

# Lecture 3

CSE 331

Sep 3, 2021

# Please have a face mask on

## Masking requirement



*UR 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>

# Enroll on Piazza

The screenshot displays the Piazza interface for a class. On the left is a sidebar with a search bar and a list of posts. The main content area shows the 'Class at a Glance' page, which includes a 'License status' section with three green checkmarks indicating 'no unread posts', 'no unanswered questions', and 'no unresolved followups'. To the right of these checkmarks is a 'License status' section with the following details: 'pending instructor license (3 days left)', '39 total posts', '290 total contributions', '20 instructors' responses', '1 students' responses', and '15 min. avg. response time'. Below this is a 'Student Enrollment' section with a green progress bar showing '111 enrolled' out of 125 (estimated). At the bottom of the main content area, there is a 'Share Your Class' section with a demo link and a '2021 Product Updates' section.

**Class at a Glance** Updated 26 seconds ago [Refresh](#) [Go to Live Q&A](#)

**License status** pending instructor license (3 days left)

- no unread posts
- no unanswered questions
- no unresolved followups

39 total posts  
290 total contributions  
20 instructors' responses  
1 students' responses  
15 min. avg. response time

**Student Enrollment** out of 125 (estimated) [Edit](#)

111 enrolled

Download us in the app store:

**Share Your Class**

Professors appreciate Piazza best when they see how it is being used.

Allow colleagues to view your class through a demo link - a restricted, read only version of your class where all students' names are anonymized and all student information hidden.

[https://piazza.com/demo\\_login?nid=kaflye75ed7red&auth=6842948](https://piazza.com/demo_login?nid=kaflye75ed7red&auth=6842948)

Opening this link in the same browser will log you out as [anonymous](#).

**2021 Product Updates**

We wanted to share exciting news about institutions that have entered enterprise license agreements with Piazza to see if your institution has purchased an enterprise license, view our customer list [here](#). We also wanted to inform you of product updates that our team is working on in 2021.

<https://piazza.com/buffalo/fall2021/cse331/>

# Read the syllabus CAREFULLY!

## Syllabus Quiz

### Options

[View handin history](#)

[View writeup](#)

[Download handout](#)

 Due: December 16th 2021, 11:59 pm

 Last day to handin: December 16th 2021, 11:59 pm

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

### Academic Integrity

Question 1: Sharing my answers to this syllabus quiz with other 331 students

- Is OK if I do it to help out a friend
- It does not matter since there is no grade attached with it
- Is an academic integrity violation and should not be done
- Is an academic integrity violation but I can take the chance

Please do keep on asking Qs!

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

# TA office hours

Finalized by today

Details will be posted on piazza



OH next week  
dedicated to help  
with proofs

# My office hour today

In Baldy 111

note @11 stop following 97 views

## Office Hour locations

This post has the list of all default locations for our office hours as well as the zoom link in case an office hour will be held virtually. (Please note you will need to log in using our ULL zoom account to join the zoom rooms.)

(Aug 27): The list below is incomplete-- among others there is no information on TA office hours, which will be fixed by end of first week of class.)

Unfortunately, due to COVID restrictions, we might have to move the physical location of an office hour or move a physical office hour to a virtual one (an office hour marked as virtual will always be virtual) so **please check piazza before you come to an office hour to see if the location has changed**. Apologies in advance for any inconvenience this might cause y'all!

- **Atri**
  - Zoom link: <https://buffalo.zoom.us/j/97811361905?pwd=clFhLDV4TDk0c0c2b2duMmhYNkRCZr09>
  - Mon 4:30-5:20pm-- Ciemen 102 (starting Sep 13)
  - Fri 1:00--1:50pm: Baldy 111 (starting Sep 3)

# Two comments on Programming

Programming is worth about 16% 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!

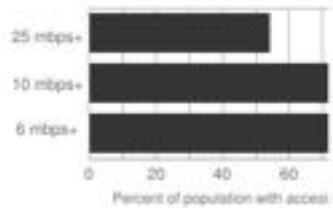
# Questions/Comments?



