

Lecture 7

CSE 331

Sep 11, 2019

If you need it, ask for help



Mini project choice due on SEP 30

note ☆ stop following 1 views

Video mini project team composition deadline EXTENDED by a week

Due to logistical reason, the deadline to submit your team composition for the video mini-project has been extended by a week from Sep 23 to **Sep 30** (still at **11am**).

All other deadlines remain the same as announced earlier.

The deadline has been extended in the [schedule](#), the [mini project page](#) as well as the calendar on the [331 landing page](#).

mini_project

edit · good note | 0 Updated Just now by Atri Rudra

Peer notetaker request

note ☆

0 views

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 studentnotes@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

Feedback on your solutions

note ☆ stop following 41 views 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

edit · good note | 0 Updated 1 hour ago by Atri Rudra

Updates to new OH policy

note ☆ stop following 65 views

Please make your questions for OH specific/detailed

While it is great that (at least many of you) are posting your questions for OH on piazza, please note that you need to ask specific Q. Saying something like "I have a question on Q1" or "I have some doubts on Q3" is too vague. Please ask specific Q-- if you do not understand a Q, which part(s) do you not understand?

As a rule of thumb: Your question should make sense to someone who will not be present at the office hours.

And again, the more specific you are, the easier it'll be for us to answer your questions.

Thanks in advance for your help!

office_hours

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

edit · good note | 2 Updated 18 hours ago by Atri Rudra

note ☆ stop following 22 views

Private post for Office hours

Thanks again to those who have been posting your Question for the office hours (and please do remember to make your questions specific-- @159).

We have one more request: **please make your post private to you and JUST the 331 staff (i.e. the specific TA or Atri) whose office hours you are planning to visit and NOT to all instructors.**

This'll help us deal with the private notes a bit better. Thanks for your patience while to fine-tune the new office hour policy [@118]

office_hours

edit · good note | 0 Updated 12 minutes ago by Atri Rudra

Q2 (b)

 note 

[stop following](#)

15 views

If you are struggling with Q2(b)

First, note that 2(b) is the **hardest** problem in the entire HW so it is natural to be a bit stumped by it.

Second, note that you are allowed to collaborate with two other students in the course (the same two people per HW though).

Finally, note that (as we state in the HW policy document), Q2(b)'s are supposed to be hard *even as a group*. So while working on the problems by yourself is fine note that it *might* mean that you are taking on more than you should. I would definitely encourage working in groups esp. for Q2(b)'s.

homework1

[edit](#)

· [good note](#) | 0

Updated 4 minutes ago by Atri Rudra

Questions/Comments?



Read your reading assignment?

note ☆ stop following 116 views

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.

#pin

lectures

edit · good note | 0

Updated 1 day ago by Atri Rudra

Gale-Shapley Algorithm

Initially 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

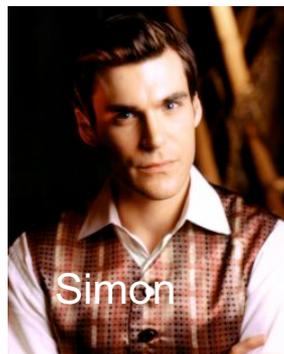
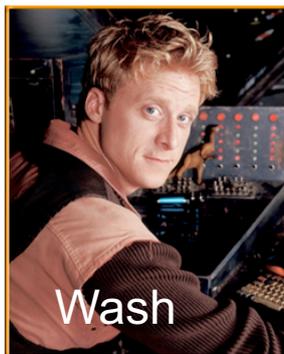
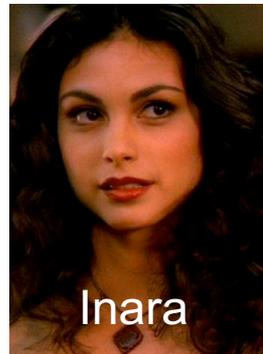
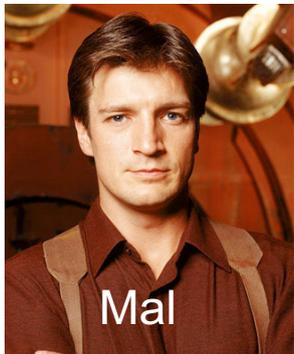
w remains **free**

