Deep Learning

Deep Learning
6 credits

Programme course

732A82

Valid from: 2025 Spring semester

Determined by	**Main field of study**	
Course and Programme Syllabus Board at the Faculty of Arts and Sciences	Computer Science	
Date determined	**Course level**	**Progressive specialisation**
2023-05-02	Second cycle	A1F
Revised by	**Disciplinary domain**	
	Technology	
Revision date	**Subject group**	
	Computer Technology	
Offered first time	**Offered for the last time**	
Spring semester 2025		
Department	**Replaced by**	
Institutionen för datavetenskap		

Course offered for

- Master's Programme in Statistics and Machine Learning

Entry requirements

- 180 ECTS credits passed including 90 ECTS credits in one of the following subjects:
    - statistics
    - mathematics
    - applied mathematics
    - computer science
    - engineering
- Passed courses in:
    - calculus
    - linear algebra
    - statistics
    - programming
- English corresponding to the level of English in Swedish upper secondary education (Engelska 6)
  Exemption from Swedish
- Passed Advanced Academic Studies, 3 ECTS credits

Intended learning outcomes

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

- design and apply artificial neural networks to signal, image or data analysis that learn from previous experience and data

- use relevant concepts, methods, and software within Deep Learning in order to formulate, structure and solve practical problems that involve large and complex data

- motivate a deep learning architecture and hyperparameter settings that are appropriate for a given data structure, problem formulation and application area

- evaluate the performance of predictions from Deep Learning models

- argue and orally explain and discuss solutions and conclusions in dialogue with other groups

- plan and carry out tasks within given time frames

- critically reflect upon perspectives of sustainability related to Deep Learning

Course content

The course deals with:

- Shallow and deep neural networks

- Regularization, drop out and early stopping. Optimization of deep neural networks

- Convolutional neural networks and image analysis

- Deep recurrent neural networks and sequence analysis

- Autoencoders and feature extraction

- Generative Adversarial neural networks

- Supervised and unsupervised Deep Learning

- Sustainability within Deep Learning

Teaching and working methods

The teaching comprises lectures, practical sessions, seminars and computer labs. Homework and independent study are a necessary complement to the course. Language of instruction: English.

Examination

The course is examined by:

- individual written computer examination, grade scale: EC
- individual oral presentation, grade scale: EC, P/F
- written reports in groups on the computer assignments, grade scale: EC, P/F

For Pass (E) as the final grade, at least E is required on the individual written computer examination and Pass on other parts. Higher grades are based on the individual written computer examination.

Detailed information can be found in the study instructions.

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.