# Make broadband more available

## Cattaraugus County

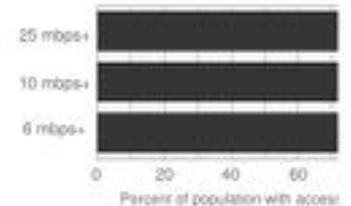
Population: 79518  
Median Income: \$41,368.88  
Access to any cable technology: 67.5%  
Access to two or more wireline providers: 61.2%



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?

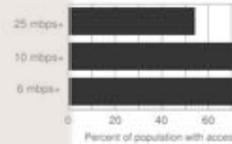
## Algorithm Design

Implement the scheme

How should we do testing and maintenance?

### Cattaraugus County

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



Is Internet a right?

Environmental factors

Security/Privacy

Where is funding coming from?

Income inequality in population

Get regulatory approval

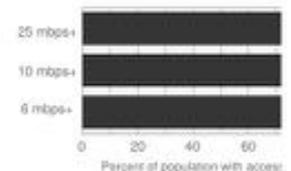
Hire people

Get access to physical space

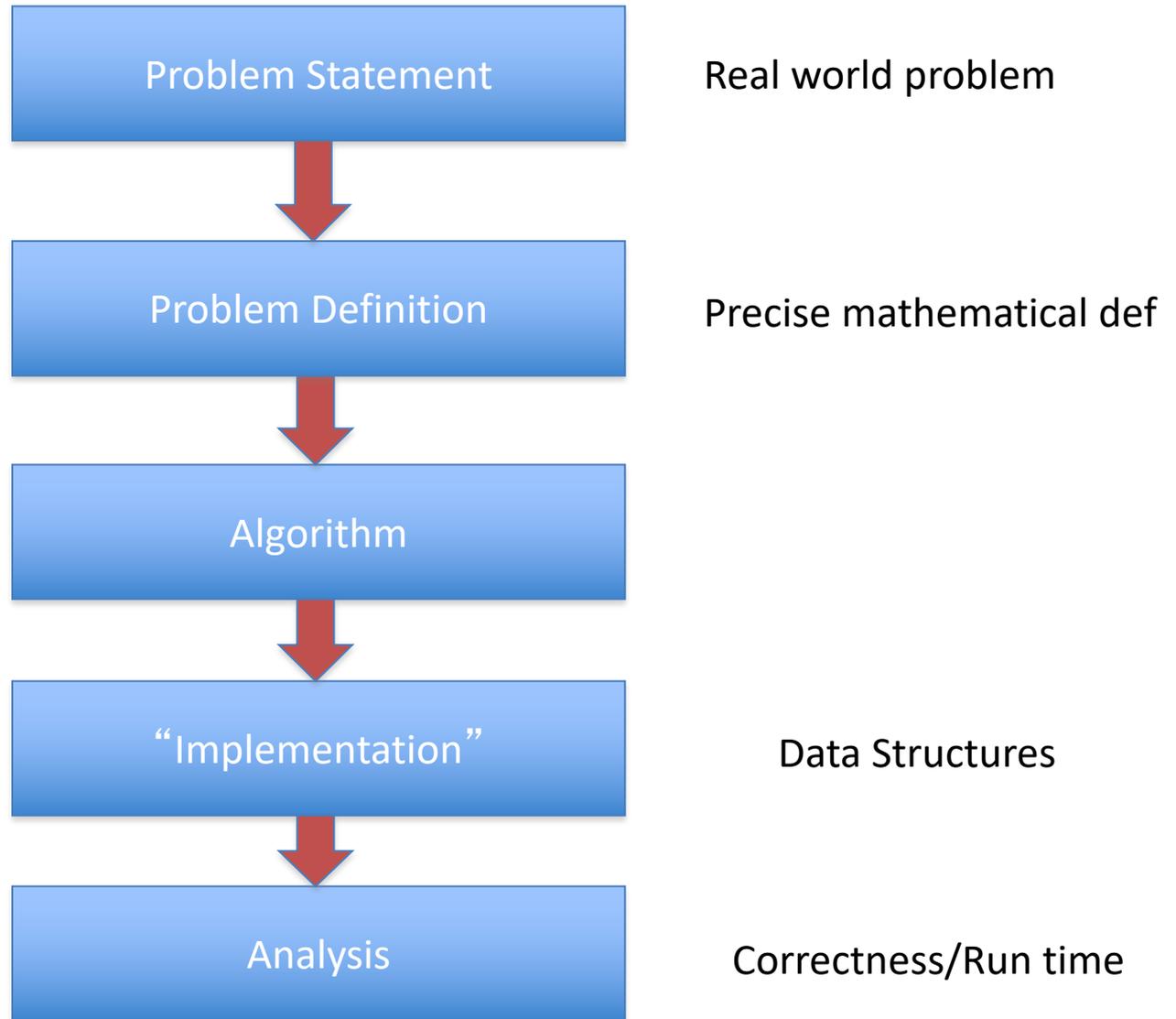
Outreach

