Lecture 9

CSE 331

Sep 19, 2022

HW 1 (pre)post-mortem

(Advance view of) post-mortem on Homework 1

The post below is from Fall 2019 that I posted after HW1 was due but 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 immediately after 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?**
  - *We recommend that you think about a problem early enough so that you can go to an office hours before Monday, when the office hours have relatively low traffic.*
- **Did you leave yourself enough time to write down your proofs?**
  - *Even if you have the right idea(s) in your heads, it takes time to write them down in a manner that would be understandable to the TA (who will not have the benefit of having access to your thoughts beyond what you have written down). We recommend that you start early to write down your solutions and definitely not wait till the end to write them down.*
- **Did you submit early (and often) enough?**
  - *We recommend that you submit early enough (and e.g. not very late at night when you might be prone to making silly mistakes) so that you do not make mistakes such as submitting in word instead of PDF or submitting your part (a) solution to part (b). In particular, we recommend that you submit as soon as you have a reasonable version of your solution written up. You can re-submit a better version later on (we only grade the last version that is submitted).*
- **Were there specific background material that you struggled with?**
  - *If so, review the relevant material from the support pages.*
- **Did you ask the right questions in the office hours?**

stop following

1 view

Actions

Follow ALL instructions on HW1

! Submit part (a) and (b) separately

You need to submit **two (2) PDF** files to Autolab: one for part **(a)** and one for part **(b)**. While you can assume part **(a)** as a given for part **(b)**, to get credit for part **(a)** you have to submit you solution for part **(a)** separately from part **(b)**.

We recommend that you typeset your solution but we will accept scans of handwritten solution -- you have to make sure that the scan is legible.

! PDF only please

Autolab might not be able to display files in formats other than PDF (e.g. Word cannot be displayed). **If Autolab cannot display your file, then you will get a zero (0) on the entire question. Note that Autolab will "accept" your submission even if you submit non-PDF file, so it is YOUR responsibility to make sure you submit in the correct format.** However, after submission, Autolab will try and display your non-PDF submission and it should give an error message then. Also the file size has to be **at most 3MB**.

Grading Guidelines

We will follow the usual grading guidelines for non-programming questions. Here is a high level grading rubric specific to part **(a)** of this problem:

1. `Proof idea`: 1**0** points.

and here is the high level grading rubric for part **(b)**:

1. `Proof idea`: 2**0** points for a counterexample idea explaining the insight behind why you think the property does not hold.
2. `Proof details`: 2**0** points for a complete description of a counterexample and a complete proof for why the given counter example does not have any stable schedule.

! Note

If you do not have separated out proof idea and proof details for part **(b)**, you will get a zero (0) irrespective of the technical correctness of your solution..

📄 Templates

[Download LaTeX template.]   [Download Microsoft Word template.]

! Note

You must explicitly list your sources and collaborators when you upload your submission to Autolab. Note that there are only five allowed sources. If you have used a source that is not allowed, please do **not** submit your homework. If you did not consult any source or did not collaborate with anyone just say *None* .

Review the HW policy doc!

CSE 331   Syllabus   Piazza   Schedule   **Homeworks ▾**   Autolab   Project ▾   Support Pages ▾   ▶ channel   Sample Exams ▾

HW 0
Soln 0
HW 1

Allowed Sources
Homework Policies

CSE 331 ~~Hom~~ework Policies

Fall 2022

This page contains policies, suggestions and explanations of things related to CSE 331 homeworks. Please note that not following some of these policies can lead to a **letter grade reduction or an F** in the course and not following some could lead to you getting a zero on your homework submission.

Please Note

It is **your responsibility** to make sure you read and understand the contents of this document. If you have any questions, please contact the instructor. Or better yet, make a post on Piazza ☑.

Overview

On this page, you can find more details on:

1. Source and Collaboration policy (or how not to get an F in this course);
2. Preparing your homework submissions (or how not to get a zero on a question);
3. Grading details (or what to expect on how your homework submissions will be graded);
4. Other helpful tips (or how to do better on the homeworks and in the course).

