Marburg University

Department of Computer Science
Prof. Dr. Sebastian Wild

Date: 2025-11-28
Version: 2025-11-28 14:55

Exercise Sheet 7 for Algorithms of Bioinformatics (Winter 2025/26)

Hand In: *Until 2025-12-05 18:00, on ILIAS.*

Problem 1

10 points

Is it possible for 99 cities to be linked by roads, with each city being linked to exactly 17 other cities? Justify your answer, and generalize it.

Problem 2

40 points

The t-addition k-mer problem is the following: Given a multiset $\mathcal{R}[0..n)$ of k-mers, add at most t additional k-mers $\mathcal{T}$ to the multiset, and create a string A of length $n+t+k-1$, so that every k-mer from $\mathcal{R} \cup \mathcal{T}$ appears precisely once within A – or conclude that this is impossible.

Find an efficient algorithm for the t-addition k-mer problem. For full marks, the algorithm should run in $O(f(t) \cdot (n+k))$ time for some function f.