

# COMP 131: Fundamentals of Computer Science

2017-08-30

Preamble

# Register for CSP 96!

- Meet faculty and STEM students and hear about ongoing projects
  - Get acquainted with the ins and outs of completing a STEM major at Oxy
- 
- 1 credit, 12:30-1:25pm Thursdays



# Who Am I?

- Justin Li
  - You can call me Justin
- Joined Oxy in August 2015
- Professor in:
  - Cognitive Science
  - Computer Science
- Research in artificial intelligence



# What is Computer Science?

- The *organization* and *processing* of *information*
- More practically:
  - How can we automate things that are tedious to do?
  - How can we automate the management of these automated things?
  - How do people approach problems, and what knowledge do they need?
  - Robots! AI! Simulations! Smartphones!

# What is Computer Science?

- NOT just programming!
  - And definitely not just learning new languages
- Upper level classes instead focus on:
  - Applying algorithms to do useful things
  - Understanding the properties of those algorithms
  - Improving the efficiency of those algorithms
  - Making these algorithms usable by others

# Why Study It?

# 1. It Makes You a lot of \$\$\$

- That's true!
  - Entry-level software engineer: \$72,000
  - Google software engineer: \$120,000+
  - Start-up: ??? + Equity (potentially millions)
    - Facebook bought Instagram for \$1 billion
- And that's just the *starting* salary in 2015

## 2. It's Changing Everything

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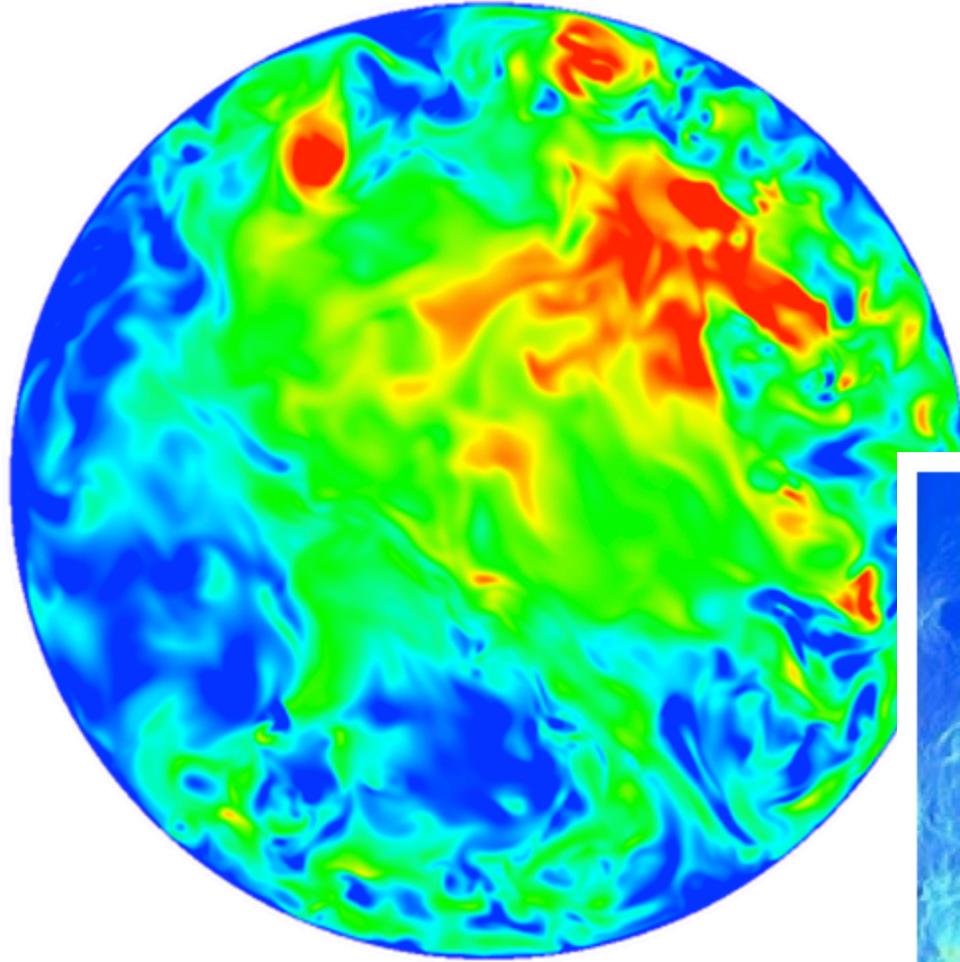
COMPUTER SCIENCE  
IS  
CHANGING EVERYTHING

