Lecture 9

CSE 331

Sep 20, 2021

Please have a face mask on

Masking requirement

UB requires all students, employees and visitors – regardless of their vaccination status – to wear face coverings while inside campus buildings.

https://www.buffalo.edu/coronavirus/health-and-safety/health-safety-guidelines.html

HW 1 (pre)post-mortem

note @130 stop following 5 views

(Advance view of) post-mortem on Homework 1

The post below is from Fall 2019 that I posted after HW1 was due bit I figured I should post it a bit earlier this time in case it is helpful to some of you as y'all work on your HW 1 submissions.

Of course this would depend pretty much on you as an individual but here are some questions, **in no particular order**, for y'all to ponder on (with some of our comments in *italics*):

- **Did you start early enough?**
  - *We recommend that you start working on the homework on Wednesday the homework is handed out itself. And distribute your hours over the week rather than wait to start till Monday (or gasp! Tuesday).*
- **Did you go to the recitations AND read the recitation notes?**
  - *Both of them help you a lot towards answering Q1(a) and Q2(a) so they are highly recommended.*
- **Did you work on the questions in correct order?**
  - *We have the current order based on what we think is most beneficial to you. In particular, we want y'all to focus more on the proof based questions, which is why they come before the programming question. But perhaps a different order would work better for you?*
- **Did you get help when you got stuck?**
  - *If you were stuck at a problem for a long time did you ask for help on piazza? Did you go to one of the office hours?*
- **Did you work on all the problems alone?**
  - *While working on all the problem by yourself will be good for you in the long run (since you are developing your proofs/algorithms skills), in the interest of time we recommend that you at least collaborate on Q2 (b).*
- **(If you submitted HW 0), did you get enough feedback?**
  - *(This is going to be true for all homeworks so extrapolate this advice for future homeworks.) If you lost points, did you understand why you lost points? If not, did you go talk with the TA who graded your submission to ask why?*
    - *If you did understand why you lost points, did you figure out how you could have changed your thought process (and hence your solution) to get a level 0? If not, did you talk with a TA to get their thoughts on how they would change your solution to make it correct?*
- **Did you go an office hours early enough?**

If you need it, ask for help

Advice from TAs

CSE 331 Advice from TAs

Where students who took CSE 331 and became TAs share their experiences of how to fully utilize the class to your advantage. (And no, Atri did not pay them to say these things.)

Under Construction

This is a living document that will get updated over time. However, all the advice below is valid and you should pay attention to them!

The class is structured to your advantage

Utilize the before, during and after aspects of the course to their fullest.

Do the assigned readings before coming to class and if you get time even watch lecture videos from previous years. Atri will give you plenty of time during lecture to ask questions about the readings or the lecture itself. And of course get the most out of the assignments (Explained further below).

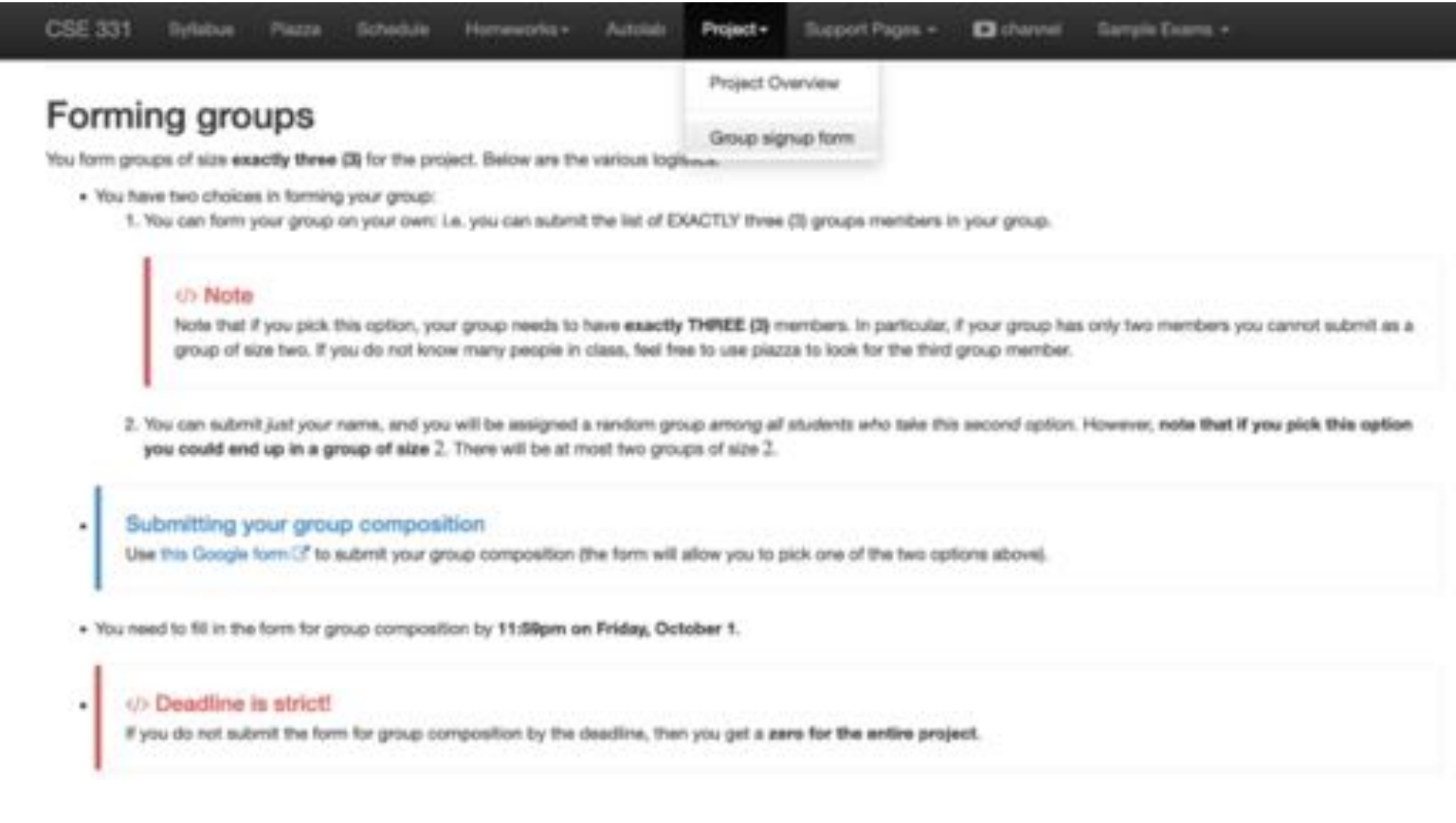
The assignments are separated into different parts for your convenience.

