BAYES 20 @LUND 16

A Mini-conference on Bayesian Methods at Lund University
5th of February, 2016
Room C121, Lux building, Helgonavägen 3, Lund University.
www.lucs.lu.se/bayes-at-lund-2016/

Program

12.15–12.45 Welcome and invited presentation

▷ *An Introduction to Bayesian computation and evidence synthesis using STAN*, Robert Grant, Faculty of Health, Social Care and Education, University of London.

12.45–13.15 Sandwich lunch and mingle in the foyer (free, but requires registration)

13.15–14.15 Keynote presentation

▷ *Bayesian Benefits for the Pragmatic Researcher*, Eric-Jan Wagenmakers, Department of Psychology, University of Amsterdam.

14.20–15.10 Session 1

▷ *Bayesian Meta Analysis and Bias Modeling: A Case Study with Relative Clause Processing in Mandarin Chinese,* Shravan Vasishth and Lena Jaeger, Departement of Linguistics, University of Potsdam.

▷ *A Bayesian reflection on the meaning of evidence*, Ullrika Sahlin, Centre for Environmental and Climate Research, Lund University.

▷ *The Bootstrap is a Bayesian procedure, but that doesn't mean it's any good*, Rasmus Bååth, Lund University Cognitive Science.

15.10–15.30 Coffee and Cake

15.30–16.30 Session 2

▷ *Bayesian methods in epidemiological research – why so seldom used?* Jonas Björk, Division of occupational and environmental medicine, Lund University.

▷ *Regularized supervised topic models for high-dimensional multi-class regression*, Måns Magnusson, Department of Computer and Information Science, Linköping University.

▷ *Modeling the growth of Swedish Scots pines*, Henrike Häbel, Department of Mathematical Sciences, Chalmers University of Technology.

16.30 Concluding remarks and end of conference.

Invited presentation

An Introduction to Bayesian computation and evidence synthesis using STAN

Robert Grant, Faculty of Health, Social Care and Education, University of London, Robert.Grant@sgul.kingston.ac.uk

Stan has rapidly become one of the most popular packages for Bayesian modeling in recent years. It is open-source and free, and uses a newer, faster and more stable algorithm than the method in BUGS, JAGS, MLwiN, Stata and SAS. I will introduce the software and highlight where it will have particular advantages for researchers. An application will be given in detail from a recent meta-analysis of the psycho-social benefits of exercise interventions for people with osteoarthritis. The published evidence measures benefit with different scales, dichotomises them in different ways, and reports different summary statistics, all of which are potentially problematic for analysis.

Keynote presentation

Bayesian Benefits for the Pragmatic Researcher

Eric-Jan Wagenmakers, Department of Psychology, University of Amsterdam, ej.wagenmakers@gmail.com

The practical advantages of Bayesian inference are demonstrated through two concrete examples. In the first example, we wish to learn whether or not a criminal is intellectually disabled — this is a problem of parameter estimation. In the second example, we wish to quantify support in favor of a null hypothesis, and track this support as the data accumulate — this is a problem of hypothesis testing. The Bayesian framework unifies both problems within a coherent predictive framework, where parameters and models that predicted the data successfully will receive a boost in plausibility, whereas parameters and models that predicted poorly suffer a decline. Our examples demonstrate how Bayesian analyses can be more informative, more elegant, and more flexible than the orthodox methodology that remains dominant within many fields.

Session 1

Bayesian Meta Analysis and Bias Modeling: A Case Study with Relative Clause Processing in Mandarin Chinese

Shravan Vasishth and Lena Jaeger, Departement of Linguistics, University of Potsdam, vasishth.shravan@gmail.com

The reading difficulty associated with Chinese relative clauses presents an important empirical problem for psycholinguistic research on sentence comprehension processes, but the results vary from study to study. We carried out a Bayesian random-effects meta-analysis using 15 published studies; this analysis showed that the posterior probability of a subject relative advantage is approximately 0.77. Bias modelling was used to incorporate expert opinion quantitatively in the model. As a proof of concept, we identified biases in five of the fifteen studies, and elicited priors on these using the SHELF framework. Then we fitted a random-effects meta-analysis, including priors on biases. This analysis showed a stronger posterior probability (0.96) of a subject relative advantage compared to the standard random-effects meta-analysis.

