Exercise 04; Part B - Linear Ordering

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Problem 1 - Greedy transposition algorithm

a) Implement one iteration of the algorithm with pen&paper given:

Set $A = \{E, F, G, H\}$
Initial order $\alpha^0 = F < H < E < G$
Cost matrix

$$\mathbf{C_{a,b}} = \begin{array}{c} \\ E \\ F \\ G \\ H \end{array} \begin{array}{c} E \quad\ F \quad\ G \quad\ H \end{array} \left[\begin{array}{cccc} & 3 & 1 & 4 \\ -3 & & -10 & 0 \\ -1 & 10 & & -8 \\ -4 & 0 & 8 & \end{array} \right]$$

b) Implement the algorithm in Python using this dataset (it contains the results of the Bundesliga season 2018/19). Use the total goal difference as costs.

c) Computational complexity: How many calculations are needed to compute the optimal pair to switch in each iteration?

Problem 2 - Greedy transposition using the technique of Kernighan and Lin (1970)

a) Implement one iteration of the algorithm with pen&paper given the data from problem 1 a).

b) Additional task (voluntary): Implement the algorithm in Python using the dataset given in problem 1 b).

c) Computational complexity: How many calculations are needed to compute the optimal pair in each iteration?

Problem 3 - Comparing the two algorithms

a) What is one main disadvantage of the Greedy Transposition algorithm (compared with the Greedy Transposition algorithm generalized by the technique of Kernighan and Lin)?

Please note: the professor is happy to review any implementations of the Greedy Transposition or the Generalized Greedy Transposition algorithm.