

**BATH, UNAM AND CIMAT (BUC) WORKSHOP SERIES:  
STATISTICS IN ENVIRONMENTAL RESEARCH  
CIMAT, GUANAJUTO  
12-14 NOV 2015**

*When populations and hazards collide: modelling exposures  
and health risks in space and time*

**Instructors:**

Dr **Gavin Shaddick**, Department of Mathematical Sciences, University of Bath  
Professor **Jim Zidek**, Department of Statistics, University of British Columbia

**Abstract:**

This course provides an introduction to modelling exposures to hazardous processes and epidemiological analyses where data has structure both over space and time. The course covers methods for spatio-temporal analysis and the practical application of methods. The course will have cover both theory and applied examples, the latter specifically through practical 'hands-on' computer sessions in which participants will be guided through the analyses of real life examples of data with both temporal and spatial structure.

**Outline:**

- The need for spatial and temporal modelling
- Applications in exposure estimation and epidemiology
- Lattice and point referenced spatial processes
- Spatio--temporal processes
- Further topics to include a selection from: time-series modelling, measurement error, ecological bias, monitoring designs, Bayesian analysis and computation

**Teaching methods & Course format:**

- A mixture of lectures, worked examples and computer-based practicals.
- Students will need to bring a laptop to the course with R, R-INLA and WinBUGS software installed (details of how to access these materials will be provided on registration)

**Learning outcomes:**

- An understanding of the basic principles of hierarchical Bayesian modelling
- An understanding of the need to account for spatial and temporal dependence in exposure modelling and epidemiological analyses
- Knowledge of how to implement methods for spatial and temporal modelling using real datasets.
- An appreciation of advanced aspects of spatial-temporal modelling

**Textbook:**

*Spatio-Temporal Methods in Environmental Epidemiology*  
Gavin Shaddick and James V. Zidek, Chapman and Hall/CRC

**Target audience:**

Postgraduate students, postdoctoral researchers, individuals working in industry or government in the field of statistics, exposure modelling or epidemiology. Those who have found a need for implementing spatial methods in their research.

**Prerequisite knowledge:**

Participants will be expected to have a basic understanding and experience of applying and interpreting multiple regression models. Familiarity with the R software will be assumed.

**Biographies:**

Dr Gavin Shaddick is Reader in Statistics at the Department of Mathematical Sciences, University of Bath. He is an internationally recognised, collaborative researcher in the field of environmental epidemiology, a subject to which he contributed both theoretical and practical work that has had a substantial impact. He has taught a number of short courses on this topic for audiences at various levels coming from both the academic and non-academic worlds

Professor Jim Zidek is Professor Emeriti of Statistics at the University of British Columbia. He is an expert in the area of environmetrics and he has co-authored a book on that subject that was published in 2006. His research has involved the design of networks for monitoring environmental hazards as well as methods for modelling and analysing the data these networks produce. He has taught short courses on a variety of topics associated with spatial and temporal modelling.

**Timetable:**

*Thursday (12 November):*

09:30-10:00: Introduction  
10:00-11:15 The need for spatio-temporal modelling  
11:15-11:30 Break  
11:30-13:00 Spatial lattice processes and applications  
Lunch  
15:30-17:00 Computer labs

*Friday (13 November):*

09:30-10:30 Point referenced spatial processes  
11:00-11:30 Break  
11:30-13:00 Point referenced spatial processes (cont.) and applications  
Lunch  
15:30-17:00 Spatio-temporal processes

*Saturday (14 November):*

9:30-11:00 Computer labs  
Wrap-up