



GÖTEBORGS UNIVERSITET

Bayes in Practice, 1.5 hp

Course period: October 16-20, 2017	Last day for application: September 30, 2017
Course leaders / Address for applications: Daniele Silvestro / daniele.silvestro@bioenv.gu.se Bengt Oxelman / bengt.oxelman@bioenv.gu.se	
Course description (Advertisement for Ph.D. students): Most biologists are exposed in their research to a multitude of methods and algorithms to test hypotheses, infer parameters, explore empirical data sets, etc. Bayesian methods have become standard practice in several fields, (e.g. phylogenetic inference, comparative methods, population genetics/genomics), yet understanding how this Bayesian machinery works is not always trivial. This course is based on the assumption that the easiest way to understand the principles of Bayesian inference and the functioning of the main algorithms is to implement these methods yourself. I will outline the relevant concepts and basic theory, but the focus of the course will be to learn how to do Bayesian inference <i>in practice</i> . I will show how to implement the most common algorithms to estimate parameters based on posterior probabilities, such as Markov Chain Monte Carlo and Gibbs samplers, and how to build hierarchical models. We will also touch upon hypothesis testing using Bayes factors and Bayesian variable selection. The course will take a learn-by-doing approach, in which participants will implement their own MCMCs using R or Python (templates for both languages will be provided). Participants are encouraged to think of potential applications of Bayesian inference in their research, which we will discuss and try to implement during the course.	

Responsible department and other participation departments/organisations: Department of Biology and Environmental Science
Teachers: D. Silvestro
Examiners: B. Oxelman, D. Silvestro



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Faculty of Science; Department of Biological and Environmental Sciences

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Third cycle education

1. Confirmation

Disciplinary domain: Science

Department in charge: Department of Biological and Environmental Sciences

2. Position in the educational system

Elective course; third-cycle education.

3. Entry requirements

Admitted to third cycle education.

4. Course content

The course includes: 1) frontal lectures on Bayesian inference 2) practical computer work implementing algorithms

5. Outcomes

After completion of the course the participants will have gained a better understanding of how the main Bayesian methods implemented in many programs used in biological research work. Participants will also learn how to model at least basic problems using Bayesian statistics and how to implement the necessary algorithms to solve them.

6. Required skills

Basic knowledge of Python or R

7. Assessment

The final grade will be based on course participation and interaction in discussion, as well as the implementation of a Bayesian algorithm.

8. Grading scale

The grading scale comprises Fail, (U), Pass (G)



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9. Course Evaluation

The course evaluation is carried out together with the Ph.D. students at the end of the course, and is followed by an individual, anonymous survey. The results and possible changes in the course will be shared with the students who participated in the evaluation and to those who are beginning the course.

10. Language of instruction

The language of instruction is English.