Crowdsourcing

CS 347
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Announcements

Abstract revisions due next Weds

We will send feedback on your drafts — use it to refine your idea and get it to a point where you had a crisp idea of your project!

(Yes, you can still pivot if you want. But make sure to check your new idea with the staff!)

P.S. Write commentaries separately; website is just for submitting and may eat your work
How might computing connect us to tackle bigger, harder problems together?
Today: crowdsourcing

Peer production: decisions made collectively

• Open source software, collaborative encyclopedias, and Q&A
• Success disasters in peer production
• The role of community leaders

Crowdsourcing: decisions made centrally

• The Wisdom of Crowds and the threat of path dependence
• Creating complex outcomes

The future of work
Peer production
What is peer production?

[Benkler 2002]

Modes of production are ways that people create the things they need to survive and thrive.

You’re very familiar with one mode of production: firm-based production, where there exist clear boundaries on who’s in and who’s out, and typically hierarchical control.

However, the internet has enabled another mode: peer production, where volunteers self-organize.
Peer production examples

- Wikipedia
- Linux
- StackOverflow
When should we use it?

Yochai Benkler [2002] asks: what is peer production good at?

“Peer production is limited not by the total cost or complexity of a project, but by its modularity.” [Benkler 2002]

In other words, can we break it down into mostly-independent pieces?
Conflicts and coordination

What happens to collaboration costs as Wikipedia grows?
[Kittur, Suh, Pendleton, and Chi, CHI ’07]

Amount of direct work on articles goes down, and activity on coordination pages goes up.
Conjecture: the tools and regulations put into place to deal with spam as Wikipedia grew wound up making the site less welcoming for newcomers.

Q: What do we think happened this year?

Decline!

[Halfaker et al., American Behavioral Scientist '13]

https://stats.wikimedia.org/v2/#/en.wikipedia.org/contributing/active-editors/normal|line|all|~total|monthly
What makes a leader in a peer production project?

Even self-organized collectives develop leadership structures, and those structures ossify over time [Shaw and Hill 2014]

Reader-to-leader framework [Preece and Shneiderman, AIS Trans. HCI ’09]: Readers > Contributors > Collaborators > Leaders

Goal: guide users into each new stage. See also: legitimate peripheral participation [Lave and Wenger ’91]

Leaders are born, not made [Panciera et al. GROUP ’09]

We can classify future power editors even from their first day!
What powers do leaders have?

[Keegan and Gergle, CSCW ’10]

How powerful are leaders in open communities like Wikipedia?

Method: data mine deliberations for breaking news articles on the Wikipedia homepage. Stories were nominated and voted on by elite, middle-class, or newbie editors.

Result: “one-sided gatekeeping”

Elite editors could block nominations, but had no ability to get their own nominations approved.
Do we work on the right topics?

[Warncke-Wang et al., ICWSM ’15]

How do we know if open source software and Wikipedia are actually working on content that matters?

Method: use Wikipedia logs to measure the web pages people are reading, and compare those levels of readership to the quality level of the corresponding articles

Results: 40% of pageviews are to articles that are lower quality than should be if views and quality were perfectly correlated

Most over-represented: countries, pop music, internet, comedy
Recall: Answer Garden

[Ackerman and Malone, OIS '90]

An “organizational memory” system: knowing what the company knows

Main idea: members leave traces for others to solve their questions

The original Yahoo! Answers, Quora, Aardvark
Expertise recommendation

[McDonald and Ackerman, CSCW ’00]

Recommend people, not documents

Goal: help organizations know who can tackle each problem
Crowdsourcing
Crowdsourcing examples

Games with a Purpose

Innovation competitions

Data annotation services
What is crowdsourcing?

Crowdsourcing term coined by Jeff Howe [2006] in Wired

“Taking [...] a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call.”
What is crowdsourcing?

Two common models of crowdsourcing

- **Wisdom of the Crowd**: aggregate opinions
- **Competition**: accept many ideas but only take the best ones
Paid Crowdsourcing

Pay money for short tasks. Amazon Mechanical Turk: millions of tasks completed each year

Label an image
Reward: $0.20

Transcribe audio clip
Reward: $5.00

Many complexities in good task design and ethical treatment of workers — a topic for CS 278
The Wisdom of Crowds

The phenomenon that, in certain situations, aggregating opinions across a large number of people can produce a more accurate estimate of the answer than even the best expert in the room.

