

Lecture 3

CSE 331

Aug 30, 2019

Enroll on Piazza

The screenshot displays the Piazza website interface. At the top, the Piazza logo is visible on the left, and navigation links for 'Home', 'Features', and 'Manage Class' are on the right. Below the navigation bar, there is a search bar and a list of questions on the left side. The main content area is titled 'Class at a Glance' and includes a 'Class at a Glance' section with a 'Class at a Glance' title and an 'Updated 11 seconds ago' timestamp. This section contains several key metrics: 'no-unread posts', 'no-unanswered questions', and 'no-unresolved follow-ups', each with a green checkmark. To the right of these metrics are 'total posts', 'total contributions', 'instructor's responses', 'student's responses', and 'avg. response time'. Below these metrics is a 'Student Enrollment' section with a green progress bar and a 'Download us in the app store' button. At the bottom, there are three featured content cards, each with a video thumbnail and a title: 'Using Student Engagement in Large Classes with Piazza', 'Empowering Women in British Politics with Piazza', and 'Empowering Small Discussion Board Classes on Piazza'.

<https://piazza.com/buffalo/fall2019/cse331/>

Please do keep on asking Qs!

The only bad question is the one that is not asked!

Read the syllabus CAREFULLY!

No graded material will be handed back till you pass the syllabus quiz!

Syllabus Quiz

Options

[View handin history](#)

[View writingup](#)

[Download handout](#)

 Due: December 12th 2019, 4:00 pm

 Last day to handin: December 12th 2019, 6:00 pm

Academic Integrity

Question 1: Sharing my answers to this syllabus-quiz with other 311 students.

- Is OK if I do it to help out a friend
- It does not matter since there is no grade attached with it
- It is an academic integrity violation and I should not do it.

Autolab FAQ

Autolab

Details on Autolab, which will be used for all homework submissions in CSE 301.

The main link

We will be using the old CSE extension to [Autolab 1.7](#) for submission and autograding of CSE 301 homeworks. You can access Autolab via <https://autograder.cse.berkeley.edu/1.7/>.

Signing up

Follow these steps to setup an account on Autolab (unless you already have one in which case you'll use your existing account):

1. Go to [this page](#) and click on the [Sign in with MyCSE 301 1.7](#). A new account will automatically be created for you.
2. By default, Autolab will use your official CSE 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 will:

What happens next

TA office hours

Finalized by today

Details on 1-on-1 meeting by Monday

HW 0 Solution posted

Solutions to Homework 0

Please note that we will provide online solutions for HW 0 **only**. From HW 1 onwards, we will only hand out hard copies of the solutions.

What is a proof?

The goal of this question is to present a gentle start to proofs. In particular, the idea is to highlight a common mistake students make while writing proofs.

The Problem

Consider the following 'proof':

¹ *Just like if* has a beard



² Every goat has a beard



Two comments on Programming

Programming is worth about 15% of your final grade

Algorithm design/proofs are worth about 80% of your final grade

Invest your time wisely

331 is not the place to learn a new language!

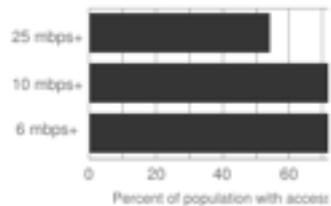
Questions/Comments?



