

Collective Intelligence

Steven Rick and Yasmine Kotturi

Scott introduces us to
crowdsourcing

Goals of this afternoon:

1. What is crowdsourcing? (thanks Scott!)
2. Dive into how design allowed an online game to contribute to real scientific problems with Foldit
3. Understand that crowdsourcing is a complex socio-technical challenge and how Soylent had success through Find, Fix, Verify
4. Develop an appreciation for the powerful nature of human-machine collaborative systems (greater than the sum of its parts)
5. Discuss the future of crowdsourcing

Foldit

combinatorial side-chain rotamer packing

gradient-based minimization

fragment insertion

Foldit

Any biochemists
in the house?

combinatorial side-chain rotamer packing

gradient-based minimization

fragment insertion

Foldit

combinatorial side-chain rotamer packing



'shake'

gradient-based minimization



'wiggle'

fragment insertion



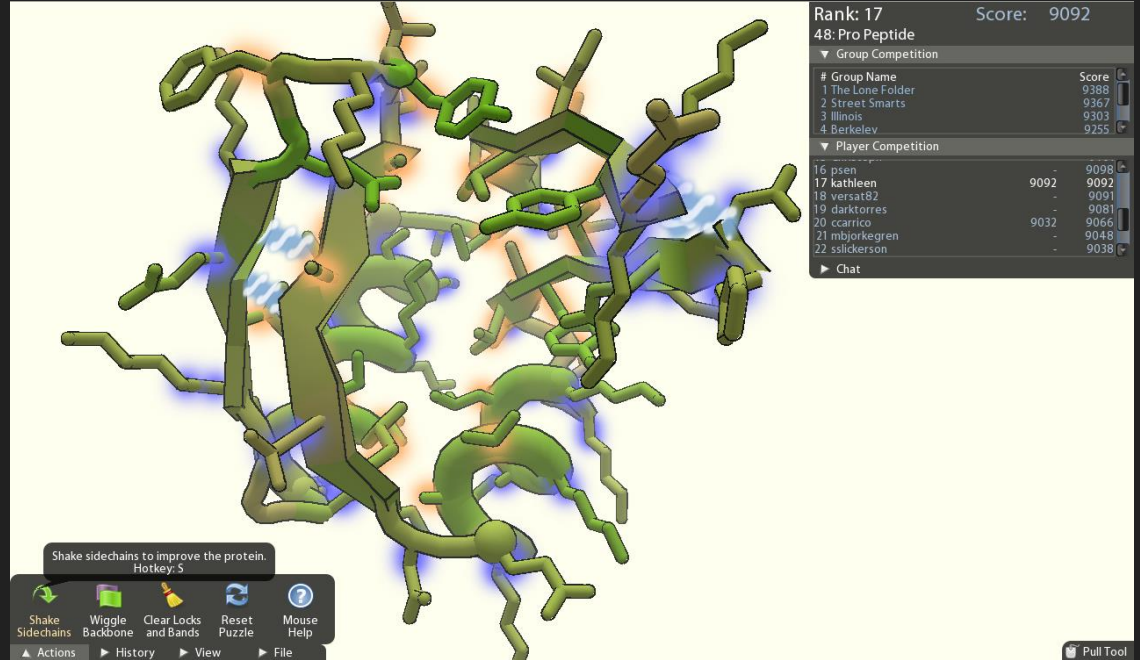
'rebuild'

Foldit

Locating the biologically relevant native conformation of a protein...

OR

Solving puzzles for science!



The screenshot displays the Foldit game interface. On the left, a 3D protein structure is shown in a green stick representation, with some regions highlighted in blue and orange. On the right, a leaderboard is visible, showing the current rank and score, and a list of players and their scores.

