Lecture 35

CSE 331

Nov 30, 2022

Homework 8 out (last one!!)

Homework 8

Due by **11:30pm, Tuesday, December 6, 2022**.

Make sure you follow all the homework policies.

All submissions should be done via Autolab.

Check the week 14 recitation notes for this homework.

The support page on SAT solvers could be useful for Question 3.

How are graphs represented in Q1 and Q2?
It does not matter: you can assume either the adjacency list representation or the adjacency matrix representation-- whatever is more covenient for y'all.

Question 1 (Clique problem) [50 points]

In this problem, we will consider a problem that is essentially the "complement" of the independent set problem. Given a graph $G = (V, E)$, a *clique* is a subset $S \subseteq V$ such that **all** $\binom{|S|}{2}$ edges between the vertices in S exist. ⊙ As we have done in class, we consider the following *decision* version of the problem of finding the *largest* clique in a graph

The problem
Given a graph G and a number k, does G contain a clique of size at least k? I.e. does there exists a subset $S \subseteq V$ such that $|S| = k$ and there are all possible $\binom{k}{2}$ edges present among the vertices in S?

Sample Input/Output pairs
For the sample inputs, let us consider the following graph, which we will call G_0:

Sample final exam

Final exam post

Actions ▾

Final exam post

I'll start off with some generic comments:

- The final exam will be based on all the material we will see in class up to NP-completeness of k-colorability (we'll finish that stuff by Friday, Dec 9).
    - In case you want a head-start we will cover Sections 8.1-8.4 and Section 8.7 in the textbook. For the rest the schedule page details what sections of the book we have already covered.
    - I know this does not give a huge lead time into the final exam but unfortunately the snow day means less lead time than in previous years.
- Exam will be from **12:00pm to 2:30m** on Monday, **Dec 12** in class (**Hoch 114**). Note that the exam will be for 2.5 hours and *not 3 hours* as it says on HUB.
    - Remember the deadline to request a makeup final due to exam conflict is tomorrow, Monday, Nov 28 (@432)
- **DO NOT FORGET TO BRING YOUR UB CARD TO THE** EXAM (@460)

Next are comments related to **preparing for the finals**:

1. Take a look at the sample final (@440) and spend some quality time solving it. Unlike the homeworks, it might be better to try to do this on your own. Unlike the sample mid-term, this one is an actual 331 final exam so in addition to the format, you can also gauge how hard the final exam is going to be (your final exam will be the same ballpark). However as with the sample mid-term, you make deductions about the coverage of topics at your own peril (but see points below). Once you have spent time on it on your own, take a look at the sample final solutions (@440).
2. The actual final will have the same format as the sample final: The first question will be T/F, 2nd will be T/F with justification, the rest of the three will be longer questions and will ask you to design algorithms (parts of them might be just *analyzing* an algorithm.)
3. For the T/F questions (i.e. the first two questions), anything that was covered in class or recitations or piazza is fair game. If you want to refresh your memory on what was covered, take a look at the schedule page. If you want quick summaries of (almost all) the lectures, review the lecture notes or slides or videos.
4. To get more practice for the T/F questions, review all the T/F polls on piazza (@81)
5. For the remaining 3 questions, one will be on greedy algorithms, one will be on divide and conquer algorithms and one will be on dynamic programming. However, note that Chapter 2 and 3 in the book are basic stuff and almost any question in the final could fall under the purview of those two chapters. There will be **at least** one T/F and one T/F with justification Q for the NP-complete material so y'all should definitely focus on those as well but I will not ask any "proof based" Qs on that material.
6. In previous finals, like your mid-terms, there have been questions that are either straight lifts from homeworks or are closely related and this trend will continue in the actual exam (though to a lesser extend then the mid-term). This means that you should review your homeworks (all of them) before the exam. Also make sure to review the support pages and recitation notes.
7. If you are short on time and you are prioritizing the topics to study, keep points 5 and 6 above in mind.
8. Sections in the book that were not covered at all in the class but were handed out as reading assignments or recitation notes: I can also ask any direct questions from them. In addition, it might be useful to read them to get a better feel for the material. In any case once you have read the material covered in class a couple of times, it might do your brain some good to read some different material.
9. You can bring in **two** 8.5"X11" review sheets (you can use both sides on both). Use this judiciously: they can be a very useful tool to note down some weird things you have a hard time remembering and/or noting down specific references. However, do **not** spend a lot of time preparing these sheets: they can be huge time sinks without much payoff.