Questions 1 and 2

For Q1 and Q2, think of the algorithm and proof ideas as things that go inside a header (`.h`) file. They are the high level overview of how you are approaching the problem; you don't have to be very technical here. For example, listing out all the steps in your algorithm, what proof technique are you using, what property of the algorithm are you induction on, etc.

Register your project groups

Deadline: Friday, Oct 1, 11:59pm



Your UBIT ID is

xyz if your email ID is xyz@buffalo.edu

NOT

xyz@buffalo.edu

Your UB person number

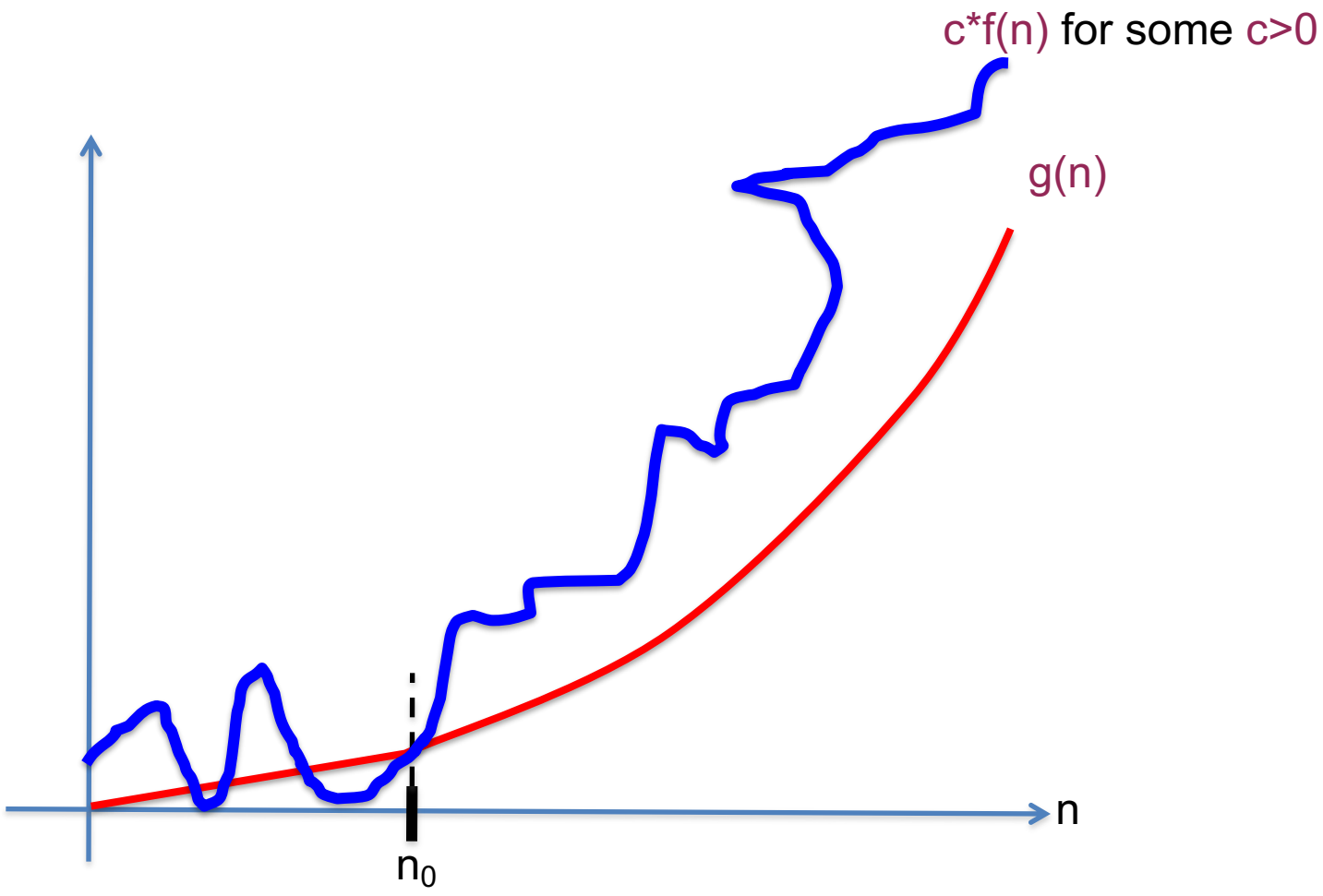
Today's agenda

$O(n^2)$ implementation of the Gale-Shapley algorithm

Some practice with run time analysis

Questions?

g(n) is O(f(n))



Properties of O (and Ω)

Transitive

g is O(f) and f is O(h) then
g is O(h)

Step 1 // O(n) time
Step 2 // O(n) time

Additive

g is O(h) and f is O(h) then
g+f is O(h)

Overall:
O(n) time

Multiplicative

g is $O(h_1)$ and f is $O(h_2)$ then
$g*f$ is $O(h_1*h_2)$

Overall:
