November 13

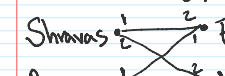
Friday, November 13, 2020 3:56 PM

Comp Sci 212

1. Stable matching

Stable matching - n jobs (ranked list of preferences of applicants) n applicants (ranked list of jobs)

(Stable marriage, applicants men, job women)



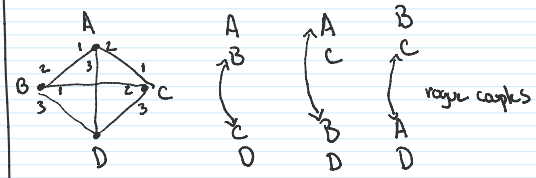
How to match people in the best way

Shravas — Facebook — rogue couple

Andreas — Microsoft

Def. Rogue couple - a job, applicant pair where both job & applicant prefer each other to their match.

Def. Stable matching - a perfect matching (every job & applicant matched) w/ no rogue couples.



Thm. There exists a stable matching between jobs & applicants

(Gale-Shapely algorithm).

Proof. 1. Each applicant interviews at their favorite job.

2. If a job has multiple applicants, reject all but favorite

3. Applicant gets rejected, crosses job off list

4. Repeat 1-3 until every job has at most one applicant.

Ex.

Day 1- Only Shravas interviews at Facebook

Day 2- Andreas also interviews at Facebook (rejected from 1st choice), Facebook prefers Andreas, reject Shravas.

1. Procedure ends
2. Everyone gets matched
3. No rogue couples

1. Everyone has a list of n jobs. Each time we need to repeat 1-4, someone crossed a job off list. Jobs are never added. Therefore total # of jobs on all lists is strictly decreasing.

P= for each job j and applicant a, if j is crossed off a's list, j prefers another applicant b to a, a j is b's favorite job that's not crossed off.

2. Use contradiction, assume a didn't get matched, there must be a job j w/ no match. j must be crossed off a's list, and has an interested applicant by P, which is a contradiction.

3. Use contradiction, assume a & j are rogue. Either j is crossed off a's list, or not. Case 1 Case 2

Case 1- By P, j prefers another interested applicant to a, j & a can't be rogue.

Case 2- a prefers their job to j, a & j can't be rogue.

2. Shravas 1. Facebook
1. Andreas 2. Microsoft

Day 1- Shravas & Andreas interview at Facebook
Facebook rejects Shravas

Day 2- Shravas interviews at Microsoft
Andreas at Facebook