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<https://www.youtube.com/watch?v=xJqSu1IbcHg>

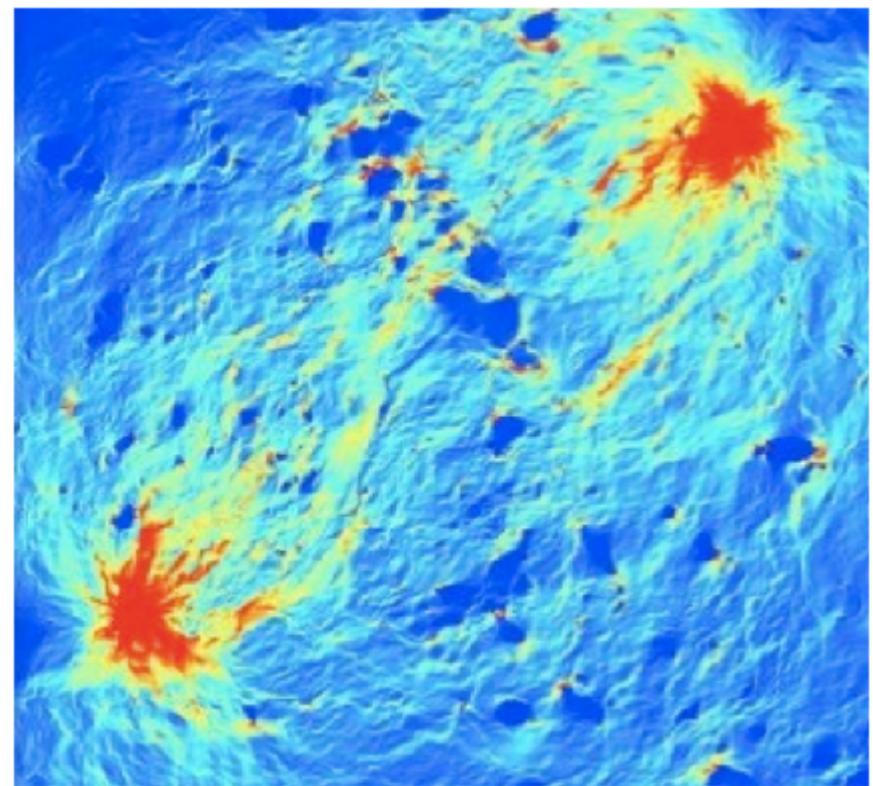
## 2. It's Changing Everything

- Challenge: name a field that computers have not touched
  - Physical sciences need simulations, analyses, and visualizations



Wood Frog Population Density  
(from Prof. Amanda Zellmer)

Velocity of Convection Heat Flow  
(from Prof. Janet Scheel)

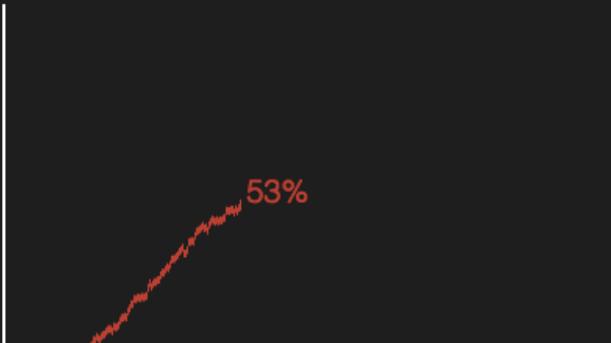


## 2. It's Changing Everything

- Challenge: name a field that computers have not touched
  - Physical sciences need simulations and data analysis
  - Social sciences use it too



