Professor Dr. Vera Traub
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Exercise Set 1

Exercise 1.1. Consider the following procedure for (unweighted) Minimum Vertex Cover: Given a graph G, compute a DFS tree for every connected component. Return all vertices with non-zero out-degree in the tree. Show that this is a 2-approximation algorithm.

(4 points)

Exercise 1.2. Formulate linear-time 2-factor approximation algorithms for the following optimization problems and prove performance ratio as well as running time:

(a) Given an undirected, unweighted graph G, determine $v, w \in V(G)$ such that their distance is maximum.

(b) Given a directed graph G with non-negative edge weights, find an acyclic subgraph of maximum weight.

(c) Maximum-Satisfiability: Given an instance for Satisfiability, determine an assignment of truth values satisfying the maximum number of clauses.

(6 points)

Submission: You can submit your solutions in groups of 2 people, either on paper in the lecture or via upload on Sciebo to

`https://uni-bonn.sciebo.de/s/omVU1VMioEQwDa0`

(late submissions after 2.15 pm will not be considered).

Deadline: Tuesday, April 11$^{\text{th}}$, 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.