Lecture 5

CSE 331

Sep 9, 2016

HW 1 posted

Homework 1

Due by **12:30pm, Friday, September 16, 2016**.

Make sure you follow all the homework policies.

All submissions should be done via Autolab.

Some Questions on Stable Matching

Sample Problem

The Problem

Decide whether the following statement is true or false:

In every Stable Marriage problem instance where a man m and woman w have each other as their least preferred partner, the following is true. There is no stable matching for the instance where (m, w) are matched.

If you state to a then you will have to formally argue why the statement is correct. If you state false, then you have to give a counter example.

Take note of the many(!) notes

! Note

Both the input and output parsers in each of the three languages are already written for you.

Note that you have to work with the input data structures provided (which will come pre-loaded with the data from an input file). Also note that you do not have to sort your output: we'll take care of that.

! Addition is the only change you should make

Irrespective of what language you use, you will have to submit just one file. That file will come pre-populated with some stuff in it. You should **not** change any of those things because if you do you might break what the grader expects and end up with a zero on the question. You should of course add stuff to it (including helper functions and data structures as you see fit).

Please Note

We tried to polish the helper material as much as we could but they of course can be improved. If you have any suggestions for improvement and/or need some clarification, please ask on piazza!

We do not have the full functionality of Autolab yet, so we will have separate submission links for each language. From HW 2 onwards, we are hoping to have a single submission link, where you can choose your language from a drop-down menu.

As a corollary of the above, for Questions 2 and 3 you will have to explicitly write down your sources and collaborators in your submissions. From HW 2 onwards, we are hoping that you submit this via a form when you upload your PDF.
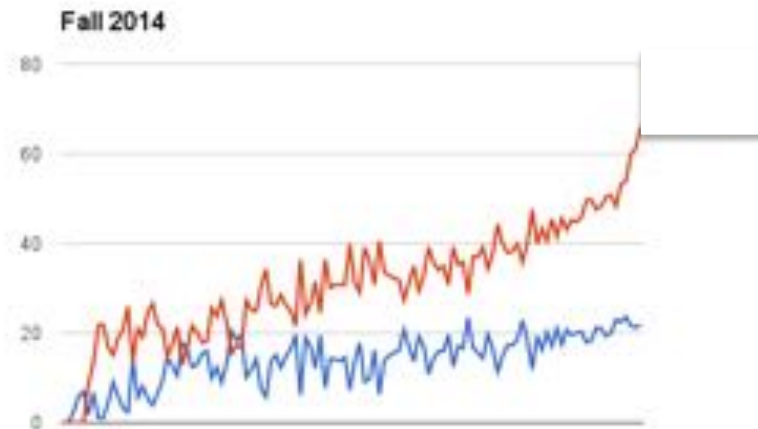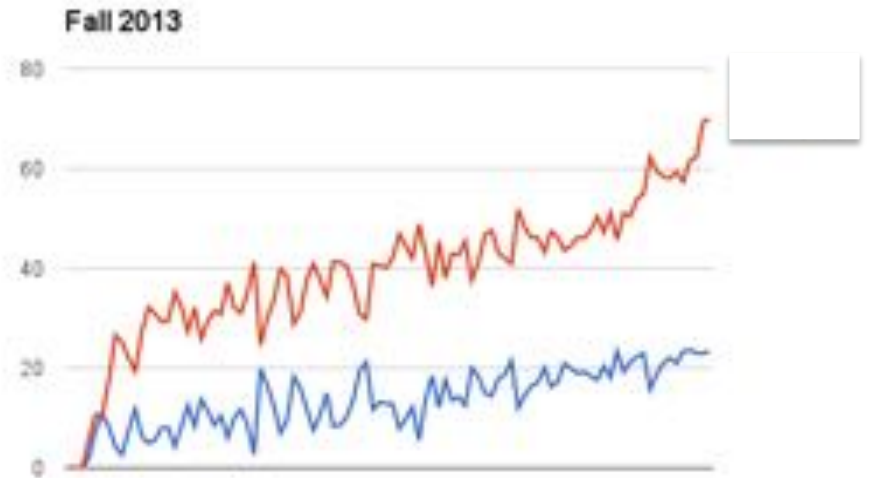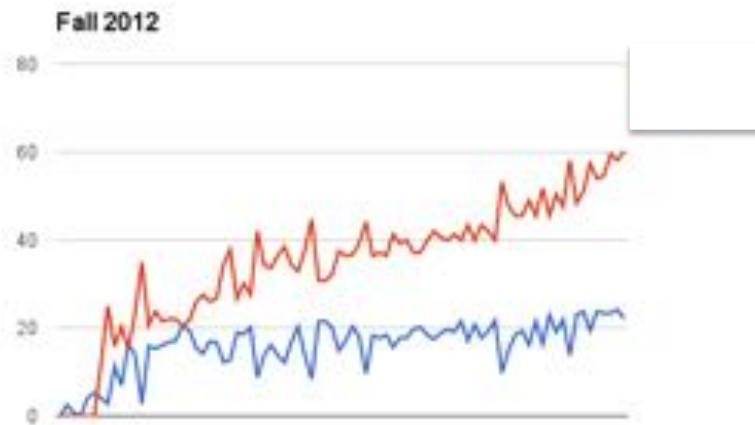
Small changes