AGATION

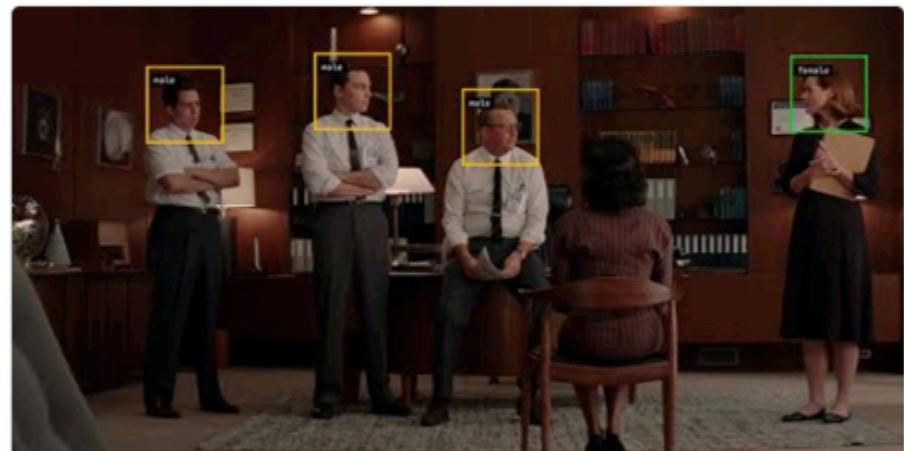


Caroline Heldman

@carolineheldman

Following

The [@GDIGM](#) GD-IQ uses technology to detect gender bias in media. Grateful to work on this dope project.



Using technology to address gender bias in film | Google

Hollywood's missing women: how Google is helping uncover gender bias in film with machine learning →

[google.com](http://google.com)

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  - Social sciences use it too
  - Humanities increasingly use digital techniques

# **‘Delta’: a Measure of Stylistic Difference and a Guide to Likely Authorship<sup>1</sup>**

**John Burrows**

University of Newcastle, Australia

## **Abstract**

This paper is a companion to my ‘Questions of authorship: attribution and beyond’, in which I sketched a new way of using the relative frequencies of the very common words for comparing written texts and testing their likely authorship. The main emphasis of that paper was not on the new procedure but on the broader consequences of our increasing sophistication in making such comparisons and the increasing (although never absolute) reliability of our inferences about authorship. My present objects, accordingly, are to give a more complete account of the procedure itself; to report the outcome of an extensive set of trials; and to consider the strengths and limitations of the new procedure. The procedure offers a simple but comparatively accurate addition to our current methods of distinguishing the most likely author of texts exceeding about 1,500 words in length. It is of even greater value as a method of reducing the field of likely candidates for texts of as little as 100 words in length. Not unexpectedly, it works least well with texts of a genre uncharacteristic of their author and, in one case, with texts far separated in time across a long literary career. Its possible use for other classificatory tasks has not yet been investigated.

## 2. It's Changing Everything

- Challenge: name a field that computers have not touched
  - Physical sciences need simulations, analyses, and visualizations
  - Social sciences need it too
  - Humanities increasingly use digital techniques
  - (Interactive) digital arts



## 2. It's Changing Everything

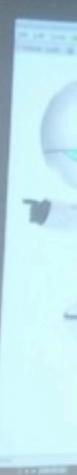
- Challenge: name a field that computers have not touched
  - Physical sciences need simulations, analyses, and visualizations
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  - (Interactive) digital arts
  - Philosophical questions
    - Can computers be conscious?

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- Challenge: name a field that computers have not touched
  - Physical sciences need simulations, analyses, and visualizations
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  - Humanities increasingly use digital techniques
  - (Interactive) digital arts
  - Philosophical questions
    - Can computers be conscious? (Take COGS 101!)

### 3. It's Fun!

- Taught LEGO robotics to middle school kids







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- Procrastinate by writing small web apps
  - <https://appoxy.herokuapp.com/jeopardy/>

The Mind	The Brain	Computation	Cognitive Psychology	Linguistics	Miscellaneous
\$100	\$100	\$100	\$100	\$100	\$100
\$200	\$200	\$200	\$200	\$200	\$200
\$300	\$300	\$300	\$300	\$300	\$300
\$400	\$400	\$400	\$400	\$400	\$400
\$500	\$500	\$500	\$500	\$500	\$500
\$600	\$600	\$600	\$600	\$600	\$600

