

Introduction to Machine Learning and Data Mining

Subject area: Computer Science/ICT

University:	DTU
Level:	BA2, BA3, BA4, MA all years
Teaching mode:	hybrid: some students participate online, other students attend real-life
Instructor(s):	Morten Mørup, Georgios Arvanitidis, Bjørn Sand Jensen, Tue Herlau, Jes Frelsen, Mikkel N. Schmidt

Short description

Structured data modelling. Feature extraction and dimensionality reduction. Similarity measures and summary statistics. Visualization and interpretation of models. Overfitting and generalization. Regression and classification (decision trees, nearest neighbor, naive Bayes, neural networks, and ensemble methods). Clustering (k-means, hierarchical clustering, and mixture models). Association rules. Density estimation and outlier detection. Applications in a broad range of engineering sciences.

Full description

<https://kurser.dtu.dk/course/02450>

Learning outcomes

At the end for the course, the learning will be able to::

- + Describe the major steps involved in data modeling from preparing the data, modeling the data to evaluating and disseminating the results.
- + Discuss key machine learning concepts such as feature extraction, cross-validation, generalization and over-fitting, prediction and curse of dimensionality.
- + Sketch how the data modeling methods work and describe their assumptions and limitations.
- + Match practical problems to standard data modeling problems such as regression, classification, density estimation, clustering and association mining.
- + Apply the data modeling framework to a broad range of application domains in medical engineering, bio-informatics, chemistry, electrical engineering and computer science.
- + Compute the results of the data modeling framework by use of Matlab, R or Python.
- + Use visualization techniques and statistics to evaluate model performance, identify patterns and data issues.
- + Combine and modify data modeling tools in order to analyze a data set of their own and disseminate the results of the analysis.

General information

Contact hours per week:	4
Total workload:	140 (in student hours for the whole course)
ECTS credits:	5
Language:	English
Course start date:	31 January 2023
Course end date:	09 May 2023
Add. info about start date:	
Weekly teaching day/time:	Tuesday 1 PM - 5 PM
Time zone:	CET (Denmark, Germany, France, Netherlands, Switzerland, Czech Republic)

Further information:

Prerequisites:	First year university mathematics including basic course in linear algebra and calculus, furthermore basic knowledge of probability theory or statistics, basic knowledge of either Matlab, Python or R.
Activities and methods:	Lectures, Group work, Exercises
Presence on campus:	Not required can be attended online

Final examination

Form:	For virtual online EuroTeq students it will be an oral online exam.
Date:	
Location/format:	online
Re-sit possibility:	yes
Transcript available:	end of semester
Add. info/requirements:	Date will be announced but final examination following regular exam periods at DTU and will be held during the last two weeks of May 2023

Registration

To register for this course, follow the registration requirements of your **home university** as specified here: www.euroteq.eu/courses-registration.

Administration

Number of places:	5
Minimum participants:	
Internal course code:	02450
Contact:	mmor@dtu.dk

This course is part of the EuroTeQ Engineering University joint course catalogue 2023. This is a collaborative activity of the partner universities DTU, L'X, TU/e, TalTech, CTU, TUM as well as Technion. Students from these universities can participate in the offered courses. It is the responsibility of the student to check if you fulfil the requirements to participate in a specific course. Students are also advised to check with their home institution how to get recognition of the ECTS credits gained in courses of the EuroTeQ course catalogue. For further information about EuroTeQ Engineering University, visit www.euroteq.eu or get in touch with the above-mentioned point of contact.