

Lecture 3

CSE 331

Sep 1, 2017

Enroll on Piazza

University at Buffalo - Fall 2017

CSE 331: Introduction to Algorithm Analysis and Design

+ Add Syllabus

Course Information

Staff

Resources

Description

Edit

Add a Class Description
Click the Edit button to add a class description.

General Information

Edit

General Information

For your CSE 331 needs go to <http://www-student.cse.buffalo.edu/~atri/cse331/fall17/>

Announcements

+ Add

Recitations start from Monday at 8am!

Edit

Delete

8/23/17 11:39 PM

A reminder that we will have **ALL** recitation take place in first week of class. In particular, we will have recitations at 8am, 9am and noon on Monday even those are before the first lecture.

The first week of recitation will go over proof background.
[View on Piazza](#)

Welcome to CSE 331!

Edit

Delete

<https://piazza.com/buffalo/fall2017/cse331/>

Read the syllabus CAREFULLY!

No graded material will be handed back till you submit a signed form!

CSE 331

Introduction to Algorithm Analysis and Design

Fall 2017

University at Buffalo

Department of Computer Science & Engineering

CSE 331 — Introduction to Algorithm Analysis and Design


-
- Make sure you fill in form **with a pen**.
 - After you have filled in the form, scan it and upload it to Autolab.
-

I, _____ (PRINT name), acknowledge that I have read and understood the syllabus (and the homework policy document) for this course, CSE 331 *Introduction to Algorithm Analysis and Design*.

Autolab FAQ

Signing up

Follow these steps to setup an account on Autolab:

1. Go to [this page](#) and click on the Sign in with MyUB link . A new account will automatically be created for you.
2. By default, AutoLab will use your official UB first and last name. **If you have a different preferred name, please let us know ASAP.**
3. We will have leader boards for all the programming assignments. For anonymity, all students are identified by their chosen nicknames. So please make sure you pick an appropriate one (you can change your nickname at any point of time).
4. After you have done the above steps, you wait.

What happens next

Here are the steps that we need to take at our end:

1. We will upload a list of UB emails of students registered in the course (students cannot register themselves in a course). After that, you can just login into AutoLab using MyUB and you should see the CSE 331 course.
2. If you turned in your syllabus form, you will be added to the **Y** section. Otherwise you will be added to the **N** section.
3. Whenever you submit your form, you should be moved to the **Y** section: if this does not happen within two days of you submitting the form, you should send us a reminder.
4. I will only release the grades for section **Y**.

In the steady state

Here are the various things to keep in mind once you are successfully added to the course on Autolab:

1. Once you log in to the system (after creating your account), you will see all the courses for which you have been registered. CSE 331 should appear with the description **CSE 331: Introduction to Algorithm Design (f17)**.
2. Once you go to the course web page for CSE 331, you will see a list of pending homeworks. To begin with you should one box for Homework 0 and one link each for Question 1 and another for Question 2. (You will need to click on each Question and submit your solution on the corresponding page.) As you move along in the semester, you will also see completed assignments/homeworks.
3. For each homework, there will be three question for each homework.
4. The interface is reasonably intuitive but make sure you explore and make yourself comfortable with the interface, you will be spending quality time with it this semester!

