

EECS 660 Homework 1: Stable Matching

The goal of this homework is to implement the stable matching algorithm in the *Algorithm Design* book presented on page 6. The pseudo code is as follows:

```
Initially all  $m \in M$  and  $w \in W$  are free
While there is a man  $m$  who is free and hasn't proposed to
every woman
    Choose such a man  $m$ 
    Let  $w$  be the highest-ranked woman in  $m$ 's preference list
    to whom  $m$  has not yet proposed
    If  $w$  is free then
         $(m, w)$  become engaged
    Else  $w$  is currently engaged to  $m'$ 
        If  $w$  prefers  $m'$  to  $m$  then
             $m$  remains free
        Else  $w$  prefers  $m$  to  $m'$ 
             $(m, w)$  become engaged
             $m'$  becomes free
        Endif
    Endif
Endwhile
Return the set  $S$  of engaged pairs
```

Please read the following instructions carefully.

1: Input format: The input is written as plain text file with the following format. The input contains three sections, with different sections separated by an empty line. The first field indicates the number of men or women we have in this instance (note that they are the same). The second field is the men's ranking, and the third field is the women's ranking. For example, for a stable matching problem involving 3 men and 3 women, the input file should have the following format:

3

1,2,3

2,1,3

3,1,2

1,2,3

2,3,1

3,2,1

2: Output format: The output should contain a list of pairs, one pair per line. The former number should correspond to men and the second number should correspond to women. The pairs should be sorted by the men's IDs. For example:

1, 3
2, 2
3, 1

3: Men's proposal order: The order of men's proposals should be made in the manner of first-come-first serve. Ties are broken according to the men's IDs. (That is, at the beginning, men 1 should be allowed to propose earlier than men 2; and men 2 earlier than men 3...) Once a man finished the current proposal, he is removed from the queue. Once a previously matched man is set free, he should be placed at the end of the queue.

4: Execution of submission: We will run your program (Linux bash) in the following way:

```
"python [Your_Program] input.txt"
```

Your program should simply print to **stdout** instead of writing into an output file. Python 3 will be used as the interpreter.

5: Submission: You only need to submit the python code. Name the file as "stable_matching_KUID.py", where the field "KUID" corresponds to your KU ID. For example, if my KU ID is c123z456, my program should be named "stable_matching_c123z456.py". Submit the code via Blackboard. The deadline is Feb 26th, 2021 11:59PM CST.

6: Questions and/or feedbacks: Contact the instructor Cuncong Zhong at cczhong@ku.edu for logistic issues, or the grader Chiehen Hung at seanhung0621@ku.edu for technical issues.