Else

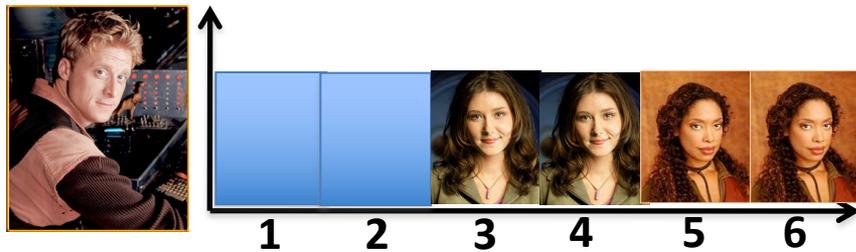
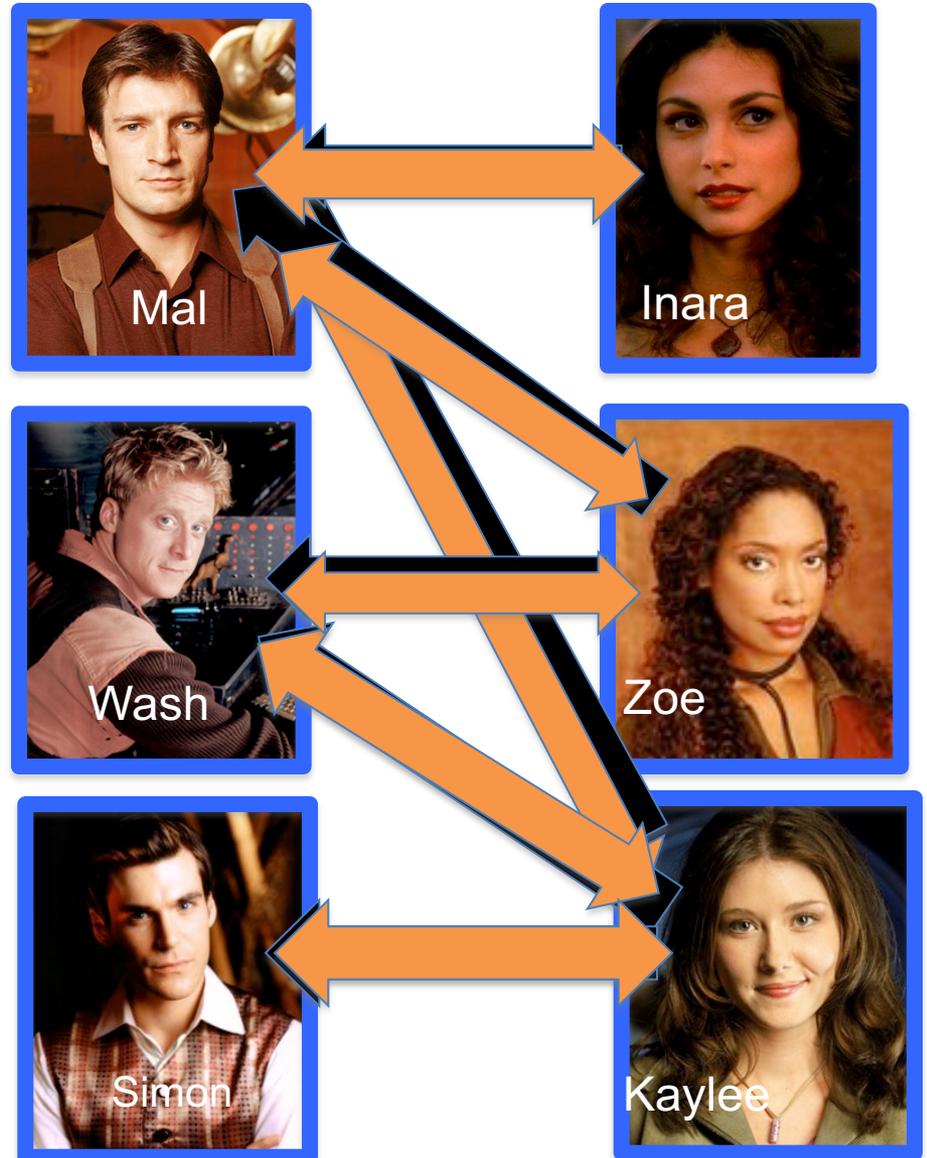
(m,w) get **engaged** and w' is **free**

Output the engaged pairs as the final output

Preferences



GS algorithm: Firefly Edition



Observation 1

Initially 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

Initially 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?

