



## Course syllabus

Faculty of Technology

Department of Computer Science and Media Technology

4DT912 Avancerad informationsvisualisering och tillämpningar, 5 högskolepoäng

Advanced Information Visualization and Applications, 5 credits

### Main field of study

Computer Engineering

### Subject

Informatics/Computer and Systems Sciences

### Level

Second cycle

### Progression

A1F

### Date of Ratification

Approved 2024-01-15.

The course syllabus is valid from autumn semester 2024.

### Prerequisites

90 credits in Computer Science (including a degree project at Bachelor level).  
5 hp information visualization on advanced level (e.g. 4DV805 or equivalent).  
English 6 or the equivalent.

## Objectives

*Knowledge and understanding*

- A.1 Define and explain visualization techniques (regarding interaction and visual representation) and example tools for special data sets and applications domains,
- A.2 describe validation and evaluation methods for information visualization tools and approaches, and
- A.3 describe the most important challenges in the field.

### *Skills and abilities*

- B.1 Represent data by expressive and effective visualizations using state-of-the-art methods, software, and tools, and
- B.2 implement new interactive visualizations for more complex and larger data sets; where required with a focus on specific application domains or analysis problems.

### *Judgement and approach*

- C.1 Critically reflect on the discussed visualization and interaction approaches in the light of current theories and research, and
- C.2 make well-grounded design choices in the context of various tasks and data constraints.

## Content

The course extends the course Information Visualization with interactive visualization techniques and systems for special data sets, such as network data, time-dependent data, and text data. Furthermore, we discuss specific applications where information visualizations are used to analyze/explore domain-specific data—e.g., in bioinformatics, geography, software development, etc. The course also reviews possibilities on how visualizations can be validated, evaluated, or used in non-standard contexts like collaborative settings or personal data analysis. The following topics are covered:

- Visualization techniques and drawing conventions for trees/hierarchies, general network data (graphs), and multivariate/dynamic networks.
- Visualization techniques for text data and document collections (corpora).
- Visualization techniques for general time series data.
- Visualizations for specific application domains including an overview of their usual analysis tasks and data specifics.
- Collaborative and personal visualization ideas and approaches.
- Validating and evaluating visualizations.
- The most important unsolved information visualization challenges.

## Type of Instruction

The instruction consists of lectures, seminars, and teacher-supervised laboratory sessions.

## Examination

The course is assessed with the grades A, B, C, D, E or F.

The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

Assessment of student performance is made through a programming project in groups, an oral presentation in groups, and an individual oral exam.

To pass the course, grade E or higher is required for all parts. The final grade is decided from: Programming project (40%) and Oral presentation (20%), and Oral exam (40%).

Resit examination is offered in accordance with Linnaeus University's Local regulations for courses and examination at the first- and second-cycle levels. In the event that a student with a disability is entitled to special study support, the examiner will decide on adapted or alternative examination arrangements.

## Objectives achievement

The examination of the course is divided as follows:

Module 2401 Programming project 2.0 credits with the grading system AF

Module 2402 Oral presentation 1.0 credits with the grading system AF

Module 2403 Oral exam 2.0 credits with the grading system AF

The examination elements are linked to the course objectives in the following ways:

Module 2401 links to the course objectives: A.2, A.3, B.1, B.2, C.1, C.2

Module 2402 links to the course objectives: A.1, C.1

Module 2403 links to the course objectives: A.1, A.2, A.3, C.1, C.2

## Course Evaluation

A course evaluation should be conducted during the course or in connection with its conclusion. The results and analysis of the completed course evaluation should be promptly communicated to students who have completed the course. Students participating in the next course instance should be informed of the results of the previous course evaluation and any improvements that have been made, no later than at the start of the course.

## Overlap

The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course:

4DV806, 5 credits

## Other Information

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest. The course is conducted in such a way that the course participants' experiences and knowledge are made visible and developed. This means, for example, that we have an inclusive approach and strive for no one to feel excluded. This can be expressed in different ways in a course, for example by using the gender neutral example.

## Required Reading and Additional Study Material

Required reading:

- Aigner, Wolfgang, Miksch, Silvia, Schumann, Heidrun och Tominski, Christian, *Visualization of Time-Oriented Data*, Springer, latest edition. Pages: 80 of 286.
- Kerren, Andreas, Ebert, Achim och Meyer, Jörg, *Human-Centered Visualization Environments*. LNCS Tutorial 4417, Springer, 2007, ISBN 978-3-540-71948-9. Pages: 150 of 403.
- Ward, Matthew, Grinstein, Georges G. och Keim, Daniel, *Interactive Data Visualization - Foundations, Techniques, and Applications*, A. K. Peters Ltd., latest edition. Pages: 150 of 558.