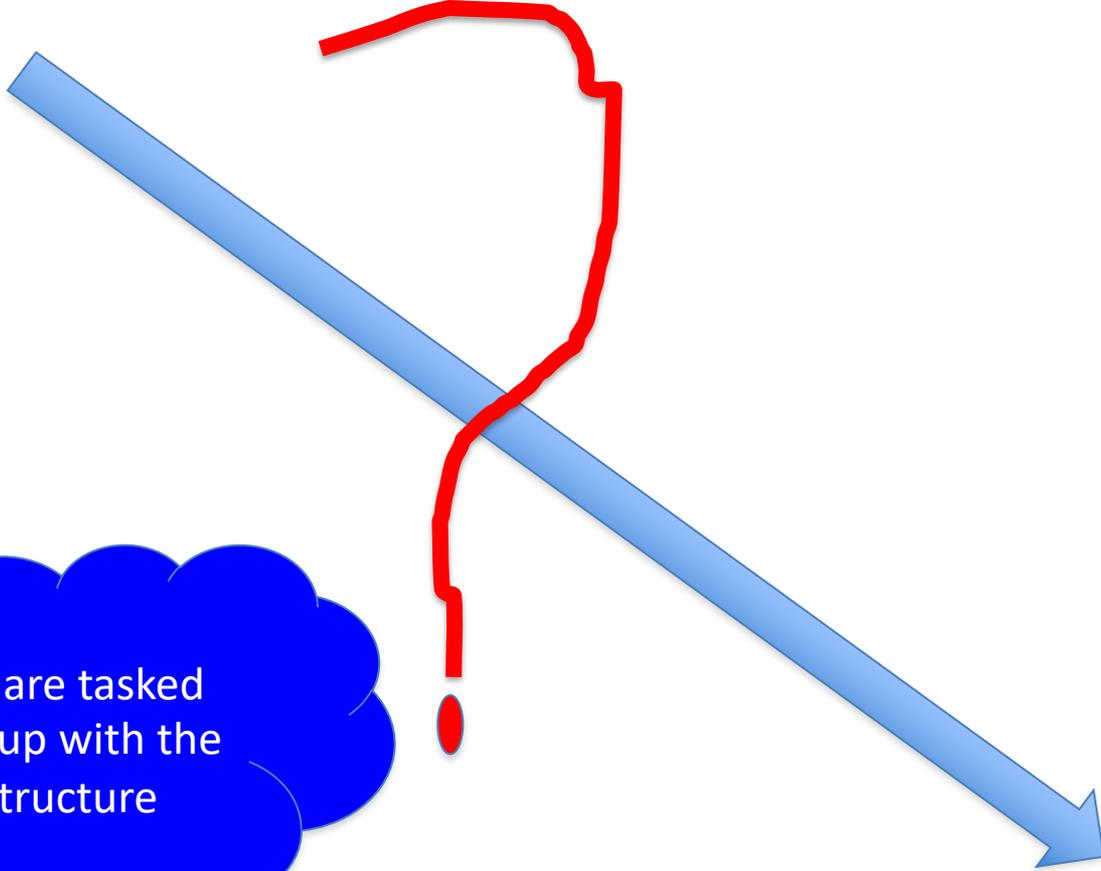
Make broadband more available

Cattaraugus County

Population: 79518
Median Income: \$41,368.88
Access to any cable technology: 67.5%
Access to two or more wireline providers: 61.2%

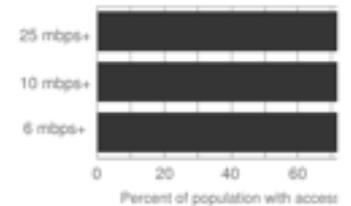


Say you are tasked to come up with the infrastructure



Erie County

Population: 913296
Median Income: \$49,817.67
Access to any cable technology: 98.9%
Access to two or more wireline providers: 96.8%



Make broadband more available

Input requirements

Where are the customers located?
What are the bandwidth requirements?
How is the input represented?

What objective are we optimizing?
How should the connections be configured?

Output requirements

Problem Definition

Where should we lay down the physical stuff?
What algorithm should be use to do this?

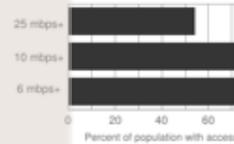
Algorithm Design

Implement the scheme

How should we do testing and maintenance?

Cattaraugus County

Population: 79518
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Decide whether this will be for-profit enterprise

What are technology should we use?