We might tweak the autograder a bit over the weekend

These changes should not affect your score

Post questions on Piazza!

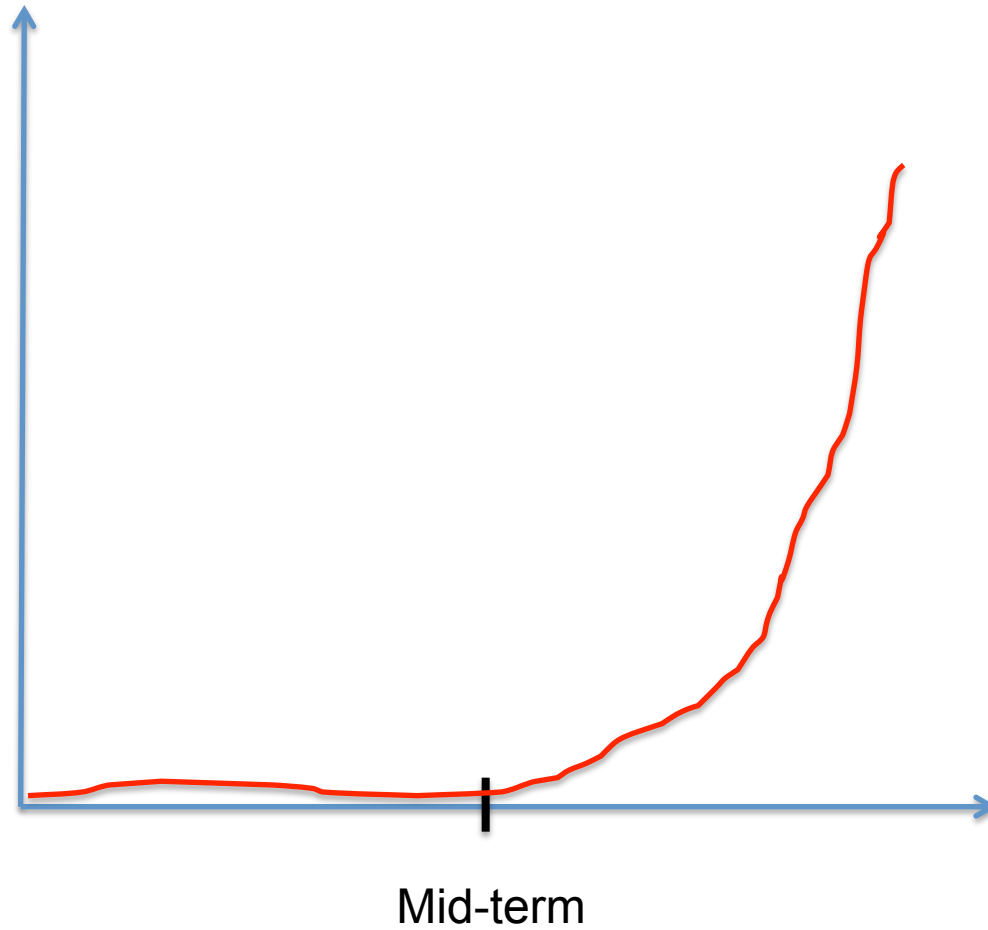# Can you guess the correlation?

