Syllabus

for course at advanced level

Statistical Information Theory

Statistisk informationsteori

7.5 Higher Education Credits

7.5 ECTS credits

Course code:	MT7037
Valid from:	Autumn 2019
Date of approval:	2017-11-20
Changed:	2017-11-20
Department	Department of Mathematics (incl. Math. Statistics)
Main field:	Mathematical Statistics
Specialisation:	A1N - Second cycle, has only first-cycle course/s as entry requirements

Decision

This syllabus has been approved by the Board of Faculty of Science at Stockholm University 2019-04-26.

Prerequisites and special admittance requirements

To qualify for the course, knowledge equivalent to Mathematics I, 30 hp (MM2001), Mathematics II - Analysis, Part A, 7,5 hp (MM5010), Mathematics II - Linear Algebra, 7.5 hp (MM5012), Probability theory I, 7,5 hp (MT3001), Statistical analysis, 7,5 hp (MT4001), Stochastic processes and simulation I, 7,5 hp (MT4002), Probability theory II, 7,5 hp (MT5002), Statistical inference theory, 7,5 hp (MT5003), Programming techniques for mathematicians, 7,5 hp (DA2004), and English B/English 6 or the equivalent, is required

Course structure

Examination code	Name	Higher Education Credits
TENT	Exam	7.5

Course content

The course treats information theory with applications to statistics, machine learning, time series analysis, dynamical systems and physics. In particular, rates of entropy of stochastic processes, differential entropy, flow of information and causal detection, multivariate dependencies and multi-informatioin, is treated.

Learning outcomes

After completion of the course, the student is expected to be able to:

- define basic concepts of information theory,
- relate the foundations of information theory to the basics of mathematical statistics,
- explain how information theory contributes to statistical inference theory, statistical learning and dynamical systems,
- apply tools of information theory in order to solve advanced statistical problems.

Education

Instruction is given in the form of lectures, exercise sessions and supervision in computer rooms.

Forms of examination

a. The course is examined in the following manner: measurement of knowledge is carried out through a home exam. This home exam will not be examined in case of a delayed hand-in, although the examiner will take into consideration special reasons of delay.

b. Grading is carried out according to a 7-point scale related to the learning objectives of the course:

A = Excellent
B = Very Good
C = Good
D = Satisfactory
E = Sufficient
Fx = Fail (some more work is required)
F = Fail (a lot more work is required)

c. Grading criteria for the course will be distributed at the start of the course.

d. A grade of at least E is required to pass the course.

e. Students who fail an ordinary examination are entitled to take additional examinations as long as the course is offered. There is no restriction on the number of examinations. The term "examination" here is used to denominate also other compulsory elements of the course. Students who have achieved a pass grade on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have failed to reach a pass grade on a course, or on a part of a course, on two occasions have the right to request that a different teacher be appointed to grade the next exam, unless there are special reasons against it. A request for such appointment must be sent to the departmental board. The course has at least two examinations for each academic year in the years in which instruction is provided. Intervening years include at least one examination.

f. An opportunity to make up from grade Fx to the grade E is given. The examiner decides which assignments should be carried out to make up and the criteria for passing said assignments. The making up must take place before the next examination.

Interim
Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three occasions within a two-year-period after the end of the course offering. A request for such examination must be sent to the departmental board. This provision is also valid in the case of revision of the syllabus.

Misc
The course can be taken within the Master Programmes in Mathematical Statistics and Actuarial Mathematics. It can also be taken as an individual course.

Required reading
Course literature is decided by the departmental board and is published on the web site of the Department of Mathematics (www.math.su.se) at the latest 2 months before course start.