Get regulatory approval

Get funding

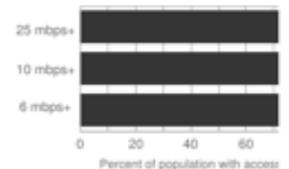
Hire people

Get access to physical space

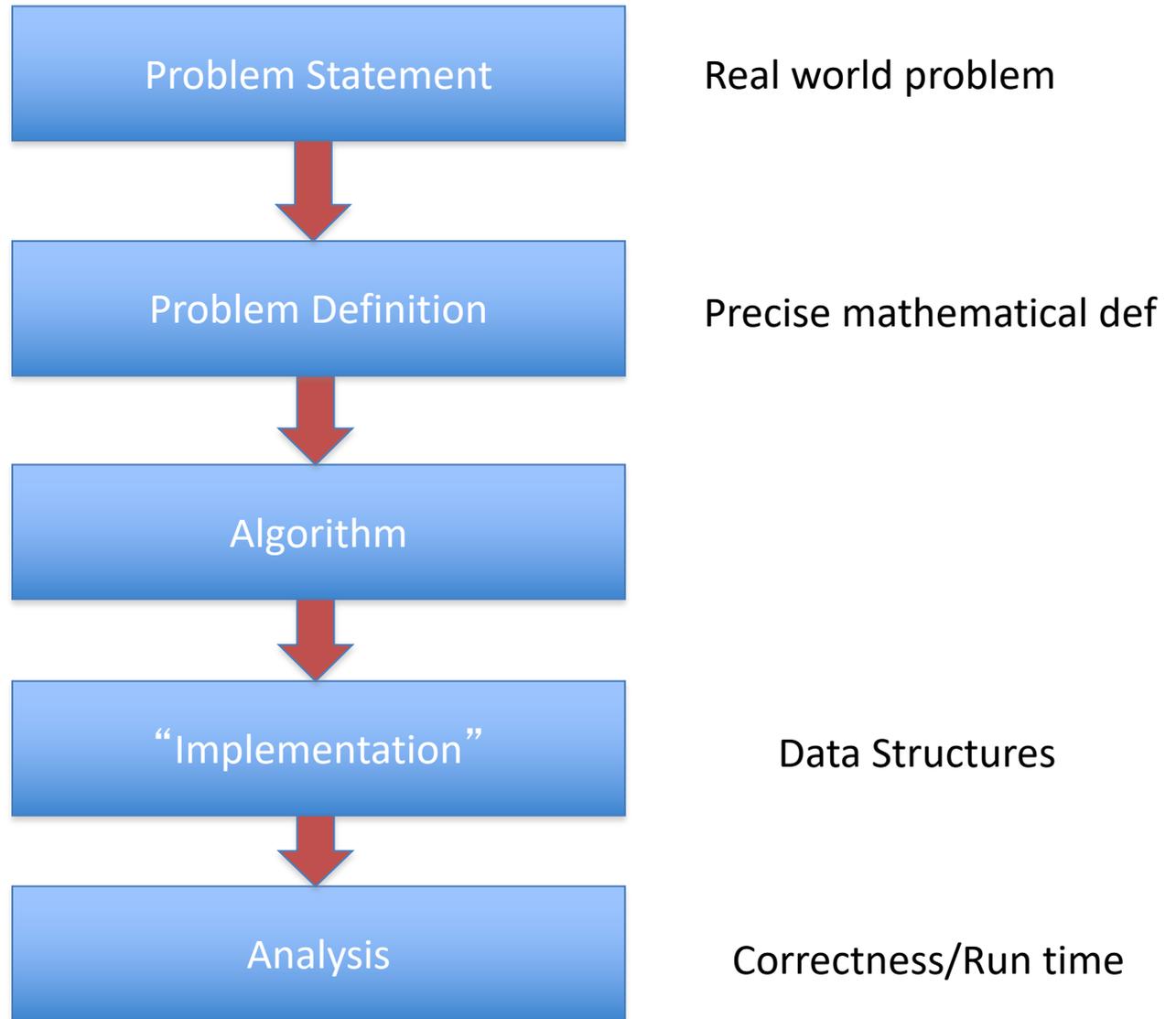
Outreach

Erie County

Population: 913295
Median Income: \$49,817.67
Access to any cable technology: 96.9%
Access to two or more wireline providers: 96.8%



Main Steps in Algorithm Design



National Resident Matching



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 Admission Medicine, Medical Technology, and Healthcare Medicine
- Final 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



Charting Outcomes in the Match

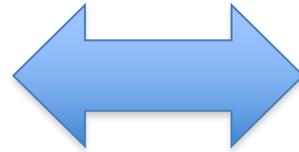


Match Process for Applicants

(Screen) Docs are coming to BUF



Bailey (Grey's Anatomy)



