

Lecture 3

CSE 331

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>

Enroll on Piazza



6 unread posts



1 unanswered questions



no unresolved followups

license status active instructor license

34 total posts

222 total contributions

42 instructors' responses

2 students' responses

10 min avg. response time

Student Enrollment

..out of 185 (estimated) [Edit](#)

171 enrolled

Download us in the app store:



<https://piazza.com/buffalo/spring2022/cse331/home>

Read the syllabus CAREFULLY!

Syllabus Quiz

Admin Options

CA Options

Options

[View handin history](#)

[View writeup](#)

[Download handout](#)

 Due: **May 16th 2022, 2:12 pm**

 Last day to handin: **May 16th 2022, 4:12 pm**

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

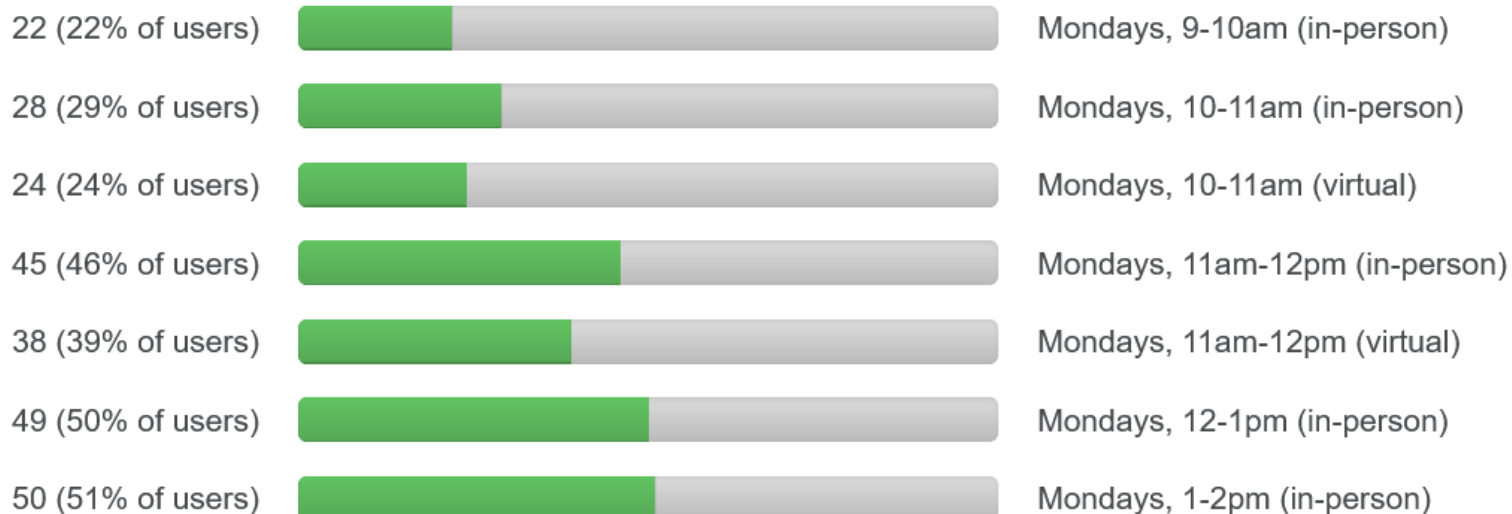
TA office hours

Almost Finalized

Details will be posted on piazza during the weekend

Vote to Select Your TA Office Hours! (Closes on Wed, at 2pm) is now closed

A total of **98** vote(s) in **121** hours



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

Apps and Societal Implications?!

STREET BUMP

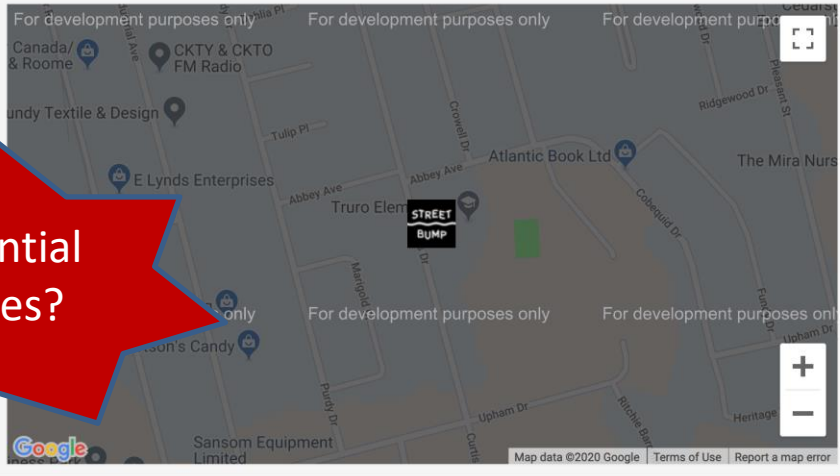
About

Sign In

Where's Street Bump being used?

549 trips, 37,016 bumps, 0 potholes filled, and 0 roadway problems identified

99 bumps reported in 101–199 Curtis Dr, Truro, NS almost 6 years ago



Want to use Street Bump to improve your community? [Contact Us](#)

What's Street Bump?