TA office hours

Finalized by Monday

Two comments on Programming

Programming is worth about 12% of your final grade

Algorithm design/proofs are worth about 82% of your final grade

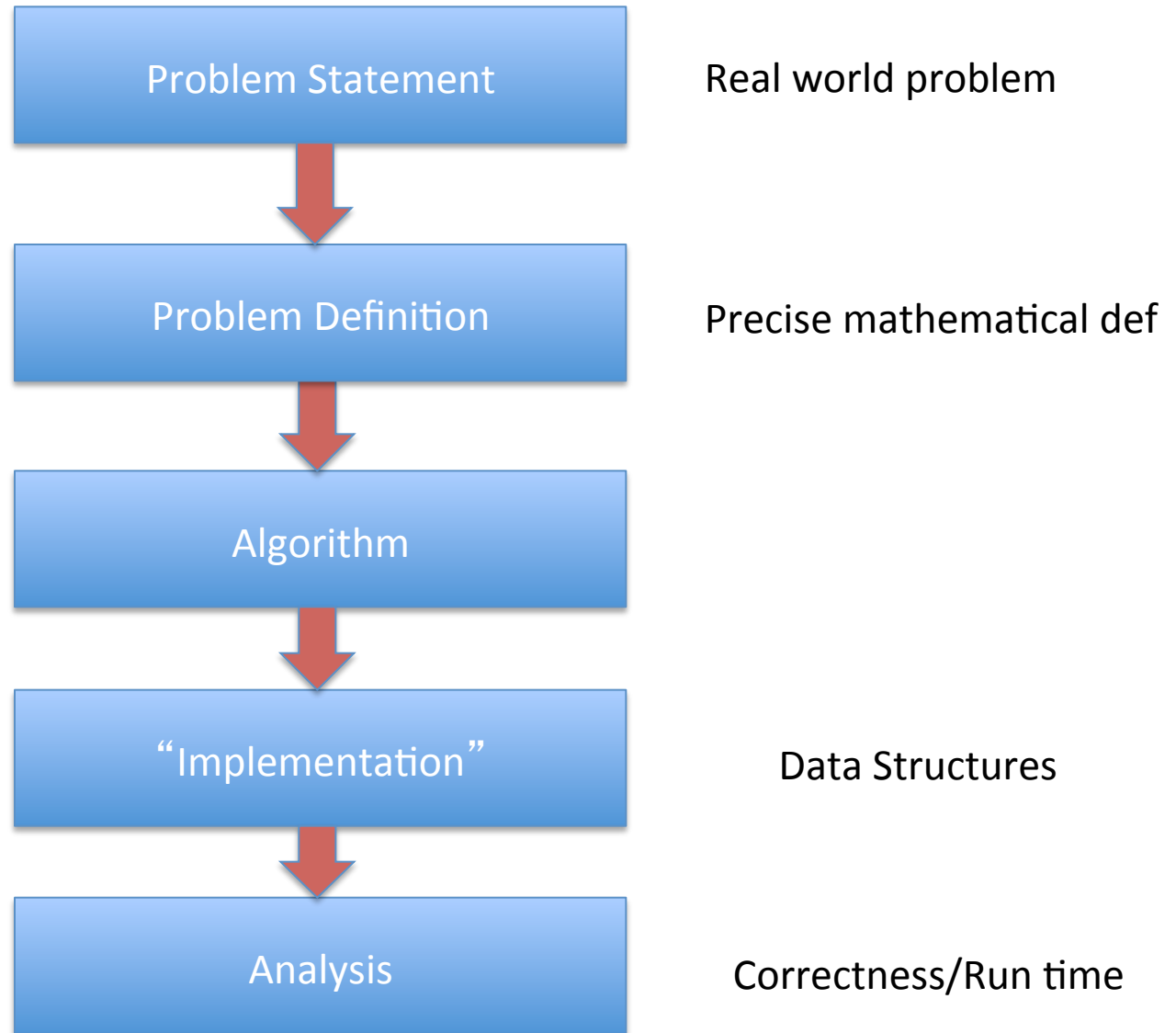
Invest your time wisely

331 is not the place to learn a new language! ..



C++, Java, Python
from HW 1

Main Steps in Algorithm Design



National Resident Matching

THE MATCH
NATIONAL RESIDENT MATCHING PROGRAM

RESIDENCY

FELLOWSHIP

POLICIES

DATA AND REPORTS

ABOUT

Search

MATCH CALENDARS

LOGIN/REGISTER

Preparing for #Match2018?

Frequently
Asked
Question

An NRMP ID is
NOT Required for
Submitting Your
Applications

[>> Learn more](#)

WHAT'S HAPPENING

- Check the Eligibility of Applicants
- Registration Open for Adolescent Medicine, Medical Toxicology, and Headache Medicine
- Timely Residency Applicant Resources
- Registration Open for Colon & Rectal Surgery, Medical Genetics, Sleep Medicine, and Spinal Cord Injury

