

UNIVERSITY OF COLOGNE
MACHINE LEARNING IN APPLIED SETTINGS
Syllabus

Summary

Lecturers:	M. Weinmann, C. Coors, S. Demir
Contact:	via e-mail
Coordinator:	Prof. Dr. Markus Weinmann
Structure:	Final paper & presentation, 2 check-ins
Group size:	3-4 participants
Conditions for access to tests (yes/no):	No
Period (Term):	Term 1
ECTS:	6
Entry requirements:	N/A
Study level:	Master
Course schedule:	08.04.2023 - 17.05.2023
Room:	check-ins & kickoff online

Course Description

Machine learning is a rapidly growing field that involves the development of algorithms and statistical models that enable computers to learn from data without being explicitly programmed. This seminar will provide an introduction to the concepts, techniques, and tools used in machine learning, with a focus on supervised and unsupervised learning. Topics covered will include data preprocessing, model selection and evaluation, classification, regression, clustering, and dimensionality reduction. By the end of the course, students should be able to understand the underlying principles behind machine learning algorithms and how to apply these algorithms to solve real-world problems. Specifically, students will learn how to preprocess and clean data, select and evaluate machine learning models, and apply supervised and unsupervised learning techniques to solve classification, regression, clustering, and dimensionality reduction problems.

Seminar Topics and Learning Blocks

- ML topics from the lecture 'Machine Learning and Artificial Intelligence'
- Image Recognition
- Unsupervised Learning: Clustering and Dimensionality Reduction
- Tensor decomposition methods

Course Setup

This course consists of two parts: (1) students choose their topic and research for suitable data. Of course finding data can be sometimes a limiting factor, and hence this step can be the most dominant and will drive the choice. The students should be aware that some datasets are more challenging to preprocess than others.

Some example sources where you can pick your dataset from:

- Google dataset search (<https://datasetsearch.research.google.com/>)

- Kaggle (<https://www.kaggle.com/datasets>)
- Tensor data (<https://www.nrel.gov/grid/solar-power-data.html>)

(2) students show their understanding of the modelling techniques by writing up a paper and perform a final presentation in video format.

Course Assessment

Your final grade will be based on 3 items: (1) clearness and scope of the code (2) their own paper report (3) the final video presentation. In detail the grade will be calculated as follows:

Item	Description	Weight
Code	R or Python	25%
Report	Academic paper	50%
Report	Video	25 %

Item 1: Code. You write up your analysis in R or Python. Please comment your code, that it will be understandable. Also the quality of data analysis and scope of the chosen models will be graded.

Item 2: Academic paper. Teams will submit a 10-page written academic paper detailing their research context, research gap, data description, models, results, conclusion. Graded will be the effectiveness of communication and presentation of results in a scientific way.

Item 3: Video presentation. Teams will submit a video with a short 7-10 min. presentation, that is hold by everyone from the group. Graded will be the ability to work in a team and contribute to the project and also the adherence to project requirements and deadlines.

Important Dates

Kickoff April 08 - 14:00 (106 Seminarraum S12)
 1st check-in presentation with tutor April 22
 2nd check-in presentation with tutor May 3
 Submission of video, code, and report May 17 at 17:00

For the 1st check-in please prepare a short presentation to show the chosen data and the plans for the analysis. It is important that dataset and the planned analysis match. You will be able to choose from different timeslots on this day.

The 2nd check-in is for more detailed questions considering the model structure. Please send all questions in one document to: coors@wiso.uni-koeln.de till the 2nd of May before the check-in. You will be able to choose from different timeslots on this day.

Send the final paper including the video presentation and the code to: coors@wiso.uni-koeln.de

Communication Policy

Since this is a seminar, we don't provide a Slack channel. Please communicate only via e-mail.