

## Machine Learning for Smart Cities

Maskininlärning för smarta städer  
6 credits

Programme course

TNK129

Valid from: 2023 Spring semester

|   |  |  |
|---|--|--|
| <b>Determined by</b><br>Board of Studies for Industrial Engineering and Logistics | <b>Main field of study</b><br>Computer Science and Engineering, Electrical Engineering |  |
| <b>Date determined</b><br>2022-08-31  | <b>Course level</b><br>Second cycle  | <b>Progressive specialisation</b><br>A1N |
| <b>Revised by</b>   | <b>Disciplinary domain</b><br>Technology   |  |
| <b>Revision date</b>  | <b>Subject group</b><br>Computer Technology  |  |
| <b>Offered first time</b><br>Autumn semester 2023                                 | <b>Offered for the last time</b>   |  |
| <b>Department</b><br>Institutionen för teknik och naturvetenskap                  | <b>Replaced by</b>   |  |

## Course offered for

- Master of Science in Communications, Transport and Infrastructure
- Master's Programme in Intelligent Transport Systems and Logistics

## Prerequisites

Basic knowledge in linear algebra, calculus, statistics and probability theory as well as computer programming.

## Intended learning outcomes

In this course, you will learn how to utilize advanced models and deep learning architectures to learn from data in order to gain insights for decisions in smart city applications.

After completing the course, the student should be able to:

- Explain assumptions and theory behind different type of machine learning methods
- Explain and motivate differences in characteristics between different type of methods and give examples of when they should be applied
- Evaluate and choose among different methods for a specific problem instance and dataset
- Use existing datasets to train and evaluate different machine learning models
- Use selected machine learning models for prediction, inference and decision-making for smart city applications

## Course content

The course aims to provide knowledge in machine learning. The course will cover both conventional machine learning methods as well as deep learning. The course content includes statistical inference, bias-variance tradeoff, Bayesian learning, Gaussian processes, support vector machines, kernels, neural networks, deep learning and reinforcement learning.

## Teaching and working methods

Lectures, tutorials and labs.

## Examination

|      |                        |           |            |
|------|------------------------|-----------|------------|
| UPG1 | Individual assignments | 2 credits | U, 3, 4, 5 |
| PRA1 | Project work           | 2 credits | U, G       |
| LAB1 | Lab assignments        | 2 credits | U, G       |

Grades for examination modules are decided in accordance with the assessment criteria presented at the start of the course.

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Other information

### 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 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.

### Other

The course is conducted in a manner where both men's and women's experience and knowledge are made visible and developed.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

The course is campus-based at the location specified for the course, unless otherwise stated under “Teaching and working methods”. Please note, in a campus-based course occasional remote sessions could be included.

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.