Machine Learning for Social Science

Maskininlärning för samhällsvetenskap
7.5 credits

Single subject course

771A42

Valid from: 2022 Autumn semester

Determined by	**Main field of study**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Computational Social Science	
Date determined	**Course level**	**Progressive specialisation**
2021-12-07	Second cycle	A1N
Revised by	**Disciplinary domain**	
	Technology	
Revision date	**Subject group**	
	Other Subjects within Social Science	
Offered first time	**Offered for the last time**	
Autumn semester 2022		
Department	**Replaced by**	
Institutionen för ekonomisk och industriell utveckling		

Entry requirements

- 180 ECTS credits passed including 90 ECTS credits within one of the following areas humanities, social-, cultural-, behavioural-, natural-, computer-, or engineering-sciences
- 15 ECTS credits passed in one or several of the following subjects:
  Statistics
  Mathematics
  Computer science
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6 or Engelska nivå 2)
  Exemption from Swedish

Intended learning outcomes

After completion of the course, the student should at an advanced level be able to:

- Use concepts and methods in machine learning to formulate and solve practical problems relevant for social scientific research.
- Use statistical software to estimate machine learning models, evaluate their fit, select their parameters, and interpret their results.
- Describe the strengths and weaknesses of different machine learning methods.
- Describe which machine learning models are suitable for specific applications/settings.
- Compare machine learning tools with traditional statistical methods, identify problems most suitably modeled with machine learning, and problems in which the two can complement each other.

Course content

This course provides an overview of the key concepts and tools of machine learning (ML) that are relevant to social science research. First, a general introduction to ML is provided, where foundational ideas are reviewed and contrasted to those of traditional statistics. Then, central techniques in supervised learning (e.g., decision trees) and unsupervised learning (e.g., k-means) are introduced. In computer labs, students learn how to use these techniques in statistical software to solve practical problems relevant for social scientific research. Finally, the intersection between ML and causal inference will be considered.

Teaching and working methods

The teaching consists of lectures, and interactive computer labs. Homework and independent studies are a necessary complement to the course.

Language of instruction: English.

Examination

The course is examined through

- Computer-based laboratory assignments, pass/fail
- Final computer examination, A-F

A passing grade on the assignments and E on the final computer examination are required for a final passing grade.

Higher final grades are determined by the grade on the final computer examination.

Detailed information about the examination can be found in the course's study guide.

If special circumstances prevail, and if it is possible with consideration of the nature of the compulsory component, the examiner may decide to replace the compulsory component with another equivalent component.

If the LiU coordinator for students with disabilities has granted a student the right to an adapted examination for a written examination in an examination hall, the student has the right to it.

If the coordinator has recommended for the student an adapted examination or alternative form of examination, the examiner may grant this if the examiner assesses that it is possible, based on consideration of the course objectives.

An examiner may also decide that an adapted examination or alternative form of examination if the examiner assessed that special circumstances prevail, and the examiner assesses that it is possible while maintaining the objectives of the course.

Students failing an exam covering either the entire course or part of the course twice are entitled to have a new examiner appointed for the reexamination.

Students who have passed an examination may not retake it in order to improve their grades.

Grades

ECTS, EC

Other information

Planning and implementation of a course must take its starting point in the wording of the syllabus. The course evaluation included in each course must therefore take up the question how well the course agrees with the syllabus.

The course is conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

If special circumstances prevail, the vice-chancellor may in a special decision specify the preconditions for temporary deviations from this course syllabus, and delegate the right to take such decisions.

About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is “Swedish”, the course as a whole could be given in Swedish, or partly, or as a whole, in English. Examination language is Swedish, but parts of the examination can be in English.
- If teaching language is “English”, the course as a whole is taught in English. Examination language is English.
- If teaching language is “Swedish/English”, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English depending on teaching language.