

Lecture 4

CSE 331

Sep 7, 2022

Please do keep on asking Qs!

The only bad question is the one that is not asked!

Not just technical Qs but also on how the class is run

We're not mind readers



If you need it, ask for help



Syllabus Quiz (and sections)

note #57

stop following 0 views

Actions

Sections updated

If you scored at least 18 in your syllabus quiz before 8:00pm on Sun, Sep-4, your section on Autolab should have been updated to a **Y** (otherwise it should still say **N**). To receive graded material back, you should be in section **Y**.

To check your section, go to the CSE 331 page on Autolab, click your name on right top, then click *Course Profile*. It should show your section there.

If you had passed the quiz before 8:00pm on Sun but your section still says **N**, please let me know.

Otherwise, I will update the sections next weekend again, so please do fill in your syllabus quiz (and make sure you pass) if you have not done so already.

A clarification: feedback on programming questions will be posted immediately irrespective of your section. For submissions that are graded manually (e.g. Q1 and Q2 on the homeworks), the graded score (and the feedback) will only be released to students in Section **Y**.

autolab

edit good note 0

Updated 10 seconds ago by Abri Rudra

Separate Proof idea/proof details

Note

Notice how the solution below is divided into proof idea and proof details part. **THIS IS IMPORTANT: IF YOU DO NOT PRESENT A PROOF IDEA, YOU WILL NOT GET ANY CREDIT EVEN IF YOUR PROOF DETAILS ARE CORRECT.**

Proof Idea

As the hint suggests there are two ways of solving this problem. (I'm presenting both the solutions but of course you only need to present one.)

We begin with the approach of reducing the given problem to a problem you have seen earlier. \Rightarrow Build the following complete binary tree: every internal node in the tree represents a "parent" RapidGrower while its two children are the two RapidGrowers it divides itself into. After x seconds this tree will have height x and the number of RapidGrowers in the container after x seconds is the number of leaf nodes these complete binary tree has, which we know is 2^x . Hence, the claim is correct.

The proof by induction might be somewhat simpler for this problem if you are not comfortable with reduction. In this case let $R(x)$ be the number of RapidGrowers after x seconds. Then we use induction to prove that $R(x) = 2^x$ while using the fact that $2 \cdot 2^x = 2^{x+1}$.

Proof Details

We first present the reduction based proof. Consider the complete binary tree with height x and call it $T(x)$. Further, note that one can construct $T(x+1)$ from $T(x)$ by attaching two children nodes to all the leaves in $T(x)$. Notice that the newly added children are the leaves of $T(x+1)$. Now assign the root of $T(0)$ as the original RapidGrower in the container. Further, for any internal node in $T(x)$ ($x \geq 0$), assign its two children to the two RapidGrowers it divides itself into. Then note that there is a one to one correspondence between the RapidGrowers after x seconds and the leaves of $T(x)$. \Rightarrow Then we use the well-known fact (cite your 191/250 book here with the exact place where one can find this fact): $T(x)$ has 2^x leaves, which means that the number of RapidGrowers in the container after x seconds is 2^x , which means that the claim is correct.

Office hours finalized

note @46 stop following 60 views Actions

Office hours mega-post

This post has all the important information about 331 office hours:

- OH locations: @48
- TA OH times: @44
- Late night OH: @45
- Recordings of late night OH:
 - TBA

office_hours

Edit good note | 1 Updated 3 days ago by Abri Rudra

Come ask your proof related Questions!

Late night office hour starts tonight!

note #45

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Actions

Late night office hours

Based on the votes in #7, the late night office hour will be on

Wednesdays, 9:30-10:20pm

As a reminder this is a virtual only OH (see "Office Hour locations" post for the link), will be recorded and is meant for general discussions. Trevor will also be around in case there is a need for some one-on-one help (e.g. with a student solution).

office_hours

Edit good note 0

Updated 3 days ago by All Roots

1st True/False poll



poll @52



stop following

82 views

Actions

The first true/false question

The plan is to do a weekly True/false question on piazza. The way it is going to work is that every Monday (or so) I will post a statement in a poll and ask you guys to vote True or False. (Please just vote and do not post your justification: yet.) Then after two days, I will give the correct answer (and we will see how well crowd-sourcing works in this context) and then ask for you guys to construct the correct justification. Note that this is to give you guys more practice for the true/false questions on the exams (there will be pretty much no true/false questions on the homeworks). So try and work on these on your own so that you gain some practice.