Next are some suggestions for when you are **in the exam**:

1. Spend 5 10 minutes reading all of the questions in one page; this'll let the problems germinate in your subconscious until you actually get to solving them

Bring your UB card to final

Actions ▾

Assigned seating for final exam

Your seating for the final in Hoch 114 will be assigned (and you won't be able to sit wherever you find a spot as it was for the mid-term).

I will release more details by Saturday, Dec 10. In the meantime, two important things to remember:

- **You will HAVE to have your UB card on you during the exam**
  - A TA will come and verify that you are seated in the correct row
- To facilitate the TAs checking your UB IDs, **please keep your bag in the front of the room** (i.e. not with you).

final

Edit | good note | 0

Updated 23 minutes ago by Atri Rudra

Incentive to complete course evals

note @459 · stop following · **0 views**

Actions ▾

Incentive for filling in course evals

As I have done in the past few years, depending on the level of response on the official course evals, I will release come questions on the final exam. (See @440 to see what Q I mean below)

- If >=85% students submit the course evals, I will release **Q1(a)**
- If >=90% students submit the course evals, I will release **Q1(a) AND Q2(a)**

Some other relevant comments:

- I will post the current response rate in the comments section below every 3 days AFTER the Thanksgiving break till the deadline
- The % is based on current number of students registered (133): i.e. it does not include students who have resigned
- I believe this is the link to the course evals: https://sunyub.smartevals.com/
  - But double check the email you might have received on this.

feedback

Edit | good note | 0   Updated 25 minutes ago by Atri Rudra

followup discussions, *for lingering questions and comments*

◉ Resolved ◯ Unresolved   **@459_f1** 🔗   Actions ▾

Atri Rudra 25 minutes ago
Update (as of *Nov 27 at 1:10pm*): **2%** have filled in the course evals.
good comment | 0

Reply to this followup discussion

CSE 331 UTA positions for 2023

Want to be a UTA for 331 in 2023?

Prof. Akhter be teaching 331 in the upcoming Spring semester and is looking for UTAs. I expect to be teaching 331 again in Fall 2023 (though this is **not** finalized and is subject to change) and will be looking for TAs then as well. So Prof. Akhter and I are looking to jointly interviewing candidates for CSE 331 TAs for 2023 (on **zoom** tentatively the final week (Dec 13 and after) and/or the week after that (week of Dec 19), 2022).

(As an aside: I also have openings for doing research but I'll post on those once I'm done with all 331 related stuff: i.e. after the grades have been submitted.)

These will be *paid* positions. Time-commitment wise here is what we're looking for

- *Ideally,* you should be able to commit close to 10 hours/week on average. More is of course better!
- Depending on your background (e.g. if you have TAed before), we're willing to be OK with ~5 hours/week on average but no lower than that (and no more than 1-2 TAs with << 10 hrs/week).

A few important points:

- There is *no* formal minimum grade requirement to be a 331 UTA (Of course you don't know your grade by now). For now, we're basically looking for interested students who enjoyed 331 so far and would be excited to help others.

- A large fraction of your current TAs will be TAing CSE 331 this spring (but pretty much all of them will be gone by the summer) so there will be fewer slots for Spring 23 (5-10) as compared to Fall 23 (10+).
- Being a 331 UTA is definitely a great experience (feel free to ask one of your TAs!) and also **a great preparation for your interviews -- there is no better way to learn algorithms than to teach it!**
- The application process is basically you presenting an algorithm that is covered in class to a "mock recitation"-- once you apply, we will provide more details on the process.

If you are interested in a UTA position, please fill this form.

piazza   logistics

Edit   good note | 0   Updated 14 hours ago by Atri Rudra

Next two weeks are brutal

Mon, Nov 28	The P vs. NP problem ▶F21 ▶F19	[KT, Sec 8.1]
Tue, Nov 29		**(HW 8 out, HW 7 in)**
Wed, Nov 30	More on reductions ▶F21 ▶F19	[KT, Sec 8.1]
Fri, Dec 2	The SAT problem ▶F21 ▶F19	[KT, Sec 8.2] **(Project (Problem 3 Coding) in)**
Mon, Dec 5	NP-Completeness ▶F21 ▶F19	[KT, Sec. 8.3, 8.4] **(Quiz 2)** **(Project (Problem 3 Reflection) in)**
Tue, Dec 6		**(HW 8 in)**
Wed, Dec 7	*k*-coloring problem ▶F21 ▶F19	[KT, Sec 8.7]
Fri, Dec 9	*k*-coloring is NP-complete ▶F21 ▶F19	[KT, Sec 8.7] **(Project (Problems 4 & 5 Coding) in)**
Mon, Dec 12	**Final Exam**	**(noon-2:30pm in HOCH 114 (usual classroom))**
Tue, Dec 13		**(Project (Problems 4 & 5 Reflection) in)** **(Project Survey in)**

