

Syllabus

for course at advanced level

Statistical Learning
Statistisk inläring

7.5 Higher Education
Credits
7.5 ECTS credits

Course code:	MT7038
Valid from:	Autumn 2021
Date of approval:	2017-11-20
Changed:	2021-06-17
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 course syllabus was approved by the Board of Science at Stockholm University on 2017-11-20 and revised 2021-06-17.

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; basics of regression and discriminant analysis, model selection and model assessment, regularization through shrinkage and smoothing, tree-based methods such as bagging, random forests and boosting, and support-vector machines for classification and regression.

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

Teaching consists of lectures, exercise sessions and supervision in computer rooms. The course is given in English.

Forms of examination

a. The course is examined in the following manner:

Assessment of module Theory, 4 hp, takes place through written examination.

Assessment of module Hand-in assignments, 3.5 hp, takes place through written and oral presentations of hand-in assignments.

Hand-in assignments will not be graded in case of late submission. However, the examiner should take special circumstances into account.

The examination will be conducted in English. The examiner can decide on adapted or alternative examination formats for students with disabilities.

b. The course has no compulsory teaching.

c. Grading: The course's final grade is set according to a seven-point criterion-referenced scale:

A = Excellent

B = Very good

C = Good

D = Satisfactory

E = Adequate

Fx = Failed, some additional work is required

F = Failed, much additional work is required

Grades of modules 1 and 2 will be set according to a seven-point criterion-referenced scale. A passing final grade requires passing grades on all included parts. The final grade of the course is determined by weighing the grades from all course modules, where each grade is weighed in relation to the scope of the course module.

d. The course's grading criteria are handed out at the start of the course.

e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board. Under normal circumstances, the course includes three examination opportunities for each course module per academic year the course is offered. For the academic years that the course is not offered, at least one examination opportunity is offered.

f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides on the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments should be completed before the next examination opportunity.

Interim

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two-year period after the course was discontinued. Requests must be made to the department board. The provision also applies in the case of revisions of the course syllabus and revisions of the required reading.

Misc

The course can be taken within the Master Programs in Mathematical Statistics and Actuarial Mathematics. It can also be taken as a separate course.

Required reading

The required reading is decided by the department board and published on the Department of Mathematics' website (www.math.su.se) at least 2 months before the start of the course.