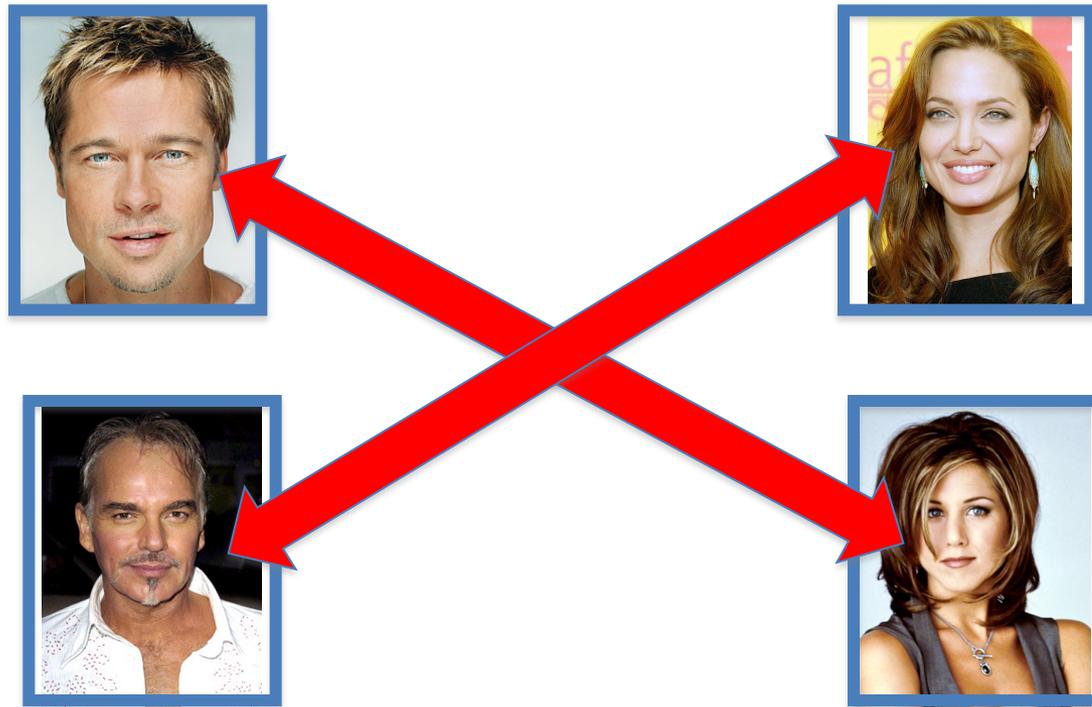


Why bother proving correctness?

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



Today's lecture

GS algorithms always outputs a stable marriage

The Lemmas

Lemma 1: The GS algorithm has at most n^2 iterations

Lemma 2: S is a perfect matching

Lemma 3: S has no instability

Questions/Comments?



Extensions

Fairness of the GS algorithm

Different executions of the GS algorithm

Main Steps in Algorithm Design

Problem Statement



Problem Definition



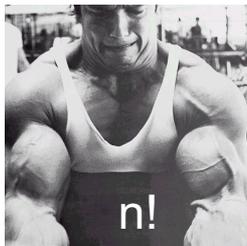
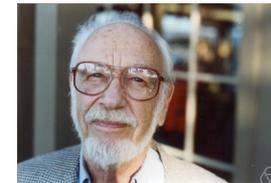
Algorithm



“Implementation”



Analysis



Correctness Analysis

Definition of Efficiency

An algorithm is efficient if, when implemented, it runs quickly on real instances

Implemented where?



Platform independent definition

What are real instances?