Anyhow, here is the question for this week. Is the following statement **True** or **False**?

Given n numbers a_1, \dots, a_n such that for every $i \in [n]$ (we will use $[n]$ to denote the set of integers $\{1, \dots, n\}$) we have $a_i \in \{0, 1\}$. That is, we are given n numbers each of which is a bit. Then we can sort these n numbers in $O(n)$ time.

- True
- False

Submit

You have not yet voted.

Revoting is not allowed. Select your vote and click submit to register your vote.

Your name will not be visible to anyone.

Register your project groups

Deadline: Friday, Sep 30, 11:59pm

CSE 331

Syllabus

Piazza

Schedule

Homeworks -

Autolab

Project -

Support Pages -

channel

Sample Exams -

Forming groups

You form groups of size **exactly three (3)** for the project. Below are the various logs

Project Overview

Group signup form

• You have two choices in forming your group:

1. You can form your group on your own: i.e. you can submit the list of **EXACTLY** three (3) groups members in your group.

</> Note

Note that if you pick this option, your group needs to have **exactly THREE (3)** members. In particular, if your group has only two members you cannot submit as a group of size two. If you do not know many people in class, feel free to use piazza to look for the third group member.

Also, if you form a group of size three, please make **only one submission per group**.

2. You can submit *just your name*, and you will be assigned a random group among *all* students who take this second option. However, **note that if you pick this option you could end up in a group of size 2**. There will be at most two groups of size 2.

</> Potential risk

Note that if you pick the option of being assigned a random group, you take on the risk that a assigned group might not "pull their weight." We unfortunately cannot help with such aspects of group dynamics. (Of course if a group member is being abusive, please do let Atri know.) Please note that a group member who does not do much work will get penalized on the [individual component](#) of the project grade.

Submitting your group composition

Use [this Google form](#) to submit your group composition (the form will allow you to pick one of the two options above).

• You need to fill in the form for group composition by **11:59pm on Friday, September 30**.

</> Deadline is strict!

If you do not fill in the form for group composition by the deadline, then you get a zero for the entire project.

Update on VM

Using VM image on Windows

If plan to run the VM on Windows then Fall 2022 onwards, we recommend that you run it using Virtual Box (and not VMWare). Here is a walkthrough video by Nick Minor [2] on installing the VM on Windows using VirtualBox.



Using VM image on MacOS

Unfortunately, it looks like VirtualBox does not work that well on MacOS. We're looking into fixes.

In the meantime, using VMWare on MacOS might be the Bly option. If you already have a VMWare license that lasts until the semester lasts, then you should be all set. If you need a license please email Aht ASAP.

Piazza Response policy

Piazza Response policy

Please note the following rules regarding response time to student questions on piazza:

1. Any question posted between Friday at 5pm and Monday 9am might not get an answer from CSE 331 staff before Monday 9am.
2. On weekdays, we will aim to respond to student question within four hours unless the question is posted between 7pm and 9am, in which case we might only be able to respond after 9am.

Please note that the above does *not* mean that we will never answer questions posted in the evening/night times as mentioned above-- it's just that we might not always be able to respond within four hours. Based on previous years, I do expect there to be reasonable response time in the evening times as well-- it's just that OUR response times might be more variable.