Questions?

$$Y \leq_P X$$

NRMP
National Resident Matching Program

Production Company	Slot 1	Slot 2	Slot 3	Slot 4
P_1	S_1	free	S_2	free
P_2	free	S_1	free	S_2

Production Company	Slot 1	Slot 2	Slot 3	Slot 4
P_1	S_1	free	S_2 (truncate here)	
P_2	free	S_1 (truncate here)		

Poly time steps

ANY algo for stable matching problem works!

Arbitrary Y instance

Output for Y instance

Pre-process the input

Algo for X

Post-process the output

All processing is poly-time
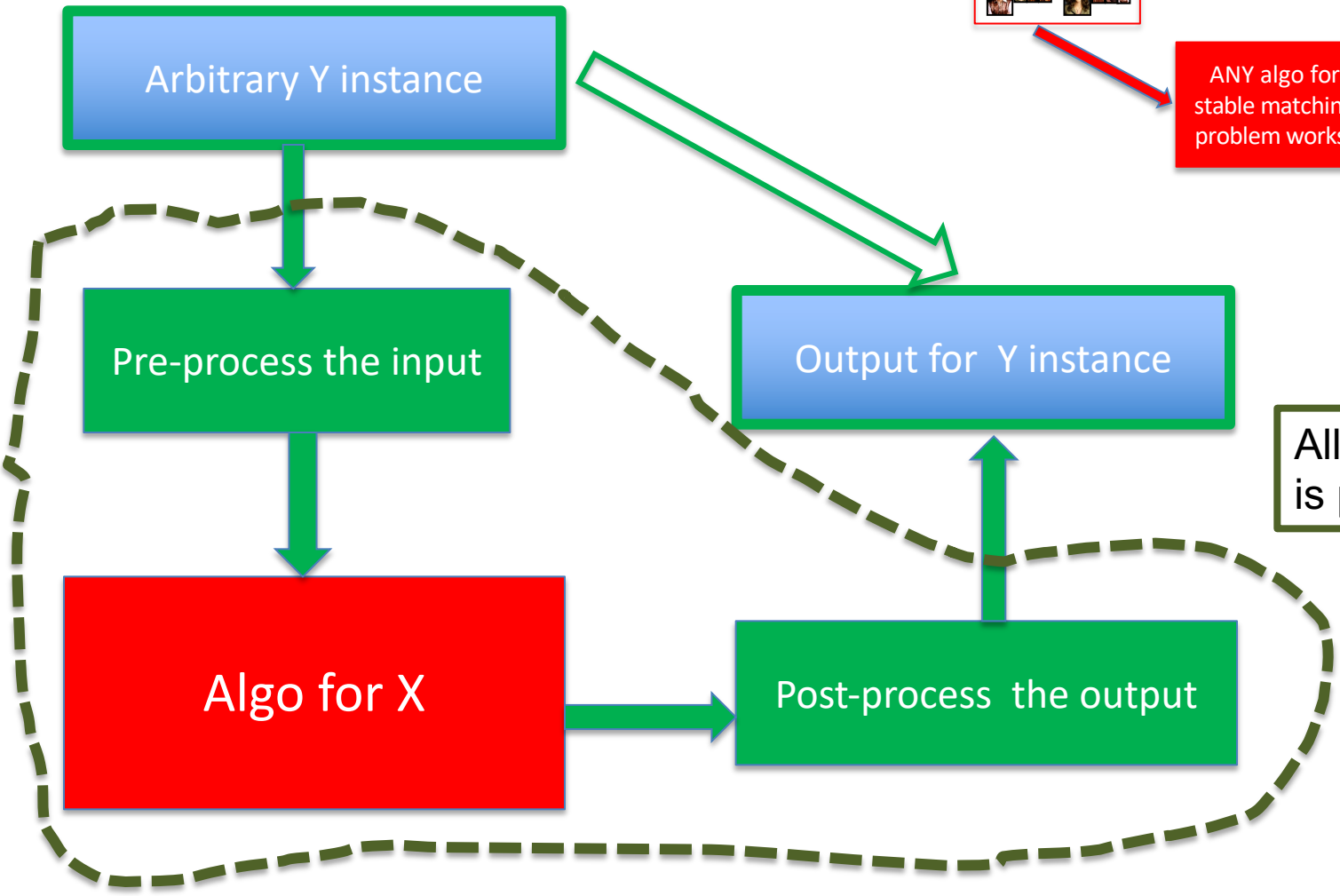
$$A \implies B$$

