

# NEXT: Crowdsourcing, machine learning and cartoons

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<https://speakerdeck.com/stsievert/elucid8-next-talk>

# Problem



Data collection with  
crowdsourcing can be expensive

<https://speakerdeck.com/stsievert/elucid8-next-talk>



# Crowdsourcing problems



comic by [P.C. Vey](#)

Cardinal Bandits

Dueling Bandits

Select the street that looks safer



Select face on the bottom most similar to the face on top

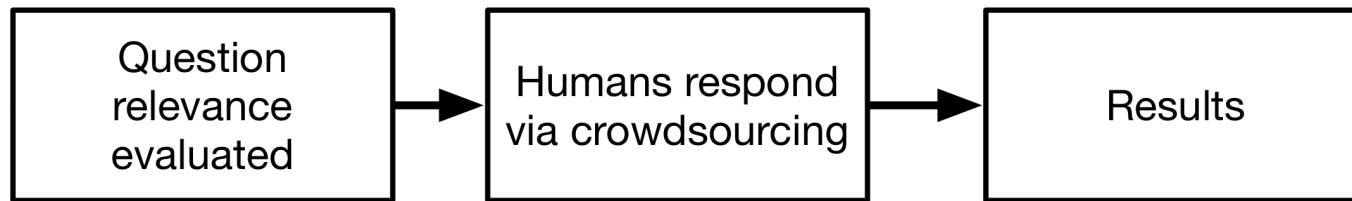


Pool based triplets



# One solution

Existing crowdsourcing systems are *passive*

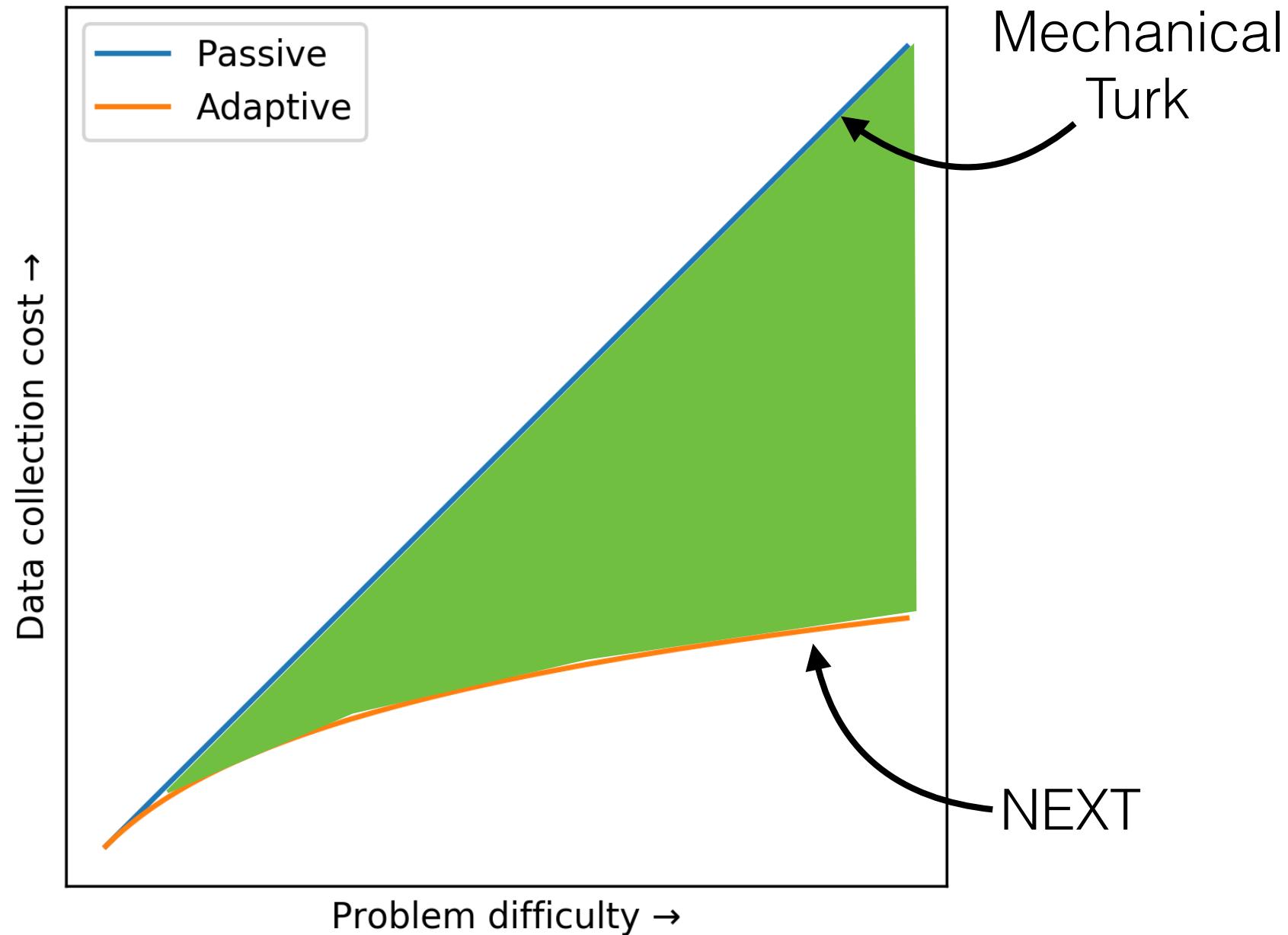


*Adapting* to previous responses requires fewer data

