

**SYLLABUS**

# **Advanced deep learning 7.5 credits D7047E**

**Avancerad djupinlärning**

**Course syllabus admitted: Autumn 2023 Sp 1 - Present**

**DECISION DATE  
2021-02-16**

# Advanced deep learning 7.5 credits D7047E

## Avancerad djupinlärning

### Second cycle, D7047E

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Datalogi	Computer Technology

### Main field of study

Computer Science and Engineering

## Entry requirements

Bachelor's degree of at least 180 credits in a relevant area such as Computer Science, Engineering Physics, Electrical Engineering, Information Systems, Systems Science, or a closely related area. The studies shall have included Introductory Programming (for example D0009E Introduction to Programming or D0007N Objectoriented programming) and a fundamental Machine Learning course such as D7046E Neural networks and learning machines, or equivalent.

Knowledge in English equivalent to English 6.

## Selection

The selection is based on 30-285 credits

## Course Aim

The objective of the course is for the student to expand their knowledge and skills in Deep Learning. After passing the course, the student should be able to:

- [1]. Explain and use the advanced deep learning concepts & techniques
- [2]. Describe how those advanced techniques work
- [3]. Explain how the advanced techniques are, or should be, used in organizations
- [4]. Evaluate results of applying the advanced analytics techniques
- [5]. Analyze and reflect on the relationship between the techniques, the dataset, the problem or opportunity in hand, and the tools and technology used

## Contents

The course is an advanced course in deep learning. The course is set out to provide knowledge to the students which is expected to help them address various machine learning problems with most recent state-of-the-art methodology. While specific topics will be updated based on the current development in the research area of Deep Learning, the following topics will be covered: Vanishing Gradient problem and solutions: ResNet and LSTM; reinforcement learning and artificial curiosity; Image Captioning and Question Answering; Deep Learning for NLP; Bleeding-edge architectures.

## Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

Lectures, labs, assignments, case studies and project work. During the course, the students work in small groups. Some assignments or case studies in the course might contain work in contact with or about the industry. The student uses different methods and techniques, and it is important to choose the right method, technique or computer support for each task. Before and after the tasks are solved, there are lectures to present and discuss different solutions.

Teaching is in English and on the Internet for distance students or on campus for students living here. IT support: Learning management system (Canvas), e-mail and phone. The learning management system is used for delivering course material, information and submissions. Knowledge is shared and created within the course through virtual meetings with teachers and other students for discussions, supervision, teamwork and seminars. For students on campus, there will be meetings on campus.

## Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Through written tests, individual and group/project assignment, different student abilities are examined. Those are: the ability to explain and use advanced deep learning techniques and the ability to solve advanced machine learning problems using deep learning (if applicable in combination with other machine learning techniques) individually and in groups.

## Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

## Remarks

Technical Requirements: Access to PC with Windows XP, microphone, Web cam, and permission to install software. Internet connection (minimum 0,5 Mbps).

## Course offered by

Department of Computer Science, Electrical and Space Engineering

## Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Written exam/Individual exam	G U 3 4 5	4	Mandatory	S20	
0002	Individual tasks	G U 3 4 5	1.5	Mandatory	S20	
0003	Group/Project work	U G#	2	Mandatory	S20	

## Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

## Last revised

by Jonny Johansson, HUL SRT 2021-02-16

## Syllabus established

by Jonny Johansson, HUL SRT 2019-02-15