Crowdsourcing and Peer Production

Which volunteer-written software do you rely most heavily on?
Crowdsourcing: an open call to a large group of people who self-select to participate

Crowds can be surprisingly intelligent, if opinions are levied with some expertise and without communication, then aggregated intelligently.

Design differently for intrinsically and extrinsically motivated crowds

Quality issues are best handled up front by identifying the strong contributors and gating them through
Last time

Parallel, independent contributions

But, this only works if the goal can be subdivided into modular components with few or no interdependencies.

Think filling out rows of a spreadsheet or taking argmax.
Today

Interdependent, integrated contributions

Think invention, engineering, or game design.
How?

There are fundamental differences between parallel and interdependent contribution structures.

We can't just make a movie or build Linux with parallel contributions.
Johnny Cash Project: crowdsourced music video
One frame per participant — beautiful, slightly anarchic
Star Wars Uncut: crowdsourced movie remake, 2hr long
One scene per participant — style whiplash
How?

There are fundamental differences between parallel and interdependent contributions. We can’t just make a movie or build Linux with parallel contributions.

So, how do we create complex outcomes with distributed online collaborations?

Topics:

Workflows
Peer production
Convergence and coordinated adaptation
Workflows
Iterative crowd algorithm

[Little et al. 2009]
Iterative crowd algorithm

[Little et al. 2009]

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)
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 differences in structure aren't important to the user's particular editing task. For example, if the user only needs to edit near the end of each line, then differences at the start of the line are largely irrelevant, and it isn't necessary to split based on those differences. 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, perhaps using drag-and-drop to merge and split clusters. Clustering and selection generalization would also be improved by recognizing common text structure like URLs, filenames, email addresses, dates, times, etc.

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Find-Fix-Verify

[Bernstein et al. 2010]

Find-Fix-Verify is a design pattern for open-ended tasks.

**Find a problem**

**Fix the problem**

**Verify each fix**

- Soylent is a prototype...
- Soylent is a prototypes...
- Soylent is a prototypetest...
Find
“Identify at least one area that can be shortened without changing the meaning of the paragraph.”

Independent agreement to identify patches

Fix
“Edit the highlighted section to shorten its length without changing the meaning of the paragraph.”

Randomize order of suggestions

Verify
“Choose at least one rewrite that has style errors, and at least one rewrite that changes the meaning of the sentence.”
Verify

“Choose at least one rewrite that has style errors, and at least one rewrite that changes the meaning of the sentence.”

Keep suggestions that do not get voted out
Realtime crowdsourcing

[UIST 2012]

Can crowds achieve real-time responses?

- Could this lecture be live-captioned as I give it?
- Shotgun sequencing algorithm (designed for gene alignments)
- Could this lecture be live-captioned as I give it?

2.9s latency
How might we enable crowds to achieve complex work such as writing short stories?

Unlike most crowdsourcing workflows, creative work requires tight interconnections between different parts of a story, and between the high-level goal and low-level text.

Reflect
choose a high-level goal

Revise
break into tasks and edit
The Hot Air Balloon

A young boy named Malcolm finds himself alone in a runaway hot air balloon and accidentally travels to a city in the sky.

Malcolm found himself fascinated by the balloon. He imagined what it would be like to fly to some exotic location, soaring above the clouds. He closed his eyes and saw himself flying through the clouds. "Hey you!" he heard a voice shout. "What are you doing in my balloon!" The operator yelled as he dropped his snack and ran toward the balloon. Malcolm, startled by the man stumbled. Trying not to fall he reached out and grabbed a rope hanging next to him. As he pulled it, it released the ballast and the balloon leapt into the air. Before he knew it he was rising up to feet in the air. Horrified, he looked down...
relief as he felt the balloon descend a bit. Then suddenly a great gust of wind took the balloon and sent it higher and higher. Fell to the floor, grabbing a lever on the way down that made the balloon rise even faster.

Answer the following questions about the story:

**What did you like about the story above?**

I like...

**What do you wish you could change about the story above?**

I wish...

**Is the wish you wrote above mostly about the plot, the characters, or the writing? (select one)**

Choose...

**In one sentence, suggest something for the next revision of the story that could change to address your comments above.**

Start your sentence with the words "What if...". Try to write something specific that fits the story.

What if...
The story above! Which change should be the main change for the next revision?