### 3. It's Fun!

- Taught LEGO robotics to middle school kids
- Procrastinate by writing small web apps
  - <http://justinnhli-oxy.herokuapp.com/>
- As a personal journal assistant

```

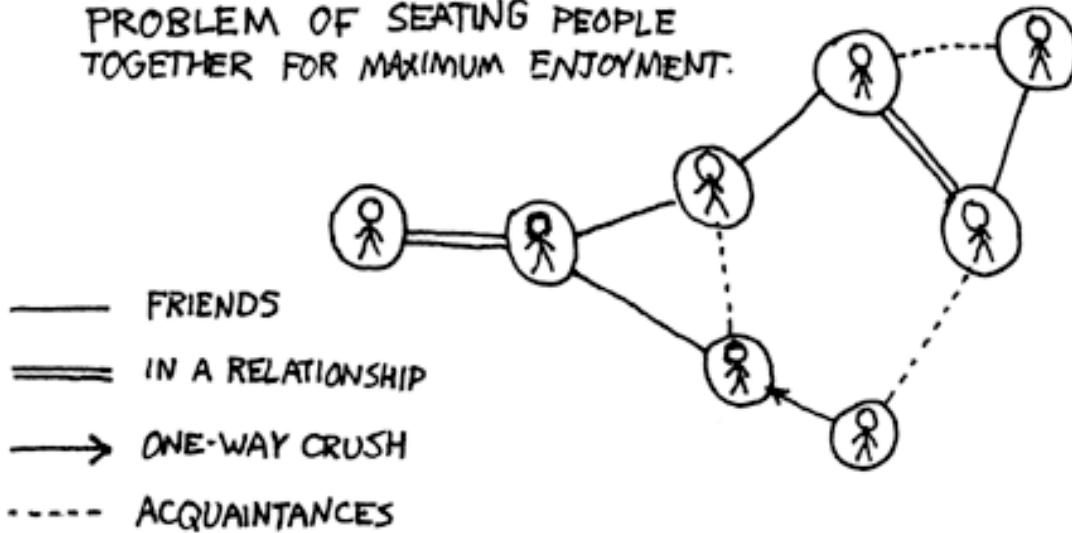
journal.py [1]
29 LOG_FILE = ".log"
30 METADATA_FILE = ".metadata"
31 TAGS_FILE = ".tags"
32 CACHE_FILE = ".cache"
33 INDEX_FILE = ".index"
34
35 arg_parser = ArgumentParser(usage="%(prog)s <operation> [options] [TERM ...]", description="A command line tool for viewing and maintaining a journal.")
36 arg_parser.set_defaults(directory= "./", headers=True, ignores=[], icase=re.IGNORECASE, reverse=False, log=True, terms=[], unit="year", use_cache="yes")
37 arg_parser.add_argument("--terms", metavar="TERM", nargs="*", help="pattern which must exist in entries")
38 group = arg_parser.add_argument_group("OPERATIONS").add_mutually_exclusive_group(required=True)
39 group.add_argument("-A", dest="op", action="store_const", const="archive", help="archive to datetimed tarball")
40 group.add_argument("-C", dest="op", action="store_const", const="count", help="count words and entries")
41 group.add_argument("-G", dest="op", action="store_const", const="graph", help="graph entry references in DOT")
42 group.add_argument("-L", dest="op", action="store_const", const="list", help="list entry dates")
43 group.add_argument("-S", dest="op", action="store_const", const="show", help="show entry contents")
