Lecture 6

CSE 331

Sep 9, 2019

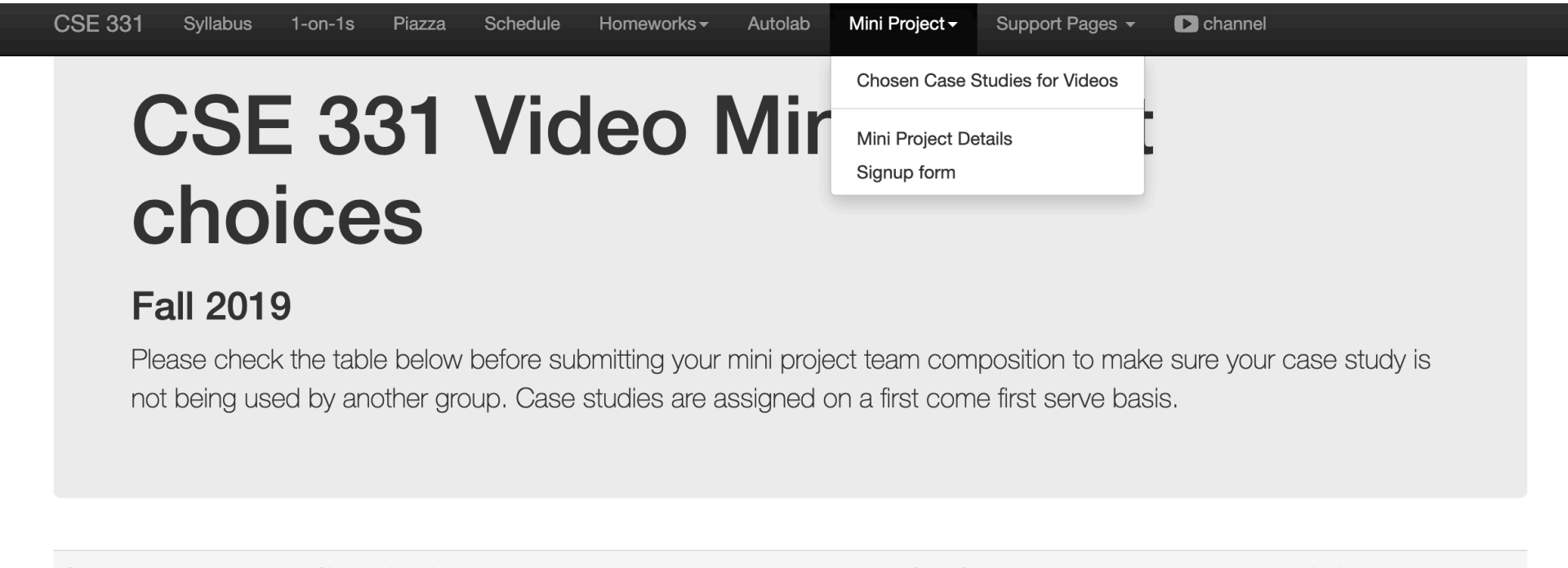
We’re not mind readers

If you need it, ask for help

Sign-up for mini projects

Only one signup so far!

Deadline: Monday, Sep 23, 11:00am



Peer notetaker request

note

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Actions

Peer notetaker request

Hi all,

Please see the message below from accessibility resources: please do help out if you can. In addition to the contact information below, I believe you can also email stu-notes@buffalo.edu

If you do end up being a peer note-taker, please let me know so that I can stop sending reminders in the future :-)
Thanks!
Atri

A student in your CSE 331 class is eligible for the services of a Peer Notetaker. Notetakers provide an essential service that helps ensure equal access to education for students who receive accommodations. Students often find volunteering to be a Peer Notetaker enhances the classroom experience by encouraging more thorough, quality notes. Notetakers who qualify may receive a letter of recommendation or, if they qualify, an honoraria at the end of the semester.

If you are interested in becoming a Peer Notetaker for this course, please stop by our office as soon as possible. We are able to accept Notetakers on a first come, first serve basis.