$O(n^2)$ time

While (loop condition) // $O(n^2)$ iterations
Stuff happens // O(1) time

Gale-Shapley Algorithm

Intially all men and women are free

While there exists a free woman who can propose

At most n^2 iterations

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

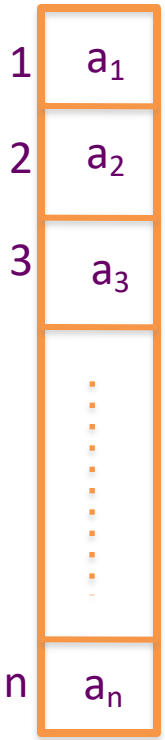
Else

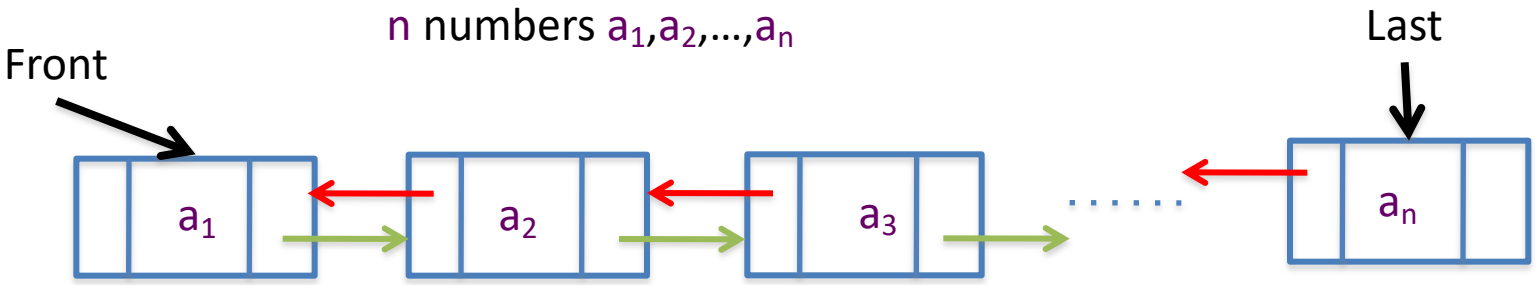
(m,w) get engaged and w' is free

O(1) time implementation

Output the engaged pairs as the final output

Arrays and Linked Lists





	Array	Linked List
Access ith element	O(1)	O(i)
Is e present?	O(n) (O(log n) if sorted)	O(n)
Insert an element	O(n)	O(1) given pointer
Delete an element	O(n)	O(1) given pointer
Static vs Dynamic	Static	Dynamic

Implementation Steps

(0) How to represent the input?

(1) How do we find a free woman w?

(2) How would w pick her best unproposed man m?

(3) How do we know who m is engaged to?

(4) How do we decide if m prefers w’ to w?

Overall running time

Init(1-4)

n^2 X (Query/Update(1-4))

Questions?

Rest on the board…