### Erie County

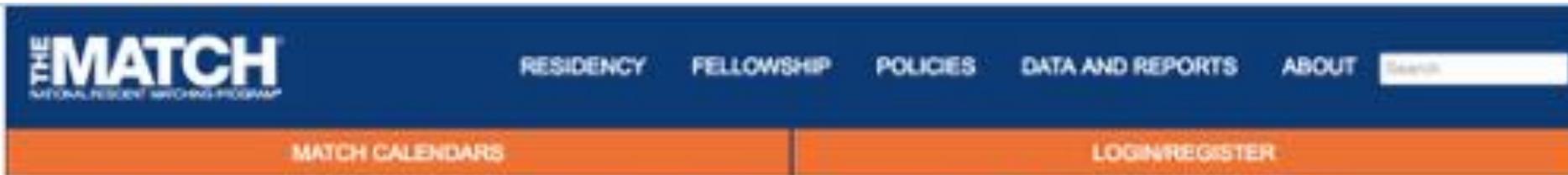
Population: 913296  
Median Income: \$49,817.67  
Access to any cable technology: 96.9%  
Access to two or more wireline providers: 96.6%



# 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 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](#)



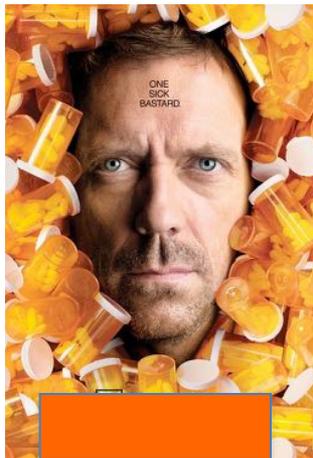
VIDEO: The Match Process for Applicants



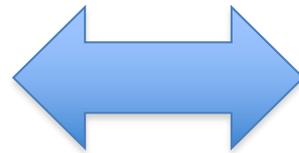
# (Screen) Docs are coming to BUF



Bailey (Grey's Anatomy)



JD (Scrubs)



Buffalo General

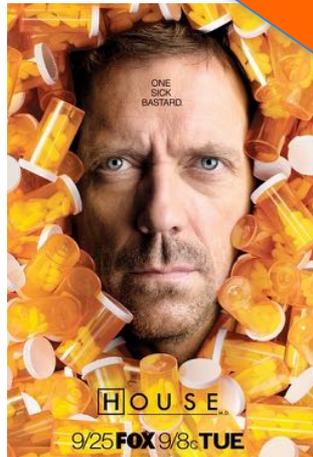


Millard Filmore (Gates Circle)

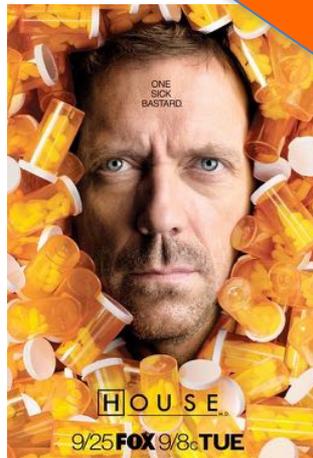


Millard Filmore (Suburban)

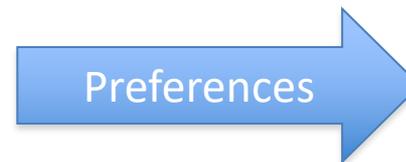
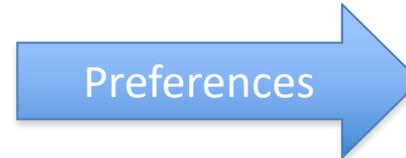
# What can go wrong?