Buffalo General



Millard Filmore (Gates Circle)



Millard Filmore (Suburban)



JD (Scrubs)

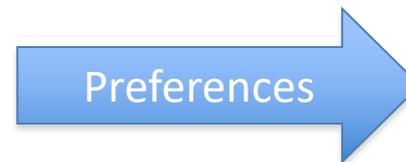
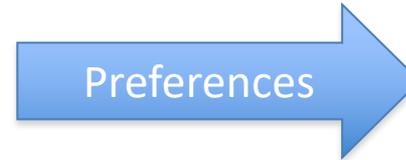
What can go wrong?



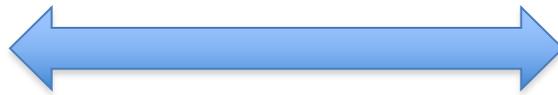
The situation is unstable!



What happens in real life



NRMP plays matchmaker



Stable Matching Problem



David Gale



Lloyd Shapley

Questions/Comments?



Matching Employers & Applicants

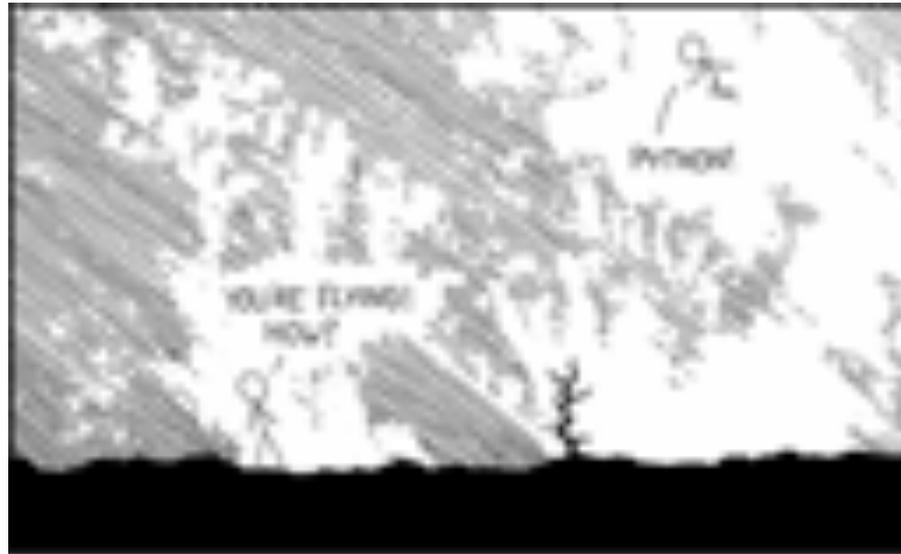
Input: Set of employers (E)
Set of applicants (A)
Preferences

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

Lost in Notation....

CSE 331 Fall 2019 Schedule

Previous schedules: [2018](#), [2017](#), [2016](#), [2014](#) , [2013](#) , [2012](#) , [2011](#) , [2010](#)  and [2009](#) .

Future Lectures

The topics for lectures in the future are tentative and subject to change. Also the links for future lectures are from [Fall 2017](#) and [Fall 2018](#). Recordings of Fall 2018 lectures are also available from [YouTube](#).

Date	Topic	Notes
Mon, Aug 26	Introduction    	(PDF 9 pages) Week 1 recitation notes
Tue, Aug 28	Main Steps in Algorithm Design     	
Fri, Aug 30	Double-Checking Problem     	(PT, Sec 1.1) (PDF 8 pages)

Questions/Comments?



