UNIVERSITEIT GENT

# Studiefiche

Vanaf academiejaar 2017-2018

## Computer-intensieve statistische methodes (C003399)

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

| | | | |
|---|---|---|---|
| **Studiepunten** | **5.0** | **Studietijd** **150 u** | **Contacturen** 62.5 u |

**Aanbodsessies en werkvormen in academiejaar 2017-2018**

| | | |
|---|---|---|
| A (semester 2) | begeleide zelfstudie | 40.0 u |
| | hoorcollege | 22.5 u |
| B (semester 2) | hoorcollege | 22.5 u |
| | begeleide zelfstudie | 40.0 u |

**Lesgevers in academiejaar 2017-2018**

| | | |
|---|---|---|
| Fiems, Dieter | TW07 | Verantwoordelijk lesgever |

| **Aangeboden in onderstaande opleidingen in 2017-2018** | stptn | aanbodsessie |
|---|---|---|
| Brugprogramma Master of Science in Bioinformatics (afstudeerrichting Engineering) | 5 | A |
| Master of Science in Bioinformatics (afstudeerrichting Engineering) | 5 | A |
| Master of Science in Statistical Data Analysis | 5 | B |
| Uitwisselingsprogramma Bioinformatics (niveau master) | 5 | A |

**Onderwijstalen**

Engels

**Trefwoorden**

Bayesian inference; Simulation of stochastic processes; Monte Carlo integration; Markov chain Monte Carlo.

**Situering**

This course addresses computer intensive methods in statistics. In particular, the foundations and the use of computer experiments (simulation) in statistics will be discussed.

**Inhoud**

Chapter 1: Bayesian inference Decision-theoretic foundations; Prior distribution; Posterior distribution; Bayes rule; Non-informative priors; Conjugate priors; Maximum entropy priors; Point Estimation; Confidence regions; Hypothesis testing.
Chapter 2: Simulation of stochastic processes Quasi-random generators; Generation of random variables; Generation of trajectories of Markov processes; Monte Carlo integration; Variance reduction techniques: antithetic variables, control variables, importance sampling; Perfect simulation.
Chapter 3: Bayesian calculations Markov chain Monte Carlo; Metropolis–Hastings algorithm; Gibbs sampler; Particle filters; Factor graphs; Sum-product algorithm.

**Begincompetenties**

Elementary statistics, probability and computer programming

**Eindcompetenties**

1 Have advanced knowledge of a wide range of computer intensive statistical methods for designing studies and analysing data.
2 The student can use specialized software in order to correctly and efficiently perform statistical calculations, and to critically validate the conclusions obtained through this analysis.
3 The student can report accurately on the design, conduct, analysis, and conclusions of statistical studies.

4 The student can express clearly the assumptions on which conclusions are based, by performing a Monte Carlo study that systematically and critically investigates the assumptions underlying the analysis approach.

**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**

Begeleide zelfstudie, hoorcollege

**Leermateriaal**

Lecture notes from lecturer are available in electronic form. Geraamde totaalprijs: 10 EUR

**Referenties**

S. Ross: Simulation (Academic Press, 1999)

**Vakinhoudelijke studiebegeleiding**

The practical assignments are supervised by the lecturer.

**Evaluatiemomenten**

periodegebonden en niet-periodegebonden evaluatie

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

Schriftelijk examen met open vragen

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

Schriftelijk examen met open vragen

**Evaluatievormen bij niet-periodegebonden evaluatie**

Werkstuk

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

Examen in de tweede examenperiode is mogelijk

**Eindscoreberekening**

Examination: 80 %
Individual assignment: 20%