GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Statistical Inference (C002678)

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

Credits 6.0 **Study time 165 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Gent	seminar
			peer teaching
			lecture

Lecturers in academic year 2024-2025

Dukes, Oliver	WEO2	lecturer-in-charge
De Keersmaeker, Frederik	WEO2	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Master of Science in Teaching in Science and Technology(main subject Mathematics)	6	A
Master of Science in Mathematics	6	A
Exchange Programme in Mathematics (master's level)	6	A

Teaching languages

English

Keywords

Estimation theory, hypothesis tests

Position of the course

The students learn the important concepts and methods in estimation theory and acquire a theoretical foundation in statistics. This training enables the students to get a good insight in each of the statistical methods used in the different domains and application fields of statistics. Students learn to develop inference methods to solve specific statistic problems using this general theory.

Contents

- *Properties of estimators: bias, variance, mean squared error, asymptotic bias, consistency*
  • Maximum Likelihood Estimators, Score vectors, Fisher information, the Cramer-Rao inequality
  • Large sample inference: convergence in distribution and probability, the Weak Law of Large Numbers,
  • the Central Limit Theorem, Consistency of estimators, Slutsky's Lemma and the Delta Method
  • Fundamentals of confidence intervals and hypothesis testing
  • Likelihood-based hypothesis testing: the Wald, Score and Likelihood ratio tests
  • Bayesian methods: Bayesian versus frequentist statistics, Bayes' Rule, prior and posterior, Bayesian
  • estimation and credible intervals, conjugate priors
  • M-estimators: unbiased estimating equation, sandwich estimator of the variance
  • Inference under the bootstrap
- Advanced topics in inference: super-efficiency, decision theory, nonparametric estimation, model-based and design-based inference.

Initial competences

Having successfully followed the courses 'Statistics I', 'Statistics II' and 'Statistics III' or having acquired the intended competences in another way.

Final competences

1 Have knowledge of the basics of statistical inference theory.
2 Apply in a specific context the most important estimation methods and inference techniques of statistics.
3 Derive the relevant properties of estimators and test procedures.
4 Judge the applicability and limitations of statistical methods.
5 Use methods to solve practical statistical problems.
6 Correctly interpret the properties of the methods in the specific context of the application.

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

Seminar, Lecture, Peer teaching

Study material

Type: Handbook

Name: Foundations of Agnostic Statistics (1st Edition), Cambridge.
Indicative price: Free or paid by faculty
Optional: yes
Language : English
Author : Aronow, P. M., Miller B. T.
ISBN : 978-1-10717-891-5
Number of Pages : 298
Alternative : NA
Oldest Usable Edition : 1st edition
Online Available : Yes
Available in the Library : Yes
Available through Student Association : No
Usability and Lifetime within the Course Unit : regularly
Usability and Lifetime within the Study Programme : regularly
Usability and Lifetime after the Study Programme : occasionally
Additional information: Can be freely downloaded from https://www.cambridge.org/core/books/foundations-of-agnostic-statistics/684756357E7E9B3DFF0A8157FB2DCECA#:~:text=This%20book%20develops%20the%20fundamentals,be%20

Type: Slides

Name: Statistical Inference
Indicative price: Free or paid by faculty
Optional: no
Language : English

References

Aronow, P. M., Miller B. T. (2019). Foundations of Agnostic Statistics (1st Edition), Cambridge.
Boos, D. and Stefanski, L. (2013) Essential Statistical Inference. Springer New York.
Casella G. en Berger, R.L. (2002). Statistical Inference, Duxbury Press.
Wasserman, L. (2004). All of Statistics (1st Edition), Springer.

Course content-related study coaching

Interactive support via Ufora (e-mail) and personally after electronic appointment.

Assessment moments

end-of-term and continuous assessment

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

Written assessment

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

Written assessment

Examination methods in case of permanent assessment

Oral assessment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Calculation of the examination mark

Periodical evaluation (75%) + non-periodical evaluation (25%).