Solutions to HW 0 out

note @65

stop following 1 view

Actions

HW 0 solution out

Here is the solution to HW 0:

<http://www-student.cse.buffalo.edu/~atri/cse331/fall22/tws/tw0/soln.html>

(Please note that as it says in the solutions, from HW 1, solutions will be released as a link to a PDF)

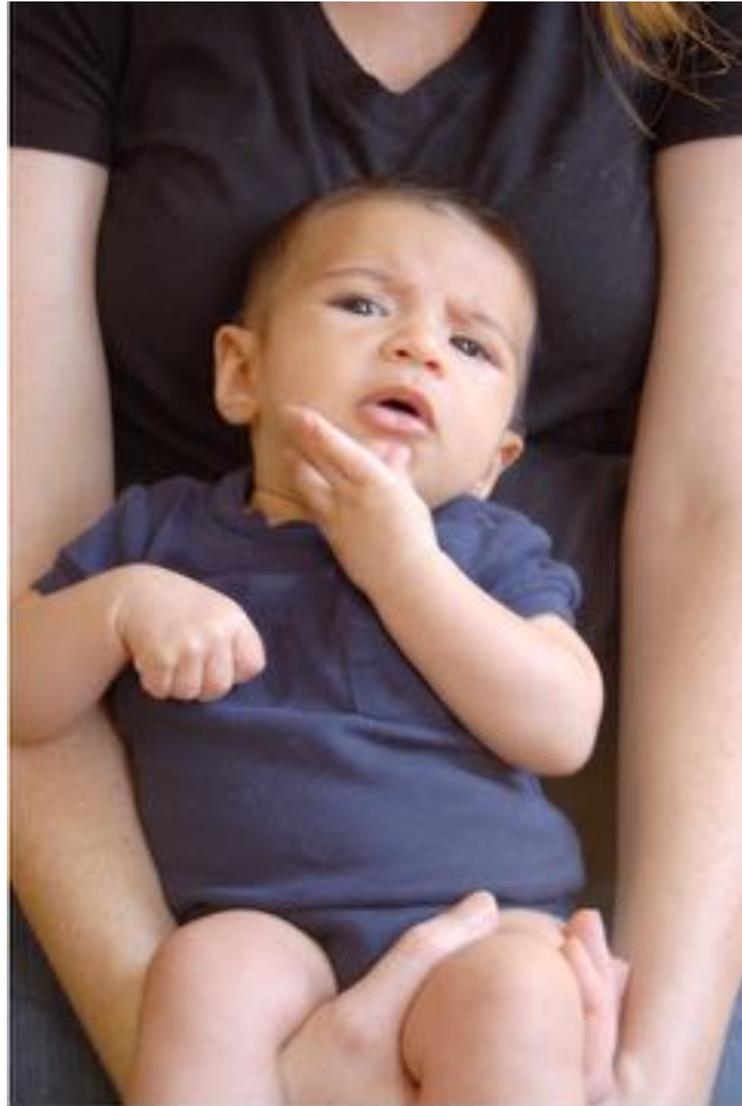
See the [schedule page](#) for the recitation notes for this week.

homework0

Edit good note 0

Updated 11 seconds ago by Atri Rudra

Questions/Comments?



Incorrect Proof Details: Q1(b) on

HWO

Argument does not use ANYTHING about the problem statement!

Follows from part (a)

of perfect matchings with n men and n women.

Base case: $P(1) = 1! = 1$

This assumes number of perfect matchings only depends on n

Inductive hypothesis: Assume that $P(n-1) = (n-1)!$

Inductive step: Note that $P(n) = n * P(n-1) = n * (n-1)! = n!$

What are the issues with the above “proof”?

Incorrect Proof Details: Q1(b) on HWO

Needs justification

Claim 1: Number of perfect matchings is = number of permutations of $1\dots n$

Claim 2: Number of permutations of $1\dots n$ is $n!$

Needs justification

Claims 1 + 2 prove the result

Follow from 191 (?)

What are the issues with the above proof?

Proof by contradiction for Q1(a)

Assume for contradiction there is an example where number of perfect matchings depends on the identities of the men and women.