Another comment

Discomfort with proofs

I will not cover proof basics in class

Please read support pages and talk to us in person if you need help

Lecture pace

Mid-term

Questions/Comments?

Gale-Shapley Algorithm

Intially all men and women are free

While there exists a free woman who can propose

> Let w be such a woman and m be the best man she has not proposed to
>
> w proposes to m
>
> If m is free
>
> > (m,w) get engaged
>
> Else (m,w') are engaged
>
> > If m prefers w' to w
> >
> > > w remains free
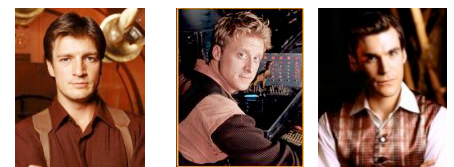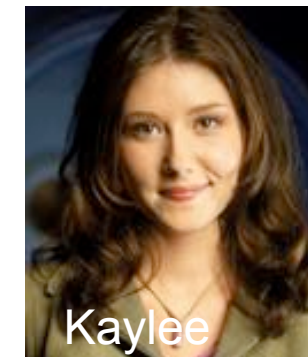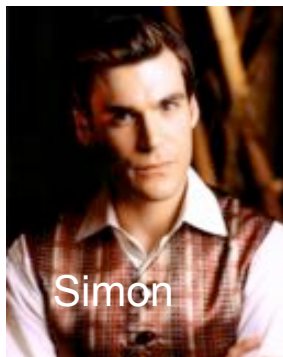> >
> > Else
> >
> > > (m,w) get engaged and w' is free