44 group.add_argument("-U", dest="op", action="store_const", const="update", help="update tags and cache file")
45 group.add_argument("-V", dest="op", action="store_const", const="verify", help="verify journal sanity")
46 group = arg_parser.add_argument_group("INPUT OPTIONS")
47 group.add_argument("--directory", dest="directory", action="store", help="use journal files in directory")
48 group.add_argument("--ignore", dest="ignores", action="append", help="ignore specified file")
49 group.add_argument("--use-cache", dest="use_cache", action="store", choices=("yes", "no"), help="use cached entries and indices")
50 group = arg_parser.add_argument_group("FILTER OPTIONS (APPLIES TO -[CLS])")
51 group.add_argument("-d", dest="date_range", action="store", help="only use entries in range")
52 group.add_argument("-I", dest="icase", action="store_false", help="ignore case-insensitivity")
53 group.add_argument("-n", dest="num_results", action="store", type=int, help="limit number of results")
54 group = arg_parser.add_argument_group("OUTPUT OPTIONS")
55 group.add_argument("-P", dest="reverse", action="store_true", help="reverse chronological order")
56 group = arg_parser.add_argument_group("OPERATION-SPECIFIC OPTIONS")
57 group.add_argument("--no-log", dest="log", action="store_false", help="([S] do not log search")
58 group.add_argument("--no-headers", dest="headers", action="store_false", help="([C] do not print headers")
59 group.add_argument("--unit", dest="unit", action="store", choices=("year", "month", "day"), help="([C] set tabulation unit")
