4th ECPR Winter School in Methods and Techniques, 13-20 February 2015
University of Bamberg, Germany
Course Description Form[1] [1-week main course, 15 hours]

Course title

WD210. Introduction to Bayesian Inference

Instructor details

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Short Bio

Susumu Shikano is Professor of Political Methodology at the University of Konstanz. His research interests are various topics of comparative political sociology and political economy. He teaches electoral politics, coalition formation and methodology in political science.
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Prerequisite knowledge

Prior knowledge of statistics including regression models with different types of dependent variables. Basic knowledge of R.

Short course outline

Political scientists increasingly apply the Bayesian approach to diverse kinds of research topics. To motivate further political scientists to use this approach, this course provides participants the following three points: First, the course provides a well-grounded conceptional background for Bayesian analysis. Second, participants will be guided how to read the literature concerning Bayesian statistics and interpret the results. Third, this course gives a practical introduction to a software for Bayesian analysis with political science examples. The course consists of lectures (morning) and lab sessions (afternoon). The lecture deals with relevant background knowledge as well as specific skills for Bayesian analysis. In lab sessions, these skills are applied to political and social science data. Hence, course participants also learn the basic knowledge of WinBUGS, which is needed to conduct Bayesian estimation.

Long course outline

Political scientists increasingly apply the Bayesian approach to diverse kinds of research topics. This development is due to a series of its attractive features: e.g. handling aggregate data without sampling processes, analysing small N data, estimating models with complex likelihood functions. Furthermore, the increasing capacity of modern computers enables a wider range of researchers to conduct such computationally intensive estimations.

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[1] *Disclaimer: the information contained in this course description form may be subject to subsequent adaptations (e.g. taking into account new developments in the field, specific participant demands, group size etc.). Registered participants will be informed in due time in case of adaptations.*

Despite of these advantages there is still backlog demand in respect to several points: First, it is not widely enough acknowledged that Bayesian statistics and conventional statistics are based on different views concerning theory and data. Second, the literature, including text books, is in general too technical to motivate most political scientists to apply Bayesian analysis to their own research questions. Third, the programs needed for Bayesian analysis is not user friendly enough for most political scientists.

The course aims to close these gaps. First, the course provides a well-grounded conceptional background for Bayesian analysis. Second, participants will be guided how to read the literature concerning Bayesian statistics and interpret the results. Third, this course gives a practical introduction in a specific software for Bayesian analysis with political science examples.

More specifically, the course covers the following topics: Fundamentals of Bayesian analysis, Bayesian estimation using MCMC and estimation of various regression models (binary logit/probit, poisson, multi-level, robust regression etc.) in Bayesian framework. The course consists of lectures (morning) and lab sessions (afternoon). The lecture deals with relevant background knowledge as well as specific skills for Bayesian analysis. In lab sessions, these skills are applied to political and social science data. Hence, course participants also learn the basic knowledge of WinBUGS which is needed to conduct Bayesian estimation.

Participants are required to have basic knowledge in statistical analysis including regression models with different types of dependent variables. Furthermore, in lab sessions participants learn how to use WinBUGS from R. Therefore, the basic knowledge in R is also recommended.

Note that this is an introductory one week course. This course, therefore, cannot thoroughly treat the wide range of statistical models and further advanced topics in Bayesian statistics. For those who have basic knowledge in Bayesian statistics and can conduct regression analysis using WinBUGS, this course is not adequate.

Day-to-day schedule (Monday 16 February to Friday 20 February)

	Topic(s)	**Details [NB : incl. timing of lecture v/s lab or fieldwork etc. hours]**
Day 1	General introduction, Basics of Bayesian inference	1.5 hours lecture, 1.5 hours lab time on R programming
Day 2	Markov-Chain-Monte-Carlo Introduction to WinBUGS	1.5 hours lecture, 1.5 hours lab time on R programming
Day 3	Regression models I	1.5 hours lecture, 1.5 hours lab time on R programming
Day 4	Regression models II	1.5 hours lecture, 1.5 hours lab time on R programming
Day 5	Advanced statistical models	1.5 hours lecture, 1.5 hours lab time on R programming

Day-to-day reading list

	Readings (please list at least the compulsory reading for the scheduled day)
Day 1	Shikano (Forthcoming), Western & Jackman (1994)
Day 2	Jackman (2009) Chapter 1-2
Day 3	Jackman (2009) Chapter 3-6
Day 4	Jackman (2009) Chapter 8
Day 5	Jackman (2009) Chapter 7

Software and hardware requirements

Software programme

R (free from http://cran.r-project.org/)
WinBUGS (free from http://www.mrc-bsu.cam.ac.uk/bugs/)

Hardware requirements

None

Literature

Shikano, Susumu, Bayesian estimation of regression models, Henning Best and Christof Wolf, eds. Regression Analysis and Causal Inference, Sage, 2014
Jackman, S. Bayesian Analysis for the Social Sciences. Wiley: New York. 2009.
Western, B. & Jackman, S. Bayesian Inference for Comparative Research, American Political Science Review, 1994, 88, 412-23
Gelman, Andew and Hill, Jennifer. Data Analysis using Regression and Multilevel/Hierarchical Models. Cambridge University Press; 2007.
Gill, Jeff. Bayesian Methods: A Social and Behavioral Sciences Approach. Boca Raton, FL: Chapman and Hall/CRC; 2002.

Lecture room requirement

A room with laptop projector

Preferred time slots

None

Other recommended courses (before or after this course)

The following other ECPR Methods School courses could be useful in combination with this one in a 'training track'. NB this is an indicative list.

Before this course:

	Course title	Summer School	Winter School
1	Introduction to Statistics		X
2	Introduction to R	X	X
3	Event History and Survival Analysis	X	
4	Advanced Topics in Applied Regression	X	
5	Multiple Regression	X	

After this course:

	Course title	Summer School	Winter School
1	Multilevel Regression Modelling	X	X
2	Advanced Discrete Choice Modelling		X
3			
4			
5			