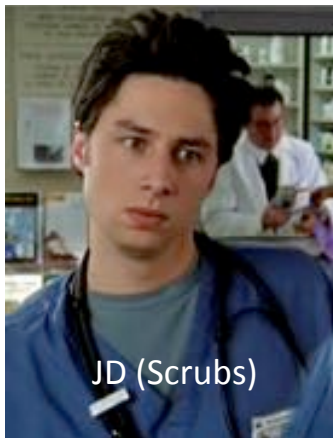
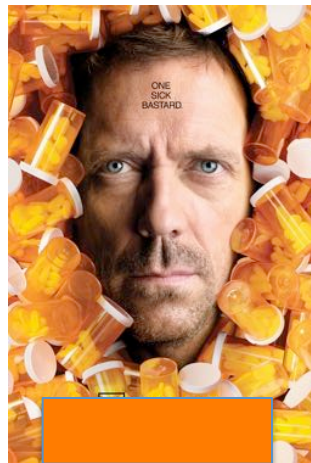
[READ MORE](#)



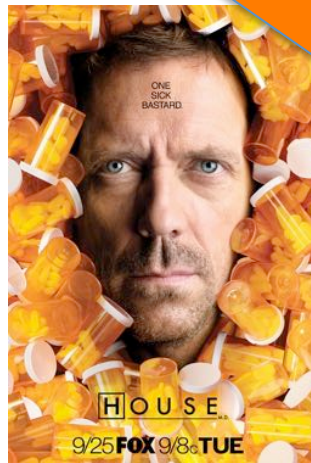
VIDEO: The Match Process for Applicants



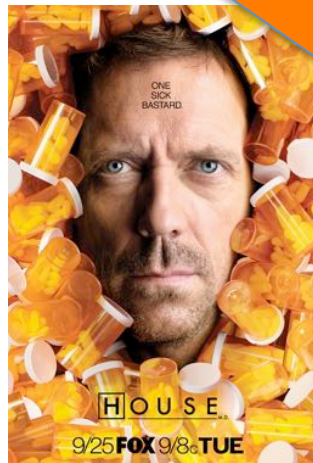
(Screen) Docs are coming to BUF



What can go wrong?



The situation is unstable!



What happens in real life



Preferences

NRMP
National Resident Matching Program



Information

NRMP
National Resident Matching Program



Preferences

NRMP
National Resident Matching Program

NRMP plays matchmaker



Stable Matching Problem



David Gale



Lloyd Shapley

Questions/Comments?



Matching Employers & Applicants

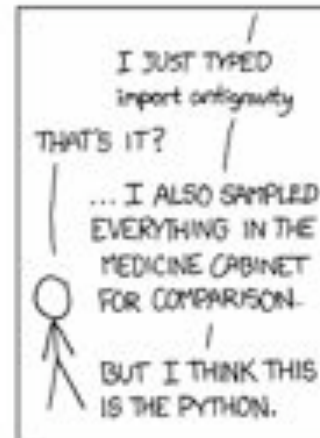
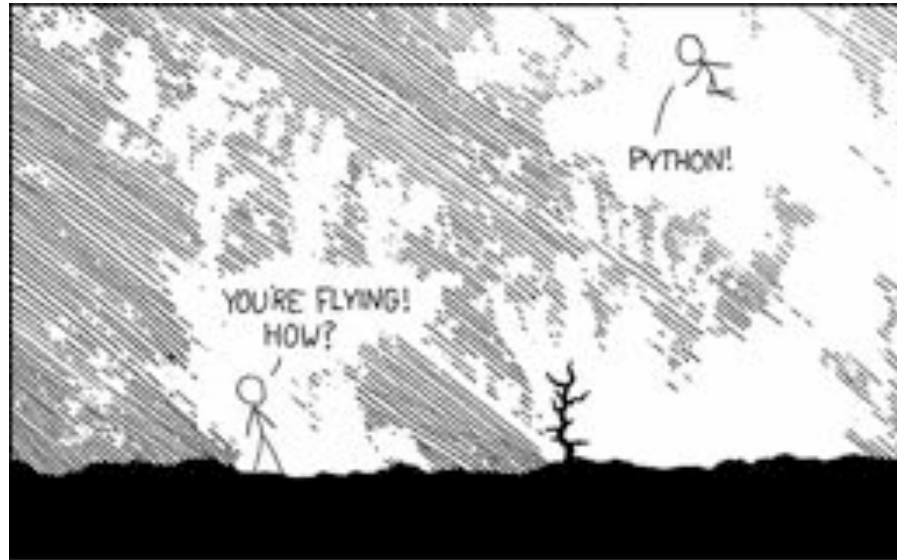
Input: Set of employers (E)
Set of applicants (A)
Preferences

Output: An assignment of applicants to employers that is “stable”

For every x in A and y in E such that x is **not** assigned to y , either

- (i) y prefers every accepted applicant to x ; or
- (ii) x prefers her employer to y

Simplicity is good



Questions to think about

1) How do we specify preferences?