Street Bump is a crowd-sourcing project that helps residents improve their neighborhood streets. Volunteers use the Street Bump mobile app to collect road condition data while they drive. The data provides governments with real-time information to fix problems and plan long term investments.



Download on the App Store

Learn More

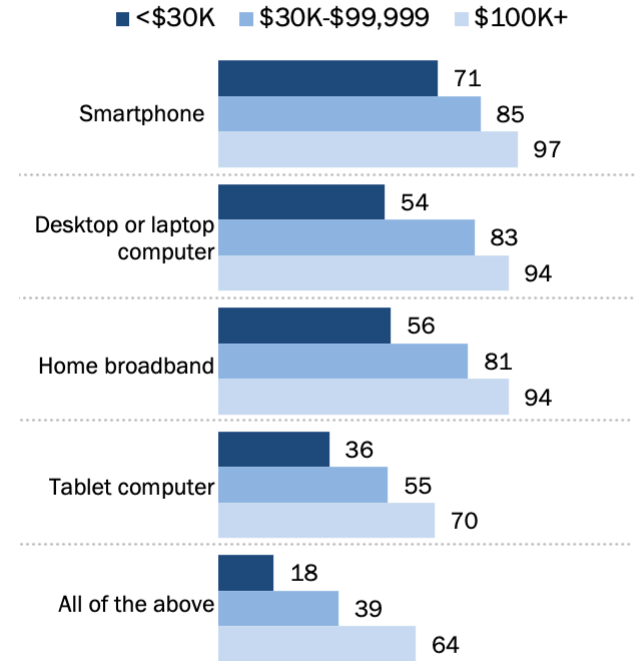
The smartphone blind-spot

Many of us in CSE assume that “everyone” has smartphones

More generally, we assume “everyone” has access to the Internet

Lower-income Americans have lower levels of technology adoption

% of U.S. adults who say they have the following ...