Rank: 17 Score: 9092
48: Pro Peptide

Group Competition	
#	Group Name
1	The Lone Folder
2	Street Smarts
3	Illinois
4	Berkeley

Player Competition		
#	Player Name	Score
16	psen	-
17	kathleen	9092
18	versat82	-
19	darktorres	-
20	ccarrio	9032
21	mbjorkegren	-
22	sslickerson	-

► Chat

Shake sidechains to improve the protein.
Hotkey: S

Shake Sidechains Wiggle Backbone Clear Locks and Bands Reset Puzzle Mouse Help

► Actions ► History ► View ► File

Pull Tool

Foldit

Applying the human mind to a complex computational problem can provide insights a machine might miss

To get many minds contributing to a task, it can't require domain expertise

Foldit simplifies a complex problem into an approachable and enjoyable game

Social forces can further drive platform success - competition (leaderboards) and collaboration (team puzzles) helped build up and maintain the Foldit community

Steven demos Foldit

Foldit player testimonials

“I played a lot because I really wanted to rank up. If a certain group was ahead of my group, I would work really hard to attempt to pass them” -[Ferzle](#)

“I have gone up to 6 hours straight without getting a single point, but I can just tell when a protein is going to break through the wall and relax in a much higher score bracket, and watching that wiggle and all the RANKUP’s totally make it worth it.” -[Guyoni](#)

“If-confessed hopeless addict; in 7 months I've missed only 2 days. But every day, and in every way, I'm getting better...” -[Feet1st](#)

Activity

Discussion

For three minutes:

Within a group of 3 to 4, decide on one problem that a machine can't seem to solve, and defend one reason why you think the machine is unsuccessful.

Discussion

For three minutes:

Within a group of 3 to 4, decide on one problem that a machine can't seem to solve, and defend one reason why you think the machine is unsuccessful.

Now for three more minutes:

Within your same group, decide on one problem that we as humans can't seem to solve, and defend one reason why you think we are unsuccessful.

“Computers are obviously superior in the ability to crunch numbers, but lack the intuitive sense of knowing when to crunch numbers, or which tool to best use at a certain point in the game. The experience and intuition part of the gameplay, for me, is being able to look fresh at a puzzle structure and note which areas 'don't look right' ”

-CharlieFortsConscience

Soylent

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Soylent

Shortening a document to under the 10 page submission limit...

- 1) Do it yourself
- 2) Use AI
- 3) Ask colleagues
- 4) ???

Soylent

Shortening a document to under the 10 page submission limit...

- 1) Do it yourself
- 2) Use AI
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- 4) Use complete strangers

Soylent

Shortening a document to under the 10 page submission limit...

1) Do it yourself

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Mechanical Turk

Soylent

Mechanical Turk - “Artificial Artificial Intelligence” from Amazon

Make Money by working on HITs

HITs - *Human Intelligence Tasks* - are individual tasks that you work on. [Find HITs now.](#)

As a Mechanical Turk Worker you:

- Can work from home
- Choose your own work hours
- Get paid for doing good work



or [learn more about being a Worker](#)

Get Results from Mechanical Turk Workers

Ask workers to complete HITs - *Human Intelligence Tasks* - and get results using Mechanical Turk. [Get Started.](#)

As a Mechanical Turk Requester you:

- Have access to a global, on-demand, 24 x 7 workforce
- Get thousands of HITs completed in minutes
- Pay only when you're satisfied with the results



Soylent

amazonmechanicalturk
Artificial Intelligence

Your Account | **HITS** | Qualifications | 294,868 HITS available now

Steven Rick | Account Settings

All HITS | HITS Available To You | HITS Assigned To You

Find **HITS** containing _____ that pay at least \$ 0.00

for which you are qualified
 require Master Qualification

All HITS

1-10 of 3002 Results

Sort by: **HITS Available (most first)** GO [Show all details](#) | [Hide all details](#) 1 2 3 4 5 > [Next](#) >> [Last](#)

