HALMSTAD UNIVERSITY
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School of Information Technology

Smart Healthcare with Applications 4 credits

Smart hälso- och sjukvård med tillämpningar 4 hp

Second cycle
Main field: Computer Science and Engineering, Second cycle, has only first-cycle course/s as entry requirements (A1N)
Syllabus is adopted by the Research and Education Board (2022-04-28) and is valid for students admitted for the autumn semester 2022.

Placement in the Academic System

The course is given as a single subject course.

Prerequisites and Conditions of Admission

Degree of Bachelor or Degree of Bachelor of Science in Engineering or the equivalent of 180 Swedish credit points or 180 ECTS credits at an accredited university. Applicants must have written and verbal command of the English language equivalent to English course 6 in Swedish Upper-Secondary School.

Course Objectives

This course aims to provide the student a general introduction to information-driven care, challenges, applications and opportunities. The student will learn about the introduction to artificial intelligence, and machine learning, as well as some use cases of information-driven care, and gain practice on how a real-world evidence project within information-driven care is investigated.

Following successful completion of the course the student should be able to:

Knowledge and understanding

- at a basic level, describe and explain the concept of information-driven care, AI and ML (supervised and unsupervised learning) and how these concepts relate to different problem statements in healthcare
- describe the challenges and concerns of AI solutions in healthcare and how explainable AI (XAI) can mitigate them
- explain different performance metrics for evaluating ML solutions in healthcare.
- briefly describe existing data sources and the ongoing transformation towards centralized data storage.

Skills and ability

- design an information-driven healthcare project with the required skills and details
- apply supervised and unsupervised ML solutions using pre-written Python programs
- present the analysis of results from different machine learning techniques using the main performance criteria

Judgement and approach

- analyze and scrutinize the performance of specific machine learning algorithms used to solve a healthcare problem
- evaluate challenges with scaling AI solutions in healthcare
- reflect on current and future AI trends in the healthcare domain

Primary Contents

The course is broken down into five main parts (short description of the main topics covered in the course):

1. AI, possibilities, and challenges in healthcare:
This part will cover the basics of AI/ML including supervised and unsupervised techniques in one lecture. Then in the second lecture, possibilities and challenges of what AI can bring into healthcare will be discussed, how XAI can mitigate them, and how information-driven care can transform healthcare.

2. Information driven use cases in healthcare:
This part will cover the current main areas of application, i.e.; i) medical related use cases including diagnostics, triaging, and treatment and ii) management related use cases including procedure- and arrival analysis and patient profiles.

3. Hands-on AI workshop:
This part will introduce Python programming and how AI/ML solutions are developed. Several pre-written exercises using real-world health datasets will be provided as a solution within the smart healthcare domain. Students will have the opportunity to try the provided exercises in different scenarios, manipulate them and get the feeling of how ML

development is performed in practice.

4. Relevant Regulations in Healthcare:
This part will briefly review relevant regulations including Medical Device Regulation, GDPR, CE-marking, ethical approval etc.

5. Data sources in Information driven healthcare:
In this part, existing data sources will be covered, including EHR, HR systems, national quality registers and other. An introduction to the ongoing work of centralized data storage with common API's will be given, including a discussion on pros and cons.

Teaching Formats

Each lecture is delivered through a video conference tool, and followed by a practical lab assignment using Python Jupyter Notebooks. Videos of the lectures will also be put online for students to revise and follow at their own pace. Teaching is online and in English.

Examination

The overall grades of Fail or Pass will be awarded for the course.
Exams will consist of an individual oral examination and a project that can be done in a group. The project is presented by the end of the course.

Name of the test		Grading
Oral Examination	2 credits	U/G
Project	2 credits	U/G

If there are special reasons, the examiner may make exceptions from the specified examination format and allow a student to be examined in another way. Special reasons can e.g. be a decision on learning support.

For elite sports students according to Riktlinjer för kombinationen studier och elitidrott vid Högskolan i Halmstad, DNR: L 2018/177, the examiner has the right to decide on an adapted examination component or let the student complete the examination in an alternative way.

Course Evaluation

Course evaluation is part of the course. This evaluation should offer guidance in the future development and planning of the course. Course evaluations should be documented and made available to the students.

Course Literature and Other Study Resources

Burkov, A. *The hundred-page machine learning book*. Andriy Burkov. 2019

Erik Drysdale et al. Implementing AI in healthcare, Vector-SickKids Health AI Deployment Symposium. 2020

Markus, A. F., Kors, J. A., & Rijnbeek, P. R. The role of explainability in creating trustworthy artificial intelligence for health care: a comprehensive survey of the terminology, design choices, and evaluation strategies. *Journal of Biomedical Informatics*, 113, 103655. 2021

Murray, M., Macedo, M., C. Glynn, C. Delivering health intelligence for healthcare services. In: *First International Conference on Digital Data Processing* (DDP), pp. 88–91. 2019