

Bayesian Analysis and Decision Theory

- a summer school at Lund University 2015

This course is organized in cooperation with the research school [ClimBEco](#)

Contact and info [ullrika.sahlin at cec.lu.se](mailto:ullrika.sahlin@cec.lu.se)

Background to the course

Bayesian methods are becoming more used in research. Bayesian methods are used for inference, modelling of complex data, model calibration, integration of multiple sources of information, combination of data with expert knowledge, and decision analysis. Despite the usefulness and growing interest of Bayesian methods there is a low supply of courses in Bayesian methods in Sweden. This course contributes to fill this gap.

There is a growing interest to integrate decision problems in scientific projects, either to model decisions (e.g. agent based modelling) or to provide decision support to managers or policy makers. Decision analysis is a natural application of Bayesian reasoning where making predictions and quantifying uncertainty becomes important. Decision analysis is needed to frame inference with the purpose of making predictions, which often is held back by inference focusing on the values of parameters or hypothesis testing. Learning about Bayesian methods in combination with decision analysis will give the course participants a basis to understand and work with assessment and communication of environmental and climate problems.

When and where

The course will be given as a summer school from August 17th to 21st 2015 in Lund, Sweden. Lectures will be mixed with computer assignments and literature seminars.

Who

The course will be open for anyone who has basic knowledge in probability theory. Due to limited number of places the applicants will be asked to motivate why they want to take the course and provide a brief description of the type of research they are doing upon registration. Experience in R will be an advantage. Methods will be presented in settings where they are applied using simple examples from the field of environmental and risk management. The purpose with the applied focus is to give students basic skills to use these methods, understand what they can be used for, and stimulate the student's curiosity in learning more about them at a more foundational level.

Register [here](#)

Last date to register is May 7th and we will notify the participants if they are accepted to the course on May 12th.

Description

The course has four parts:

Part 1. Decision analysis and Bayesian Belief Networks

Part 2. Bayesian and hierarchical modelling

Part 3. Quantification and treatment of uncertainty

Part 4. Scientific principles for knowledge production to support decisions

Presentation of lecturers

[Johan Lindström](#) is a lecturer at Mathematical Statistics Lund University with many years of experience in teaching Bayesian methods and hierarchical modelling.

[Roger Flage](#) is an assistant professor in Risk Analysis at the University of Stavanger in Norway. He has a PhD in risk management and societal safety and has co-authored several articles and a book on the topic of treatment of uncertainty in risk analysis.

[Matthias Troffaes](#) is a senior lecturer at the Department of Mathematical Sciences at Durham University. Amongst his experience in teaching decision making under severe uncertainty and he has written several papers and books about imprecise probabilities.

[Niklas Vareman](#) is a postdoc in medical ethics with a PhD in Theoretical Philosophy working with decision making under uncertainty and scientific principles for dealing with poor knowledge.

[Yann Clough](#) is a researcher at Lund University Centre of Environmental and Climate research with experience in teaching Bayesian modelling and ecological modelling.

[Ullrika Sahlin](#) (course organizer) is a researcher at Lund University Centre of Environmental and Climate research with experience in teaching risk analysis and uncertainty management.

Preliminary schedule

The summer school will take place in August 2015

Time	Monday 17th	Tuesday 18th	Wednesday 19th	Thursday 20th	Friday 21st	Individual work on projects	Web-conference One day the week Sept 15 to 18 - to be decided
8:30 - 10:00		Intro to Decision Theory (MT)	BBN - Lecture and case-study II (US)	Robust Bayesian Analysis - Lecture and exercise (MT, US)	Present projects ideas		
10:15 - 12:00	Intro to Bayesian analysis - Lecture and exercise (JL, YC)	BHM -Lecture and case-study II (JL, YC)	BHM - inference and predictions in case-study III (JL, YC, US)		Introduction of projects		
Lunch							
13:15 - 14:00				Project preparations			
14:15 - 15:00	BBN - Lecture and exercise, case study I (US, YC)			Uncertainty in quantitative risk assessment - exercise (RF)			
15:15-17:00		Values and cautionary principles - Lecture (NV)	Uncertainty in quantitative risk assessment - Lecture (RF)	Literature seminar (NV)			
Evening		Social event	Social event				

Course content

– as soon as we have the course home page running we will post more information here

Lectures

Exercises

Literature seminar – literature will be handed out before the course

Individual project – the student get the chance to take something delivered in the course and apply it on something that are in their own interest. It can be purely theoretical or more hands-on modelling project. The students will be encouraged to use the project to address a scientific question and their ideas will be discussed the last day of the course. Then they will work individually with it for one week. Projects will be presented on a web-conference, where other people than those attending the course will be invited to listen (or we make a podcast of the presentations).

Web-conference