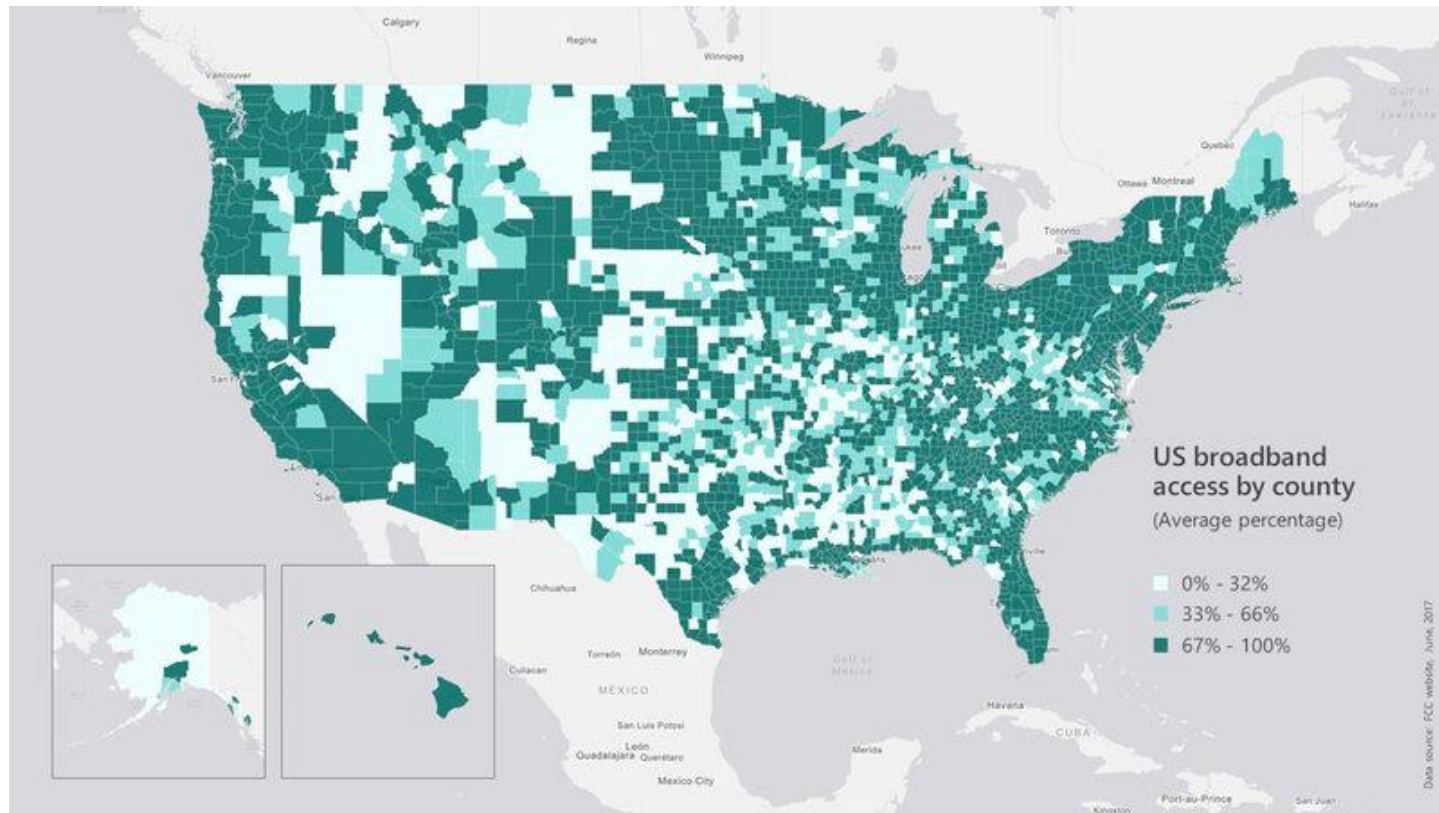


Note: Respondents who did not give an answer are not shown.
Source: Survey conducted Jan. 8-Feb. 7, 2019.