Preference lists

2) Ratio of applicant vs employers

1:1

3) Formally what is an assignment?

(perfect) matching

4) Can an employer get assigned > 1 applicant?

NO

5) Can an applicant have > 1 job?

NO

6) How many employer/applicants in an applicants/employers preferences?

All of them

7) Can an employer have 0 assigned applicants?

NO

8) Can an applicant have 0 jobs?

NO

Questions/Comments?



Non-feminist reformulation

n men

Each with a preference list

n women

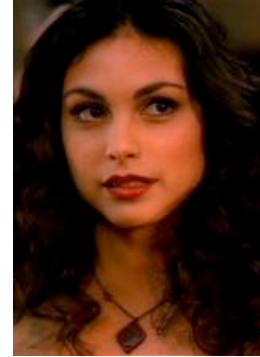
Match/marry them in a “stable” way

On matchings

Mal



Inara



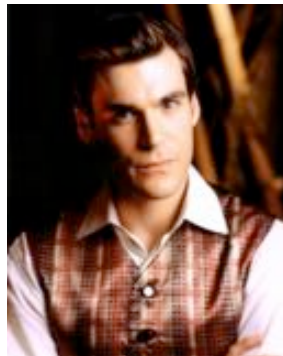
Wash



Zoe



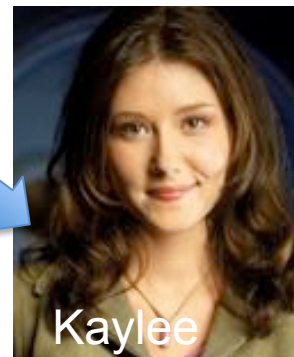
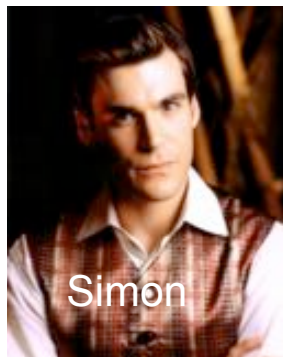
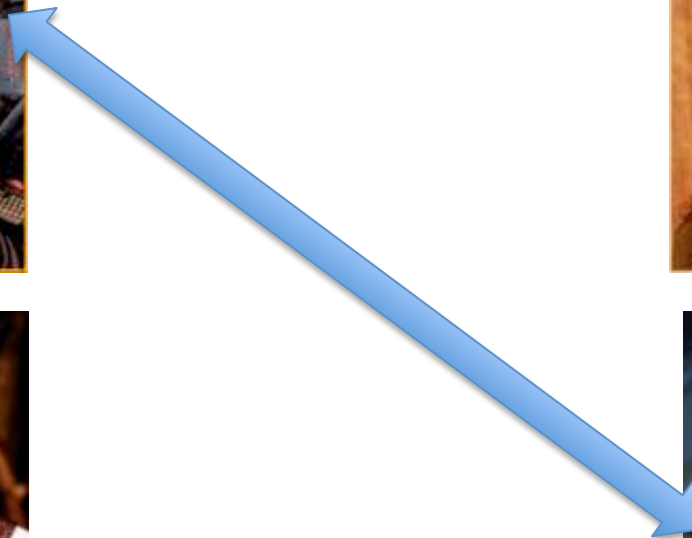
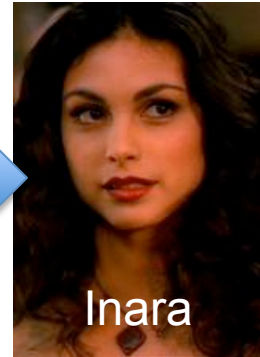
Simon



