
Machine Learning B

2024-2025

Home Assignment 1

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The deadline for this assignment is **29 April 2025, 17:00**. You must submit your *individual* solution electronically via the Absalon home page.

A solution consists of:

- A PDF file with detailed answers to the questions, which may include graphs and tables if needed. Do *not* include your full source code in the PDF file, only selected lines if you are asked to do so.
- A .zip file with all your solution source code with comments about the major steps involved in each question (see below). Source code must be submitted in the original file format, not as PDF. The programming language of the course is Python.
- **IMPORTANT: Do NOT zip the PDF file**, since zipped files cannot be opened in *SpeedGrader*. Zipped PDF submissions will not be graded.
- Your PDF report should be self-sufficient. I.e., it should be possible to grade it without opening the .zip file. We do not guarantee opening the .zip file when grading.
- Your code should be structured such that there is one main file (or one main file per question) that we can run to reproduce all the results presented in your report. This main file can, if you like, call other files with functions, classes, etc.
- Handwritten solutions will not be accepted. Please use the provided latex template to write your report.

1 Numerical comparison of kl inequality with its relaxations and with Hoeffding's inequality (40 points) [Yevgeny]

Solve Exercise 2.3 in Yevgeny's lecture notes.

2 Occam's razor with kl inequality (30 points) [Yevgeny]

Solve Exercise 3.1 in Yevgeny's lecture notes.

3 Numerical comparison of the kl and split-kl inequalities (30 points) [Yevgeny]

Solve Exercise 2.6 in Yevgeny's lecture notes.

4 [Optional, not for submission] Bernoulli Distribution Maximizes the Variance (0 points) [Yevgeny]

Solve Exercise 2.1 in Yevgeny's lecture notes.

5 [Optional, not for submission] Refined Pinsker's Upper Bound (0 points) [Yevgeny]

Solve Exercise 2.4 in Yevgeny's lecture notes.

6 [Optional, not for submission] Refined Pinsker's Lower Bound (0 points) [Yevgeny]

Solve Exercise 2.5 in Yevgeny's lecture notes.

7 [Optional, not for submission] Asymmetry of the kl divergence (0 points) [Yevgeny]

Solve Exercise 2.2 in Yevgeny's lecture notes.