Lecture 36

CSE 331

Dec 1, 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

Remaining two weeks are packed

Mon, Nov 29	More on reductions F19	[KT, Sec 8.1]
Wed, Dec 1	The SAT problem F19	[KT, Sec 8.2] (**HW 8 out, HW 7 in**)
Fri, Dec 3	NP-Completeness F19	[KT, Sec. 8.3, 8.4] (**Project (Problem 3 `Coding`) in**)
Mon, Dec 6	*k*-coloring problem F19	[KT, Sec 8.7] (**Quiz 2**) (**Project (Problem 3 `Reflection`) in**)
Wed, Dec 8	*k*-coloring is NP-complete F19 F18	[KT, Sec 8.7] (**HW 8 in**)
Fri, Dec 10	Wrapup F19 F18	(**Project (Problems 4 & 5 `Coding`) in**)
Mon, Dec 13		(**Project (Problems 4 & 5 `Reflection`) in**) (**Project Survey in**)

Quiz 2 on Monday

note @518 stop following 1 views

Quiz 2 on Monday

A gentle reminder that Quiz 2 is on Monday, Dec from 10:20-10:30am. The lecture will start at 10:35am.

Everything till Friday's lecture will be on quiz 2. There will be three questions. The first two will be T/F without justification (like Q1(a) on sample final @507) and the 3rd one will be T/F with justification (like Q2(a) on sample final @507).

quiz2

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

HW 8 (last one!) out

Homework 8

Due by **8:00am, Wednesday, December 8, 2021**.

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.

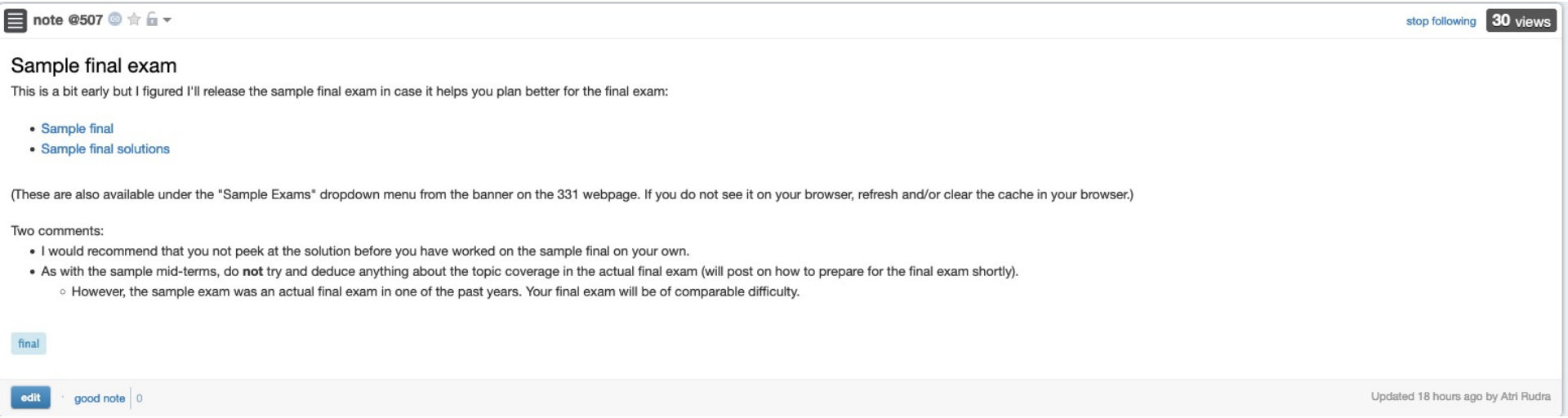
How are graphs represented in Q1 and Q2?

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. 1 As we have done in class, we consider the following *decision* version of the problem of finding the *largest* clique in a graph

Sample final exam



note @507

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Sample final exam

This is a bit early but I figured I'll release the sample final exam in case it helps you plan better for the final exam:

- Sample final
- Sample final solutions

(These are also available under the "Sample Exams" dropdown menu from the banner on the 331 webpage. If you do not see it on your browser, refresh and/or clear the cache in your browser.)

