

Problem sheet 7

Course Fundamental Computer Science, Dr. Holger Kenn
e-mail: h.kenn@iu-bremen.de, tel.:+49 421 200 3112

1.) Matrix-Chain Multiplication

Give a recursive Algorithm $\text{MATRIXCHAINMULTIPLY}(A, s, i, j)$ that actually performs the optimal matrix-chain multiplication, given the sequence of matrices $\langle A_1, \dots, A_n \rangle$, the s table computed by MATRIXCHAINORDER , and the indices i and j . (The initial call would be $\text{MATRIXCHAINMULTIPLY}(A, s, 1, n)$.) (3p)

2.) The greedy Professor Capulet

As stated, in dynamic programming we first solve the subproblems and then choose which of them to use in an optimal solution to the problem. Professor Capulet claims that it is not always necessary to solve all the subproblems in order to find an optimal solution. She suggests that an optimal solution to the matrix-chain multiplication problem can be found by always choosing the matrix A_k at which to split the subprodukt $A_i \dots A_j$ (by selecting k to minimize the quantity $p_{i-1}p_k p_j$) *before* solving the subproblems. Find an instance of the matrix-chain multiplication problem for which this greedy approach yields a suboptimal solution. (3p)

3.) Longest Common Subsequence

Determine an LCS of CACATGAT and CGCTACCT using the DP LCS algorithm, give the matrices b and c and then show how the LCS is reconstructed from the b matrix by indicating the fields used to form a LCS. (4p)