Non-feminist reformulation

n men

Each with a preference list

n women

Match/marry them in a “stable” way

On matchings

Mal



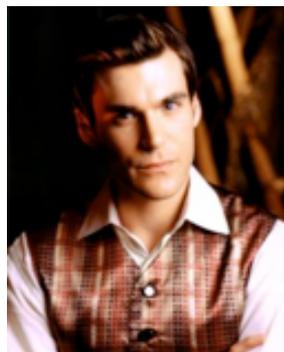
Inara

Wash



Zoe

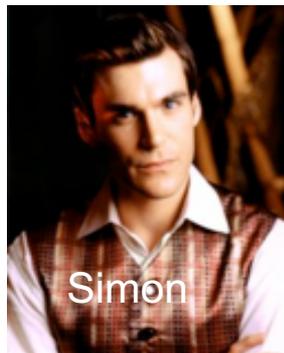
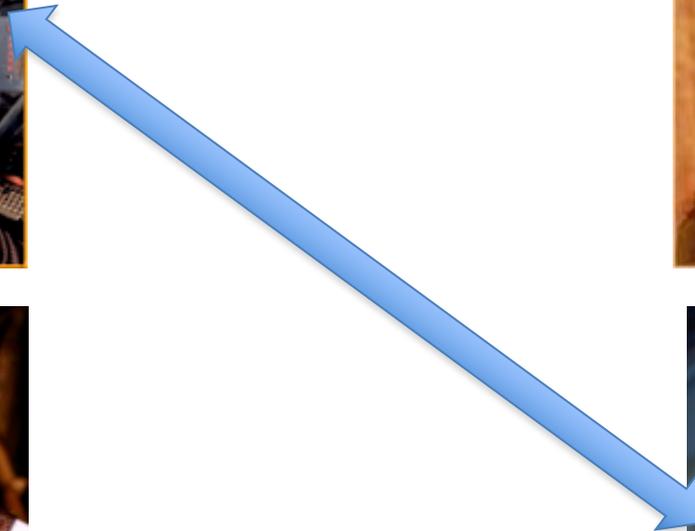
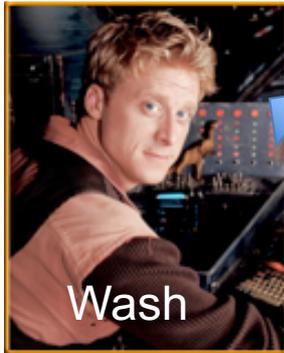
Simon



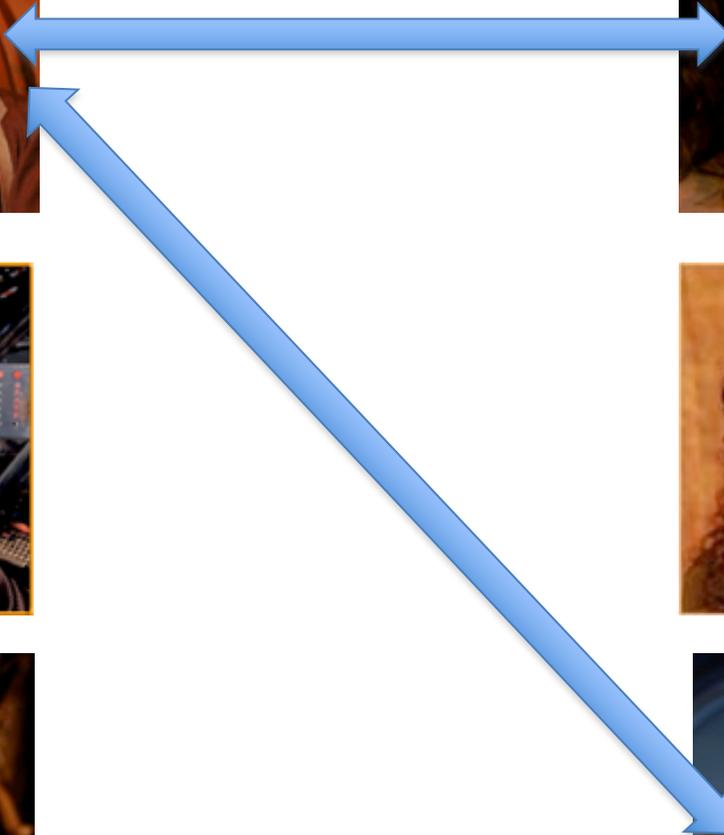
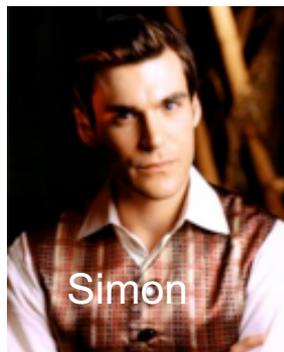
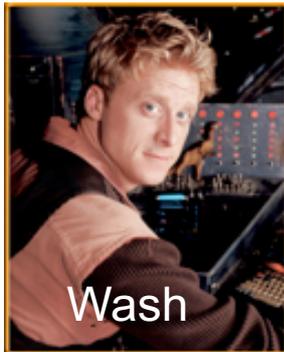
Kaylee