60 args = arg_parser.parse_args()
61
62 is_maintenance_op = args.op in ("archive", "update", "verify")
63 if is_maintenance_op:
64     for option_dest in ("date_range", "icase", "terms"):
65         setattr(args, option_dest, arg_parser.get_default(option_dest))
66
67 if args.date_range and not all(dr and RANGE_REGEX.match(dr) for dr in args.date_range.split(",")):
68     arg_parser.error("argument -d: '()' should be in format YYYY[-MM[-DD]][::]YYYY[-MM[-DD]][::]")
69 if args.num_results is not None and args.num_results < 1:
70     arg_parser.error("argument -n: '()' should be a positive integer".format(args.num_results))
71 args.directory = realpath(expanduser(args.directory))
72 args.ignores = set(realpath(expanduser(path.strip())) for arg in args.ignores for path in arg.split(","))
73 args.terms = set(args.terms)
74
75 if args.op == "archive":
76     filename = "jnl" + datetime.now().strftime("%Y%m%d%H%M%S")
77     with tarfile.open("{}.tarz".format(filename), "w:xz") as tar:
78         tar.add(args.directory, arcname=filename, filter=(lambda tarinfo: None if basename(tarinfo.name).startswith(".") else tarinfo))
79         tar.add(argv[0], arcname=join_path(filename, basename(argv[0])))
80     exit()
81
82 log_file = join_path(args.directory, LOG_FILE)
83 metadata_file = join_path(args.directory, METADATA_FILE)
84 tags_file = join_path(args.directory, TAGS_FILE)