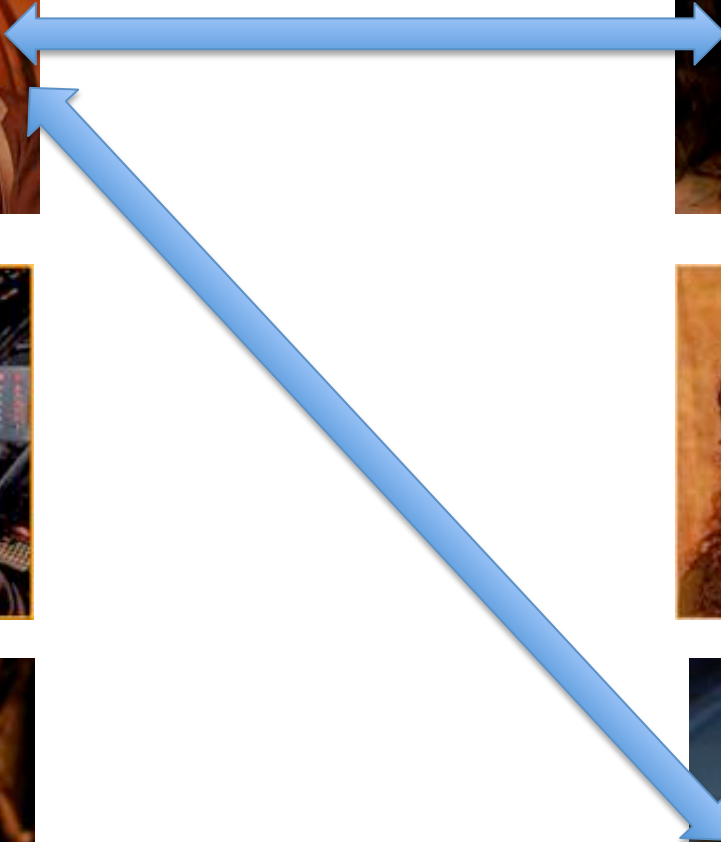
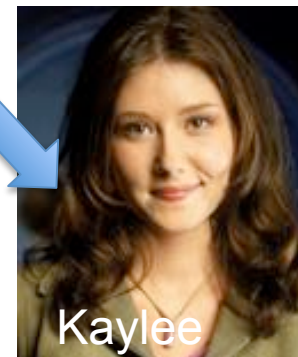
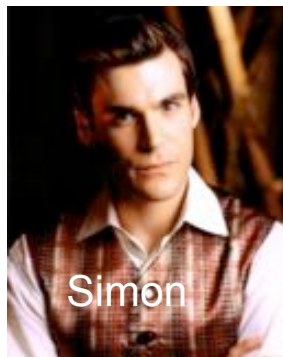
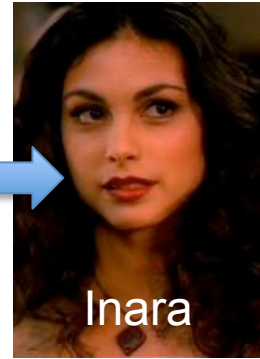
Kaylee