<table>
<thead>
<tr>
<th>Think about what you wish you could change about the story. Which statement below do you agree with most?</th>
</tr>
</thead>
<tbody>
<tr>
<td>I wish there would be a bit more exposition at the beginning of the story. The events all start very quickly and it's easy to not understand what's going on.</td>
</tr>
<tr>
<td>The order of the paragraphs. It jumped all over the place.</td>
</tr>
<tr>
<td>I want to see more exciting things happen to Malcom in Cloud City, and I want to know about his return to the ground.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Which new idea below do you think should be the main change for a revision of the story above?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What if instead of beginning so abruptly, we learned a little more about Malcom first?</td>
</tr>
<tr>
<td>What if... We wrote a new story about hot air balloons and a mistaken escape?</td>
</tr>
<tr>
<td>What if Malcom investigates the Cloud City and then tries to get home, maybe bringing along a friend from Cloud City.</td>
</tr>
</tbody>
</table>
When he woke up, he found himself staring at glow of big, beautiful crystal-like glass buildings, shimmering in the brilliant sunshine. One was emerald green, another ruby red, still another sparkling like diamonds, others radiating spectacular colors he had never seen. He was a little scared, to be in an unfamiliar place, but he was mostly curious. He could sense that something interesting

He suddenly found himself staring at gargantuan glass buildings, their exteriors shimmering under the sun's rays. These buildings were like no others he'd seen before - one was emerald colored, another ruby red, and a third sparkling like a multifaceted diamond. This scenery was frightening, yet, he was curious. Something was going on in this city, and it could be something wonderful. Maybe there were helpful people down below? Perhaps he should take a little gander and see if he can get some help with the balloon.
Peer production
Coronavirus Tech Handbook

Mission

The Coronavirus Tech Handbook is a crowdsourced library of tools, services and resources relating to COVID-19 response. It is a rapidly evolving resource with thousands of expert contributors.

Notices

Upcoming Editathons

Online events where many people contribute to the handbook at the same time! All are welcome, and we run events multiple time on any given day so that people from all over the world can get involved in helping to create this handbook. No experience required! editathon archive

📅 Saturday 2nd May 2020

APAC Zone, PST (+45) - Revision
What is peer production?

Crowdsourcing: making an open call to a large set of individuals who self-select into tasks

Peer production includes additional requirements… [Benkler 2009]

- Decentralized conception: many control the direction and outcome, not a traditional bureaucracy
- Diverse motivations: especially non-monetary incentives
- Results treated as a commons: the output is publicly available and generally non-rival (def: when I use it, it doesn’t reduce your ability to use it)
- No contracts: governance and work allocation isn’t handled through signed contracts
When does peer production work?

Benkler’s argument [2002] is that peer production outperforms traditional firms when there exists strong intrinsic motivation and work can be broken down into granular and easy-to-integrate tasks.
More examples

- Kasparov vs. the world
- Collaborative math proofs
- NASA Clickworkers
- Ushahidi
- Film production
- Search for a missing person
Why do people do this?

The usefulness of the outcome to the contributor; hedonic pleasure of contributing (e.g., writing software); increased social capital, reputation, and status [von Hippel and von Krogh 2003, von Krogh 2003, Benkler, Shaw and Hill 2015]

Many, many surveys have revealed that there exists a diverse tapestry of motivations [Glott et al. 2010, Ghosh and Prakash 2000]

But people self-select into communities that match their motivations: Those extrinsically motivated by reputation and employment will contribute more to industry-sponsored projects. Those more intrinsically motivated contributed to free culture communities. [Belenzon and Schankerman 2008, Benkler, Shaw and Hill 2015]
But does it really work?

Pros

Linus’s Law: “With enough eyes, all bugs are shallow” [Raymond 1999]

Wikipedia used to be disallowed as a citable source because it could not be trusted. But then:

Cons

Many efforts do not achieve critical mass needed for quality [Ghost Town lecture]

Peer production appears better at creating functional artifacts (e.g., code) than creative artifacts (e.g., movies) [Benkler 2006]

1.5B monthly Wikipedia go to articles that would be higher quality if editors optimally distributed their work to meet reader demand. [Warncke-Wang et al. 2015]
And errors do occur...

node.js leftpad module incident

So given these tradeoffs, when would you opt for peer production over firm-based production, assuming you had moderate but not infinite funds? [2min]
Convergence and coordinated adaptation
Limits of algorithmic coordination

So far, goals such as invention, production, and engineering have remained largely out of reach [Kittur et al. 2013]

Why?
Dominant architecture: algorithms

Modularize and pre-define all possible behaviors into workflows.

