HALMSTAD UNIVERSITY
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School of Information Technology

Data-driven Healthcare 4 credits

Datadriven sjukvård 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 (2021-08-23) and is valid for students admitted for the spring semester 2022.

Placement in the Academic System

The course is given as a single subject course.

Prerequisites and Conditions of Admission

Degree of Bachelor in Computer science or Degree of Bachelor of Science in Engineering or the equivalent of 180 Swedish credit points or 180 ECTS credits at an accredited university. Programming 7.5 credits, and Machine Learning 7.5 credits or equivalent. 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 a broad introduction to healthcare analytics: Applying data analytics tools and techniques to organize and analyze healthcare data. Students will learn the concepts and techniques for framing the healthcare problems using a data-driven approach, and gain practice analyzing a set of real-world healthcare related data using predictive analytics methods.

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

Knowledge and understanding

- describe the nature and form of healthcare data, its applications and ethics issues
- explain the conceptual and practical issues related to the healthcare data collection, preprocessing, structuring, and analysis

Skills and ability

- apply data analytics techniques to clean and prepare healthcare data for analysis
- apply classification techniques on real-world healthcare datasets
- choose appropriate approaches to visualize healthcare data
- interpret the results of healthcare datasets' analysis

Judgement and approach

- evaluate the classification approaches presented during the lectures on various healthcare datasets
- assess the performance and the accuracy of predictive analytics methods

Primary Contents

The course is broken down into four parts:

- Part 1: Healthcare data understanding and ethics. This part discusses general issues related to the collection, sharing, and management of healthcare data, as well as issues related to patients' privacy, ethics, bias, social and economic constraints when using healthcare data.
- Part 2: Data preparation and visualization. This part will discuss challenges related to healthcare data such as the data size and the class imbalance problem. Then, it introduces techniques for preprocessing healthcare data, extracting and selecting the most relevant features, and visualizing the data.
- Part 3: Classification techniques in healthcare data. This part will discuss predictive modeling techniques such as classification using decision trees, neural networks, and others. These techniques will be applied to various practical health care problems, such as: readmission risk assessment, personalization of treatment regimen, predicting patient survival rates, etc.
- Part 4: Evaluation metrics in predictive analytics. This part will present commonly used metrics to evaluate the predicted outcomes, but also introduce evaluation strategies relevant in the healthcare domain such as: AB Testing, Propensity Scores, and Randomized Control Trials.

Teaching Formats

Each lecture is delivered through a video conference tool with a set of presentation slides that will be displayed online during each class session. Online practical labs are also provided in the lectures via Jupyter notebooks in Python. Students have the opportunity to work on the provided assignments which allow them to dig into the concepts presented in the lecture and put them to practice. Presentation slides, videos of the lectures, and assignments will be available online via The university's learning platform. Teaching is in English and fully online.

Examination

The overall grades of Fail or Pass will be awarded for the course.
Exams will consist of a written examination and a project presented by students.

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

If a disabled student has been granted learning support through a decision by Halmstad University, the examiner may decide on an adapted or alternative form of assessement for this student.

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

Main textbook

Kumar, V. V. H*ealthcare Analytics Made Simple: Techniques in healthcare computing using machine learning and Python.* Packt Publishing Ltd, 2018

Recommended textbooks

El Morr, C., & Ali-Hassan, H. *Analytics in Healthcare: A Practical Introduction*. Springer. 2019

Reddy, C. K., & Aggarwal, C. C. (Eds.). *Healthcare data analytics* (Vol. 36). CRC Press. 2015

Recommended papers

Gotz, D., & Borland, D. Data-driven healthcare: challenges and opportunities for interactive visualization. IEEE computer graphics and applications, 36(3), 90-96. 2016

Kumar, S., & Singh, M. (2018). Big data analytics for healthcare industry: impact, applications, and tools. Big Data Mining and Analytics, 2(1), 48-57.

Online materials

How to learn Python: `https://www.learnpython.org/`

Predictive analytics on healthcare datasets: `https://www.kaggle.com/tags/healthcare`

A list of healthcare datasets: `https://data.world/datasets/health`