Let $n = 1$ and consider two cases

(1) $M = \{BP\}$ and $W = \{JA\}$

(2) $M = \{BBT\}$ and $W = \{AJ\}$

You can only assume things about the example directly implied by it being a counter-example

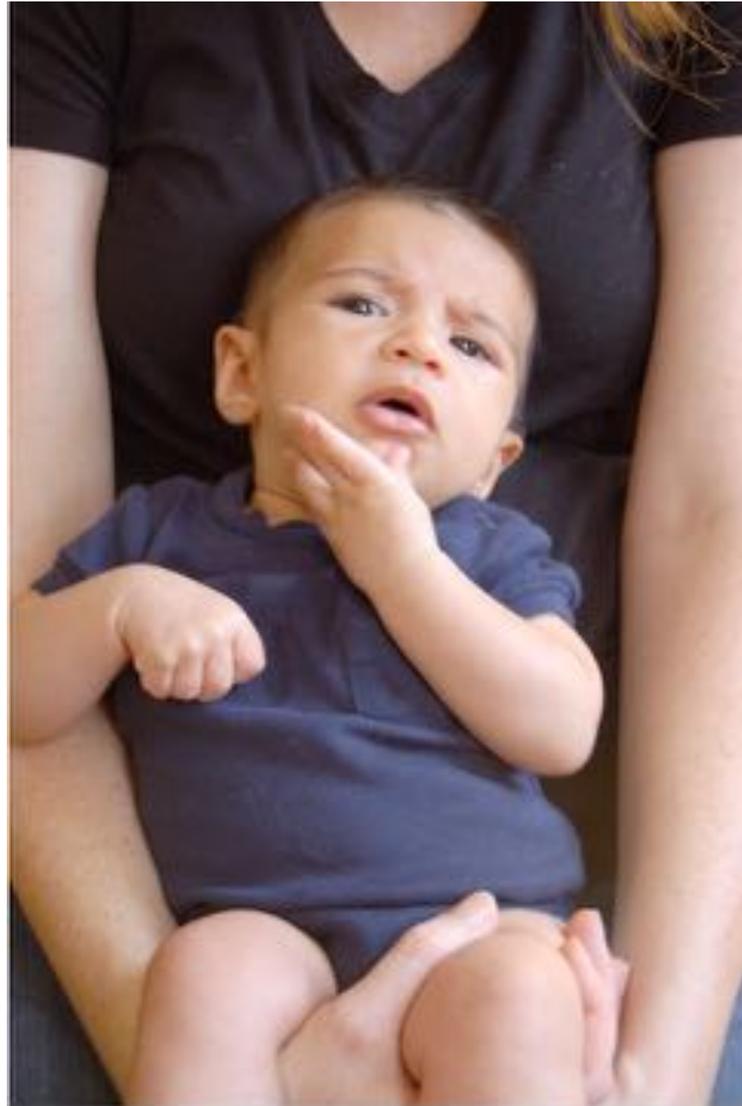
In both cases the number of perfect matchings is $1 = 1!$

Hence contradiction.

There is NO contradiction

What are the issues with the above proof?

Questions/Comments?



Questions to think about

1) How do we specify preferences?

Preference lists

2) Ratio of applicant vs employers

1:1

3) Formally what is an assignment?

(perfect) matching

4) Can an employer get assigned > 1 applicant?

NO

5) Can an applicant have > 1 job?

NO

6) How many employer/applicants in an applicants/employers preferences?

All of them

7) Can an employer have 0 assigned applicants?

NO

8) Can an applicant have 0 jobs?