Computation decides which behaviors are taken, when, and by whom; optimizes, error-checks, and combines submissions.

[Kittur 2011]
[Little 2010]
[Dai and Weld 2010]
Limits of algorithmic coordination

Returning to the question: why have complex goals remained largely out of reach?

Open-ended, complex goals are fundamentally incompatible with a requirement to modularize and pre-define every behavior [Van de Ven, Delbecq, and Koenig 1976; Rittel and Weber 1973; Schön 1984]
Limits of crowdsourcing and peer production

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

“With the Linux kernel [...] we want to have a system which is as modular as possible. The open–source development model really requires this, because otherwise you can’t easily have people working in parallel.” [Torvalds 1999]
Interdependence and collective action remain challenging

The result: algorithmic, workflow-based architecture confines collaborations to goals so predictable that they can be entirely modularized and pre-defined.

But many valuable collective activities do not fit this criteria.
Why are these challenging?

Convergence: crowds are excellent at generating ideas and at spreading awareness, but it's much more challenging for them to build consensus toward a single action.

(This was noted as a challenge that the Occupy movement faced.)
Convergence

The New York Times

Twitter Users Split on Boycott Over Platform’s Move Against Rose McGowan

The Washington Post

#WomenBoycottTwitter revives post-election conversations about the lack of solidarity among women

VOGUE

CULTURE > OPINION

Why I’m Not Joining the Women Boycotting Twitter Today

MADAMENOIRE

Black Women Commandeer #WomenBoycottTwitter And Turn It Into A Celebration Of Ourselves With #WOCAffirmation
Convergence

Lauren@AnimeBoston
@laureninspace

So let me get this straight: we're fed up with men silencing us, so we're going to just silence ourselves? #WomenBoycottTwitter
4:59 AM - Oct 13, 2017

56 people are talking about this

Danielle Henderson
@knottyarn

Big ups to those participating in #WomenBoycottTwitter but the foundation of my feminism is about NOT being silenced.
6:54 AM - Oct 13, 2017

2,378 people are talking about this

Elizabeth Minkel
@elizabethminkel

I think as a tool of economic activism, this thing was too slipshod to be effective—and that women of color are spot-on in their critiques.
6:25 AM - Oct 13, 2017

10 people are talking about this
Why are these challenging?

Coordinated adaptation: changing direction in sync with each other.

Crowds are excellent at executing pre-defined tasks, but it’s much more challenging for them to continually re-evaluate goals and adapt in sync.
Hybrid peer production

Why is it that many successful peer production projects form traditional organizations to support their efforts?

MongoDB: MongoDB, Inc.

Ubuntu: Canonical

In reality, peer production struggles with tasks that traditional contract-based firms achieve (e.g., marketing, keeping release schedules, integrated contributions). So, hybridized models often support the community.

Example: plugging a USB drive into a Ubuntu machine
Has your opinion changed?

When would you opt for peer production over firm-based production, assuming you had moderate but not infinite funds?

Which would you use if the goal were to:
- Write a lecture for CS 278?
- Redesign the requirements for your major?
- Decide whether Stanford should have in-person classes in the fall?

[2min]
A Class in Two Acts

Act I: We got this!
- Going viral
- Bustling spaces and ghost towns
- Designing norms and culture
- Growing pains
- Designing for strong and weak ties
- Group collaboration
- Prototyping social systems
- Wisdom of the crowd
- Crowdsourcing and peer production

Act II: Not so much.
- Antisocial computing: mobs and trolls
- Moderation
- Decision-making and governance
- AIs in social environments
- Future of work
- Unintended consequences
Shifting from simple wisdom-of-the-crowd tasks requires much more than just a scaling up of ambition: it requires designing for interdependence.

Peer production — the term encompassing shared open work (e.g., Wikipedia, open source) is one powerful method for volunteer coordination. Workflows and algorithms offer another approach. Both have their issues.

Aiming higher means we will need to solve issues of convergence and coordinated adaptation.
Midterm

90 minute open-book exam on Canvas on May 21–22, completed before 11:59pm PT on May 22. Staff Q&A periods available.

Questions sampled from the question bank of top ~10% questions from Assignment 3. Question bank posted May 14.

1/4 Easy questions, 1/4 Medium questions, 1/4 Hard questions…

And 1/4 staff-written questions, covering the same lectures as well as Moderation and Anti-social computing

Study groups OK, but no collab. on or sharing notes or answers

Details on the website
Social Computing

CS 278 | Stanford University | Michael Bernstein

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