Running C++ template on Linux

Hunter's OH today at 6pm

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, Sep 30, 11:59pm

CSE 331   Syllabus   Piazza   Schedule   Homeworks ▾   Autolab   Project ▾   Support Pages ▾   ▶ channel   Sample Exams ▾

Project Overview

Group signup form

Forming groups

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

- 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!

  the form for group composition by the deadline, then you get a **zero for the entire project**.

Your UBIT ID is

xyz if your email ID is xyz@buffalo.edu

NOT

xyz@buffalo.edu

Your UB person number

Today's agenda

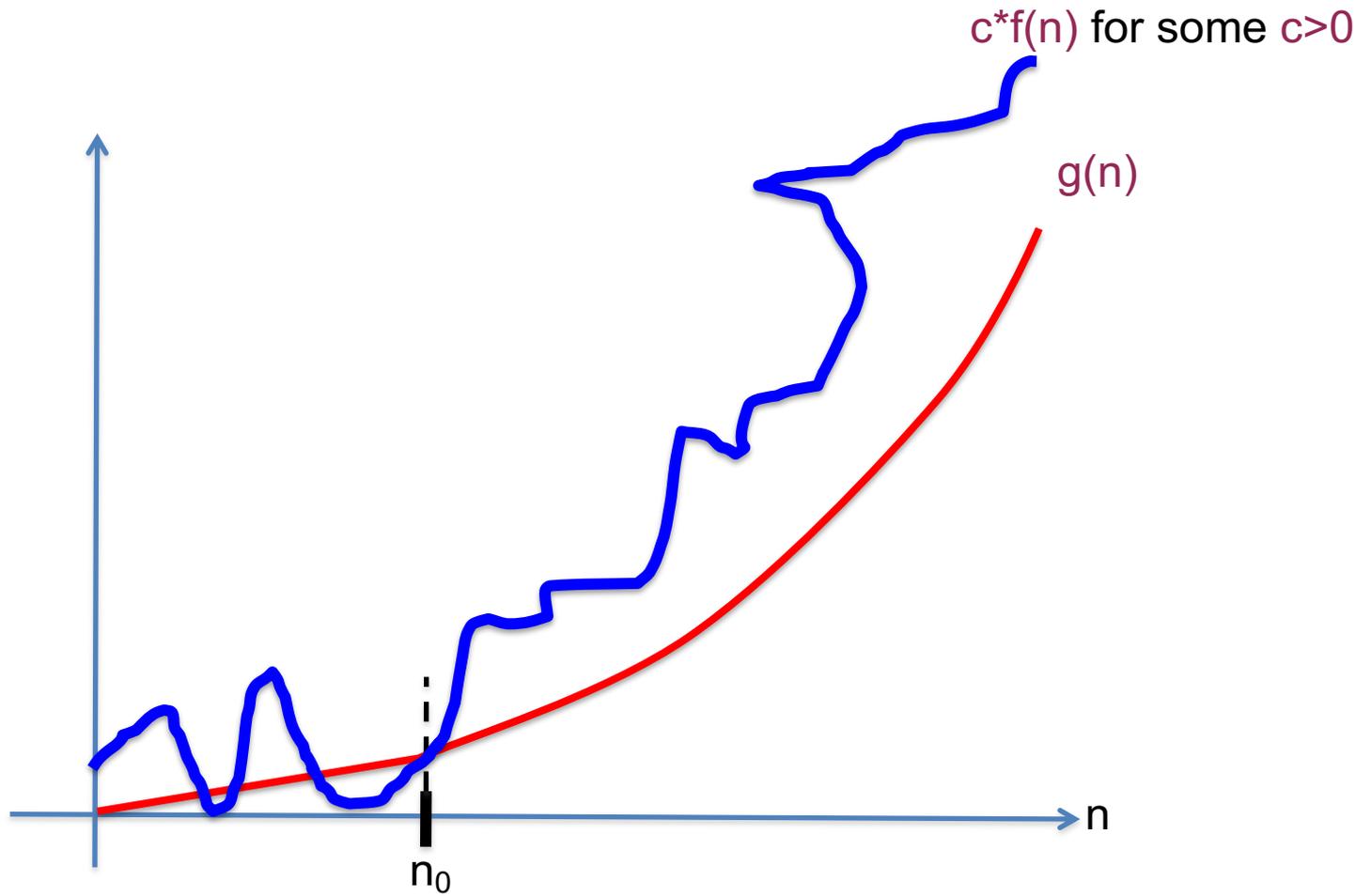O(n^2) implementation of the Gale-Shapley algorithm

