GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2015-2016

Bayesian Statistics (F000803)

Course size (nominal values; actual values may depend on programme)

Credits	6.0	Study time	180 h
Contact hrs	60.0 h		

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	English	seminar: practical PC room classes	20.0 h
		guided self-study	7.5 h
		self-reliant study activities	7.5 h
		lecture	25.0 h

Lecturers in academic year 2018-2019

Benoit, Dries	EB23	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Master of Science in Business Engineering (main subject Data Analytics)	6	A
Master of Science in Business Engineering (main subject Finance)	6	A
Master of Science in Business Engineering (main subject Operations Management)	6	A
Master of Science in Economics	6	A
Master of Science in Economics	6	A

Teaching languages

English

Keywords

probability, regression, classification, model building, Markov Chain Monte Carlo

Position of the course

Familiarize the students with the principles of Bayesian estimation. The students are expected to learn how Bayesian inference differs from classical inference. Moreover, the students should be able to use Bayesian techniques correctly in practical applications and they acquire the skills to interpret obtained results in a meaningful way. This course builds on the content of 'principles of statistical inference' and assumes the student has acquired the skills taught in "Applied Statistics II (B)".

Contents

Bayesian concepts:
- Bayesian versus frequentist probability
- exchangeability and the likelihood principle
- choice of prior distributions
- the likelihood function
- summarizing the posterior distribution
- conjugate priors
- Markov Chain Monte Carlo methods: Gibbs sampler, Metropolis-Hastings, slice sampling, etc.

Bayesian estimation of the following models:
- (multivariate) linear regression
- choice models: logit, probit, multinomial
- longitudinal data analysis
- Bayesian hypothesis testing
- Bayesian variable selection

Computer labs using the following software:
- R
- JAGS (using the rjags package in R)

Initial competences

This course builds on the final competences of the course “Applied Statistics II (B)”.

Final competences

1 Profound understanding of the difference between Bayesian versus frequentist estimation
2 Be able to read, interpret and report scientific literature that makes use of Bayesian methods.
3 Good working knowledge of the software (R and JAGS) used in the course
4 Be able to estimate the models discussed in class on new data and interpret and report the results in a meaningful way

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, lecture, self-reliant study activities, seminar: practical PC room classes

Extra information on the teaching methods

- Teaching of the different techniques
- Active class discussions of the different techniques with application on existing datasets.
- Presentations
- Assignments in team en individual, with coaching en presentations (written and oral)

Learning materials and price

A syllabus is available
Estimated cost: 10 EUR

References

Albert, J. (2007). Bayesian Comutation with R, Springer, New York (USA).
Kruschke, J.K. (2011). Doing Bayesian Data Analysis, Elsevier, Oxford (UK).
Bernardo J.M. And Smith, A.F.M. (2002). Bayesian Theory, Wiley, New York (USA).

Course content-related study coaching

The exercises and practical assignments are supervised by the lecturer.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Oral examination

Examination methods in case of periodic evaluation during the second examination period

Oral examination

Examination methods in case of permanent evaluation

Assignment, peer assessment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

The project work involves solving a real life problem using Bayesian inference. The students are allowed to work in groups of 2-3 persons. The result of the project work is a written report that should satisfy scientific and professional standards. The insight of individual students in the statistical concepts, analyses and the data is evaluated on the oral exam. A second examination for the project is possible.

Calculation of the examination mark

The total mark is constructed as follows:
- Project work: 10/20 (with correction based on peer-assessment)
- Oral exam: 10/20