Summer school on Advanced Bayesian Methods

11-15 September 2023

2nd announcement

Interuniversity Institute for Biostatistics and statistical Bioinformatics

The Interuniversity Institute for Biostatistics and statistical Bioinformatics organizes for the **5th time** the **Summer School on Advanced Bayesian Methods**. As before, the focus is on novel Bayesian methods relevant to the applied statistician.

In the fifth edition of the summer school, the following two courses will be organized in Leuven from **11 to 15 September 2023**:

- **Three-day course (11-13 September) on Bayesian Workflow for hierarchical and ODE-based models using Stan** by Dr. Charles Margossian (Flatiron Institute, Center for Computational Mathematics in New York)
- **Two-day course (14-15 September) on Spatial modelling with inlabru in ecology and beyond--background and practice** by Prof. Janine Illian (University of Glasgow, UK)

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:

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

Three-day course	
I-Biostat member:	€ 50
PhD student:	€ 250
Quetelet member	€ 250
Academic:	€ 400
ISBA member:	€ 400
Research institute:	€ 400
Industry:	€ 1200

Note that one is registered to the course, **ONLY when the registration costs have been paid**. The **deadline for registration is July 31, 2023**.

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 2023!

For additional questions, please contact Kirsten Verhaegen (kirsten.verhaegen@kuleuven.be).

Supported by

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Bayesian Workflow for hierarchical and ODE-based models using Stan

by Dr. Charles Margossian
(Flatiron Institute, Center for Computational Mathematics in New York)

In this course we will discuss the tenants of the Bayesian workflow and how to execute them using state-of-the-art software. The Bayesian workflow is the iterative process through which we build, fit, and criticize models, with the latter step often motivating useful revisions to our model. We will take advantage of Stan, a Bayesian inference software which boasts a flexible language to specify models, and supports scalable inference algorithms, notably an adaptive Hamiltonian Monte Carlo (HMC) sampler — currently one of the most successful Markov chain Monte Carlo (MCMC) methods. This will be a hands-on workshop: students will be expected to code and attempt several exercises. Throughout, ongoing research as well as open questions on the subject of Bayesian modeling will also be highlighted.

Objectives of the course are:

- Learn the Stan language
- Develop a (deeper than usual) understanding of Bayesian inference using MCMC
- Learn the fundamentals of the Bayesian workflow
- Apply these principles to hierarchical models and ODE-based models, with an optional session on applications in pharmacometrics using the add-on Torsten

Pre-requisites:

- Familiarity with Bayesian modeling and probability distributions
- Familiarity in a coding language, e.g R or Python. We will use R scripts for the exercises, but the focus will be on coding in Stan. Students are not expected to know Stan.

Spatial modelling with inlabru in ecology and beyond-- background and practice

Professor Janine Illian (University of Glasgow, UK)

Over the last decade or so, Integrated nested Laplace Approximation (INLA) methodology has become increasingly popular. Due to its computational efficiency, in particular in the context of spatial and spatio-temporal modelling it has frequently been applied in ecological studies and elsewhere. The R package **inlabru** provides a particular flexible wrapper around the well-known package R-INLA with a streamlined user interface to R-INLA with additional capabilities.

It provides features that are particularly relevant in applied contexts, by facilitating point processes modelling for log Gaussian Cox processes, accounting for complex observation processes and allowing for non-linear functional relationships. This course will introduce the package **inlabru**, through teaching both the philosophy behind the software and the relevant syntax, and through illustrating its use with hands-on examples.

Bio sketches of the course instructors

Charles Margossian
(Flatiron Institute, Center for Computational Mathematics in New York)

Dr. Charles Margossian is a postdoctoral fellow at the Flatiron Institute, Center for Computational Mathematics in New York. Much of his work concerns the development and high-performance implementation of Bayesian inference methods, including Markov chain Monte Carlo, approximate inference techniques such as variational inference, and hybrids which combine the two paradigms. For 6 years, Charles has been a core developer of the Bayesian inference software Stan; he is the co-creator of Torsten, an extension of Stan for Pharmacometrics; and he has an ongoing collaboration with the TensorFlow Probability team. Charles earned his PhD in Statistics from Columbia University in 2022.

Janine Illian (University of Glasgow, UK)

Janine Illian is head of Statistics within the School of Mathematics and Statistics at the University of St Andrews. and Chair in Statistical Sciences at the University of Glasgow in Scotland.

Her work focuses on developing spatial statistical methodology and she is the author of "Statistical Analysis and Modelling of Spatial Point Patterns" (Wiley, 2008), which has become a standard work on point process modelling. Janine's mission has been to transform the field of spatial point process modelling from a theoretical and rather niche discipline to a practically relevant area of statistics. To do this, she has developed methods for solving realistically complex, relevant problems paired with the development of associated computationally efficient open-source model fitting software. This ensures that the methodology becomes accessible to both specialists and non-specialists and this effort has had impact, especially in spatial ecology.

Initially focusing on model development in the context of ecological research, Janine's has recently worked on spatial modelling in the context of environmental sciences, cancer research, health sciences, terrorism studies and earthquake research