The Elements of Machine Learning

23 October 2023

UNIVERSITÄT DES SAARLANDES

CISPA
HELMHOLTZ CENTER FOR
INFORMATION SECURITY

Lecturers

Prof. Dr. Jilles Vreeken
lecturer

Dr. Krikamol Muandet
lecturer

Teaching Assistants

Osman Ali Mian
Head-TA

Joscha Cueppers
Head-TA

Sarah Mameche
TA

Anurag Singh
TA

Nils Walter
TA
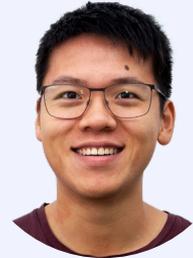
Sascha Xu
TA

Tutors

Ali Ahmed
Tutor

Jawad Al-Rahwanji
Tutor

Filippo Garosi
Tutor

Josephine Joseph
Tutor

Omer Musa
Tutor

Ahmed Osman
Tutor

Muhammed Saeed
Tutor

Christina Subedi
Tutor

Tentative Schedule

Oct	26	Bias & Variance
Nov	2	Linear Regression I
	9	Linear Regression II
	16	Classification I
	23	Classification II
	30	Generalization
Dec	7	Model Selection
	14	Moving Beyond Linear
Jan	4	Dimensionality Reduction
	11	Clustering
	18	Trees and Forests
	25	Support Vector Machines
Feb	1	Neural Networks
	8	ML and the Real World

When

Lectures
- Thu 16:15-17:45 in GHH E2.2, on Zoom, and on YouTube
- last lecture: Feb 8, 2024

Exams
- written (English)
- main exam on Friday, February 23, 2024
- re-exam on Thursday, March 21, 2024

Prerequisites

- Basic programming skills
  - we'll be using Python

- Basic mathematics and proof techniques
  - at least at Bachelor level (CompSci, BioInf, or equivalent)

- Linear algebra
  - if not, read *Introduction to Linear Algebra* by Strang

- Basic knowledge in statistics
  - if not, read *All of Statistics* by Wasserman

Assignment Zero

Assignment Zero is already available online

- ungraded self-assessment
- still time left to prepare

You are **strongly** recommended to take it

Course Material

An Introduction to Statistical Learning *with Applications in Python*
Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, and Jonathan Taylor
(first edition, 2023, PDF)
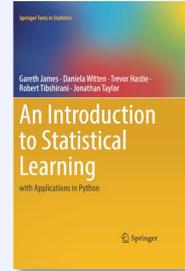
The Elements of Statistical Learning
Trevor Hastie, Robert Tibshirani and Jerome Friedman
(second edition, 2009, PDF)
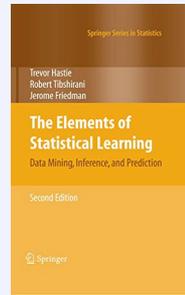
Basic and Advanced

EML is special

- **Basic Lecture** in all updated BSc CS programs
- **Advanced Lecture** for all students in other programs

You can **only once** receive credits for EML

- either as a Basic Lecture **or** as an Advanced Lecture
- and, only if you did not complete an equivalent course (e.g. ESL)

Credits and Grade

6 ECTS if you

- pass the exam

To qualify for the exam, you need to score

- a cumulative 50% of points over the theory assignments
- a cumulative 50% of points over the practical assignments

Final grade

- best grade out of main or re-exam
- *every **three** bonus points improve a **passing grade** by 1/3rd*
  - *six bonus points possible, maximum improvement 2/3rd*

Assignments

Six assignment sheets in total
- one sheet every two weeks
- deadline 14:00 on the day of lecture
- may do these individually, or in teams of two
- solutions to non-bonus questions posted after the deadline

Every sheet contains
- multiple theory questions
- multiple practical questions
- one bonus question

First sheet will be handed out on November 2nd
- deadline November 16th 2023

Plagiarism

We do not condone plagiarism
- we want you to solve the assignments
- plagiarism from other sources or teams is not tolerated
- you may of course *consult* other sources, but not simply *copy* solutions

We will carefully consider every assignment sheet
- we warn once, second time you're out and reported to exam office

Last year went quite well, but the year before we had to issue 48 official warnings!
- ten students were caught twice and expelled from the course

Tutorials

Tutorials
- two timeslots: Mon 12-14 and Tue 16-18
- **in-person** only
- register by November 2nd via https://cms.cispa.saarland/eml23/

Week n
- deadline of homework sheet, solutions posted, new homework sheet posted

Week $n + 1$
- recap of lecture n, exercise sheet for lecture n, questions from students

Week $n + 2$
- recap of lecture $n + 1$, exercise sheet for lecture $n + 1$, questions from students

Communication

I have a question!

1. check the website, lecture material, and recommended reading first
2. check if your question is not already asked/answered on the Forum
3. if not, post your question in the EML Forum on CMS

Private Issues

- email to eml-tas@cispa.de

Be Nice, Always

- we are here to help, not to serve – will not answer to rudeness
- use the template "Dear X, ... , Best regards, <Your name>"

Enjoy the ride!