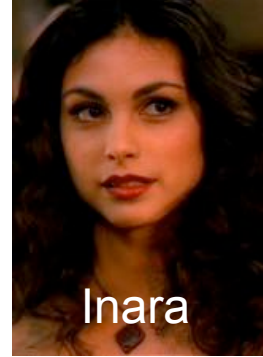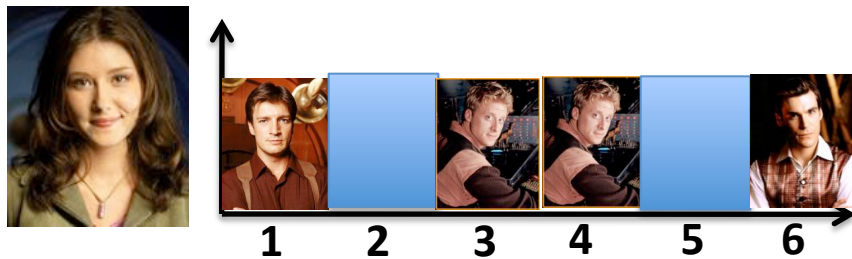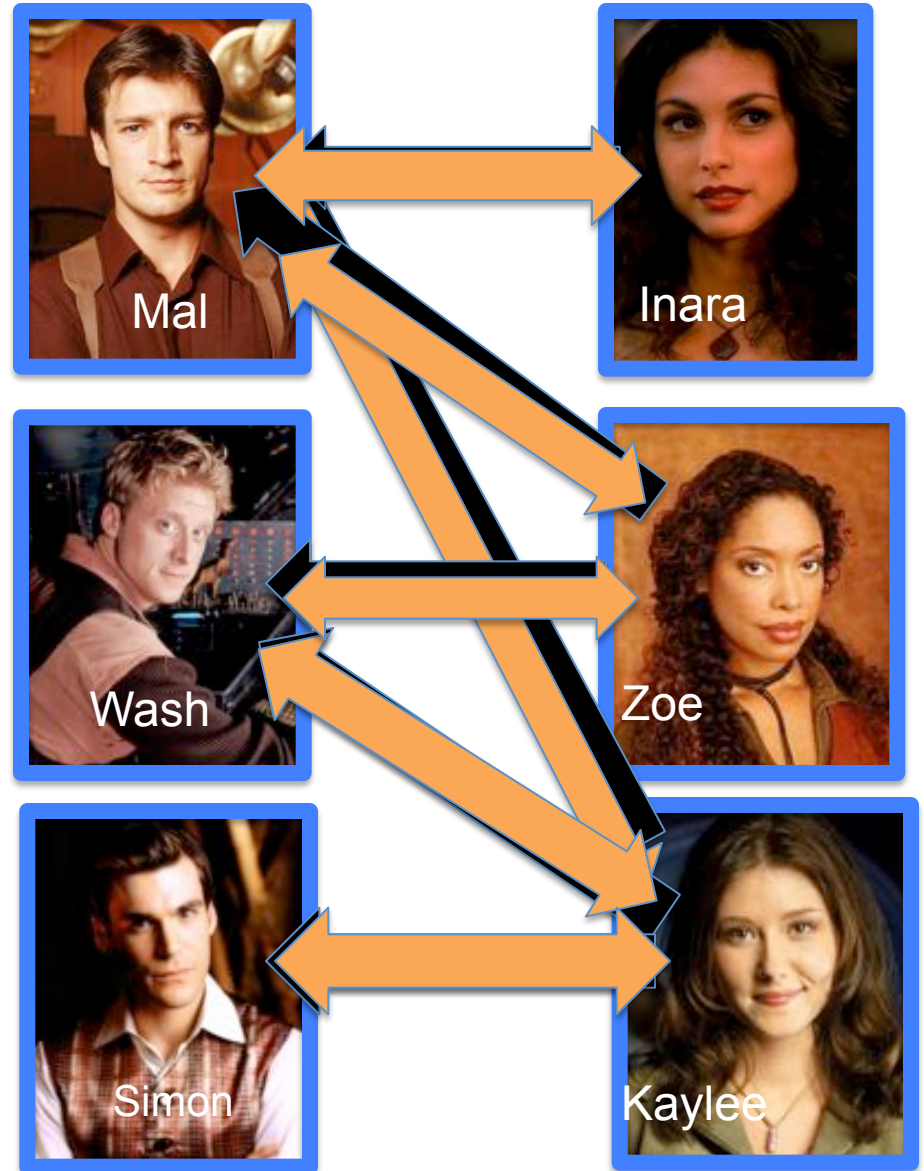Output the set S of engaged pairs as the final output

Today's agenda

Run of GS algorithm on an instance

Prove correctness of the GS algorithm

Preferences

GS algorithm: Firefly Edition

Observation 1

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

Else

(m,w) get engaged and w' is free

Once a man gets engaged, he remains engaged (to "better" women)

Output the engaged pairs as the final output

Observation 2

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

    w proposes to m

    If m is free

        (m,w) get engaged

    Else (m,w') are engaged

        If m prefers w' to w

            w remains free

        Else

            (m,w) get engaged and w' is free

If w proposes to m after m', then she prefers m' to m

Output the set S of engaged pairs as the final output

Questions/Comments?

Why bother proving correctness?

Consider a variant where any free man **or** free woman can propose

Is this variant any different? Can you prove it?

GS' does not output a stable marriage