PEW RESEARCH CENTER

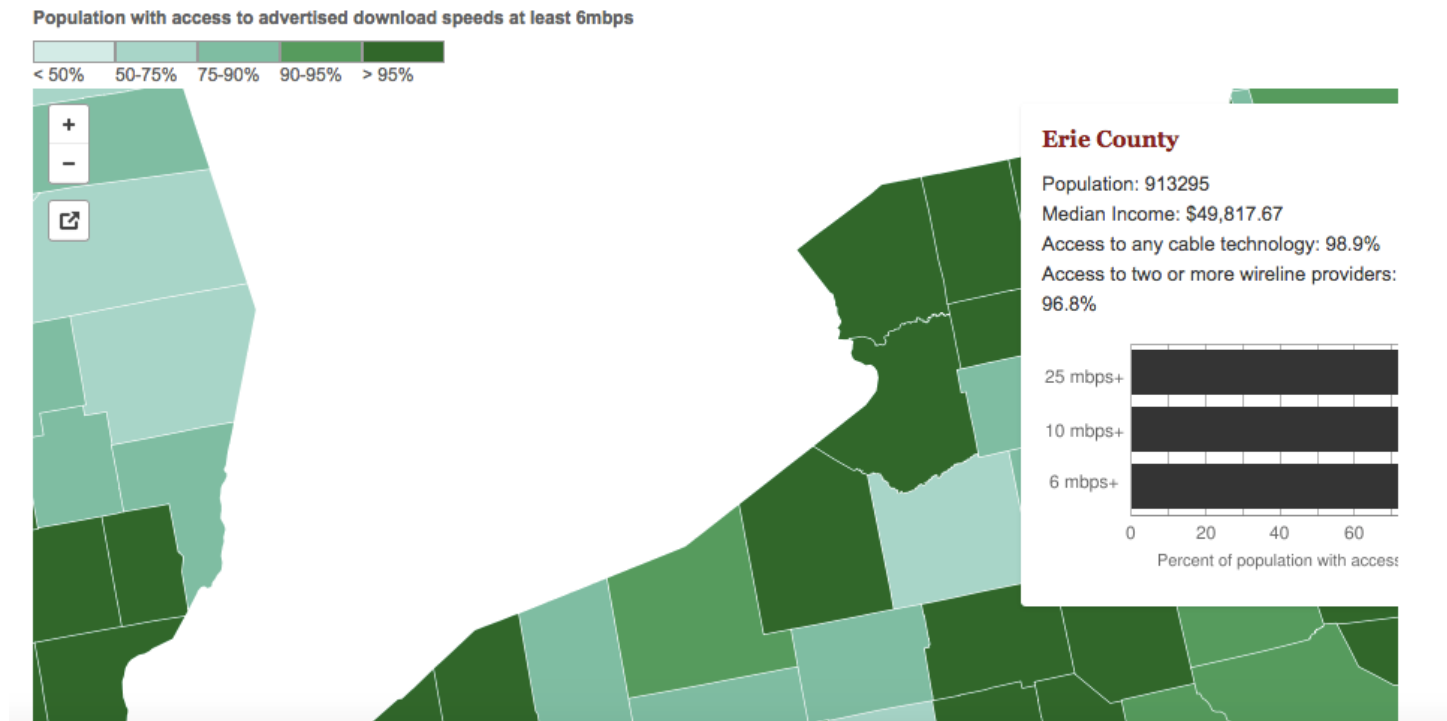
Research By Kate Crawford

Broadband access



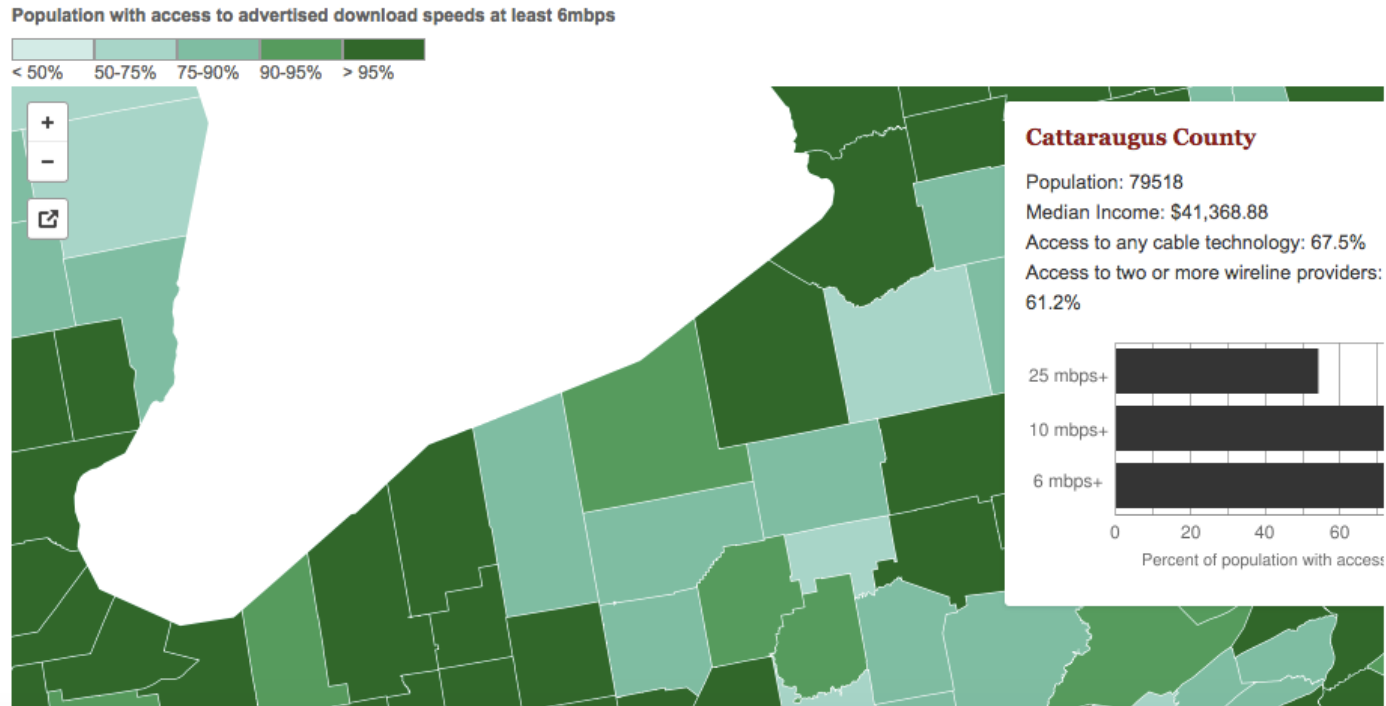
<https://assets.bwbx.io/images/users/iqjWHBFdfxIU/iZSjibxE1KJs/v1/800x-1.jpg>

