

Exercise Set 12

Exercise 12.1. Prove that Christofides' algorithm achieves no better approximation ratio than $\frac{3}{2}$ for EUCLIDEAN TSP.

(5 points)

Exercise 12.2. Consider the following variant of METRIC TSP: Given an instance of METRIC TSP, we look for a Hamiltonian path of minimum weight (with arbitrary start- and endpoint). Give a $\frac{3}{2}$ -approximation algorithm for this problem.

(5 points)

Exercise 12.3. Let G be a complete undirected graph in which all edge lengths are either 1 or 2. Give a $\frac{4}{3}$ -approximation algorithm for the TSP in this special case.

Hint: You may use that a minimum weight 2-matching, i.e. a minimum weight subgraph of G in which every vertex has degree 2, can be computed in polynomial time.

(5 points)

Exercise 12.4. Describe a polynomial-time algorithm which optimally solves any instance of the TSP that is the metric closure of a weighted tree.

(5 points)

Submission: You can submit your solutions in groups of 2 people, either on paper in the lecture or via upload on Sciebo (link on website, late submissions after 2.15 pm will not be considered).

Deadline: Tuesday, July 4th, before the lecture. The websites for lecture and exercises can be found at:

<https://www.or.uni-bonn.de/lectures/ss23/ss23.html>

In case of any questions feel free to contact me at ellerbrock@or.uni-bonn.de.