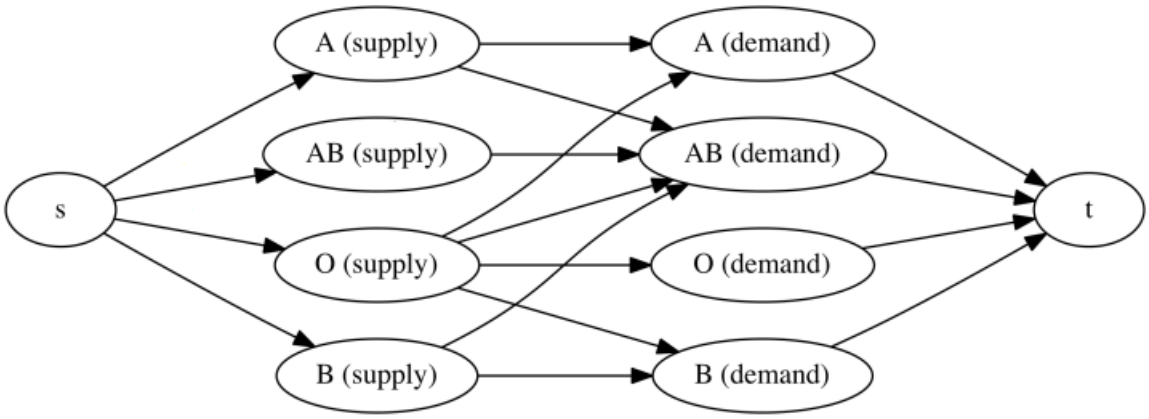
COS 226 Data Structures and Algorithms
Computer Science Department
Princeton University
Spring 2016

Week 9 Activity

1. Maxflow-Mincut Problem.

   The following flow diagram shows the demand and supply of A, B, AB and O blood types and various possibilities for each blood type donated. For example, those with type A can donate blood to types A and AB. Type AB can receive blood from any type A, B, AB, or O types.



   The table below shows supply and demand for each blood type. Assume that each person requires only one unit of their blood type. Our goal is to maximize the amount necessary to meet the total demand subject to supply constraints.

blood type	A	B	O	AB	sum
Supply	46	34	45	45	170
Demand	39	38	42	50	169

   (a) Mark edge capacity for unmarked edges. You can use the table above and assume that some edges may have infinite capacity.

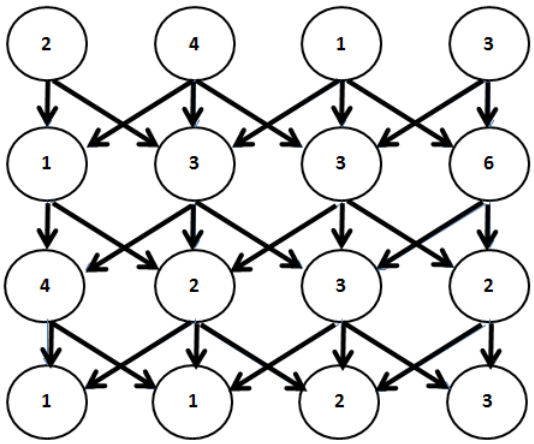
   (b) Perform all iterations of the Ford-Fulkerson algorithm by finding augmented paths and increasing the flow through the network.

   (c) What is the maxflow of the network?

   (d) Which vertices are on the t side (target side!) of the mincut? Describe why mincut can explain the fact that not all of demand for blood can be met.

2. Minimum Weight Path.

Consider the following directed graph with weights in each node (instead of edges)



(a) **Manually** find a path from top to bottom (vertical seam) that minimizes the total weight of the vertices in the path. The path can only follow directions as given by the arrows pointing downwards. There can be more than one path that minimizes the total weight.

(b) Suggest an efficient algorithm that can determine a minimum weight path. You can consider any shortest path algorithm discussed in the course or any other algorithm.

(c) (Homework) Using the algorithm in part(b), find a path that minimizes the total weight.