Erie county is reasonably good



<http://www.governing.com/gov-data/broadband-speeds-availability.html>

One county over

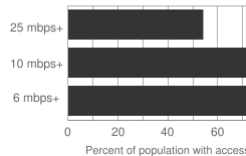


<http://www.governing.com/gov-data/broadband-speeds-availability.html>

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%

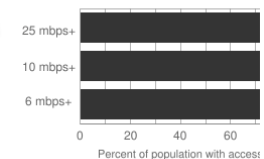


Say you are
tasked to come
up with the
infrastructure

BOTH
technical and
societal issues

Erie County

Population: 913295
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

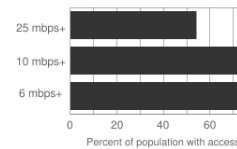
Cattaraugus County

Population: 79518

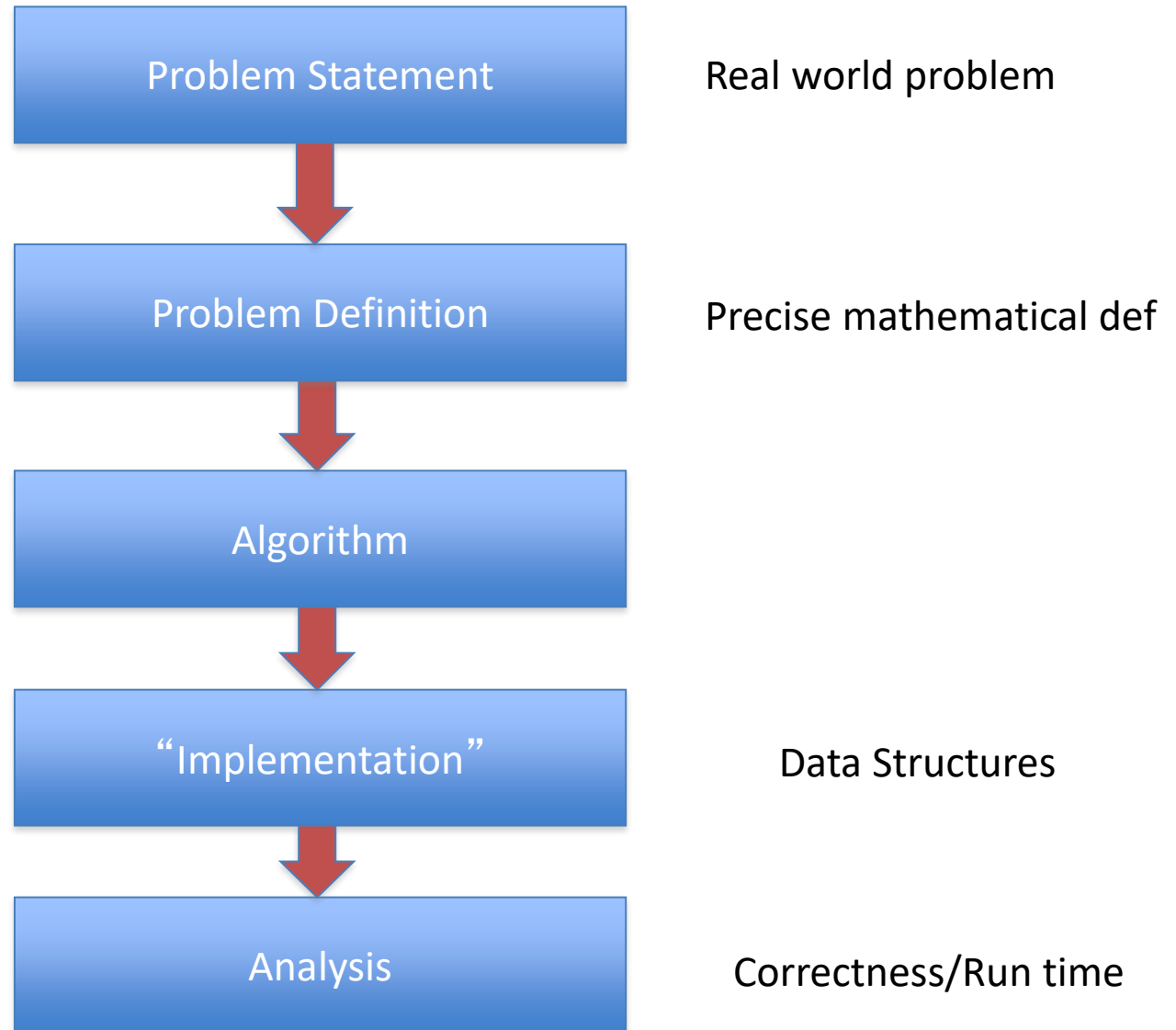
Median Income: \$41,368.88

Access to any cable technology: 67.5%

Access to two or more wireline providers:
61.2%



Main Steps in Algorithm Design



Questions/Comments?

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](#)

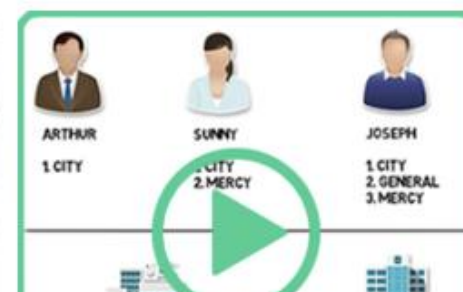
WHAT'S HAPPENING

- 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



National Resident Matching

The Matching Algorithm



The NRMP uses a computerized mathematical algorithm, the “matching algorithm,” to place applicants into the most preferred residency and fellowship positions at programs that also prefer them. The video below explains how it works:

How the Matching Algorithm Works



How the NRMP Matching Algorithm Works

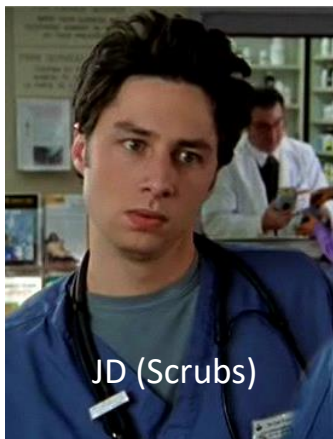
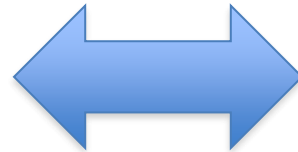
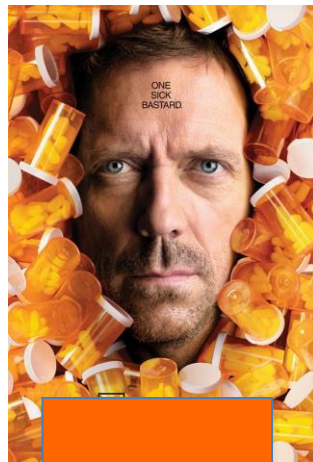