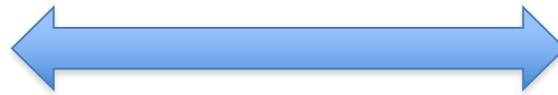
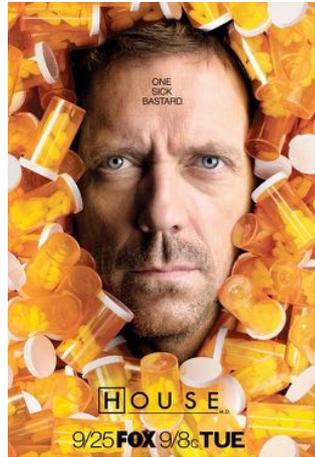
# The situation is unstable!



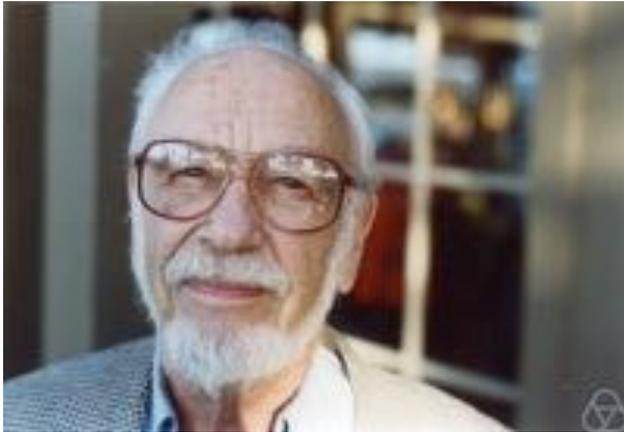
# What happens in real life



# NRMP plays matchmaker



# Stable Matching Problem



David Gale



Lloyd Shapley

# Questions/Comments?



# Matching Employers & Applicants

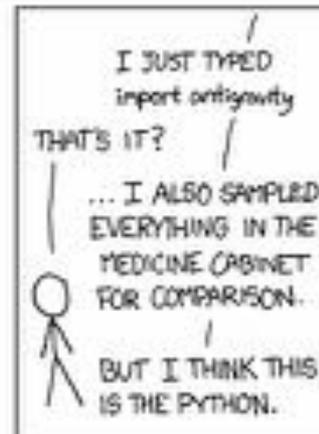
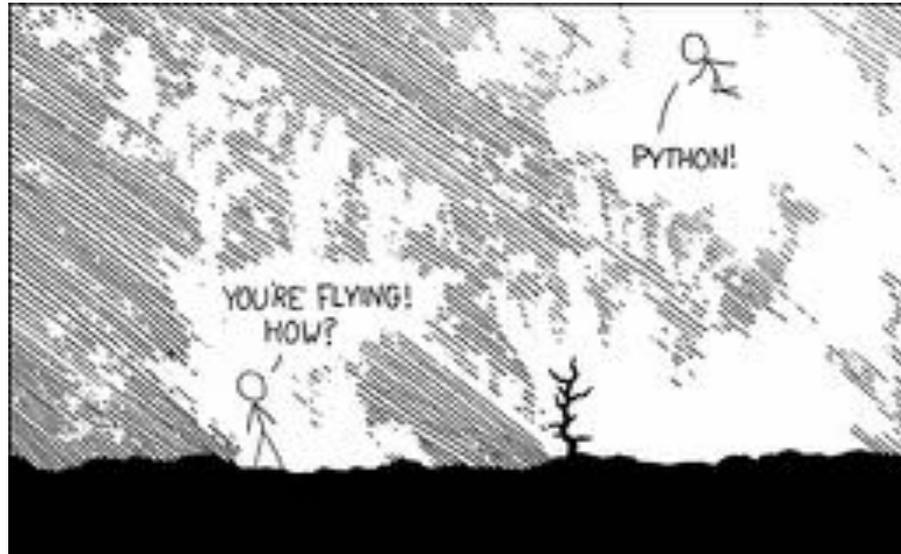
**Input:** Set of employers ( $E$ )  
Set of applicants ( $A$ )  
Preferences