Some practice with run time analysis

Questions?

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

c*f(n) for some c>0

g(n)

n

n_0

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

Overall:
$O(n)$ time

Additive

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

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

Another Reading Assignment

Analyzing the worst-case runtime of an algorithm

Some notes on strategies to prove Big-Oh and Big-Omega bounds on runtime of an algorithm.

The setup

Let A be the algorithm we are trying to analyze. Then we will define $T(N)$ to be the worst-case run-time of A over all inputs of size N. Slightly more formally, let $t_A(\mathbf{x})$ be the number of steps taken by the algorithm A on input $\mathbf{x}$. Then
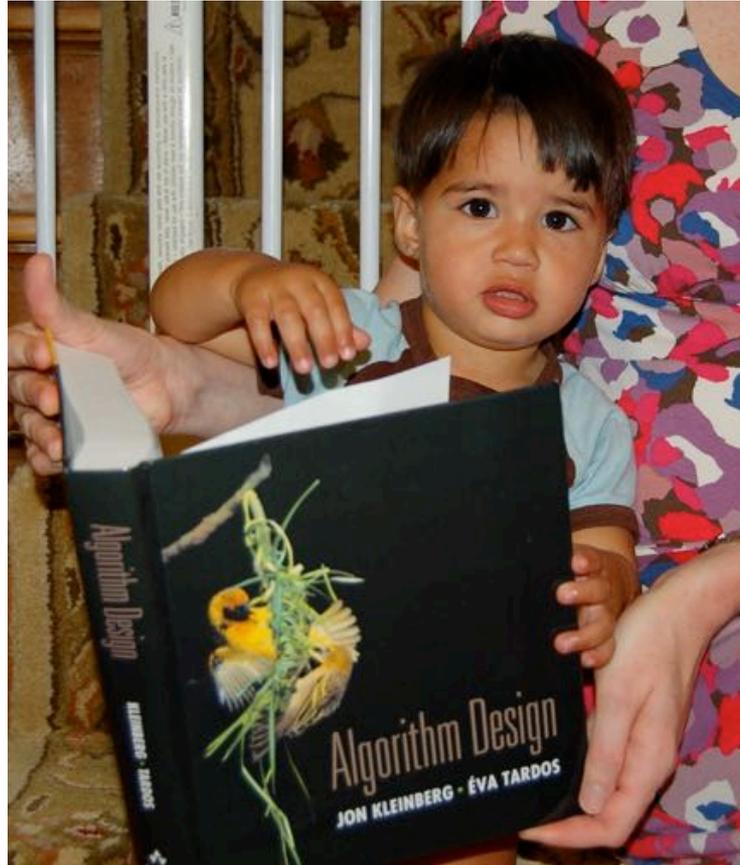
$$T(N) = \max_{\mathbf{x}: \mathbf{x} \text{ is of size } N} t_A(\mathbf{x}).$$

In this note, we present two useful strategies to prove statements like $T(N)$ is $O(g(N))$ or $T(N)$ is $\Omega(h(N))$. Then we will analyze the run time of a very simple algorithm.

Preliminaries

We now collect two properties of asymptotic notation that we will need in this note (we saw these in class today).

Reading Assignments

Sections 1.1, 1.2, 2.1, 2.2 and 2.4 in [KT]

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

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…