Watch later

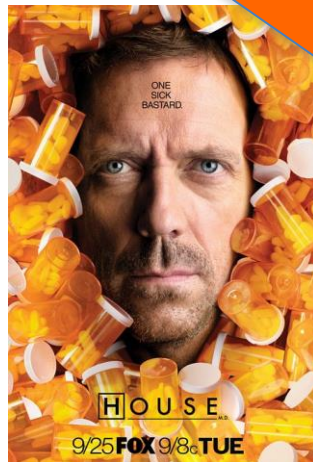


Share

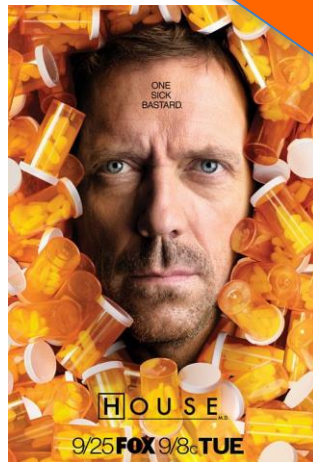
(Screen) Docs are coming to BUF



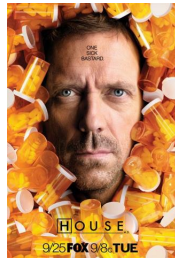
What can go wrong?



The situation is unstable!



What happens in real life



Preferences

NRMP
National Resident Matching Program



Information

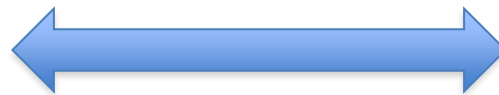
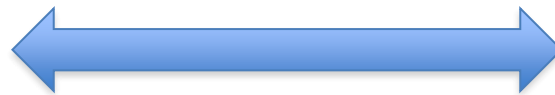
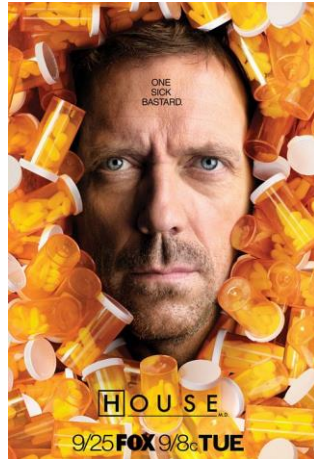
NRMP
National Resident Matching Program



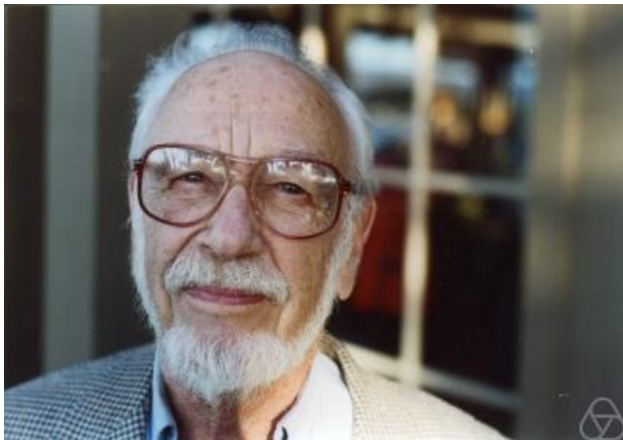
Preferences

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

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 Spring 2022 Schedule

Date	Topic	Notes
Week 1 Mon, Jan 31	Introduction    F21  F19  F18  F17	Week 1 recitation notes (HW 0 out)
Wed, Feb 2	Main Steps in Algorithm Design    F21  F19  F18  F17	
Fri, Feb 4	Stable Matching Problem  F21  F19  F18  F17 	[KT, Sec 1.1]

Questions/Comments?

