Marburg University

Department of Computer Science
Prof. Dr. Sebastian Wild

Date: 2025-10-16
Version: 2025-10-16 22:08

Exercise Sheet 1 for Algorithms of Bioinformatics (Winter 2025/26)

Hand In: *Until 2025-10-24 18:00, on ILIAS.*

Exercise Policy

- The exercise problems take up the material from lecture. Working on them deepens understanding and increases proficiency, and I consider them an integral part of the course.
- You will require at least 50% of the total points to take the exam.
- You may collaborate on the problems and hand in your solutions as a group of 2–4 students.
- If you make use of external sources, make sure to clearly mark the used parts as such, including unambiguous references to the original sources. In case of websites, at least add the access date and use permanent links whenever possible (e. g., for Wikipedia). You may cite any publicly accessible sources, but take their credibility into account: you are responsible to verify what you cite.

  This applies even more so to generative AI answers. The tasks are designed to be solved without AI tools; don't deprive yourself of the learning experience.

  Collaboration between groups on conceptual solutions to the exercises is fine, but each group must work out a detailed submission individually. In these cases, add a quick statement with which groups you joined forces to work on a given problem.

  Plagiarism is not tolerated in academia, be it external sources, other groups' submissions, or genAI answers; severe cases can lead to expulsion from university.

Problem 1

40 points

Consider the backtracking algorithm for the Turnpike problem from class. How does an input difference multiset D look like that leads to an exponential running time of the algorithm?

Describe a family of inputs (i.e., for infinitely many sizes n) and prove that the backtracking algorithm needs exponential time.