Linnæus University

Dnr: 2022/4550-3.1.2.2

Course syllabus

Faculty of Technology

Department of Computer Science and Media Technology

4DT907 Projekt i dataintensiva system, 10 högskolepoäng
4DT907 Project in data intensive systems, 10 credits

Main field of study
Computer Engineering

Subject Group
Informatics/Computer and Systems Sciences

Level of classification
Second Level

Progression
A1N

Date of Ratification
Approved by Faculty of Technology 2022-12-19
The course syllabus is valid from spring semester 2024

Prerequisites
90 credits in Computer Engineering, Linear algebra (1MA901), 7,5 credits, Applied probability and statistics (1MA915), 7.5 credits, Parallel programming (1DT906), 7.5 credits, Software Development Project (1DT908), 10 credits and Technical Communication (1ZT010), 5 credits, or equivalent.

Objectives

After completing the course the student shall be able to:

Knowledge and understanding

- A.1 Characterize the role of machine learning in a software system and how it can be integrated in the structure of such systems,
- A.2 enumerate which properties a tool or software library should have to be applied to a given problem, and
- A.3 name and explain the most common problems when attempting to use unprocessed data in machine learning.

Competence and skills

- B.1 Independently learn different tools, methods, and software libraries used

within machine learning,
- B.2 elicit requirements from a customer and based on these determine which data is needed and which machine learning techniques that is most suitable,
- B.3 from a set of customer requirements define metrics that can be used to evaluate how well a machine learning model performs,
- B.4 implement and evaluate a system with a machine learning component,
- B.5 prioritize functionality and continuously release new functionality to customers, and
- B.6 ensure that the system is operational.

Judgement and approach

- C.1 Critically reflect on the result of a project and how well it fulfills the customer requirements with respect to, e.g., technology used, architecture (software and hardware), data, metrics, etc, and
- C.2 critically reflect on how agile and Lean were used throughout the project with respect to, e.g., work environment.

Content

The course is a project course that, given a realistic problem and settings, considers the entire CDIO (Conceive-Design-Implement-Operate) cycle. The students are placed in the role of a small development team within an agile startup that should develop a data-driven product.

The students are expected to work using agile processes in teams of 5-7 and are expected to perform all roles except product owner. The startup environment requires fast releases and effective use of available resources focus is put on Lean agile as well as applied machine learning and data processing.

- How machine learning projects are structured and implemented.
- Tools, services, and libraries that are used for data analysis and machine learning, e.g., Weka and Tensorflow.
- The configuration of pipelines for machine learning systems with respect to software and hardware, e.g., accelerators.
- The practice of working with real data with respect to, e.g., collection, processing, and analysis.
- Evaluation of performance based on customer requirements.
- Experiment-driven development with short design, training, and evaluation cycles.
- The Lean strategy for production and the Toyota production system.
- How Lean-Agile combines the ideas from Lean with agile processes.
- What is waste in software development and how can it be reduced?
- How can just-in-time-production be applied to software development?
- How can a team learn, for example from reflection after a spring and how can the process highlight the development team (and their competences).
- Software as something complete.
- Advanced skills in writing reflection reports.

Type of Instruction

The instruction consists of lectures and supervision meetings. The lectures present the project as well as the tools, methods, and resources that the students are expected to use. The students will have regular supervision meetings with a teacher during the project.

All projects will be presented at a seminar at the end of the course.

Examination

The examination of the course is divided as follows:

Code	Designation	Grade	Credits
2401	Vision and Planning Documents	AF	2,00
2402	Project Work	AF	5,00
2403	Reflection report - Choices and outcomes	AF	1,00
2404	Reflection report - Lean	AF	1,00
2405	Design, implementation, and result	AF	1,00

The course is assessed with the grades A, B, C, D, E, Fx 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 vision and planning documents, project work (incl. deliverables), two reflection reports, and a presentation. Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.

To pass the course, grade E or higher is required for all parts. The final grade is decided from: Vision and planning documents (20%), Project work (incl. deliverables) (50%), Reflection report - Choices and outcomes (10%), Reflection report - Lean (10%), and Design, implementation, and result (10%).

If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

Objectives achievement

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

Goal	2401	2402	2403	2404	2405
A.1	☑	☑	☑		☑
A.2	☑				☑
A.3	☑		☑		☑
B.1	☑	☑	☑		
B.2	☑		☑		☑
B.3	☑		☑		☑

B.4	☑	☑		☑
B.5	☑	☑		☑
B.6	☑	☑		☑
C.1		☑		
C.2			☑	

Course Evaluation

During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are to be promptly presented as feedback to the students who have completed the course. Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

Credit 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: 4DV652, 5 credits

Other

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

The students are expected to find suitable literature on their own.

The list below can be used as a starting point.
- Brambilla, M., Cabot, J. and Wimmer, M., *Model-Driven Software Engineering in Practice*, second edition, Morgan & Claypool Publishers. 2017.

- Steinberg, D., Budinsky, F., Paternostro, M. and Merks, E., *EMF: Eclipse Modeling Framework*, second edition, Addison-Wesley Professional. 2008.

- Kelly, S. and Tolvanen, J-P., *Domain-Specific Modeling*, Wiley-IEEE Computer Society Press, 2008.

- Mellor, S. J. and Balcer, M. J., *Executable UML: A Foundation for Model-Driven Architecture*, Addison-Wesley Professional. 2002.

- Royer, J. and Arboleda, H., *Model-Driven and Software Product Line Engineering*, John Wiley & Sons, Inc. 2013.