A reformulation

n men

Each with a preference list

n women

Match/marry them in a “stable” way

On matchings

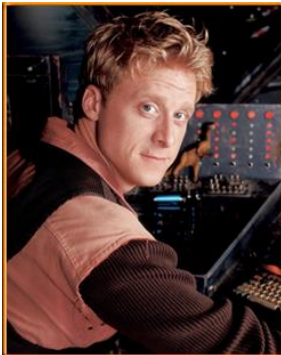
Mal



Inara



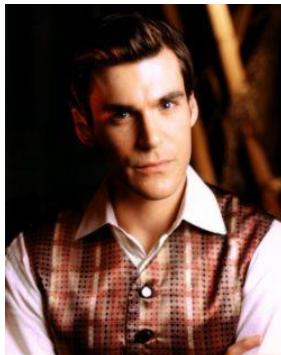
Wash



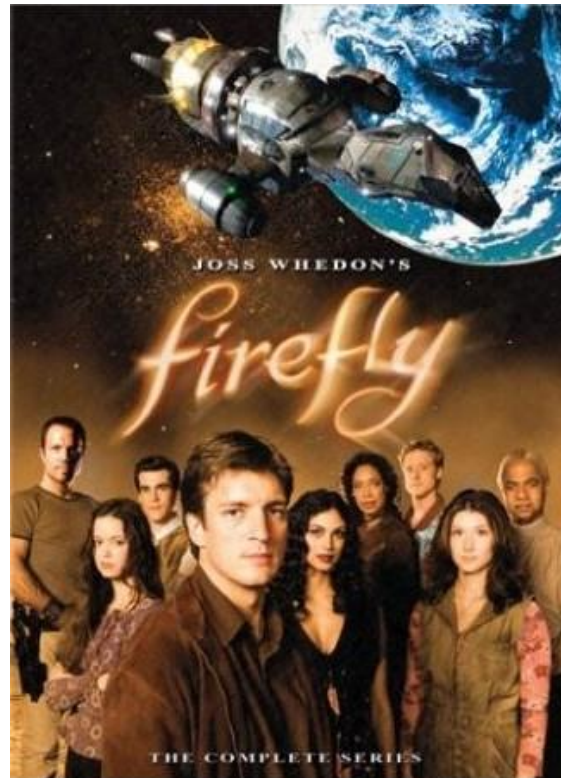
Zoe



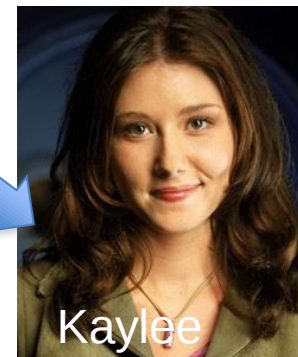
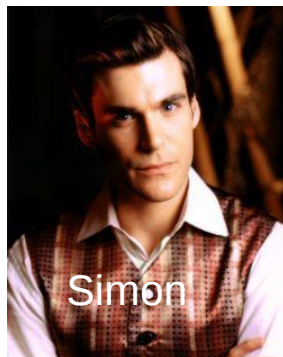
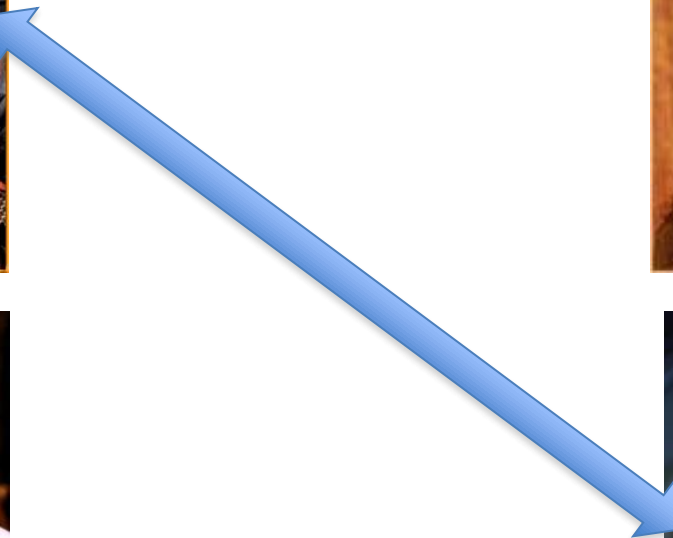
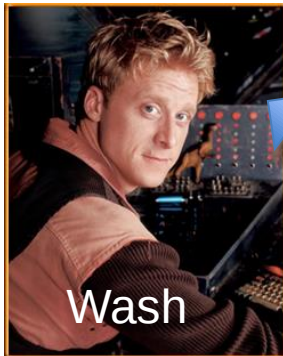
Simon



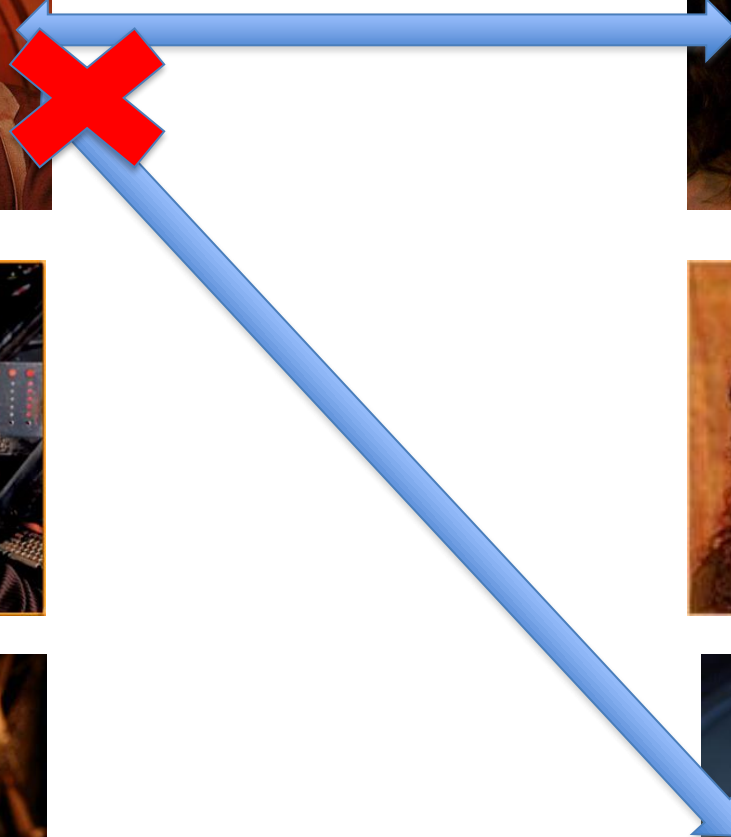
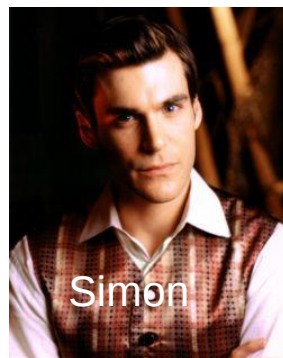
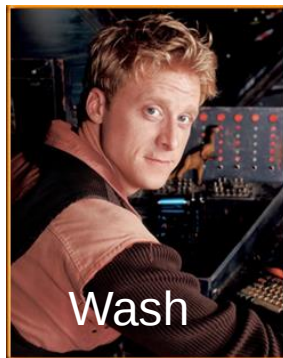
Kaylee