NO

On matchings

Mal



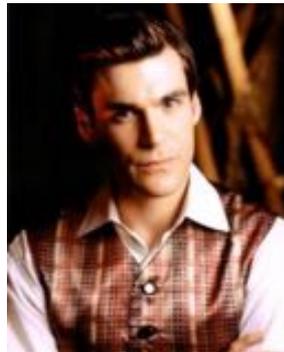
Inara

Wash



Zoe

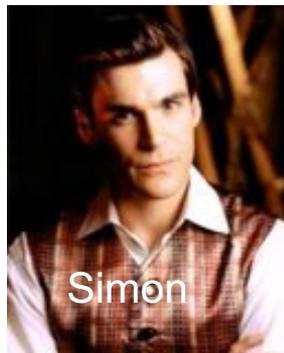
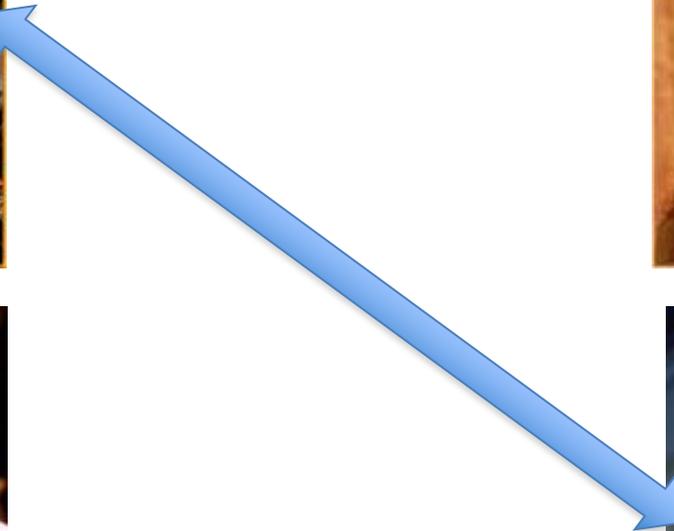
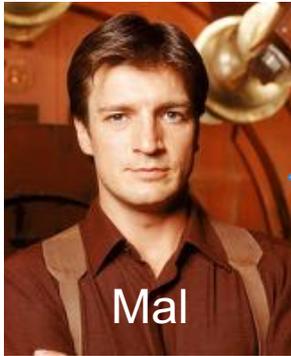
Simon



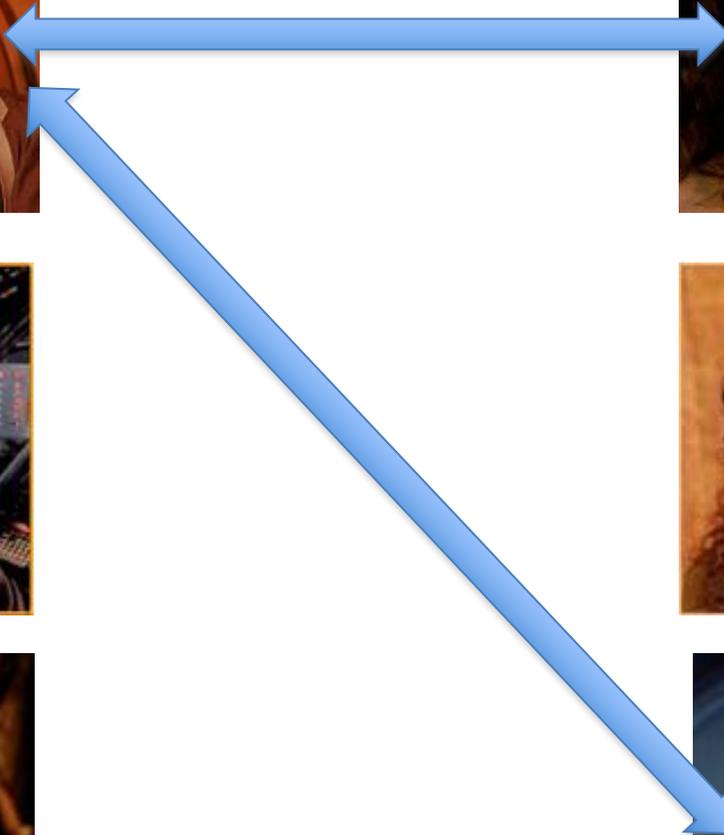
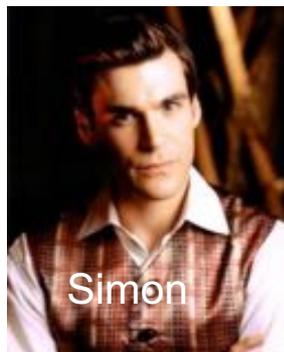
Kaylee