A Bayesian reflection on the meaning of evidence

Ullrika Sahlin, Centre for Environmental and Climate Research, Lund University, ullrika.sahlin@cec.lu.se

Evidence-based decision-making is something many see as ideal. Current models for evidence-based decision-making have set requirements of what qualify as evidence, and may even rate evidence from low to high quality. Still, evidence is a vaguely defined term. I am often puzzled about what is, and what is not, seen as evidence. Is evidence restricted to data? Can an expert judgment be evidence? Can a prediction from a complex simulation model be evidence? To get a little wiser I studied the definition of evidence in examples of Bayesian analysis. I find that a Bayesian interpretation of evidence is broader than put forward in current evidence-based frameworks. Perhaps this broader view can be useful when setting new standards to evaluate quality of evidence in evidence-based decision-making.

The Bootstrap is a Bayesian procedure, but that doesn't mean it's any good

Rasmus Bååth, Lund University Cognitive Science, rasmus.baath@gmail.com

The non-parametric bootstrap is a popular statistical method that produces something that looks very much like draws from a Bayesian posterior distribution. There are papers comparing the bootstrap to Bayesian models and one might wonder which alternative is more appropriate: Bayes or bootstrap? But these are not opposing alternatives, because the non-parametric bootstrap is a Bayesian model. Just because it's Bayesian does not necessarily mean it is any good and "We used a Bayesian model" is as much a quality assurance as "we used probability to calculate something". However, writing out a statistical method as a Bayesian model can help you understand when that method could work well and how it can be made better.

Session 2

Bayesian methods in epidemiological research – why so seldom used?

Jonas Björk, Division of occupational and environmental medicine, Lund University, jonas.bjork@med.lu.se

Epidemiology is a science that seek to understand the variation in disease across population groups. The study designs are usually observational, which hampers the possibilities to draw firm conclusions regarding cause and effect. Subgroups are often investigated in order to identify groups that are especially susceptible to exposure or treatment effects, which means that multiple inferences are routinely conducted. All this makes epidemiology a suitable arena for both empirical and fully Bayesian methods, but such methods are still quite rarely used within the field. In this talk, I will give examples of Bayesian approaches in epidemiological research, and discuss what can be done in order to make Bayesian methods more widespread among epidemiologists.

Regularized supervised topic models for high-dimensional multiclass regression

Måns Magnusson, Department of Computer and Information Science, Linköping University, mons.magnusson@gmail.com

During the latest years supervised topic models has become more and more popular as an approach for modeling textual data to predict a label. We introduce a supervised topic model to handle both many classes as well as many covariates in the stage of prediction. To handle many classes we use the recently proposed Diagonal Orthant probit model for multiclass classification and to handle many topics and covariates we use an efficient horseshoe prior for variable selection/shrinkage.

Modeling the growth of Swedish Scots pines

Henrike Häbel, Department of Mathematical Sciences, Chalmers University of Technology, henrike.habel@chalmers.se

Predicting tree growth is important in forestry. Forest dynamics - including immigration of trees, their growth and death due to natural causes or interactions with other trees - can be spatio-temporally modeled by a time-dependent marked point process, where the points correspond to locations of trees and the marks to their sizes. In this case study, a Growth-Interaction-process containing all building blocks mentioned above is used to model the growth of Swedish Scots pines. We concentrate on the open growth (without interactions), and compare a hierarchical Bayesian and a frequentist mixed approach to estimate the parameters of the growth function.

Acknowledgement

The organizing committee of this year's Bayes@Lund consisted of Rasmus Bååth (Lund University Cognitive Science) and Ullrika Sahlin (Centre of Environmental and Climate Research). The conference was arranged as part of the advanced study group *Quantifying and Communicating Uncertainty* at the Pufendorf institute. We are deeply grateful to the Pufendorf institute for financial support of this event.

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