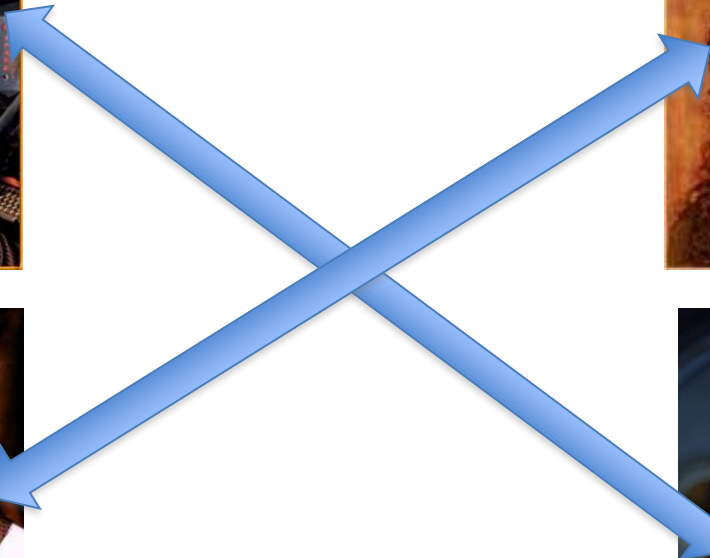
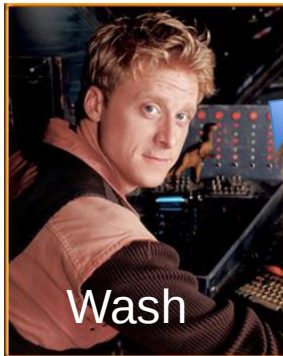
Is this a valid matching?



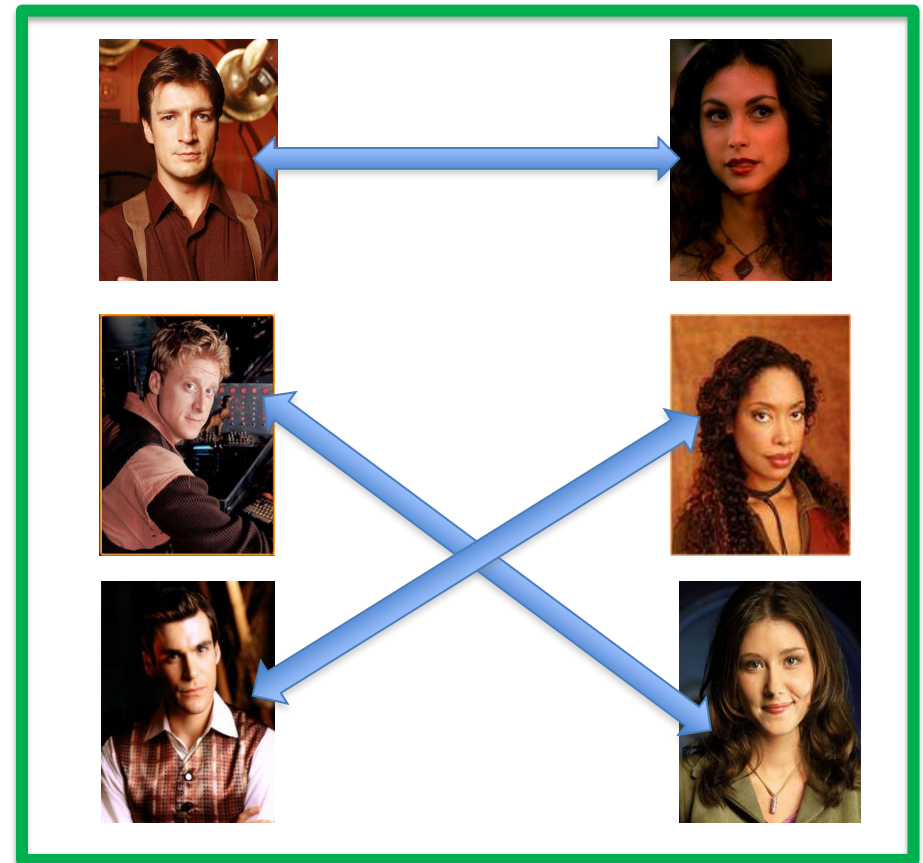
Is this a valid matching?



Is this a valid matching?



Which one is a perfect matching?



Work things out on paper