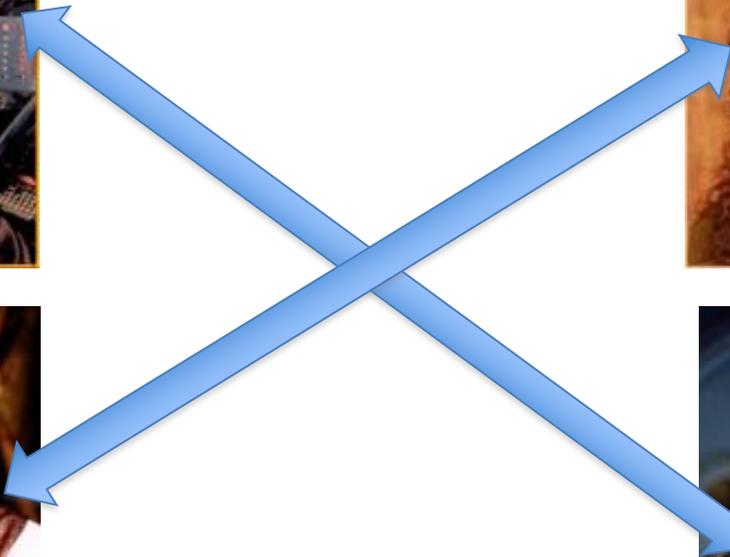
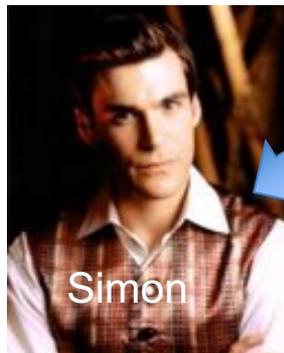
A valid matching



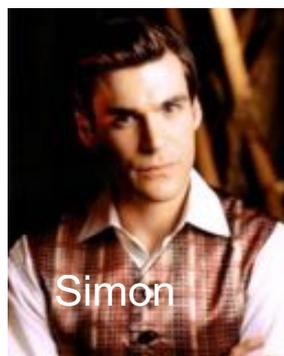
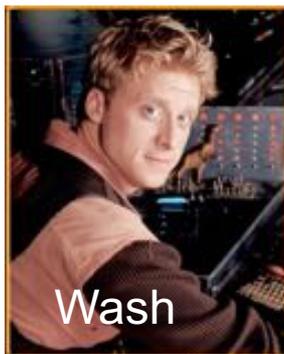
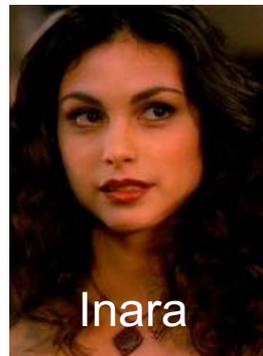
Not a matching



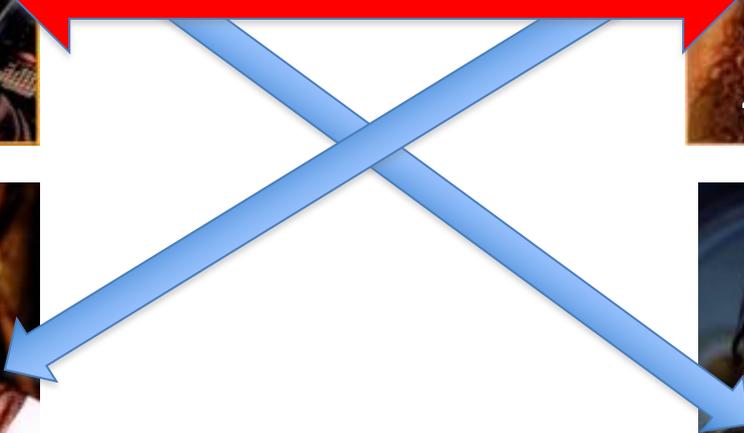
Perfect Matching



Preferences



Instability



Back to the board...

