CS3230
Design and Analysis of Algorithms
github.com/securespider

01. Stable matching

Both sides rank each other and goal is to pair each up **Constraints** No **rogue couples** - matched partner likes someone more than current partner that also likes them back

Gale-Shapley Algo

Invariant

- If woman not on boy list, she has a better current fav
- Boy choice is strictly worsening
- Girl choice cannot worsen (weakly increasing)

04. Greedy algorithms

- Consider jobs in some order and immediately take the job that is compatible with the previous jobs
- Has some heuristic to sort the jobs

Scheduling intervals

- Maximize number of jobs run
- Heuristic: end time, start time, interval size, fewest conflict

Interval Partitioning

- Minimize number of classrooms to run lectures concurrently
- Heuristic: start time
- Assign lecture to first compatible classroom

Minimize lateness scheduling

- Heuristic: Earliest deadline, Shortest processing time first, Smallest slack ($d_j - t_j$)
- Start with an optimal solution and inductively reduce number of inversions until it reaches the greedy solution

Inversions

- Pair of jobs i and j where dl(i)¡dl(j) but j schedule before i
- Greedy solution does not have any inversions

Greedy analysis Strategies

1. Each step in greedy solution is at least as good as other solutions
2. Exchange argument: Transforming solution to greedy algorithm without hurting its quality
3. Structural: Every solution has a certain value and greedy algos can be in this bound

Optimal offline caching

- Eviction strategy that minimises number of cache misses
- Heuristic: Farthest in future

– Evict item in cache that is not requested until farthest in the future