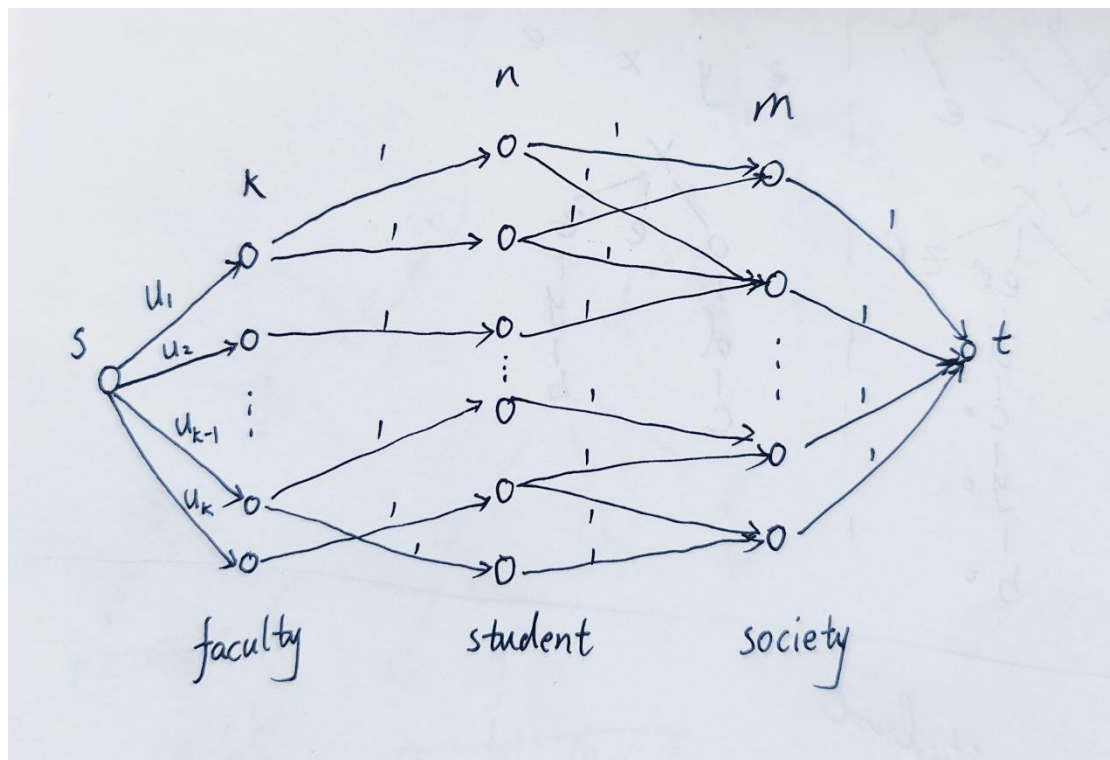**Qiyao Zhou**

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Question 1

We begin by constructing a flow network using the input data. The network is showed in the diagram below:

- source s and sink t,

- The combinations of vertices from left to right represent faculty, students and societies in that order,

- connect s to each faculty vertex(i) with capacity equal to u_i,

- The student vertices are connected to the corresponding faculties and societies according to the input, with a capacity of 1 for all connections,

- connect s to each society vertex with capacity equal to 1.

From this flow network construction, we run Ford-Fulkerson to find the

maximum flow. If the maximum flow is less than m, then we output "no solution". Otherwise, a selection is possible. We can deduce a selection of students by examining which of the student vertices are in the max flow. If student vertex i is in the max flow, then the student i is selected to attend the event.

The time complexity is $O(|V||F|)$ where $V = k+m+n+2$ and $F <= 3m+k <= 3m+n$, so the algorithm runs in $O(nm)$.