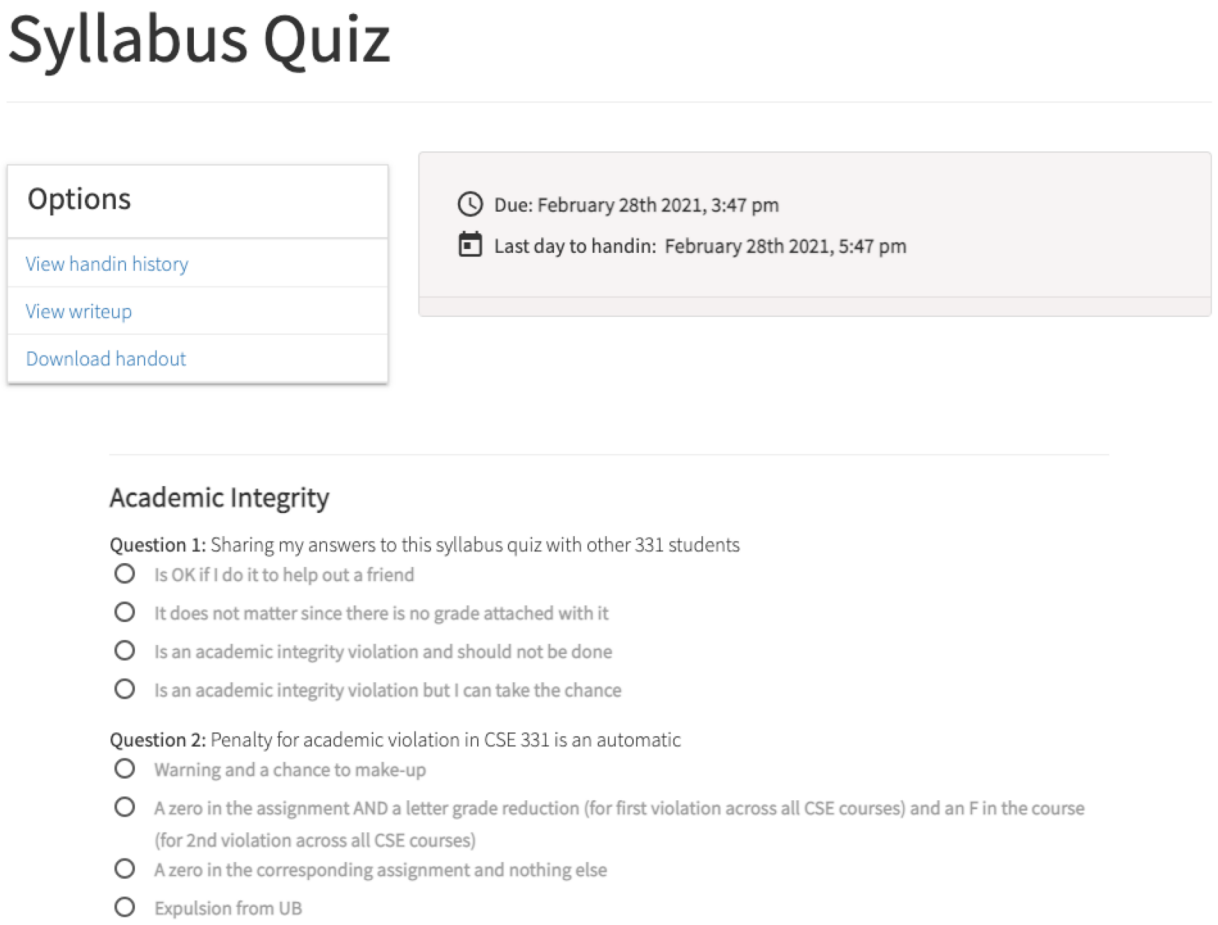
Lecture 7

CSE 331

Feb 15, 2021

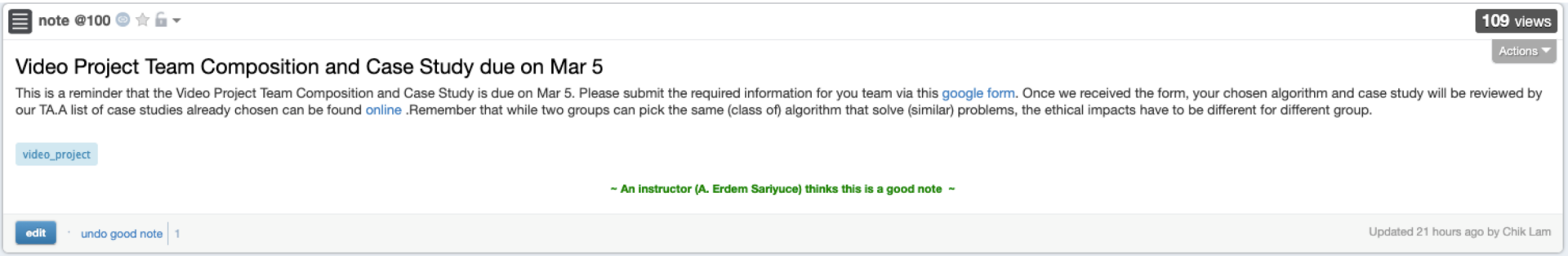
Pass the syllabus quiz

No graded material will be handed back till you pass the syllabus quiz!
There are still 28 students who did not pass this!



Sign-up for mini projects

Deadline: Friday, Mar 5, 8:00pm



HW 1 posted

Homework 1

Due by **8:00pm, Friday, February 19, 2021**.

Make sure you follow all the homework policies.

All submissions should be done via Autolab.

Check the week 3 recitation notes for this homework.

Start with Q1!!!

Post questions on Piazza!

Some Questions on Stable Matching

Sample Problem

The Problem

Decide whether the following statement is true or false:

In every Stable Marriage problem instance where a man m and woman w have each other as their least preferred partner, the following is true. There is no stable matching for the instance where (m, w) are matched.

If you state true then you will have to formally argue why the statement is correct. If you state false, then you have to give a counter-example.

Click here for the Solution

More Practice Questions

HW 1 posted

Remember this!

Collaboration policy

Collaboration is generally allowed on the non-programming questions on the homeworks. Here are the policies regarding collaboration:

1. You are allowed to collaborate provided you have thought about **each problem for at least 30 minutes on your own**. This will help you in the exams.
2. You can collaborate on any homework in a **group of size at most 3**, including yourself. Note that you *cannot* collaborate with different groups for different problems.
3. You must write the name of **everyone** in your group on your submission. You will have the ability to do this in your Autolab submission.
4. You can **only discuss the problems with your group till you come up with the ideas (e.g. proof ideas)**: the details (e.g. the formal proof) is something you should work on alone.
5. Your submitted homework must be **written in your own words**. Everything, including the proof idea, has to be written up individually. In particular, at no point of time should you have in your possession the written homework of someone else.

⊘ NO collaboration on programming question

There is **no** collaboration allowed on the programming question on the homeworks. The programming questions have to be done individually. **Unlike some of your previous CSE courses, you cannot even discuss data structures with other students**.

You are also not supposed to look up programming based questions *unless it is one of the allowed sources for programming*: see the list of allowed sources for more specifics.

⊘ Grade reduction in the course

Deviating from the rules above will be considered cheating with a **minimum** penalty of a **letter grade reduction** for the course for the **first violation of academic integrity**. If the violations if student's second violation in CSE then this will lead to an automatic **F in the course**.

Questions/Comments?