Separate artist name from song title Request Qualification (Why?) View a HIT in this group	
Requester: Smule AWS	HIT Expiration Date: Oct 3, 2015 (2 days 17 hours) Reward: \$0.02
Time Allotted: 5 minutes	HITS Available: 22968
Inv_B_2 Request Qualification (Why?) View a HIT in this group	
Requester: rohzi0d	HIT Expiration Date: Oct 26, 2015 (3 weeks 4 days) Reward: \$0.00
Time Allotted: 48 minutes	HITS Available: 22053
Classify Receipt Request Qualification (Why?) View a HIT in this group	
Requester: Jon Brelig	HIT Expiration Date: Oct 7, 2015 (6 days 21 hours) Reward: \$0.02
Time Allotted: 20 minutes	HITS Available: 18590
Categorization Request Qualification (Why?) View a HIT in this group	
Requester: David Somers	HIT Expiration Date: Oct 3, 2015 (2 days 16 hours) Reward: \$0.02
Time Allotted: 60 minutes	HITS Available: 18234
Find Athlete Information in YouTube Video Request Qualification (Why?) View a HIT in this group	
Requester: Michael F Farb	HIT Expiration Date: Oct 5, 2015 (4 days 14 hours) Reward: \$0.02
Time Allotted: 60 minutes	HITS Available: 14608
Type the text from the images, carefully. Productivity and bonuses guaranteed. Request Qualification (Why?) View a HIT in this group	
Requester: CopyText Inc.	HIT Expiration Date: Oct 7, 2015 (6 days 23 hours) Reward: \$0.01
Time Allotted: 10 minutes	HITS Available: 14366

Soylent

KEYBOARD SHORTCUTS: Scroll: Shift + up/down [Open Image](#)

Welcome to QuikTrip
QuikTrip #00649
6312 S. Lindbergh
Green Park, MO
3144875800

3:37:51 PM 09-29-2015
Register #0002

To 34z COLD Refill \$.89
To 34z COLD Refill \$.89
A6 Dr Pepper/7-UP/Sunkist/A&W 20oz 2/2.69\$ 2.69
Dr Pepper Diet Chry20zBt1
Amount: \$1.35
Dr Pepper Diet Chry20zBt1
Amount: \$1.35
A6 Dr Pepper/7-UP/Sunkist/A&W 20oz 2/2.69\$ 2.69
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A6 Dr Pepper/7-UP/Sunkist/A&W 20oz 2/2.69\$ 2.69
Dr Pepper Diet Chry20zBt1

Extract purchased items from a shopping receipt

Hit Reward: \$0.08 for first 20 items + Bonus: \$0.01 for every 4 items.

Real readable original receipt Not a receipt or not readable

#	Type	Qty	Item Description	Price	Per Item
#	Item	3	EXAMPLE DESCRIPTION CLOROX BLEACH	26.97	8.99
1.	Item	1			
2.	Item	1			
3.	Item	1			
4.	Item	1			
5.	Item	1			
6.	Item	1			
7.	Item	1			
8.	Item	1			
9.	Item	1			

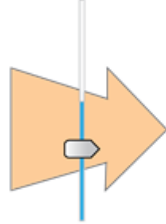
What is the transaction date & time on the receipt?

09/29/2015 HH : MM

Soylent

Shortn

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han contributions directly
avors that span many levels of conceptual and
atic activity. Authoring tools offer help with prag-
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easibility, cost, wait time, and work time for edits.



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Crowdproof

uitive, but they didn't let people be able to control computers eff
software developed by software companies, unless they know how
if one who knows nothing about programming needs to click through 100 buttons to complete
job everyday, the only thing she can do is simply to click through those buttons by hand every ti
But if she happens to be a computer programmer, there is a little chance that she can write a pro
automate everything. Why is there only a little chance? In fact, each GUI application is a big black

The Human Macro

Write a request:

This paper introduces architectural and interaction patterns for integrating crowdsourced human contributions directly
plex endeavors that span many levels of conceptual and
pragmatic activity. Authoring tools offer help with prag-
other people. We thus present Soylent, a word processing
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The Lazy Turker

Does as little work as necessary to be paid

The theme of loneliness features throughout many scenes in Of Mice and Men and is often the dominant theme of sections during this story. This theme occurs during many circumstances but is not present from start to finish. In my mind for a theme to be pervasive is must be present during every element of the story. There are many themes that are present most of the way through such as sacrifice, friendship and comradship. But in my opinion there is only one theme that is present from beginning to end, this theme is pursuit of dreams.

