

CS375 Small Assignment 12

Due Nov 22th 10PM ET

Recall the MAXFLOW problem from class:

MAXFLOW

Input: A graph $G = (V, E)$ with vertices V and directed edges E with capacities $c(u, v) \geq 0$ for each edge (u, v) in E and two marked vertices s and t (we'll assume there are no edges into s or out of t).

Output: The maximum flow on the graph.

Constraints:

1. For each vertex v other than s and t it holds that $\sum_u f(u, v) = \sum_w f(v, w)$: ie, the flow into all vertices equals the flow out.
2. For each edge (u, v) in E it holds that $f(u, v) \leq c(u, v)$.

The following problem is taken from *Algorithm Design* by Kleinberg and Tardos:

HOSPITALSCHEDULING

Given: A parameter c and a list of doctors $d_1, \dots, d_n$ and a list of holiday periods $H_1, \dots, H_m$, where each holiday period H_i consists of h_i individual days. Each doctor has additionally marked each individual day they are capable of working during the holiday periods.

Output: Whether or not we can choose one doctor for each individual holiday workday under the following constraints:

Constraints: No doctor can work more than 1 day per holiday period and no doctor is assigned more than c days total.

Show that $\text{HOSPITALSCHEDULING} \leq_p \text{MAXFLOW}$.