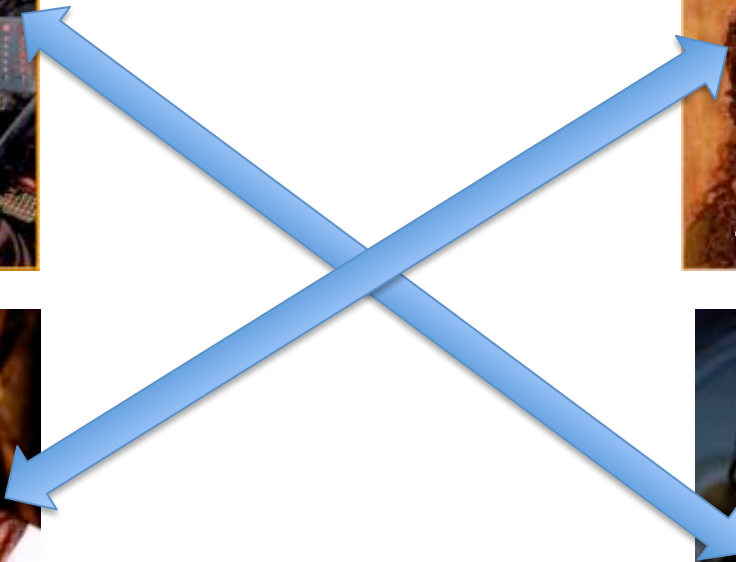
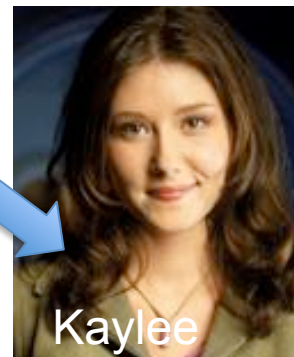
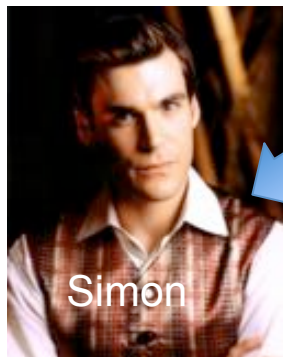
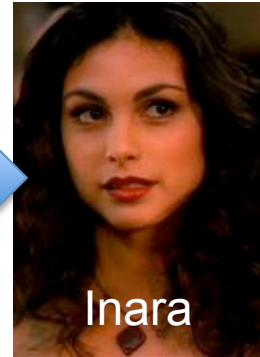
A valid matching



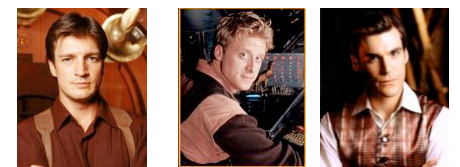
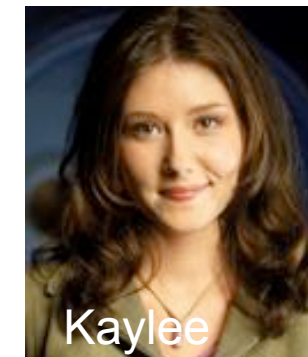
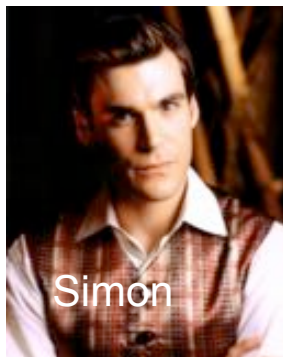
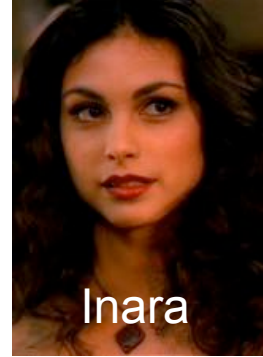
Not a matching



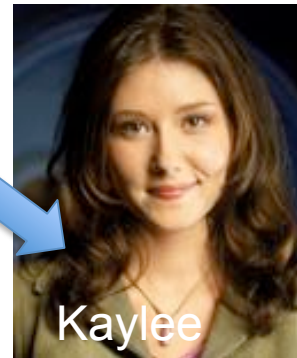
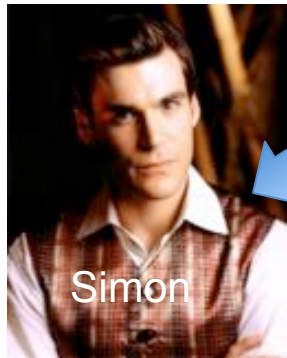
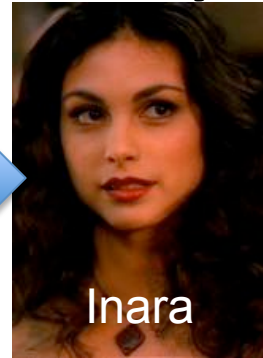
Perfect Matching



Preferences



Instability



Questions/Comments?



Discuss: Naïve algorithm!



The naïve algorithm

Go through all possible perfect matchings S

If S is a stable matching

then Stop



Else move to the next perfect matching

Gale-Shapley Algorithm



David Gale



Lloyd Shapley

$O(n^3)$ algorithm

Moral of the story...

