



Bayesiaanse statistiek (C003400)

Cursusomvang (nominale waarden; effectieve waarden kunnen verschillen per opleiding)

Studiepunten 5.0      Studietijd 150 u      Contacturen 62.5 u

Aanbodssessies en werkvormen in academiejaar 2017-2018

A (semester 2)	Engels	werkcollege: PC- hoorcollege	15.0 u 15.0 u
		zelfstandig werk	20.0 u
B (semester 2)		zelfstandig werk	20.0 u
		werkcollege: PC- hoorcollege	15.0 u 15.0 u

Lesgevers in academiejaar 2017-2018

Benoit, Dries      EB07      Verantwoordelijk lesgever

Aangeboden in onderstaande opleidingen in 2017-2018

	stptn	aanbodssessie
Brugprogramma Master of Science in de ingenieurswetenschappen: bedrijfskundige systeemtechnieken en operationeel onderzoek	5	A
Brugprogramma Master of Science in Industrial Engineering and Operations Research	5	A
Master of Science in Bioinformatics (afstudeerrichting Systems Biology)	5	A
Master of Science in de ingenieurswetenschappen: bedrijfskundige systeemtechnieken en operationeel onderzoek	5	A
Master of Science in Industrial Engineering and Operations Research	5	A
Master of Science in Statistical Data Analysis	5	B
Uitwisselingsprogramma Bioinformatics (niveau master)	5	A

Onderwijstalen

Engels

Trefwoorden

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

Situering

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 'Statistical Computing'.

Inhoud

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)

#### Begincompetenties

Having successfully completed introductory courses in basic probability, statistics and linear models. Experience with the statistical programming language R.

#### Eindcompetenties

- 1 The student knows basic Bayesian methods.
- 2 The student understands the difference between Bayesian and frequentist estimation.
- 3 The student is able to read and understand scientific literature in their domain of expertise that makes use of Bayesian methods.
- 4 The student is familiar with the software used in the pc-labs.
- 5 The student is able to apply Bayesian methods .
- 6 The student can interpret the results of a Bayesian analysis.
- 7 The student can report the results of a Bayesian analysis.

#### Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

#### Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

#### Didactische werkvormen

Hoorcollege, zelfstandig werk, werkcollege: PC-klasoefeningen

#### Toelichtingen bij de didactische werkvormen

Minerva will be used to ensure a smooth organisation and follow-up of the practical assignments.

#### Leermateriaal

A syllabus is available. Geraamde totaalprijs: 10 EUR

#### Referenties

Albert, J. (2007). Bayesian Computation 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).

#### Vakinhoudelijke studiebegeleiding

The exercises and practical assignments are supervised by the lecturer.

#### Evaluatiemomenten

periodegebonden en niet-periodegebonden evaluatie

#### Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Mondeling examen, werkstuk

#### Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Mondeling examen, werkstuk

#### Evaluatievormen bij niet-periodegebonden evaluatie

Werkstuk

#### Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is mogelijk

#### Toelichtingen bij de evaluatievormen

The project work involves solving a real life problem using Bayesian inference. 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.

## Eindscoreberekening

The total mark is a weighted average of:

- Project work (10/20)
- Oral exam (10/20)