**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



# 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



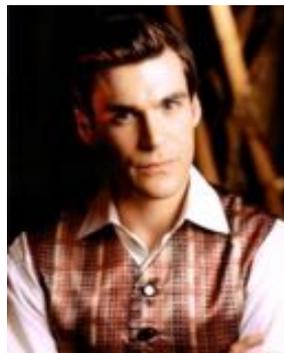
Wash



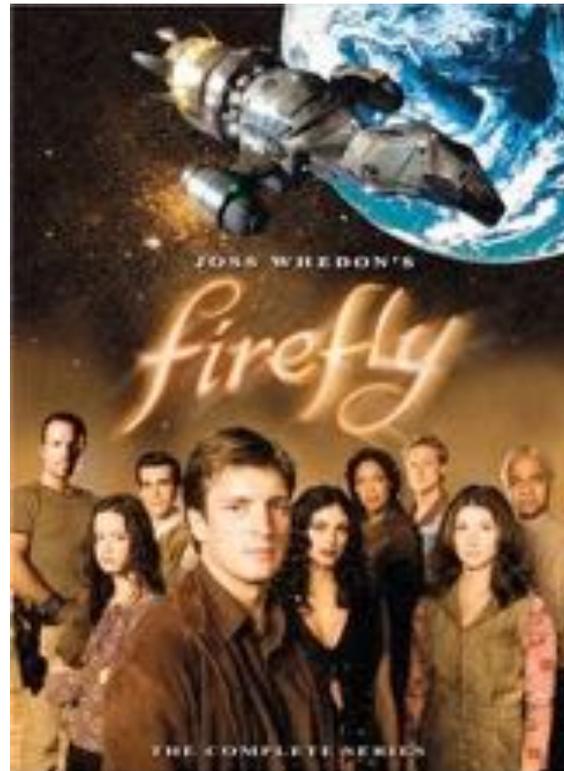
Zoe



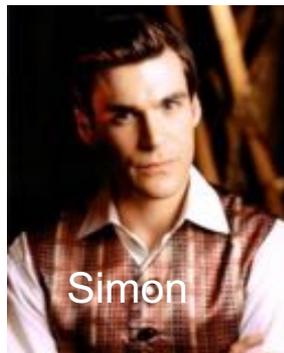
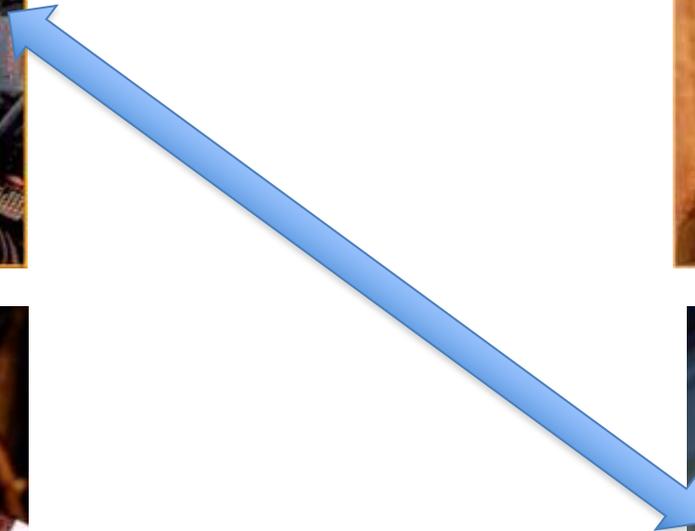
Simon



