Machine Learning Group
Fakulty IV, Technische Universität Berlin
Prof. Dr. Klaus-Robert Müller
Email: klaus-robert.mueller@tu-berlin.de

General Information

Aim and scope

The aim of this project is to practice the implementation of learning algorithms, the analysis of machine learning methods in simulations and their application on real data. The course covers both unsupervised learning (PCA, LLE, clustering, outlier detection) and supervised learning (kernel ridge regression, cross-validation, support vector machines).

Prerequisites

There are no formal requirements. However, participants should have a good grasp of the following:

- Python programming (as taught in the course "Python Programming for Machine Learning")
- Foundations of machine learning (as taught in the module "Machine Learning 1")
- Linear algebra and probability theory (as taught in B.Sc. math modules or the course "Mathematics for Machine Learning")

Structure

There are four problem sheets, each with a duration of three weeks. For each problem set, there are three sessions: (a) a lecture covering the theoretical background and (b) a group consultation for Q&A and (c) a presentation session for the solutions to the previous sheet (usually held together with next sheet's lecture). Deadlines are on Sundays 11:59pm. Attendance is optional. See Table 1 for a preliminary course schedule. The updated exact dates and times can also be found in the ISIS course calendar.

The assignments require substantial work and the solutions are often not straightforward. We highly recommend that you get going early on, so that you can use the Q&A sessions. You are encouraged to ask (and answer!) questions in the discussion forum on ISIS. A handbook that covers most topics will be provided.

	Date	Event type	Description
Sheet 1	Wed 21 Apr	Lecture	Introduction and Lecture for sheet 1
	Wed 5 May	Q&A	Q&A session for sheet 1
	Sun 9 May	Submission deadline	Sheet 1 due date
Sheet 2	Wed 12 May	Lecture	Lecture for sheet 2
	Wed 26 May	Q&A	Q&A session for sheet 2
	Sun 30 May	Submission deadline	Sheet 2 due date
Sheet 3	Wed 2 June	Lecture	Lecture for sheet 3
	Wed 16 Jun	Q&A	Q&A session for sheet 3
	Sun 20 Jun	Submission deadline	Sheet 3 due date
Sheet 4	Wed 23 Jun	Lecture	Lecture for sheet 4
	Wed 7 Jul	Q&A	Q&A session for sheet 4
	Sun 11 Jul	Submission deadline	Sheet 4 due date

Table 1: Preliminary course schedule. All meetings are Wednesdays 2:15pm–4pm in Zoom (link on ISIS page).

Grades and module

The lab course is a module in itself. Students work in groups of two. Copying code or part of the report is not allowed. The final grade is determined by an oral exam only. In order to be admitted to the oral exam, a participant must achieve at least 50% of the points in the problem sets. The points in the problem set do not influence the final grade but may be used to match students when oral exams are taken in groups. Moreover, each participant has to present a solution at

least once (during one of the presentation meetings). Presentations are informal, a few slides or showing your code is sufficient.

Submission guidelines

For each problem set, participants submit code and a written report via the ISIS electronic submission system.

- Your have to submit a `sheet?.py` file that contains the functions asked for on the exercise sheets. The functions have to adhere to the signatures defined on the exercise sheets. In this file, you may of course define additional functions. Code must be sufficiently commented; each (non-technical) step of the algorithm should be indicated in the code. You do not have to submit code for the application part.
- For each problem set, we will provide automatic tests; make sure that your submission passes these tests. We will test your code using **Python 3**.
- Your report must be LaTeX generated and use the template available on ISIS. It must not exceed 20 pages.
- You have to hand in exactly two files:
  1. Your `sheet?.py`
  2. Your `report?.pdf` of maximum 20 pages.

  Different format, names, or zip files make grading significantly harder and will not be accepted. If you feel that it is absolutely necessary, you can hand in a third file (which can be an archive, e.g. zip) and give an explanation in your report.

Contacts

ISIS is the primary channel, please use the discussion forums whenever possible. We will try to respond quickly (but not necessarily on the weekend).