Thank you in advance,

Megan Vaughan
Access Support Coordinator
Accessibility Resources
60 Capen Hall
University at Buffalo
Buffalo, NY 14260
(t) 716-645-2608
(f) 716-645-3116

logistics lectures

New Office Hour policy

note

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New Office hour policy (please read CAREFULLY)

Starting from **Monday**, the following new policy will go into affect for ALL 331 office hours:

Every student going to any 331 office hour has to post their question as a PRIVATE post on piazza BEFORE they go and talk with the 331 staff. *Not following the policy could mean refusal to answer your question during the office hour.*

Some other requirements for the post:

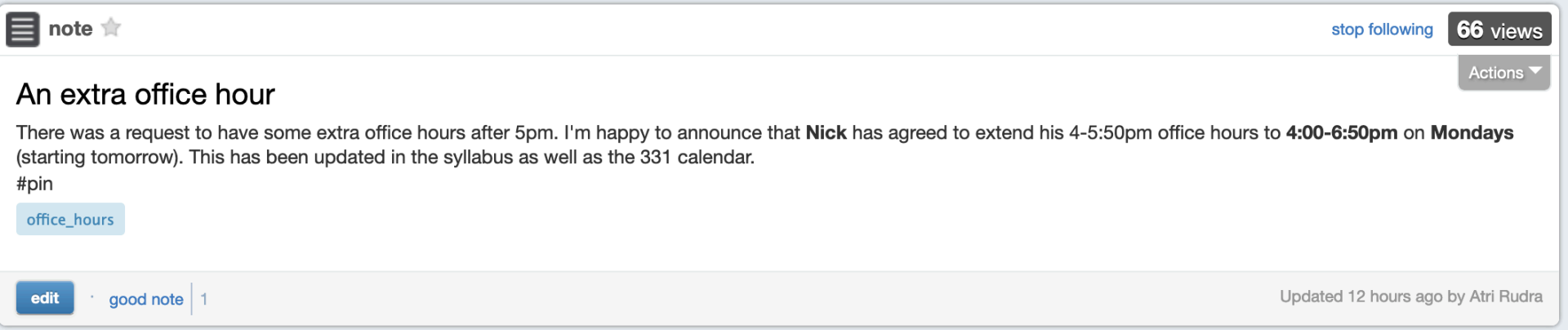
- Again, please make sure that the post is private (to you and **all** the instructors)
- Make sure the post is tagged with the "office_hours" folder/tag (like this post is)
- Make sure you state the name of the TA (or Atri) in the title of the post itself
  - We have some overlaps and it would be easier for us to figure out, which Q is for whose office hours.
- Of course we realize that sometimes your question will get refined during the discussion in the office hour and that is perfectly fine! but we do want y'all to gather your thoughts before you come in and if they get modified during the office hours then so be it (and actually that is a good thing-- that probably means your office hour visit was worth it :-)]

Here is what we will aim to do:

- If our answer to your question is something that is relevant to everyone, we will make our answer public (by summarizing our answer as a reply to your post and making the post public.)
  - If for some reason parts of your post should not be made public (e.g. if parts of your post talk about your specific solution), then we'll make a separate post where we will summarize parts of your Q that could be made public.
- If you do turn up to an office hour but for some reason, we could not get to you in time (or did not have enough to answer your question), then we would at the very least be able to answer your question on piazza.
  - I'm not suggesting that this will be common but just in case: please do not use this in lieu of coming to office hours. Especially for checking your solutions to part (a), we insist that you first come and talk in person during an office hour instead of asking us to check your solution on piazza.

Now, below in more details on our motivation for making this change.

An extra office hour



Feedback on your solutions

note

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Actions

Feedback in your part (a) solution

I just realized that I might not have explicitly stated this anywhere (except in passing in here: @118):

If you want feedback on your part (a) solution, please come to an office hour and get feedback in person from 331 staff. ***In particular, do NOT post your solution on piazza and ask for feedback.*** Doing this in an 1-on-1 meeting is an **excellent idea!**

Of course, if you come to office hours first and then have a followup request for feedback on an updated solution, then posting on piazza about that is perfectly fine.

#pin

office_hours

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Updated 1 hour ago by Atri Rudra

Advice from TAs

note

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Some words of wisdom from the TAs

Hey everyone,

As students who took this class last year, we know how quickly the class ramps up and how daunting it can be. To make things a little easier on all of you, the TAs have put together a support page with a few things that seemed to work well for us- http://www-student.cse.buffalo.edu/~atri/cse331/support/advice/index.html.

