Cs301-a0

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March 2022

1 Problem 1 (Stable Marriage Problem)

(i)Stable Marriage Problem is the matching two equal sized elements with account of their preferences. The inputs consist of elements which they have preferences over each other elements in other group. Expected outcome is the every element paired with sustainable couples.

(ii)The administration to college can be example for this. Lets imagine that we have 3 students and 3 colleges. Every collage have capacity for 1 and students can go only 1 college at same time. This students have preference to enroll to college and colleges wants certain preference of this students. Expected result is the have sustainable pairing for every element for each group. We need to define which party should propose or select other group's element. This example let assume that colleges propose students.

Student	A	B	C	Colleges	X	Y	Z
1. pick	X	Y	X	1. pick	A	A	B
2. pick	Z	Z	Y	2. pick	B	C	A
3. pick	Y	X	Z	3. pick	C	B	C

Students names: A, B, C College names: X, Y, Z

2 Gale-Shapley Algorithm

(i)

```
function stableMatching {
    Initialize all c in Colleges and s in Students to not paired
    while some unpaired Colleges c who still has a Student s to propose to {
       s = first student on  c s  list to whom c has not yet paired
       if s is unpaired
         (c, s) become paired
       else some pair (c', s) already exists
```

```
            if w prefers c to c'
               c' becomes unpaired
              (c, s) become paired
            else
              (c', s) remain paired
    }
}
```

(ii) Time complexity of algorithm is O(n^2). First it checks the selected college's highest ranking student.If this student already paired it checks next student in colleges preference list. In next iteration if student have better match for him/herself the iteration from last day cancels.

3 Implementation

https://colab.research.google.com/drive/1XCBEegFxwaI7HWezLlkEh$_i$8$yIBxVW8?usp = sharing$

I used https://towardsdatascience.com/gale-shapley-algorithm-simply-explained-caa344e643c2 for implementation and understanding Gale-Shapley algorithm.