Two comments:

- I would recommend that you not peek at the solution before you have worked on the sample final on your own.
- As with the sample mid-terms, do **not** try and deduce anything about the topic coverage in the actual final exam (will post on how to prepare for the final exam shortly).
  - However, the sample exam was an actual final exam in one of the past years. Your final exam will be of comparable difficulty.

final

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Updated 18 hours ago by Atri Rudra

Final exam post

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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 most likely finish that stuff by Wednesday, Dec 4).
  - 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.
- Exam will be from **8:30am to 11:00am** on Friday, **Dec 17** in class (**Knox 110**). Note that the exam will be for 2.5 hours and *not 3 hours* as it says on HUB.
  - If you have **three of more exams scheduled on Dec 17,** please contact me **NO later than 5PM on Wednesday, DECEMBER 1.** *If you contact me after Dec 1, I won't be able to accommodate any re-scheduling request.*
- **DO NOT FORGET TO BRING YOUR UB CARD TO THE** EXAM (@510)

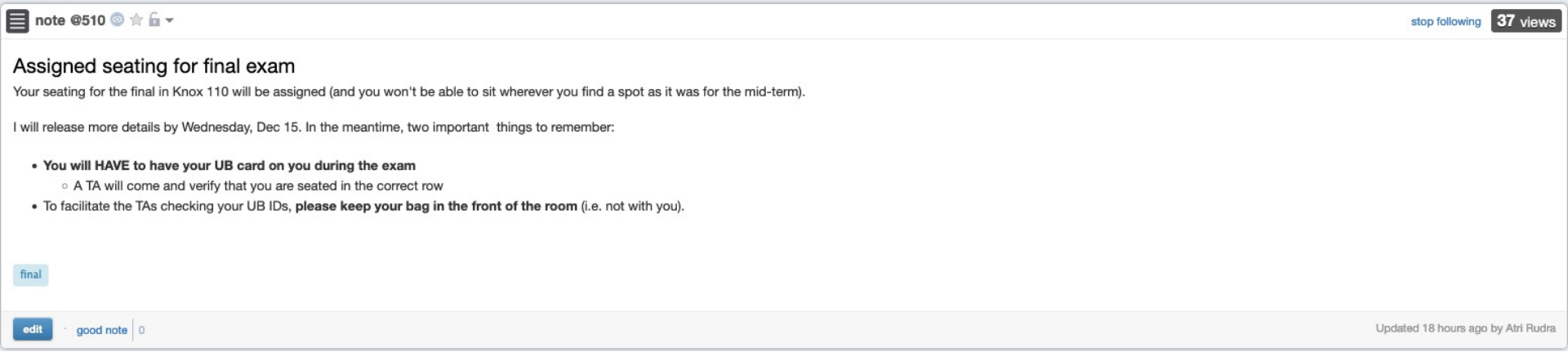
Next are comments related to **preparing for the finals**:

1. Take a look at the sample final (@507) 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 (@507).
2. We will have some extra OHs on Mon Dec 15 to Wed Dec 15 (details TBA).
3. 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.)
4. 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.
5. To get more practice for the T/F questions, review all the T/F polls on piazza (@235)
6. 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.
7. 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 (not for **all** questions though). 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.
8. If you are short on time and you are prioritizing the topics to study, keep points 6 and 7 above in mind.
9. 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.
10. 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 pass: this'll let the problems germinate in your subconscious until you actually get to solving them.
2. You should have plenty of time for the exam: by my count a well prepared student should be done by spending at most one minute per point, i.e. 100 minutes. The exam will be for 150 minutes, so you will have 50 extra minutes.
3. If you are not sure how to design an algorithm for a problem in the exam I generally recommend the following sequence:
   - Try and see if you can reduce the problem to something you have already seen in class;
   - If not, then try and slightly modify an existing algorithm we have not see;
   - If not, only then try and build an algorithm from scratch.
4. Just to be sure the point above is just a recommendation-- your mileage may vary.
5. Once you reach the exam room, try to relax. Once you are there, you have done all the hard work, stressing out about the exam is not going to make the exam any easier for you. **Relax, it's just an exam!** The worst thing that can happen is you will do a bit

Bring your UB card to final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Assigned seating for final exam

Your seating for the final in Knox 110 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 Wednesday, Dec 15. 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

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Updated 18 hours ago by Atri Rudra

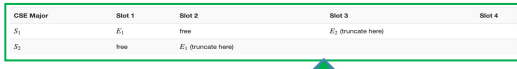
Questions?

$Y \leq_P X$

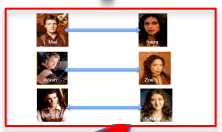
Question 2 (Big G is in town)

$\leq_P$

NRMP
National Resident Matching Program



Poly time steps



ANY algo for stable matching problem works!