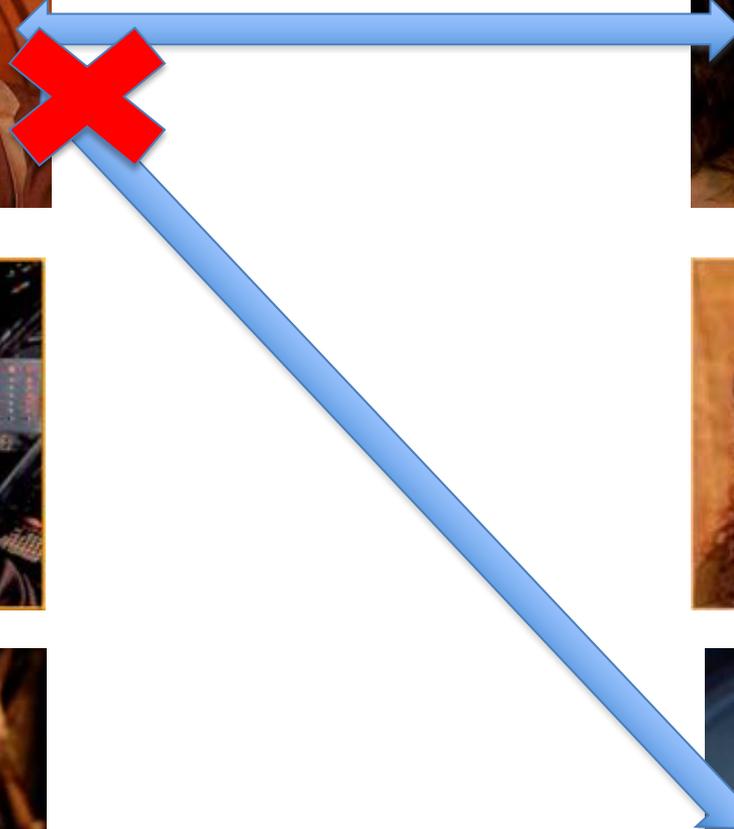
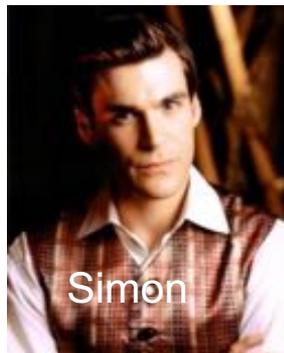
Kaylee



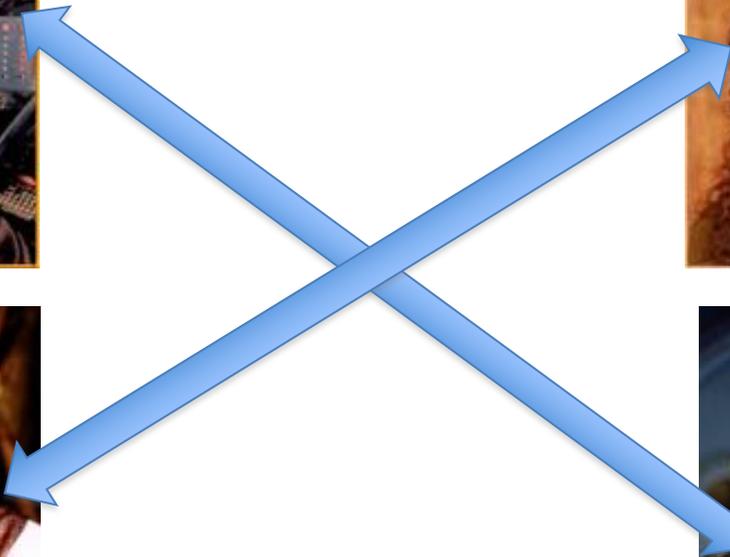
# Is this a valid matching?