$$!B \implies !A$$

Implications of $Y \leq_P X$

Arbitrary Y instance

Pre-process the input

Algo for X

Post-process the output

Output for Y instance

Polynomial algo for Y

$\Rightarrow$

Polynomial algo for X

All processing is poly-time
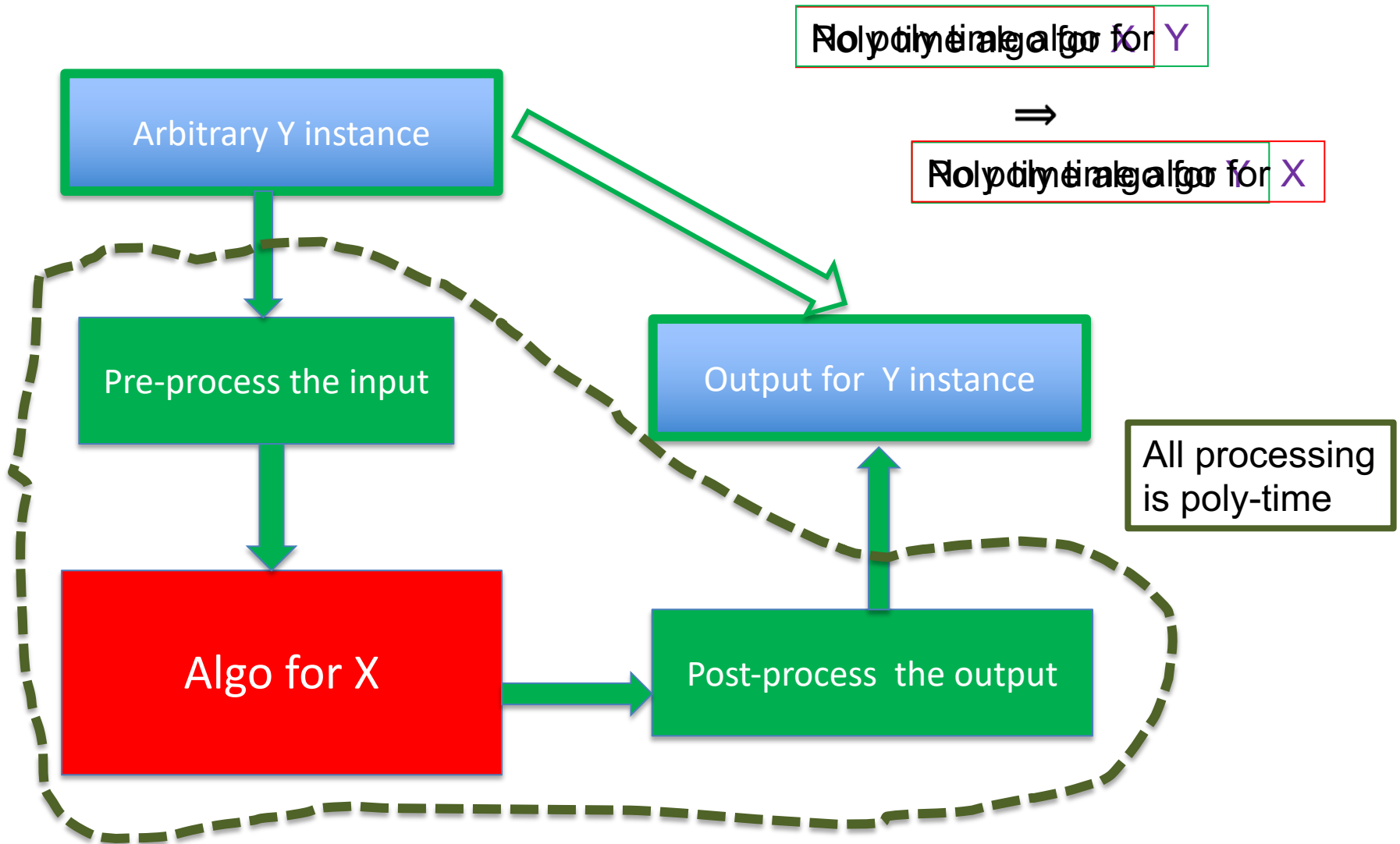
Plan for today

More on reductions

Quick definition of P and NP