

Bayesian approach

- when and why (not)

Structural equations modelling and Bayesian analysis

Background

This hybrid course will cover two different, but complimentary, aspects of statistical modelling. Structural equations modelling deals with testing hypotheses about the topological structure of multivariate statistical models; i.e. hypotheses concerning how variables are linked together in the form of a causal hypothesis concerning direct and indirect effects. Bayesian analysis deals with the way that uncertainties (such as from prior information, or unknown parameters), coded in the form of a probability density, are integrated with subsequent observations in order to estimate and test statistical hypotheses. Since these two topics deal with quite different aspects of the modelling enterprise they are complementary and, together, provide a more complete understanding of statistical modelling.

Topics and Key Words

The course will provide both a theoretical background and practical instruction on the application of these methods.

Part I: Structural Equations

- The logic of causal inference
- Independence, partial independence and d-separation
- D-separation tests
- Exploratory methods using d-separation
- Maximum likelihood estimation of SEM
- Modelling latent variables
- Inferential tests based on maximum likelihood
- Nested models

Part II: Bayesian analysis and hierarchical models

- What is probability?
- Bayesian inference
- Graphical Models
- Hierarchical Models
- MCMC
- Missing data and prediction

Target audience

PhD students and other researchers, primarily within the agricultural and biological sciences, who require advanced knowledge in these areas.

Required knowledge & prerequisites.

We assume that participants have a basic knowledge of statistical methods and are familiar with personal computers working in a Windows environment.

Scientifically responsible

Hannu Rita, Dept. of Forest Resource Management, P.O. Box 27 (Latokartanonkaari 7), FI-00014 University of Helsinki; E-mail: hannu.rita@helsinki.fi

Teaching methods

Lectures alternating with intensive use of computer exercises. The availability of required software (EQS and OpenBUGS) is essential.

Suggested references

Shipley, B. 2000. Cause and correlation in biology: A user's guide to path analysis, structural equations, and causal inference. Cambridge University Press.

Gelman, A. and Hill, J. 2006. Data analysis using regression and multi-level/hierarchical models. Cambridge University Press.

Examination

Examination (pass/no-pass) will be based on a written project report handed in at the end of the course in combination with an oral presentation. The number of credits is 6 ECTS.

Summer School Venue

The course will be held at:

Häme Polytechnic,
Mustiala Faculty of Agriculture
Mustialantie 105
31310 Mustiala,
FINLAND
<http://www.mustiala.hamk.fi/eng/>

Mustiala Faculty of Agriculture

Mustiala Faculty of Agriculture is situated in a rural environment in Tammela, about 120 km from Helsinki. It was established in 1840 as the first agricultural college in Finland. Today Mustiala faculty of Agriculture forms one of the seven units of Häme Polytechnic. The beautiful buildings of 19th century college and campus with all modern conveniences create a unique environment for the summer school.

Accommodation

The participants will be accommodated in double rooms in the student hostel located in the campus area. The hostel has well-equipped kitchen and bathroom facilities.



Food

Breakfast, lunch and dinner will be served in the refectory of Mustiala. Afternoon coffee will be available in the lecture room.

Leisure time

In the attractive park areas of the college there is a museum of agriculture, sauna by the lake and swimming place. Mustiala has its own pub and a training brewery, which also produces high quality beer commercially. During the first weekend of August the annual 17th century weekend with food and crafts market, music and drama, takes place in Mustiala.

Financed by

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UNIVERSITY

Registration

Up until May 20th 2007, course registration will be considered as preliminary. If not cancelled by this date the preliminary registration will be considered as final.

Please register at the course homepage

<http://www.dina.dk/phd/s/s10/>

Financial support

PhD students from NOVA universities participate for free (a modest fee *may* be necessary). PhD students from other universities as well as everyone else must pay for accommodation and meals (800 €). Priority is given to NOVA PhD students.

Unlike previous years, there will be no reimbursement of travel costs (not even for NOVA PhD students). It is the obligation of the participant's university to cover the travel costs. Each participant must bring a laptop computer with wireless network.

Teachers

- Guest teacher: Professor John William (Bill) Shipley, Département de Biologie, Université de Sherbrooke, Sherbrooke (Québec), Canada
- Guest teacher: Academy Research Fellow Bob O'Hara, Dept. of Mathematics and Statistics, University of Helsinki, Finland
- Hannu Rita, University of Helsinki

Language

The course will be held in English

National contact persons

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Norway: Knut Kvaal, Dept. Mathematical Sciences and Technology, Norwegian University of Life Sciences, P.O. Box 5003, NO-1438 Ås; E-mail: knut.kvaal@umb.no

Sweden: Dietrich von Rosen, Dept. Biometry and Engineering, Swedish University of Agricultural Sciences, P.O. Box 7032, S-750 07 Uppsala; E-mail: Dietrich.von.Rosen@bt.slu.se

Organiser & for further information:

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Co-organiser

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Nordic PhD course



Mustiala Faculty of Agriculture
July 31 - August 10, 2007

Organized by

Faculty of Agriculture and Forestry
University of Helsinki

MTT Agrifood Research Finland

On behalf of

Nordic Informatics Network
in Agricultural Sciences