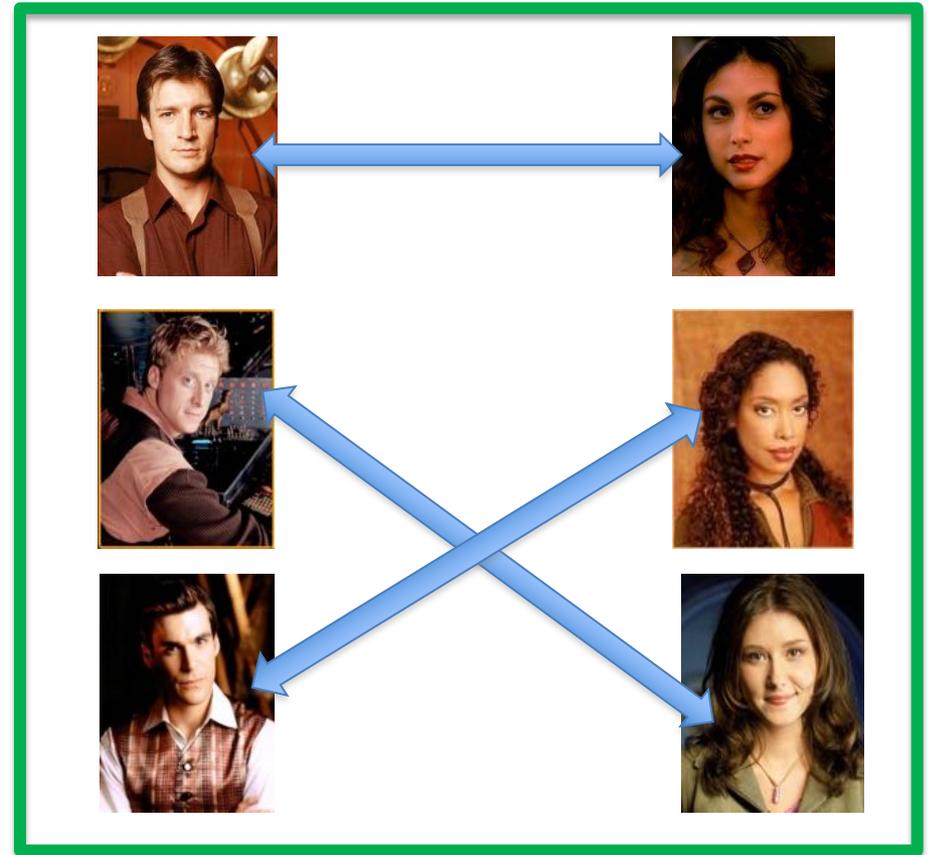
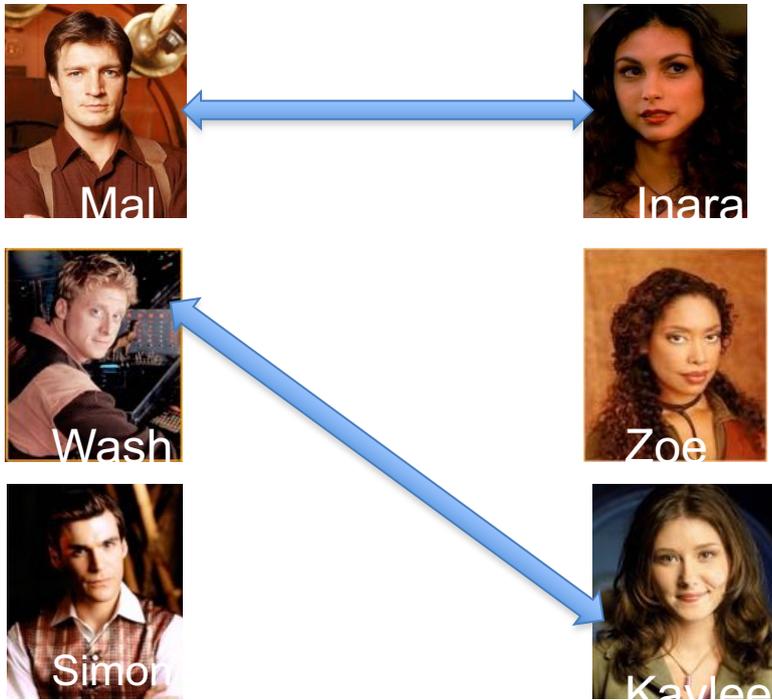
# Is this a valid matching?



# Is this a valid matching?



# Which one is a perfect matching?



Work things out on paper