Independent guesses minimize the effects of social influence [Simoiu et al. 2019]

Crowds are more consistent guessers than experts

Crowds are only at the 67th percentile on average per question…but at the 90th percentile averaged across questions per domain! (And showing consensus cues like the most popular guess decreases accuracy!)
Social influence makes outcomes unpredictable

[Salganik, Dodds, and Watts, Science ’06]

Puzzle: why can't experts to predict which songs will be hits?

Method: 14,000 participants download free music

Manipulation: no download info, or one of eight worlds that all start with zero downloads

Result: huge variance in download counts

Best songs rarely did poorly, worst songs rarely did well; any other outcome was possible
Iterative crowd algorithm
You (misspelled) (several) (words). Please spellcheck your work next time. I also notice a few grammatical mistakes. Overall your writing style is a bit too phoney. You do make some good (points), but they got lost amidst the (writing). (signature)

[Dai, Mausam, and Weld, AAAI '10]
Crowd-powered systems

Embed crowd intelligence inside of user interfaces and applications we use today

Interface    Wizard of Turk    Wizard of Oz
Automatic clustering generally helps separate different kinds of records that need to be edited differently, but it isn't perfect. Sometimes it creates more clusters than needed, because the structural differences aren't important to the user's editing task. Conversely, sometimes the clustering isn't fine enough, leaving heterogeneous clusters that must be edited one line at a time. One solution to this problem would be to let the user rearrange the clustering manually using drag-and-drop edits. Clustering and selection generalization would also be improved by recognizing common text structure like URLs, filenames, email addresses, dates, times, etc.
## VizWiz

[Bigham et al., UIST ’10]

Visual question answering for visually impaired users

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What color is this pillow?</td>
<td>I can’t tell. (89s) multiple shades of soft green, blue and gold</td>
</tr>
<tr>
<td>What denomination is this bill?</td>
<td>20 (24s) 20</td>
</tr>
<tr>
<td>Do you see picnic tables across the parking lot?</td>
<td>No (13s) no</td>
</tr>
<tr>
<td>What temperature is my oven set to?</td>
<td>It looks like 425 degrees but the image is difficult to see. (69s) 400</td>
</tr>
<tr>
<td>Can you please tell me what this can is?</td>
<td>Chickpeas. (183s) Goya Beans</td>
</tr>
<tr>
<td>What kind of drink does this can hold?</td>
<td>Energy (91s) no can in the picture (247s) energy drink</td>
</tr>
</tbody>
</table>

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Note: The answers are approximate times in seconds.
Realtime crowdsourcing
[Bernstein et al., UIST ’11]
Crowdsourcing complex work

How might we crowdsource more complex, interdependent outcomes?

Crowdsourcing as a map-reduce process

To write a wikipedia page, partition on topics, map to find facts and then reduce into a paragraph
Microtask crowds struggle with complex tasks

Design, engineering, writing, video production, music composition

[Kittur et al. 2013, Kulkarni et al. 2012]
Crowds of experts

Mechanical Turk
microtask worker
microtask worker
microtask worker
microtask worker
microtask worker

Upwork
programmer
designer
video editor
musician
statistician
Flash teams

[Retelny et al., UIST ’14]

Computationally-guided teams of crowd experts supported by lightweight team structures.
Biased crowds

[Epstein, Pennycook, and Rand CHI ’20]

How much do the outcomes of your task depend on the members of the crowd? Especially important in cases where worker identity may strongly influence results, or those where workers may have personal incentives.

E.g.: Fact-checking media sources on SNS

Finding: Similar media trust patterns across the aisle; small partisan patterns in people's ratings when they think their answers will impact a real social network.
Future of work
What would it take for us to be proud of our children growing up to work in these environments?

[Kittur et al. CSCW 2013]
What would it take for us to be proud of our children growing up to work in these environments?

[Kittur et al. CSCW 2013]
Careers in crowd work

[Kittur et al. CSCW 2013]

More and more people are engaging in online paid work: programmers, singers, designers, artists, …

Would you feel comfortable with your best friend, or your own child, becoming a full-time crowd worker?

How could we get to that point? What would it take?

• Education
• Career advancement
• Reputation
Take back the market

Turkopticon [Irani and Silberman '13]
Workers (sellers) review requesters (buyers)

Dynamo [Salehi et al. '15]
Helps workers engage in collective action
Needed infrastructure

- Support for career growth
- Training and education (e.g., micro-internships [Suzuki et al. 2016])
- Longer-term employment guarantees
- Decoupling the social safety net from firm-based employment
- Policy & labor law

Many of these don’t sound like CS issues. But our systems are situated in the real world. People’s experiences interacting with them, and even the systems we can build or even imagine depend on that broader context.
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