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Algorithms and Uncertainty

Summer Term 2021

Tutorial Session - Live Tasks 5

Exercise 1:
We have seen the Steiner Tree problem as well as the Set Cover problem in the lecture - both in its online versions. We are now interested in creating a link between the two. Therefore, we consider Steiner Trees in directed graphs.

(a) Show that the unweighted offline version of Set Cover (i.e. all sets have a cost of 1) is a special case of the directed offline Steiner Tree problem.

Remark: The directed offline Steiner Tree problem is defined as follows. For a given directed graph, a vertex $r \in V$ and terminals $T \subset V$, find a directed tree rooted in r such that for any terminal $t \in T$ there is a directed path from r to t in this tree. Minimize the overall cost of selected edges.

(b) Can your construction from (a) also be used when considering the online version? If yes, why? If no, which problems do occur and are there possibilities to overcome these?