Please note the page is still under construction and that you can expect it to be more colorful in the next few days. Let us know if you have any questions, concerns or cries of outrage.
#pin

support_pages

~ An instructor (Chinmayee Hemant Bandal) thinks this is a good note ~

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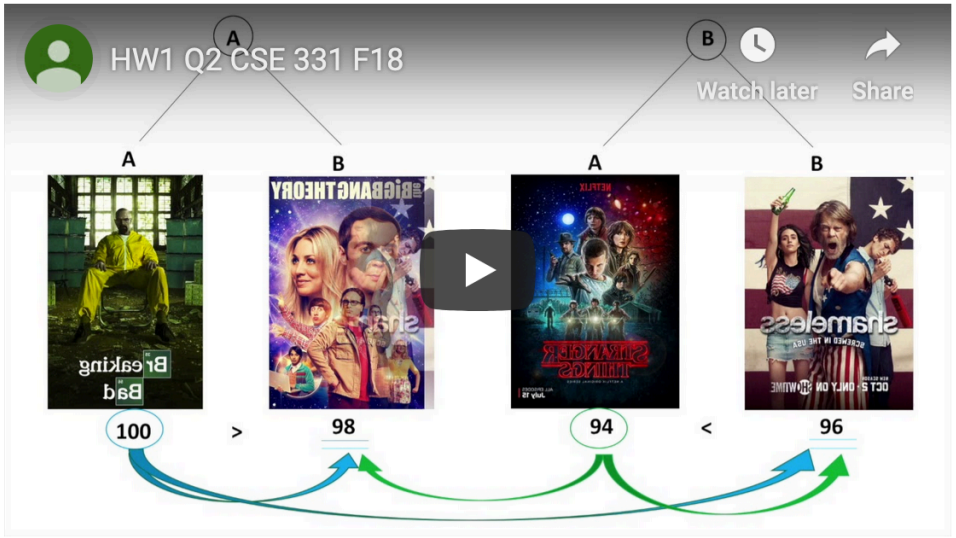
Updated 1 day ago by Atri Rudra and Supratik Neupane

Watch walkthrough videos

Walkthrough video

Here is the walkthrough video from Fall 18, which would work just as well for this year-- just ignore the fact that it talks about Q2 (instead of Q1) on HW1 (thanks to Iman Abdul-Rashed for the video):



Submission

Read recitation notes

Recitation 3

Recitation notes for the week of **September 9, 2019**.

Homework reminders

Here are some gentle reminders about HW policies:

1. Make sure you submit your HW as a **PDF only**. Otherwise your submission will not be graded.
2. Remember to put collaborators and sources during your submission. Using `none` is also appropriate.
3. You can only collaborate with 2 other people and the collaboration must be for entire homework.
4. `Proof Idea` and `Proof Details` must be clearly separated and labeled. Not doing so will result in a **ZERO** for the problem.

Finding all stable matchings

Remember

Gale-Shapley is only helpful for finding **one** stable matching (two if different depending on if women propose and if men propose) but not all of them.

Example 1

To illustrate the above comment, consider the following instance of the Stable Matching Problem:

$$L_{m_1} : w_1 > w_2 > w_3 \quad L_{w_1} : m_2 > m_3 > m_1$$

Scientista meeting tomorrow!

Questions/Comments?

Reading Assignment - I

note

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Reading Assignment: Asymptotic Analysis

As one of the changes from previous year, we will assume that y'all are familiar with asymptotic analysis and not spend reviewing it in any detail during the lectures. In case you are not that comfortable with asymptotic analysis and/or want to review the material, please read through the asymptotic analysis care package:

http://www-student.cse.buffalo.edu/~atri/cse331/support/care-package/asymptotics/index.html

We will need this either the middle of lecture on Wednesday or in the Friday lecture.
#pin

lectures

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Updated 14 minutes ago by Atri Rudra

Reading Assignment - II

note

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Reading Assignment: Pigeonhole principle

Another reading assignment for this week (here is the other one: @134). Please go through this support page on **pigeonhole principle**--

http://www-student.cse.buffalo.edu/~atri/cse331/support/pigeon/index.html

It's actually a very simple result that turns out to be surprisingly powerful. We'll use this in the Wed lecture.

lectures

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Updated Just now by Atri Rudra

