Freie Universität Berlin
FB Mathematik und Informatik
WS 2017/18

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Optimization 2

Exercise Sheet 12

Submission: Wednesday, 31.01.2018, 12:00

Exercises:
Rigorous mathematical proofs/arguments are expected if not stated otherwise. You are allowed to work in groups of two.

Homepage of the Lecture: `http://www.zib.de/ws17_Optimierung_II`
Questions?: `beckenbach@zib.de`

Exercise 12.1 — 6 Points

Give an example of a digraph $D = (V, A)$ with weights $c \in \mathbb{R}^A$ that violates Bellman's Principle of Optimality (Lemma 13.4 (b)). What happens if you run Dijkstra's algorithm starting at some vertex $s \in V$, and what happens if you run the Moore-Bellman-Ford Algorithm?

Exercise 12.2 — 6 Points

Calculate a shortest s,t-path using Dijkstra's algorithm on the graph shown in Figure 1.

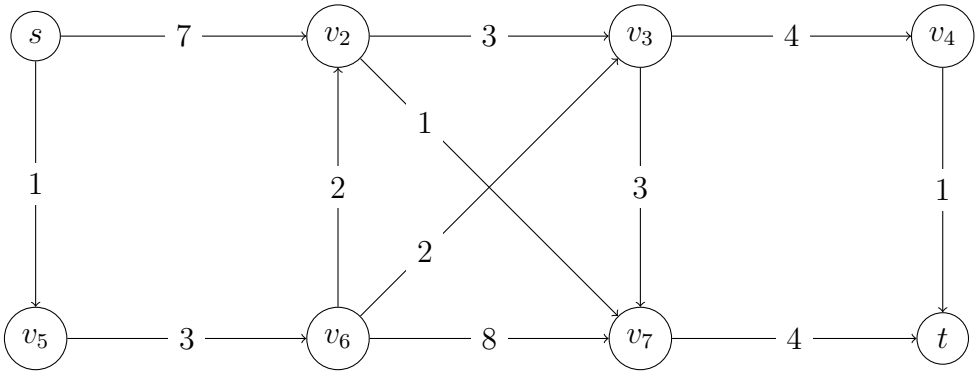

Figure 1: Example Graph

Exercise 12.3 **8 Points**

Let $D = (V, A)$ be an acyclic digraph with weights $c \in \mathbb{R}^A$ and $s, t \in V$. Show how to find a shortest s, t-path in linear time (in the number of vertices and arcs). (Hint: Use Bellman's Principle of Optimality together with recursion)