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# Spring Break Road Trip

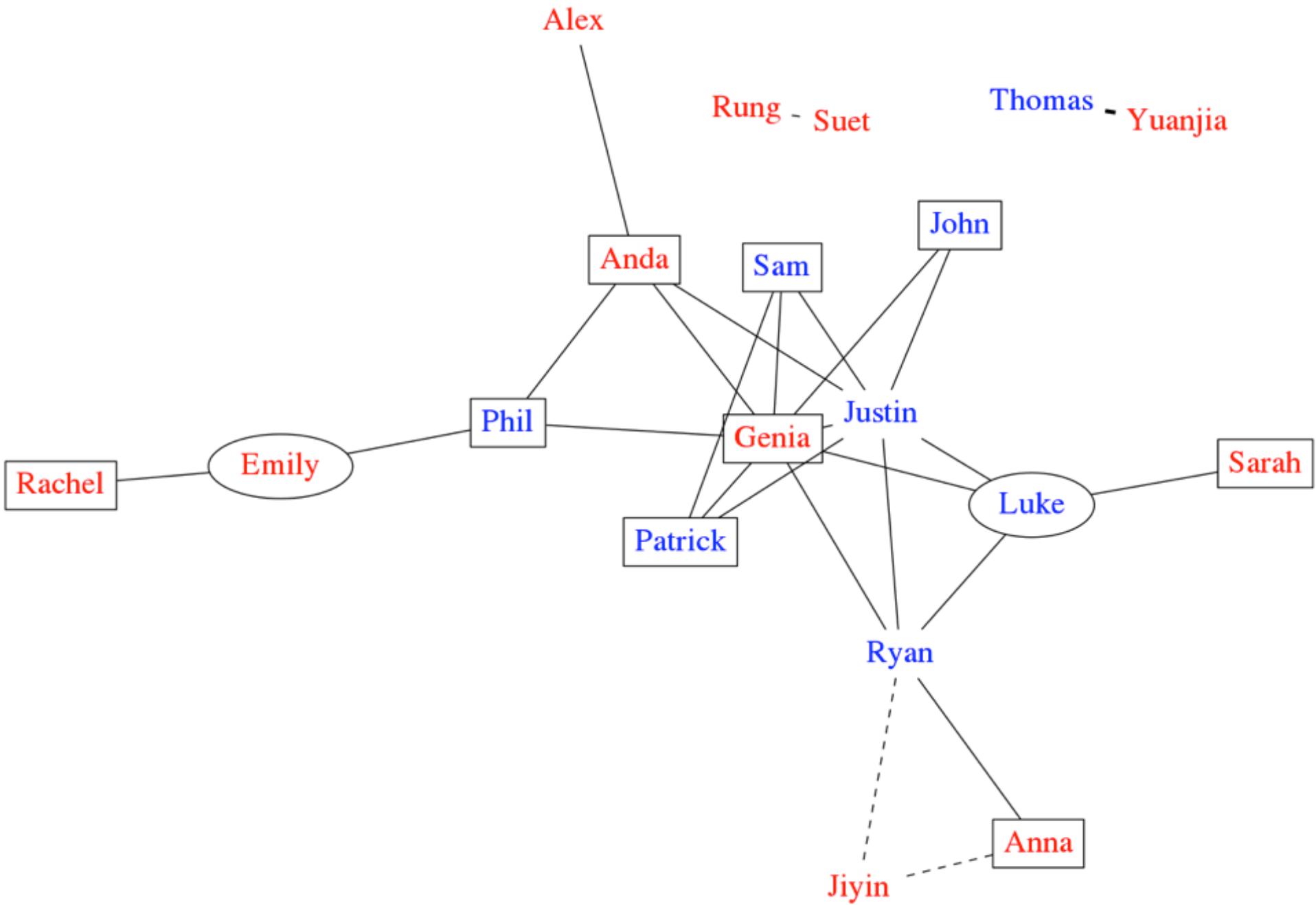
- In 2009, Justin went on spring break...
  - 24 hr drive from Chicago to Zion National Park
  - 19 people
  - 12 drivers
  - 3 cars
- Question: Who should go in which car?
  - What do we need to consider?

AT THE MOVIES, I GET FRUSTRATED  
WHEN WE FILE INTO OUR ROW  
HAPHAZARDLY, IGNORING THE  
COMPUTATIONALLY DIFFICULT  
PROBLEM OF SEATING PEOPLE  
TOGETHER FOR MAXIMUM ENJOYMENT.

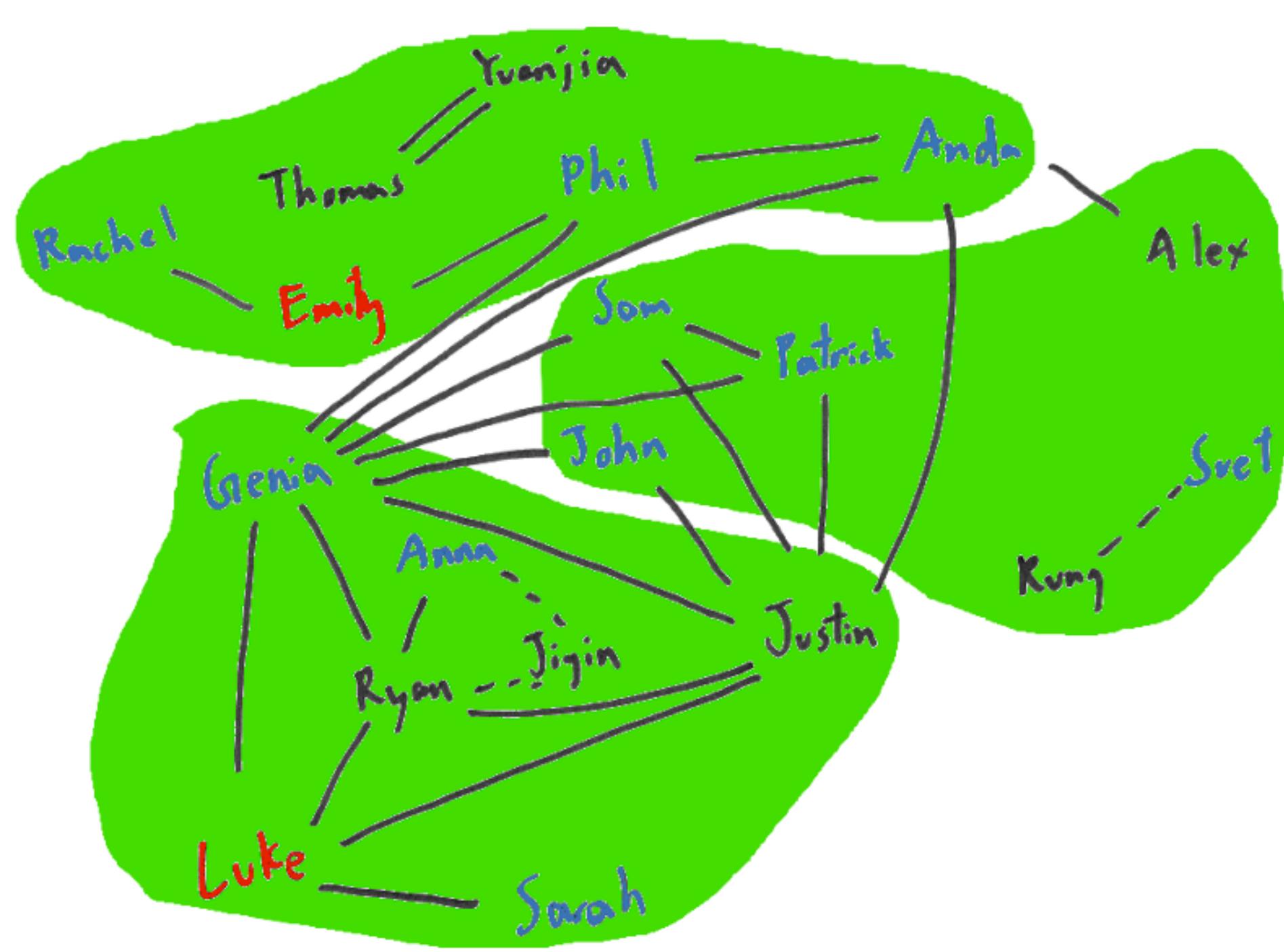


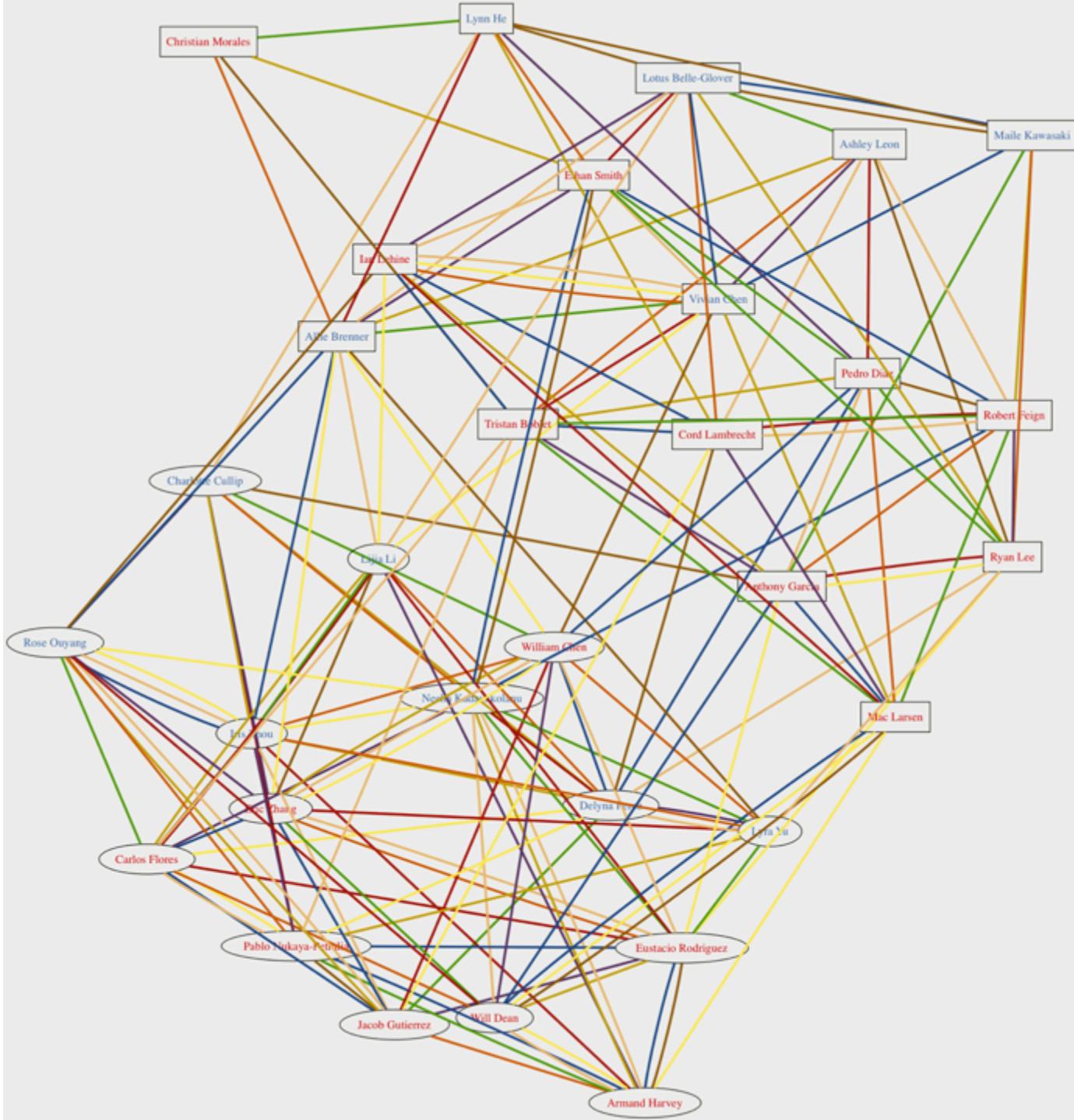
GUYS! THIS IS NOT  
SOCIALLY OPTIMAL!





	Alex	Anda	Anna	Emily	Genia	Jiyan	John	Justin	Luke	Patrick	Phil	Rachel	Rung	Ryan	Sam	Sarah	Suet	Thomas	Yuanjia	Opt A	Opt B
Alex	X	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Anda		X	0	0	2	0	0	2	0	1	2	0	0	0	0	0	0	0	2	2	
Anna			X	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
Emily				X	0	0	0	0	0	0	2	2	0	0	0	0	0	0	4	4	
Genia					X	0	2	2	2	2	2	0	0	2	2	0	0	0	4	6	
Jiyan						X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
John							X	2	0	0	0	0	0	0	0	0	0	0	2	0	
Justin								X	2	2	0	0	0	2	2	0	0	0	0	4	
Luke									X	0	0	0	0	0	0	2	0	0	0	2	
Patrick										X	0	0	0	0	2	0	0	0	2	2	
Phil											X	0	0	0	0	0	0	0	0	0	
Rachel												X	0	0	0	0	0	0	0	0	
Rung													X	0	0	0	1	0	0	1	
Ryan														X	0	0	0	0	0	0	
Sam														X	0	0	0	0	0	0	
Sarah															X	0	0	0	0	0	
Suet																X	0	0	0	0	
