"Introduction to Data Science and Advanced Programming" Requirements for the Capstone Project 2025

Fall term 2025

1 General Comments and formal requirements

To show the successful acquisition and mastery of the course content thought in the class "Advanced Programming", ALL students individually need to propose and carry out a final project that applies this knowledge to a problem of their choice.

All students individually will present their project via a 15 minutes long video that has to be submitted/uploaded/sent to the TAs of the course in the last week after classes of the semester—that is, on Sunday, **11th of January 2026, 23.59h**.

A pre-recorded presentation of the project is supposed to be 15' long, recorded, for instance, via Zoom. Clarification questions before the grading can be raised via email or Zoom call after the submission.

Question regarding the details should be directed to Anna Smirnova (anna.smirnova@unil.ch) or the other TAs of the class.

- 100% of the final grade will be based on submitting a project that provides evidence of the student's ability to apply what she/he learned during class.

- The grading will be based on several formal factors that are listed below as well as on the originality and complexity of the project and the presentation.

- By the **Monday, November 3rd, 2025** the latest, all students need to inform the TAs about the proposed project by submitting an approximately 200-word long proposal. Based on the TA's sign-off regarding the scope and complexity of the proposed project, it then can be undertaken.

- Due date of the semester project is Sunday, **11th of January 2026, 23.59h**. No late hand-in is accepted. A late hand-in will result in zero points for the project.

- The semester project will be submitted to Anna Smirnova (anna.smirnova@unil.ch).

2 Grading

The grading will be based on three factors—that is, i) satisfying the formal factors (listed below), as well as on ii) complexity of the project and iii) the originality of the project.

2.1 Formal Factors

- At the due date, three parts have to be submitted. i) a research paper of 10 pages length (min. 8 pages without references), ii) the source code (and auxiliary data if existing) to carry out the programming project, and iii) a recording of about 15 minutes lenght that presents and summarizes the project.

- The research paper will be submitted in a pdf format and in the SIAM conference style (style files and examples are provided).

- The submitted research paper needs to contain the following mandatory 8 sections

  - 1. Abstract
  - 2. Introduction
  - 3. Description of the research question and the relevant literature
  - 4. The methodology/algorithm applied to address the research question and potentially its complexity
  - 5. A discussion of the implementation of the algorithm (code) and, if possible, its parallel implementation and performance
  - 6. A description of how to maintain and update the codebase (by using git, unit testing, etc...)
  - 7. Results
  - 8. Conclusion
  - Appendix: A list of helper-tools (if used, such as Chat-GPT).

- Additional sections such as parallel scalability are permitted if they make sense in the project context.

You may use Chat-GPT, Co-pilot, and other resources aiding the code development and writing. However, all resources you use need to be clearly listed in the appendix.