Course syllabus

Interaktion 1: Neuromodellering, kognitiv robotik och agenter
Interaction 1: Neuro Modelling, Cognitive Robotics and Agents

MAMN10, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED C/D
Date of Decision: 2023-04-18

General Information

Language of instruction: The course will be given in Swedish

Aim

Based on the knowledge and skills acquired during previous computer science courses and human-technology-oriented courses, the students will assemble and test this knowledge and skills in a larger project while at the same time reflecting on their work. The students should also deepen their knowledge on software, design and cognition in relation to digital environments and biologically inspired systems. One purpose is to provide knowledge about different types of cognitive models and how these can be used to (1) understand people, (2) model people and (3) build technical systems inspired by human cognition. They will be trained in using cognitive models from classical artificial intelligence, reactive models, neuro-based learning models and situated models of cognition. Another purpose is to provide training on how to collaborate efficiently in a project team consisting of people with different backgrounds and skills. Yet another purpose is to develop the students' ability to identify and solve interaction problems related to next-generation interaction technologies connected to applications within e.g. learning, sustainability and robotics.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

• demonstrate knowledge about using modelling as a method and know about different types of cognitive models

• understand how knowledge and inspiration of biological solutions can be used to find and implement new technical solutions

• be able to compare different solutions regarding technical design, demands and function

• be able to reason about issues of methodology and relevance in a professional manner

Competences and skills
For a passing grade the student must

• be able to carry out a project under the criteria and milestones decided by the course teachers along with the project team
• be able to contribute significantly to a project, in a project team with mixed skills, aimed at developing/redeveloping a digital and/or robot-based interactive system

• be able to argue for the priorities made during the development of such a system

• be able to hold dialogues with different groups and to work effectively in mixed teams with different skills
• be able to define concepts in such a way that different perspectives, disciplines and areas of expertise can be brought together and thus serve as project manager for a team of people with different knowledge background

Judgement and approach
For a passing grade the student must

• demonstrate preparedness to deal with the unpredictability of problems involving humans and their interactions with an increasingly complex environment
• demonstrate awareness of ethical aspects of research and development
• understand the value in tackling problems in more than one way due to different methods' advantages and disadvantages and to understand how and why it is advantageous to combine certain methods with each other

• recognize the importance of inserting a project in different contexts and relate to the requirements and perspectives of others.

Contents

With the help of computer models, embodied as robotic systems in a natural environment or virtual agents in a digital environment, cognitive phenomena such as attention and learning will be explored. Within cognitive science, models of various kinds are used in order to understand the processes that give rise to cognition. These models try to describe the brain or a cognitive phenomenon in a precise manner, for example in the form of equations or computer programs. The models can be either descriptive or predictive. Descriptive models summarize the data in a uniform shape to provide a better understanding. Predictive models can also be used to generate data that can be tested for example in an experiment. The goal of creating models is for example to explore the cognitive processes or to generate new hypotheses. The purpose may also be to find biologically inspired approaches to solving technical problems. For example, artificial neural networks are used both to model the brain and as a technical method. The course is heavily project oriented and the students are developing or redeveloping their own concrete prototypes of technical systems based on different cognitive models. Depending on project selection, the emphasis of the projects vary, but all include: i) technological development, ii) cognitive science in-depth, and iii) deepening in interaction design. At least two weeks before the start of the course, students are given access to a list of suggested projects, where many tie to current research and development at the Department of Cognitive Science and

the Department of Design Sciences. All projects relate to advanced interactive systems for use in research, education (primary, secondary, higher education), health (training, diagnosis, intervention), industry or entertainment.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: All compulsory parts.

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

Assumed prior knowledge: TEK210/EXTA65 Cognition and at least one of MAMN25, MAM061, MAM101/MAMF45 or MAM120/MAMF50.
The number of participants is limited to: No
The course overlaps following course/s: KOGP05

Reading list

- Compendium by the Department of design sciences & Lund University Cognitive Science.

Contact and other information

Course coordinator: Christian Balkenius, christian.balkenius@lucs.lu.se
Course homepage: http://www.eat.lth.se
Further information: Compulsory parts: introduction lecture, written and oral presentations, workshops, project supervision, written project report, oral project presentation. Please note that the course is followed also by students from the Master program in cognitive science.