CAS in Clinical Research

Applied Bayesian Statistics in Medical Research

Description

The Bayesian approach to medical research offers a powerful framework allowing for the incorporation of externally available information. Although Bayesian statistics is sometimes perceived and discussed as controversial, this course is not about controversies, but about pragmatic ways of integrating available information in a coherent way in analyses of epidemiological and clinical studies. The course builds on applied problems and exercises. It is aimed at epidemiologists, statisticians and others who wish to use Bayesian approaches. Participants should have a good understanding of basic statistical and epidemiological principles and be able to interpret parameters and results from standard data analyses.

Objectives

- To understand the role of Bayesian statistics in clinical research and health-care evaluation.
- To introduce computational tools for Bayesian analysis.
- To highlight challenges and dangers of naïve use of Bayesian methods.
- To provide the basis for a unified statistical approach that allows approaching problems of analysis and design in a structured way

Dates

Wed 3 – Fri 5 July 2019

Equipment

Participants must bring their own laptops.

Contact:

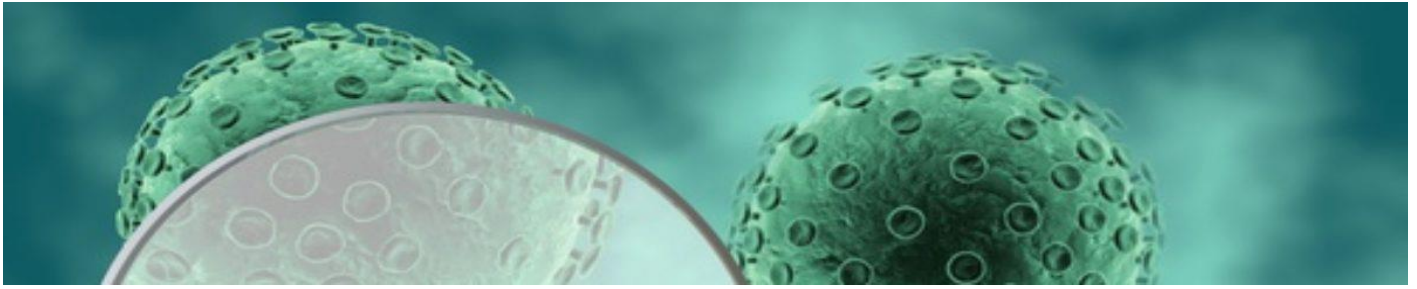Course coordination: Ann Walser

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Course Structure

The course consists of a mixture of lectures and computer practicals.

Wednesday
- Introduction to Bayesian methods: basic principles, probabilities
- Inference for binary data and making predictions for binary data
- Computer practicals:
  - on handling probabilities and Bayesian inference for binary data
  - on predictions on number of successes in additional N patients

Thursday
- Bayesian Inference for Normal Data
- Introduction to simulation-based Bayesian analysis (Markov Chain Monte Carlo algorithms) and running Generalized Linear Models (GLM) in JAGS
- Computer practicals:
  - on the analysis of normal data and running JAGS
  - on estimating prevalence, sensitivity, specificity in situations in which two different diagnostic tests are used and no gold-standard is available (in JAGS)

Friday
- Bayesian approaches to evidence synthesis and meta-analysis and how to quantify the amount of historical information
- Issues when incorporating prior information
- Computer practicals on quantifying historical information
- Question and answer session, and feedback on the course

Students will bring their own portable computers. Prior to the course, we will provide instructions regarding the installation of the software packages that will be used in the course. These are R (http://www.r-project.org/) and JAGS (http://mcmc-jags.sourceforge.net/) which are both freeware. JAGS (Just Another Gibbs Sampler) is a cross-platform engine for the BUGS language with distributions for Mac OS X, Windows, and Linux.

Assessment

Exam deliveries defined on the last day.

Credits

1 ECTS

Preliminary Work: 3 h (installing software), Contact: 22 h, Wrap-up Work: 3 h
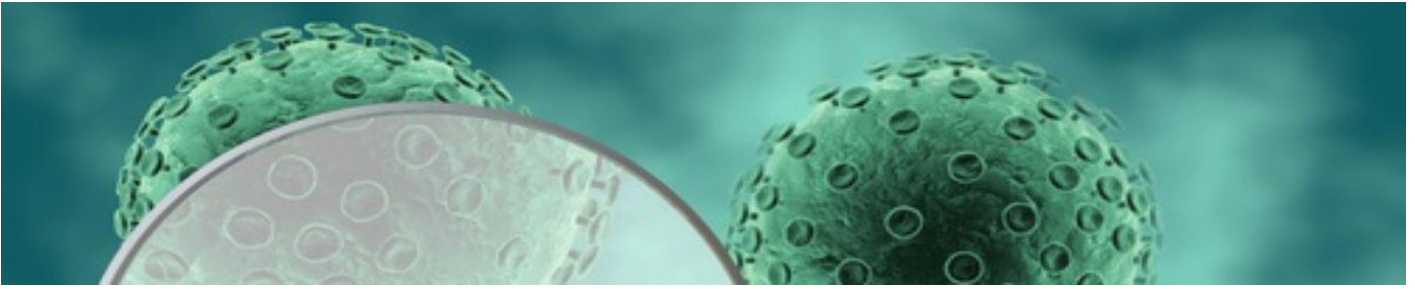
(1 ECTS corresponds to appr. 26-30 hours' work

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	Simon Wandel, PhD, Expert Statistical Methodologist, Novartis Pharma AG, Basel
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