Stable Marriage problem

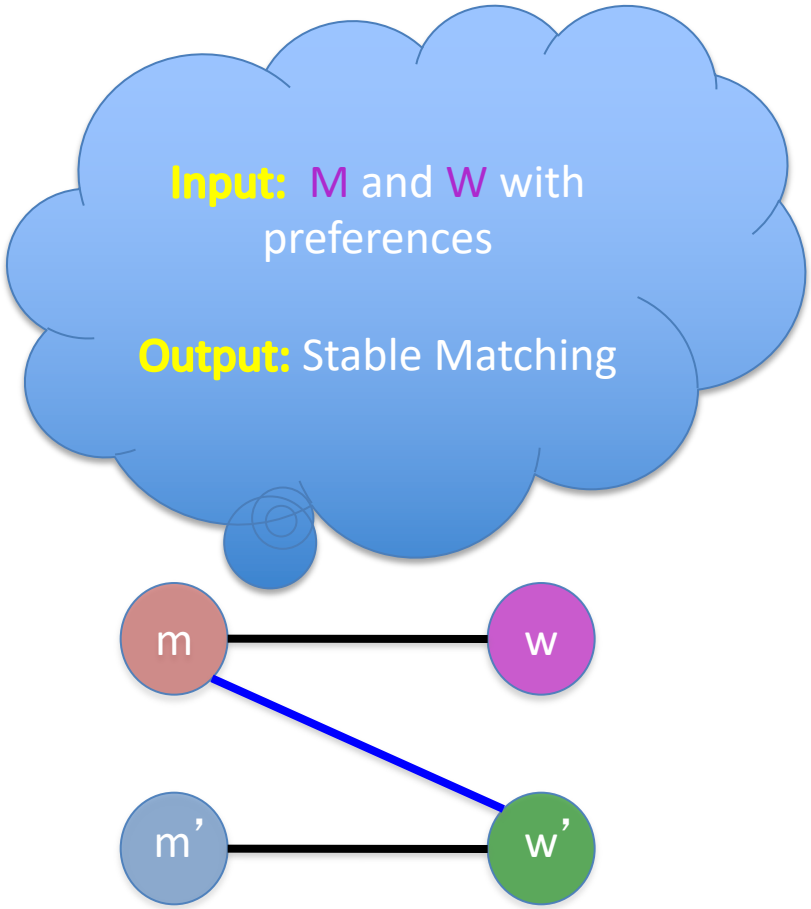
Set of men M and women W

Preferences (ranking of potential spouses)

Matching (no polyandry/gamy in M X W)

Perfect Matching (everyone gets married)

Instablity



Stable matching = perfect matching+ no instablity

Two Questions

Does a stable marriage always exist?

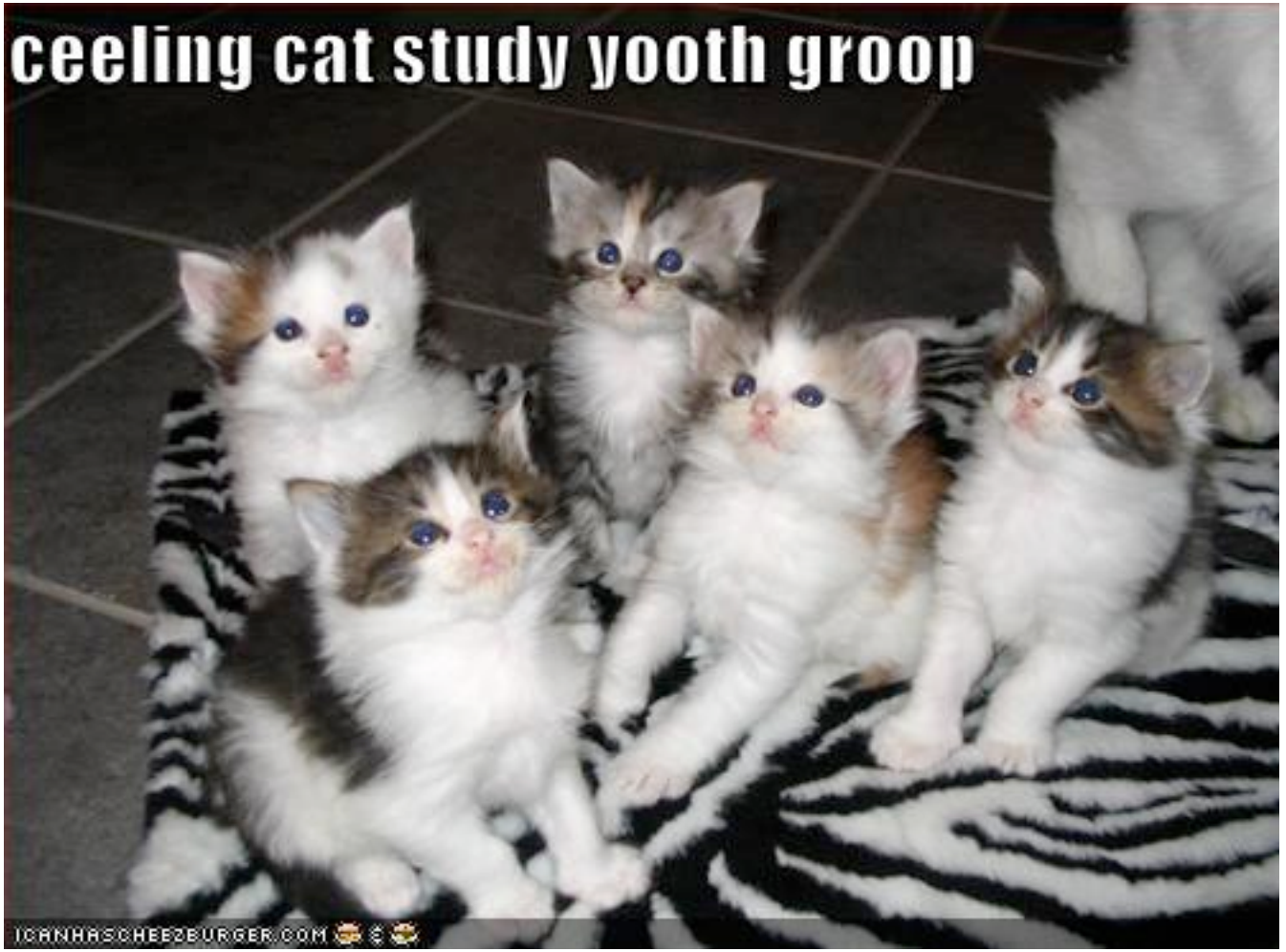
If one exists, how quickly can we compute one?