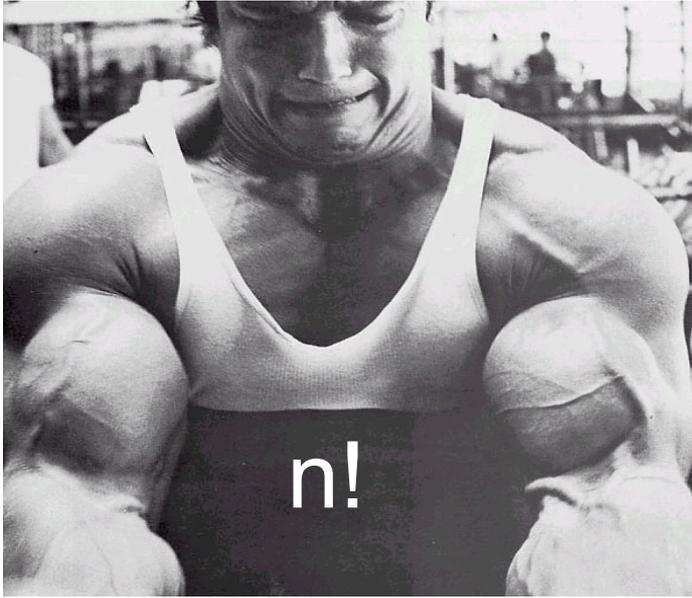
Worst-case Inputs

$$N = 2n^2 \text{ for SMP}$$

Efficient in terms of what?

Input size N

Definition-II



Analytically better than brute force

How much better? By a factor of 2?

Definition-III

Should scale with input size

If N increases by a constant factor,
so should the measure



Polynomial running time

At most $c \cdot N^d$ steps ($c > 0$, $d > 0$ absolute constants)

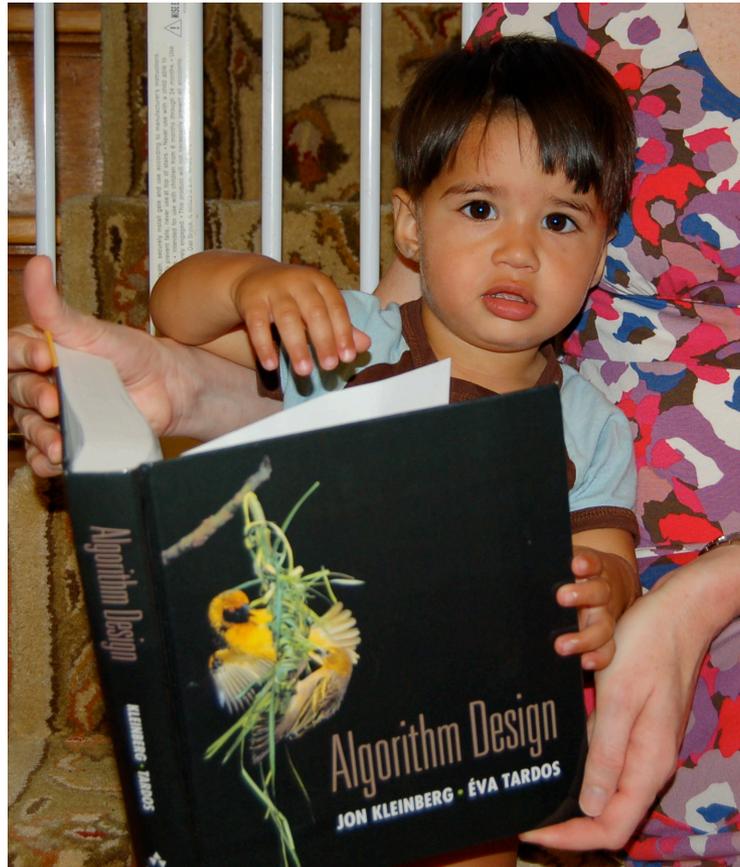
Step: “primitive computational step”

More on polynomial time

Problem centric tractability

Can talk about problems that are not efficient!

Reading Assignments



Sections 1.2, 2.1, 2.2 and 2.4 in [KT]