HALMSTAD UNIVERSITY

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School of Information Technology

SYLLABUS

-translated from Swedish
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Course Code: DI8002 / 8

Applied Data Mining 7.5 credits

Tillämpad Data Mining 7.5 hp

Second cycle
Main field: Digital Forensics, Second cycle, has only first-cycle course/s as entry requirements (A1N)
Syllabus is adopted by the Research and Education Board (2024-03-20) and is valid for students admitted for the autumn semester 2024.

Placement in the Academic System

The course is included in the Master of Science programme in Network Forensics 60 credits. The course is also offered as a freestanding course.

Prerequisites and Conditions of Admission

Bachelor of Science degree in an engineering subject or in computer science. The degree must be equivalent to a Swedish kandidatexamen and must have been awarded from an internationally recognised university. Courses in computer technology, digital communication, computer networks, computer science or digital forensics of at least 90 higher education credits, of which 15 credits must be in Computer networks and 7.5 credits in Programming. Courses in mathematics of at least 15 higher education credits. English 6. Exemption of the requirement in Swedish is granted.

Course Objectives

The aim of the course is to enable students to familiarise themselves with the practical challenges of authentic data mining issues in the context of computer networks and network security. By being exposed to problem formulations at the business level, analysis of the volume and quality of the available data, selection of suitable algorithms, and evaluation of results, students are expected to acquire an understanding of the possibilities as well as limitations of different methods of machine learning focusing on computer networks and network security.

On completion of the course, the students shall be able to:

Knowledge and understanding

- identify different classes of problems that can be addressed by methods of data mining

- describe different data mining algorithms and present their advantages and shortcomings

- discuss current research and development in the field of data mining and application for digital forensics, both technical and diversity, gender equality and democracy perspectives on social control and integrity.

Skills and ability

- perform applicability analysis for a specific problem

- configure the computer representation in accordance with the requirements for a certain problem or algorithm

- provide a scientifically appropriate formulation of a partial problem based on a general issue

- adapt general approaches to a specific problem or the data being used.

Judgement and approach

- select suitable methods and make reasonable assessments for the solution of a specific authentic problem.

Primary Contents

Concepts, algorithms and tools of data mining. Overview of paradigms within data mining; symbolic and non-symbolic methods. Detection of anomalies, clustering and classification. Introduction of Bayesian networks for assumptions and conclusions in situations of uncertainty. Detailed introduction to decision trees and a general introduction to other techniques of machine learning such as neural networks and support vector machines. Applications of data mining within digital forensics. Project work including problem analysis, application of different methods and algorithms, and testing and comparison of different solutions. Report writing and presentation techniques are also included as specific components of the course.

Teaching Formats

The teaching consists of supervised laboratory exercises, lectures and seminars with research papers. An independent project to solve an open authentic data mining problem is to be executed in groups based on the methods introduced on the course.

Teaching is in English.

Examination

The overall grades of Fail, 3, 4 or 5 will be awarded for the course.

The assessment is based on a written exam on theory, an oral project presentation also seminars and a written report on the project findings.

Name of the test		Grading
Written Report	3,5 credits	U/G
Oral Presentation	1 credits	U/G
Written Examination	3 credits	U/3/4/5

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

Chio Clarence & Freeman David. *Machine Learning and Security: Protecting Systems with Data and Algorithms* .Clarence Chio & David Freeman? 2018, O'Reilly Media.

Géron Aurélien. *Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems.* 2019, O'Reilly Media