studies into outbreaks and zoonotic diseases including Q fever, equine influenza, salmonellosis, Ross River virus and bovine Theileriosis. He also coordinates and teaches into the online Master of Veterinary Public Health program at the University of Melbourne, teaches into the Science and DVM curriculums on emerging infectious diseases, epidemiological methods and the evaluation of diagnostic test performance.
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Caitlin Pfeiffer BVSc PhD
Caitlin is a Research Fellow in Epidemiology at the University of Melbourne in Australia. Caitlin researches disease surveillance, spatial risk factors for disease emergence and the intersection of human behaviour and disease detection. She also coordinates interdisciplinary One Health subjects at the University of Melbourne, as well as teaching into the DVM, Bachelor of Agriculture and online Master of Veterinary Public Health programs.
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Learning outcomes

After completing this course, participants will:

- Understand the important considerations for working with spatial point data.
- Understand and be able to apply kernel smoothing to describe the spatial distribution of disease in animal health data.
- Understand and be able to apply the K-function to describe autocorrelation in animal health data.
- Understand the different types of models available for modelling spatial point data in animal health.
- Be able to construct and interpret models appropriate for spatial point data in animal health.

Workshop content and schedule

The workshop will provide theoretical overview including practical animal health examples each morning, followed by practical activities to apply and demonstrate the techniques using real-world datasets.

	Time	*Instructor*	*Format*	*Details*
Day 1	0830 - 0930	MS	Lecture	Introduction & motivating examples.
	0930 - 1030	CP	Lecture	Describing point data 1.
	1030 - 1100			Morning tea.
	1100 - 1200	SF	Lecture	Describing point data 2.
	1200 - 1300			Lunch.
	1300 - 1500	CP	Practical	Describing point data.
	1500 - 1530			Afternoon tea.
	1530 - 1700	SF	Practical	Quantifying spatial autocorrelation in point data.
Day 2	0830 - 1030	MS	Lecture	Explaining [modelling] point data.
	1030 - 1100			Morning tea.
	1100 - 1200	CP	Practical	Stochastic partial differential equation models for point data (using INLA).
	1200 - 1300			Lunch.
	1300 - 1500	CP	Practical	Poisson point process models for point data (using spatstat).
	1500 - 1530			Afternoon tea.
	1530 - 1700	MS	Practical	Review & wrap-up.

Background and skills for participants

This course will cater for participants with a range of experience in spatial analysis. A basic understanding of spatial data (raster vs. vector, area vs. continuous vs. point data) is expected. Basic skills in R and the use of GIS software are recommended but not required. Some knowledge of regression modelling is advantageous.

Software used in the workshop will include R (via R studio) and QGIS. More advanced R users can expect to leave the course with a toolbox of code in R that can be adapted to their own analyses. For less experienced users, worked examples using existing data will be provided so that the principles and techniques can be demonstrated without extensive coding required by participants. Participants are encouraged to bring their own examples of spatial point data to discuss with the workshop instructors.

Workshop participants are requested to bring their own laptops.

History of workshop

Workshops in spatial epidemiological methods have been delivered by members of this instructor team since 1999, with the content of courses updated as novel analytical techniques have emerged. This workshop is an abridged version of recently presented courses, focussed on techniques relevant to analysis of point data, as below:

- Strengthening Capacity for Risk Mapping of Emerging Infectious Diseases in Indonesia: An Introduction to Spatial Analysis
    - Instructors: Mark Stevenson & Caitlin Pfeiffer
    - 11 to 15 March 2019, Indonesian government agencies co-ordinated by FAO, Jakarta, Indonesia
    - 11 trainees
- An Introduction to the Development of Knowledge-Driven Models of Disease Risk
    - Instructors: Mark Stevenson, Daan Vink, Mary van Andel & Chris Compton
    - 16 - 19 October 2018, OIE Sub-Regional Representation for Southeast Asia, Bangkok, Thailand
    - 40 trainees
- Spatial Point Pattern Analysis
    - Instructors: Adrian Baddeley, Rolf Turner & Tilman Davies
    - 3 to 5 Sept 2018, University of Melbourne, Parkville Campus, Melbourne, Australia
    - 36 trainees
- Spatial Epidemiology 2.0 - From Addresses and Polygons to Interactive Dashboards
    - Instructors: Mark Stevenson, Simon Firestone, Uli Muellner
    - 4 - 6 July 2016, ANZCVS (Epidemiology Chapter) Workshop, Gold Coast, Australia
    - 20 trainees

Workshop specifications

Timing: This workshop can run either pre- or post- GeoVet
Cost: USD$500 (student rate USD$400)
Attendees: Minimum 10, maximum 30
Duration: 2 days
Accessories: No additional accessories required