Workshop 1 (Pre-conference)

Title: Spatial analysis of public health data: a practical introduction to the analysis of geocoded and areal health data
Date: Friday, December 2, 2011 (9:00am-5:00pm)
Registration desk from 8:15am (also for help in loading software)
Place: Watsons Bay room, Citigate Central Sydney Hotel
Presenter: Professor Montserrat Fuentes (North Carolina State University)
Transport: The hotel is close to Sydney Central Train Station. Delegates should make their own way to the venue.

Overview
New methods for recording the locations of health data due to recent advances in Geographical Information Systems (GIS) and Global Positioning Systems (GPS) have permitted new types of disease mapping and spatial modeling of health data, as well as new approaches to support disease prevention and control activities in public health. This has generated considerable interest in statistical modeling for location-referenced (point-level or geostatistical) data and areal (aggregated over regions) data. This course offers an introduction to the methods for modeling and carrying out inference with spatial point-level and areal data. Basic elements such as classical approaches in geostatistics, spatial disease mapping, and Bayesian inference for spatial data will be covered in detail. Each topic will include theory, examples and data analysis along with live interactive computing demonstrations. The course will also detail recent advancements in Bayesian hierarchical models for spatial data using Markov chain Monte Carlo (MCMC) methods.

Specific topics that will be covered include: geostatistical modeling, spatial risk assesment, disease mapping, CAR models for areal data, spatial linear regression, generalized linear models, uncertainty analysis, diagnostics and validation for spatial models, and spatial Bayesian inference.

We will offer a hands-on opportunity to explore the use of WinBUGS, the leading Bayesian software package, as well as several spatial packages in R for spatial geocoded and areal data. The computing demonstrations will encompass exploratory spatial data analysis as well as estimation of statistical models with practical data sets in public health and the environmental sciences.

The following are useful textbooks for Bayesian statistics and hierarchical models for spatial data analysis:
· Banerjee, S., Carlin, B.P. and Gelfand, A.E. (2004). Hierarchical Modeling and Analysis for Spatial Data. Publisher: CRC/Chapman and Hall.

· Diggle, P.J. and Ribeiro Jr., P.J. (2007). Model-based Geostatistics. Publisher: Springer.

· Waller, L. and Gotway, C. (2004). Applied Spatial Statistics for Public Health Data. Publishers: John Wiley and Sons.

· Carlin, B.P. and Louis, T.A. (2000).Bayes and Empirical Bayes Methods for Data Analysis. Second Edition. Publisher: CRC/Chapman and Hall.

· Diggle, P., Fuentes, M., Gelfand, A.E. and Guttorp, P. (2010). Handbook of Spatial Statistics. Publisher: CRC/Taylor and Francis.

· Gelman, A., Carlin, J.B., Stern, H.S. and Rubin, D.B. (2004). Bayesian Data Analysis. Second Edition. Publisher: CRC/Chapman and Hall.

· Dalgaard, P. (2002). Introductory Statistics with R.

· Faraway, J.J. (2005). Linear Models with R. Publisher: CRC/Chapman and Hall.

· Lee, P. M. (2004). Bayesian Statistics Publisher: Hodder Arnold.

· Venables, W.N., Smith, D.M. and the R Development Core Team (2002). An Introduction to R: Revised and Updated.

WORKSHOP REQUIREMENTS (November 25, 2011 – updated by Mario)
You will need to bring your laptop preferably a WINDOWS pc (32-bit or 64-bit) computer. We would like delegates to share 1 laptop between 2 people for more efficient use of time. I.e. teach one, learn one. Of course, you can rotate after lunch and the other person can be the programmer.

WinBUGS only works on a WINDOWS platform. It would be useful if you could attempt to install the following computer programs on your computer before the day of the workshop (i.e. December 2, 2011). Otherwise, come early on December 2, 2011 (8.15am) to install programs with or help.

We will provide a 'minimal' set of printed notes (an introduction, plus the exercises and computing notes) to SAVE the TREES! We will provide a complimentary USB stick (4Gbytes), which will have all of the lecture notes (230 pages!) as well as the documents linking the separate lectures, and the software mentioned below. Please note that these lecture notes on the USB stick cannot be distributed to any third party without the permission of the author (Professor Fuentes).

The FREE software to be used in the workshop will be:
(i)   The BUGS (**B**ayesian inference **U**sing **G**ibbs **S**ampling) project is concerned with flexible software for the Bayesian analysis of complex statistical models using Markov chain Monte Carlo (MCMC) methods. Go to http://www.mrc-bsu.cam.ac.uk/bugs/ for full details. You can download WinBUGS 1.4.3 or the open source version of WinBUGS called OpenBUGS. Please do read the notes carefully on the website.

(ii) The R Statistical System. Go to http://www.r-project.org/ and download the latest (base) version for WINDOWS platform. The setup file is an auto-sense installation and will install the relevant version for your 32bit or 64-bit computer. The version will be R-2.14.0 at the time of this writing.

(iii) The R Statistical System needs certain packages for the workshop. These are called akima, fields, geoR, splancs, R2WinBUGS, and BRugs. Once you have installed the R program, you can install these packages from the Internet at your home or office via the Packages menu item in R. In the workshop, we will have the binary/zipped versions of these packages on the USB stick, to install.

(iv) Editors. Some people use R to run the scripts of R code, but there is a popular editor called RStudio. Go to http://www.RStudio.org and download this software.

Programme (Skeleton only)
8: 15:Registration and checking laptops with appropriate files software
(All sessions will have extra breaks as required)
9:00am – 10.30am SESSION 1:
10.30 am – 11.00 am Morning tea
11.00 am – 12.30 pm SESSION 2:
Includes laboratory 1: R for spatial statistics. (1 hour)
12.30 pm – 1.30 pm Lunch
1.30 pm – 3.00 pm SESSION 3:
3.00 pm – 3.30pm Afternoon tea
3.30pm – 5.00 pm SESSION 4:
Includes laboratory 2: WinBUGS for spatial statistics. (1 hour)
5.00 pm Close and feedback

Last updated November 25, 2011. MF&MD