Thomas																	X	4	4	4	
Yuanjia																		X	0	0	
Opt A	R	E	R	E	R	L	R	R	L	L	E	E	L	L	L	R	E	E	21		
Opt B	R	E	L	E	L	L	R	L	L	R	E	E	R	L	R	L	R	E	E	29	





# 4. Why Should **YOU** Study CS?

- 22 Undeclared
  - 3 Cognitive Science
  - 2 Mathematics
  - 2 Diplomacy and World Affairs
  - 1 Theater
  - 1 Spanish Studies
  - 1 French Studies
  - 1 Economics
  - 1 Critical Theory/Social Justice
  - 1 Biology
  - 1 American Studies
  - 7 First-years
  - 17 Sophomores
  - 3 Juniors
  - 5 Seniors
- (with apologies)
- 20 "Female"
  - 12 "Male"

# Technology and Society

- Pokemon Go in the Holocaust Museum
  - <http://arstechnica.com/gaming/2016/07/some-public-places-want-more-pokemon-go-but-the-holocaust-museum-does-not/>
- Black BART riders: 6% ridership, 20% reported on app
  - <http://fusion.net/story/180369/we-need-to-engineer-the-racism-out-of-apps/>
- Facial recognition system fails on POC
  - <https://medium.com/@Joy.Buolamwini/incoding-in-the-beginning-4e2a5c51a45d>
- AI deduces man:programmer :: woman:homemaker
  - <https://www.technologyreview.com/s/602025/how-vector-space-mathematics-reveals-the-hidden-sexism-in-language/>
- Self driving car must be programed to kill
  - <https://www.technologyreview.com/s/542626/why-self-driving-cars-must-be-programmed-to-kill/>

# Homework

- Fill out the Computer Science Survey
- Buy the textbook (instructions on Moodle)
- Read the Syllabus
- Read Sections 1.1 and 1.2
  
- (Yes, this is part of your grade)