Gale-Shapley Algorithm

Intially all men and women are free

While there exists a free woman who can propose

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

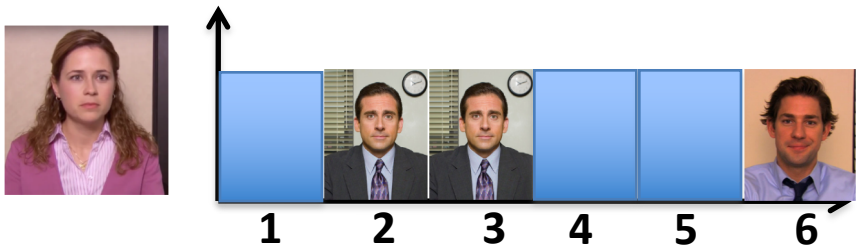
Else

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

Output the engaged pairs as the final output

Preferences

GS algorithm: The Office Edition



Any other stable matching in this example?

No!

Observation 1

Intially all men and women are free

While there exists a free woman who can propose

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

Once a man gets engaged, he remains engaged (to "better" women)

Output the engaged pairs as the final output

Observation 2

Intially all men and women are free

While there exists a free woman who can propose

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

If w proposes to m after m', then she prefers m' to m

Output the engaged pairs as the final output

How many iterations? n^2

Intially all men and women are free

While there exists a free woman who can propose

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

Output the engaged pairs as the final output

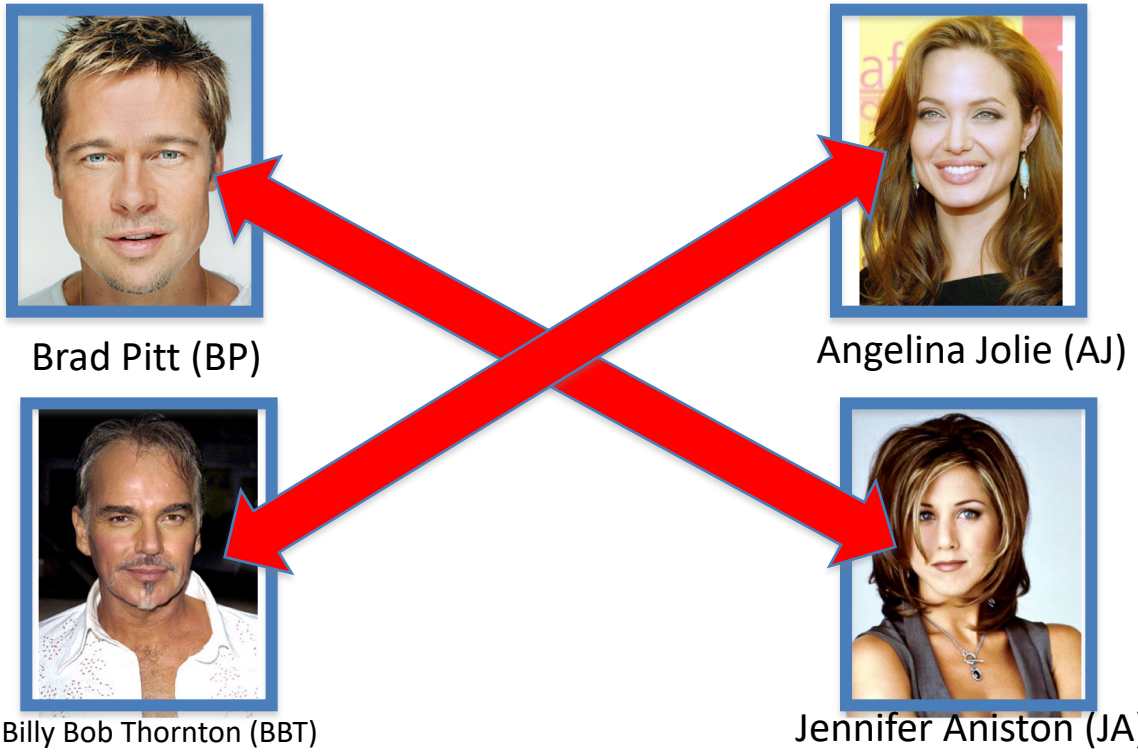
Questions/Comments?

Why bother proving correctness?

Consider a variant where any free man **or** free woman can propose

Is this variant any different? Can you prove it?

New GS variant does not output a stable marriage



Today's lecture

GS algorithms always outputs a stable marriage