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CSC226: Problem Set 4 Written Part

Q1) Tragic Comedy and Network flows

We can reduce the ~~prop~~ problem to a Max-flow problem by doing the ~~ff~~ following.

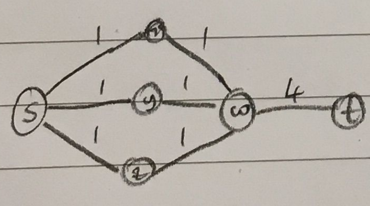
For each comedian, draw a node c_i, let the capacity of each edge be number of pairs of passengers (p_i, p_j), such that $c_i \in p_i, p_j$. Create a directed graph with all the ~~p~~ comedians and find the max-flow. If the max-flow is equal to ~~spon~~ k, then it is possible to evacuate everyone on board.

Q2) Max-flow with Node Capacities

Ans In order to satisfy the node capacity constrait, we can create an additional graph G' which contains two vertices v_o and v_i for every vertex v in G.
If we set the capacity of the edge (v_i, v_o) to be the capacity of ~~edge~~ vertex v_c, ~~then~~ then we can run the Ford-Fulkerson algorithm.
As as edge (u, v) in graph G does not have a capacity, we set the (u_o, v_i) in G' to be ~~infit~~ infinite. The flow through any vertex will not increase above capacity c_v as it has to pass through the edge (v_i, v_o).
Thus, using the Ford-Fulkerson algorithm will find a maximum s-t flow.

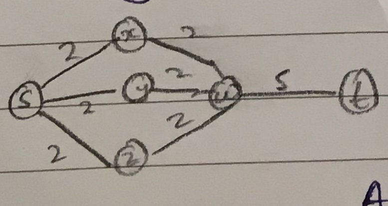
Q3) No they are not right. Consider the following counter example.

Let ~~then~~ initial graph be:



Then the minimum cut is A = {s}, B = U - A which has the capacity 3.

Increasing the edges by 1 gives:



The previous min-cut now has a capacity of 6. However the cut A = {s, x, y, z, w}, B = {t} has a capacity of 5, thus is the min cut of the graph. Thus, the friend was <u>WRONG</u>

Q4i) Knuth-Morris-Pratt