Arbitrary Y instance

Pre-process the input

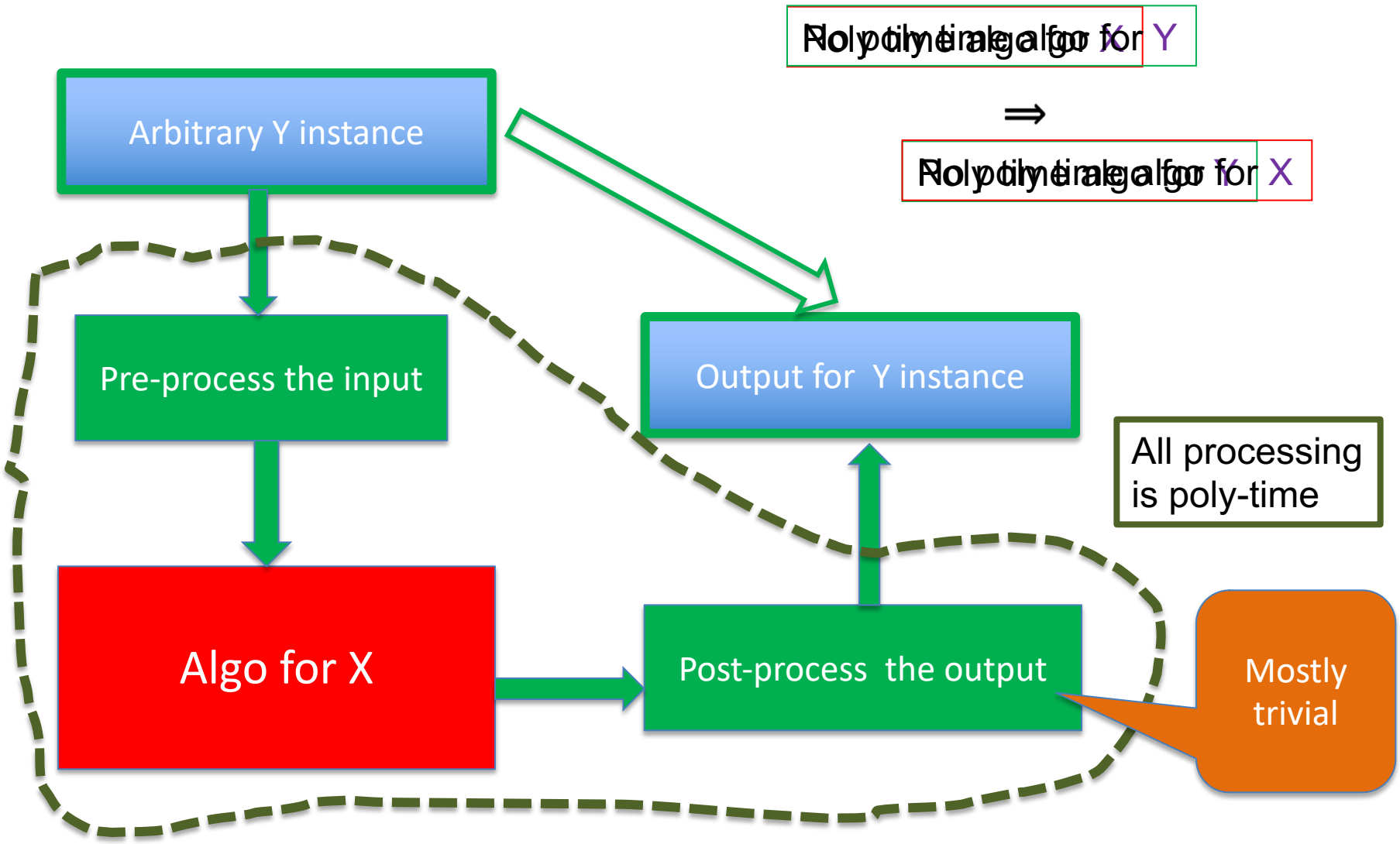
Algo for X

Post-process the output

Output for Y instance

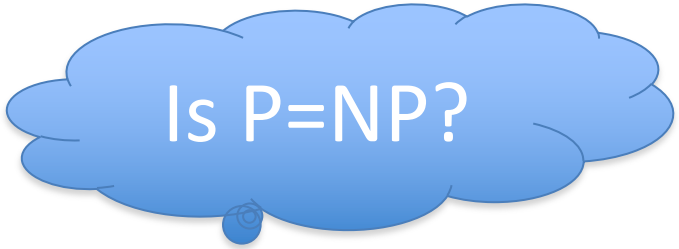
All processing is poly-time

Implications of $Y \leq_P X$



P vs NP question

P: problems that can be solved by poly time algorithms



NP: problems that have polynomial time verifiable witness to optimal solution