Today's lecture

Naïve algorithm

Gale-Shapley algorithm for Stable Marriage problem

Discuss: Naïve algorithm!



The naïve algorithm

Incremental algorithm to produce all n! prefect matchings?

Go through all possible perfect matchings S

If S is a stable matching

then Stop

Else move to the next perfect matching

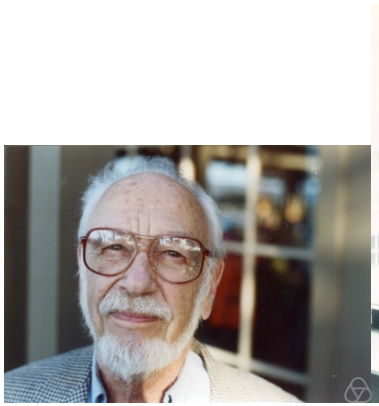
Gale-Shapley Algorithm

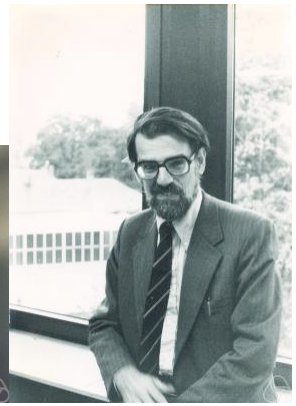
David Gale

Lloyd Shapley

$O(n^3)$ algorithm

Moral of the story…





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Questions/Comments?

Rest of today's agenda

GS algorithm

Run of GS algorithm on an instance

Prove correctness of the GS algorithm

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

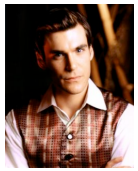
w remains free

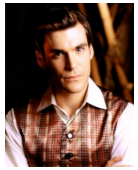
Else

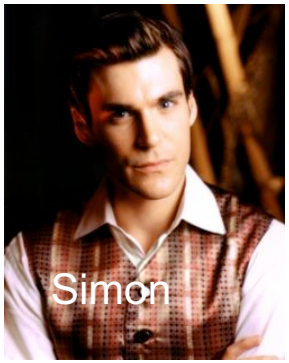
(m,w) get engaged and w' is free

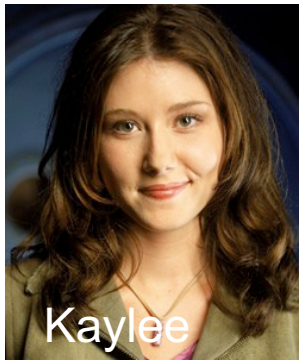
Output the engaged pairs as the final output

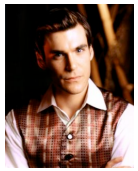
Preferences











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