

Summer school on Advanced Bayesian Methods

16-20 September 2024

1st announcement



Interuniversity Institute for Biostatistics
and statistical Bioinformatics

The Interuniversity Institute for Biostatistics and statistical Bioinformatics organizes for the **6st time** the **Summer School on Advanced Bayesian Methods**. As before, the focus is on novel Bayesian methods relevant to the applied statistician.

The following two courses will be organized in Leuven from **16 to 20 September 2024**:

- **Two-day course (16-17 September) on Bayesian causal inference** by Prof Chris Holmes and Dr Andrew Yiu (University of Oxford, UK)
- **Two-day course (19-20 September) on Advanced Bayesian Methods: Theory and Applications in R** by Prof. Nikolaus Umlauf (University of Innsbruck, Austria)

The target audience of the summer school are statisticians and/or epidemiologists with a sound background in statistics, but also with a background in Bayesian methodology. In both courses, practical sessions are organized, so participants are asked to bring along their laptop with the appropriate software (to be announced) pre-installed.

The registration costs for the courses are:

I-Biostat member	€ 50
PhD student	€ 200
Quetelet member	€ 200
Academic	€ 300
ISBA member	€ 300
Research institute	€ 300
Industry	€ 900

Note that one is registered to the course, **ONLY when the registration costs have been paid**. The **deadline for registration is July 31, 2024**. The deadline for payment is **August 31, 2024**.

More information about the courses and practicalities (registration, location, transportation, etc.) can be found in due time on <https://ibiostat.be>.

Please reserve already this week in September 2024!

For questions about the registration costs, please contact Gunhild Vercammen (gunhild.vercammen@kuleuven.be). For other questions, please contact Emmanuel Lesaffre (emmanuel.lesaffre@kuleuven.be).

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Bayesian Causal Inference

Prof Chris Holmes and Dr Andrew Yiu (University of Oxford)

Causal inference concerns statistical reasoning about the potential effect of interventions given information from observational studies and/or randomized experiments. The task is common in epidemiology, medical statistics, and the social sciences. Bayesian causal analyses make use of probabilistic models to obtain posterior distributions on causal quantities of interest that provide uncertainty quantification directly on the causal estimand, rather than indirectly via the finite sample variability of a causal estimator.

The course is intended to provide an overview of the fundamentals of causal inference, and a modern review of Bayesian approaches in this field.

Topics to be covered:

- foundations of causal inference starting with the introduction of randomized experiments by Fisher and Neyman;
- potential outcomes, counterfactuals, and the framing of the Rubin Causal Model
- causal graphical models as introduced by Pearl;
- the fundamental problem of causal inference and the necessary conditions for causal inference from observational data;
- the use of probabilistic, generative models in Bayesian causal analysis, including nonparametric methods and the Bayesian bootstrap;
- decision theoretic considerations and the avoidance of counterfactuals;
- target trial emulation.

Advanced Bayesian Methods: Theory and Applications in R

Nikolaus Umlauf (University of Innsbruck)

This 2-day short course is designed to provide participants with a comprehensive understanding of advanced Bayesian structured additive regression models and their practical implementation using the R programming language. The course begins with foundational sessions covering Bayesian regression models, structured additive models, and spatial/temporal modeling. Participants will gain hands-on experience using popular R packages such as `bamlss`, `brms`, `mgcv` and `stan`. The second day delves into advanced topics, including interactions, nonlinear effects, model selection, and the integration of Bayesian methods with machine learning. The course emphasizes practical applications through case studies and exercises, allowing participants to apply learned concepts to real-world problems. The addition of Bayesian machine learning and big data handling provides a holistic view of contemporary Bayesian statistical modeling. By the end of the course, participants will be equipped with the knowledge and skills to tackle first complex data analysis challenges using Bayesian structured additive (distributional) regression models in R.

Pre-Requisites

- Familiarity with regression models and with coding in R

Bio sketches of the course instructors

Prof Chris Holmes and Dr Andrew Yiu (University of Oxford, UK)

Chris Holmes is Professor of Biostatistics in the departments of Statistics and the Nuffield Department of Medicine at the University of Oxford. His research concerns the theory, methods and applications of statistical machine learning and Bayesian analysis in the health and medical sciences. Holmes is previous recipient of the IMS Medallion, and the Royal Statistical Society's Guy Medal in Bronze. Holmes serves on the editorial board for the New England Journal of Medicine AI, the International Advisory Board for UK BioBank, and the data science committee of the Novo Nordisk Foundation.

Andrew Yiu is a postdoctoral researcher in the Department of Statistics at the University of Oxford. Yiu completed his undergraduate degree in mathematics at the University of Cambridge, and his doctorate at the Medical Research Council's Biostatistics Unit at the University of Cambridge. His research interests are in causal inference.

Prof. Nikolaus Umlauf (University of Innsbruck, Austria)

Nikolaus Umlauf is Associate Professor of Statistics at the University of Innsbruck (Austria). His research focuses on complex (Bayesian) distributional regression models that can combine commonly used approaches for modeling highly nonlinear data with methods used in machine learning. The applications of this modeling framework are diverse and range from economic problems to meteorological, medical and remote sensing problems, etc. He is co-author of the R package `bamlss`, the C++ library `BayesX` and the corresponding R interface package `R2BayesX`, the `softtrees` package, the `MJMbamlss` package, the R package `exams`, and lead developer of the second generation R package `gamlss`. For more information please visit <https://nikum.org/>