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The Eager Beaver

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but can introduce errors in the process

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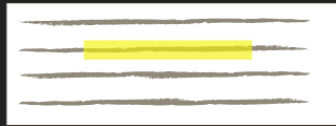
But in my opinion there is only one theme that is present from beginning to end: this theme is pursuit of dreams.

Soylent

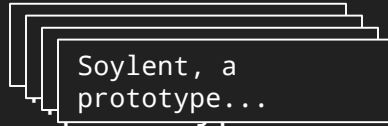
a word processing interface that uses crowd contributions to aid complex writing tasks

Find-Fix-Verify:
Crowd control design pattern

Find a
problem



Fix each
problem

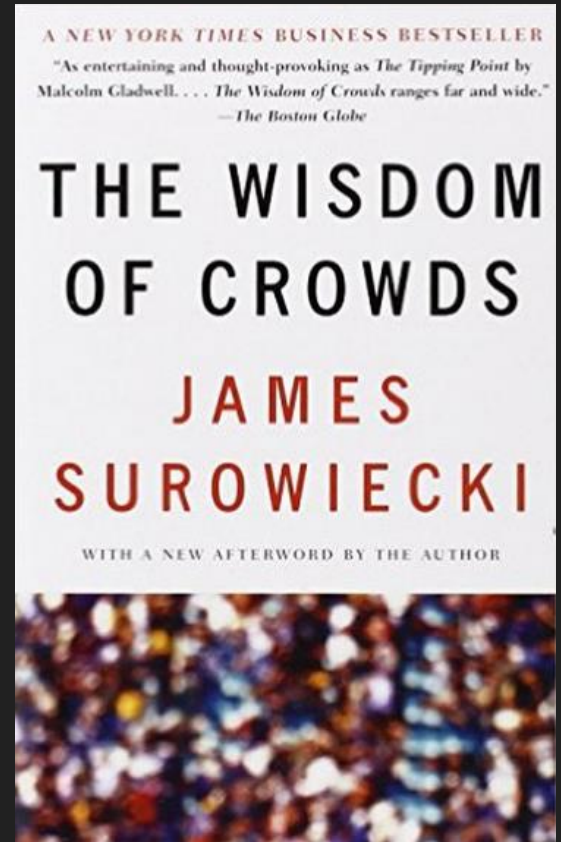


Verify quality of
each fix

- Soylent ~~is,~~ a prototype...
- Soylent ~~is-a~~ prototypes...
- Soylent is a ~~prototypetest~~...

Activity

“The Wisdom of Crowds”



Activity

“The Wisdom of Crowds”

...and candy!

Peer insight:

“I wish the paper would explore how the output of Soylent could be used as training data for artificially intelligent models. It is mentioned that this could be a possibility, but I wonder if such a model could learn to be better than the Turkers over time” -Benjamin

Peer insight:

“As the paper states, a great portion of the Turkers are from India. The language differences and standards, can introduce what seems to be errors in American writing, but completely correct in Indian writing” -Aida

This afternoon's takeaways:

Crowdsourcing is not just naive technical work; there is a huge need to structure the process well to collect high quality output

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Human-technology teamwork!

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Complex, dense issues that have been stripped down + simplified to micro tasks that *anyone* can do

Human-technology teamwork!

....thanks!

Extra discussion: AI v.s. crowdsourcing?

Will AI systems someday be capable of everything humans are?

Is there something uniquely human that will make it impossible for computers to replicate?

Extra discussion: limitations of crowdsourcing?

Do you think there are limits to what a crowd can accomplish?

Are there cases where a collective intelligence might be worse than an individual?