



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Algoritmer i geografisk informationsbehandling

Algorithms in Geographical Information Systems

EXTQ05, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED L

Date of Decision: 2023-04-20

General Information

Elective for: L4-gi

Language of instruction: The course will be given in English

Aim

In the basic courses the student were familiarized with basic theory of GIS and learnt to use GIS as a tool in geographic analyses. This course provides a theoretical foundation of how GIS systems work in terms of data structures and algorithms, i.e. it provides the underlying mathematical and computer science theory. This knowledge is necessary to evaluate the results in a spatial analysis and to carry out more advanced analyses where the tools are not available in a standard GIS program.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to explain the theory behind the fundamental algorithms for raster, vector graphics which are used in geographic information processing
- be able to analyse spatial concepts, especially topological relationships
- be able to describe geometric data structures and data encodings in 2D and 3D

Competences and skills

For a passing grade the student must

- be able to program fundamental algorithms which are used in geographic information processing
- be able to structure and solve geometric problem
- be able to handle 2D and 3D geometric data structures in GIS tools and in their own programs
- be able to do literature searches and write a summary of scientific papers

Judgement and approach

For a passing grade the student must

- demonstrate a reflecting approach to possibilities and limitations in a GIS program

Contents

The course starts with geometric data structures in geographic information storage and processing in both 2D and 3D. Linked to this part is also a description of spatial concepts, and especially topological relationships.

The second part of the course treats the most fundamental algorithms in GIS using vector, raster as well as network representations. The lectures provide the basic theory of the algorithms; some of these algorithms are implemented during the practical exercises using standard programming languages. This part is the most central and largest part of the course.

The third part of the course is devoted to a project in scientific writing that is running during the whole course.

This course consists of theoretical lectures and practical exercises in the computer lab as well as project supervision. The theoretical parts of the course are given in lectures followed by thematic sections of practical exercises in the computer lab. These exercises are compulsory. The course may also include compulsory study visits and/or guest lectures.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Assessment takes the form of a written examination, and evaluation of project work. Approved on all exercises and participation on all compulsory activities.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Admission requirements:

- L: EXTF80 Geographical Information Technology and EDAA20 Programming and Databases; LTH: EDAA01 Programming - Second Course

The number of participants is limited to: No

The course overlaps following course/s: GISN07, NGEN06

Reading list

- Worboys, M. F., and M. Duckham: GIS A Computing Perspective, 2nd edition. CRC Press, 2004, ISBN: 0415283752.
- Lars Harrie: Lecture notes in GIS algorithms. Department of Physical Geography and Ecosystem Science, Lund University, 2014.
- A collection of articles. A collection of articles.

Contact and other information

Course coordinator: Lars Harrie, lars.harrie@nateko.lu.se

Course administrator: Karin Larsson, karin.larsson@nateko.lu.se

Course homepage: <https://www.nateko.lu.se/extq05>

Further information: The course is a master level course (NGEN25) at the Faculty of Science.