Department of Mathematics
(incl. Math. Statistics)

Stockholm University

Syllabus

for course at advanced level

Statistical Learning
Statistisk inlärning

7.5 Higher Education Credits
7.5 ECTS credits

Course code:	MT7038
Valid from:	Spring 2018
Date of approval:	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 2017-11-20.

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), Linear statistical models, 7,5 hp (MT5001), Statistical computation, 7,5 hp (MT5013), 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
INLU	Hand-in assignments	3.5
THEO	Theory	4

Course content

a. The course treats basic principles and methods of statistical learning, classification and prediction. As part of this the following concepts are studied; discriminant analysis, cross validation, regularization through shrinkage and smoothing, decision and regression trees, support vector machines and methods of clustering.

b. The course consists of the following parts. Part 1, Theory (Theory) 4 hp. Part 2. Hand-in assignments 3.5 hp.

Learning outcomes

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

For Part 1, Theory, 4hp:
- explain basic principles of statistical learning in mathematical terms,
- derive basic results within the theory of statistical learning,
- choose the appropriate methods of statistical learning in order to solve a given problem and additionally explain its strengths and weaknesses,
- correctly interpret the results of an analysis conducted using methods of statistical learning.

For Part 2, Hand-in assignments, 3.5 hp:
- implement simpler methods of statistical learning using statistical software,
- apply statistical software for statistical learning and correctly interpret the results,
- present results, orally or in written form, from an analysis conducted using methods of statistical learning.

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: Theory, 4 hp: measurement of knowledge is carried out through a written exam. Hand-in assignments, 3,5 hp: written and oral presentation of the hand-in assignments.

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. In order to pass, a grade of at least E is required for all parts of the course. The final grade combines the grades of the different parts of the course, weighted according to their numbers of credits.

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 an 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. This 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 at the latest 2 months before course start.