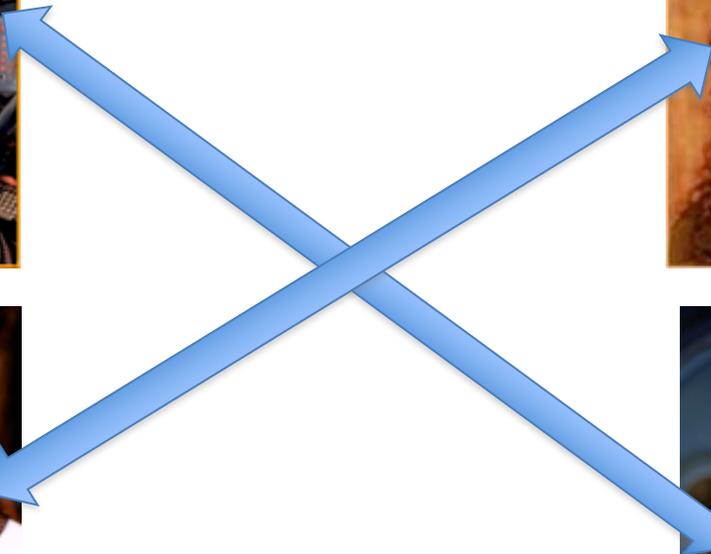
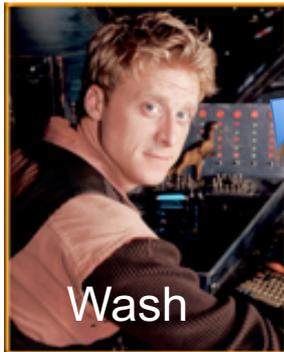
A valid matching



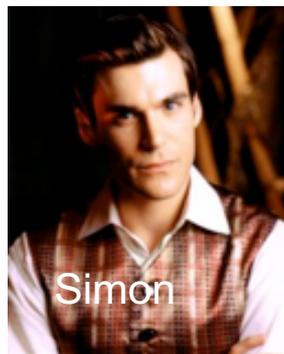
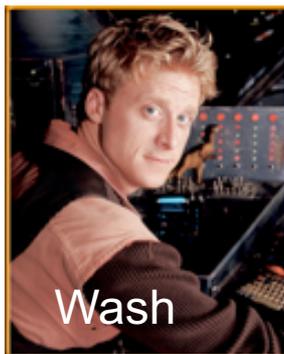
Not a matching



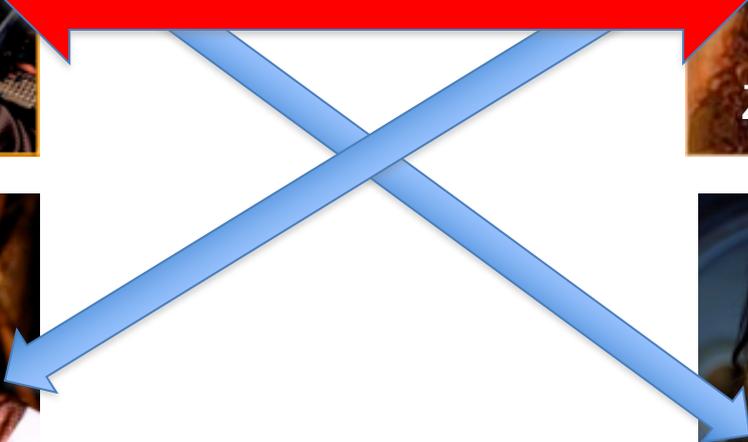
Perfect Matching



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...