**Goal:** adapt to previously collected responses



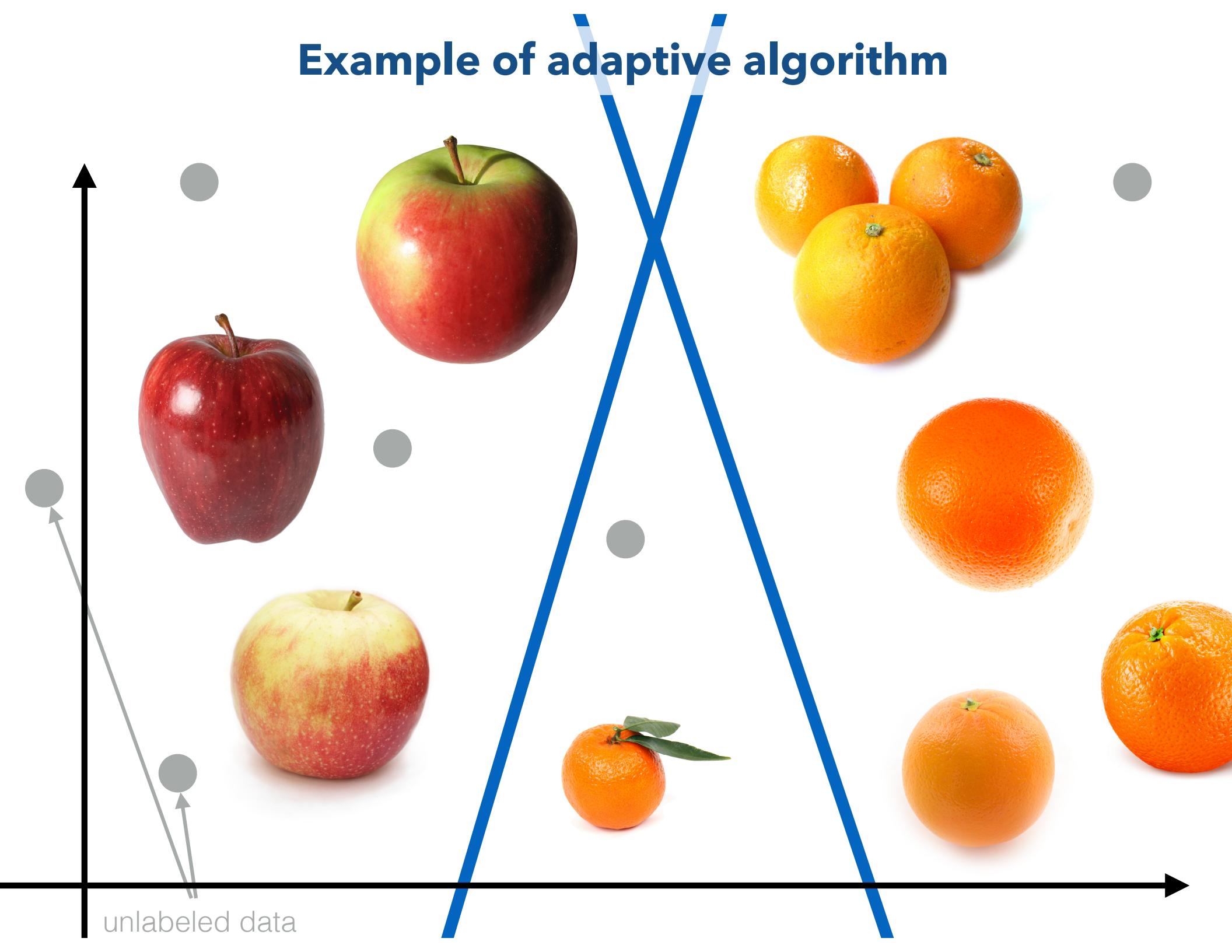
# Benefits



Adaptive sampling can have large benefits



# Example of adaptive algorithm



[nextml.org](http://nextml.org)

**NEXT**

ASK BETTER QUESTIONS.  
GET BETTER RESULTS.  
FASTER. AUTOMATED.

Fork me on GitHub

GitHub Paper Docs  
Blog Team Data



[Lalit Jain](#)



Daniel Ross



[Rob Nowak](#)



[Kevin Jamieson](#)



Sandia National Laboratories

amplab



Homepage: <http://nextml.org>

Source: <https://github.com/nextml/NEXT>

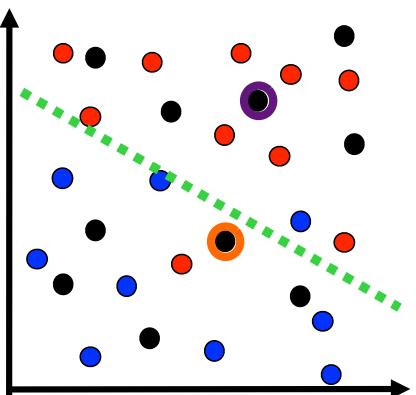
Documentation: <https://github.com/nextml/NEXT/wiki>

# NEXT users

Theory

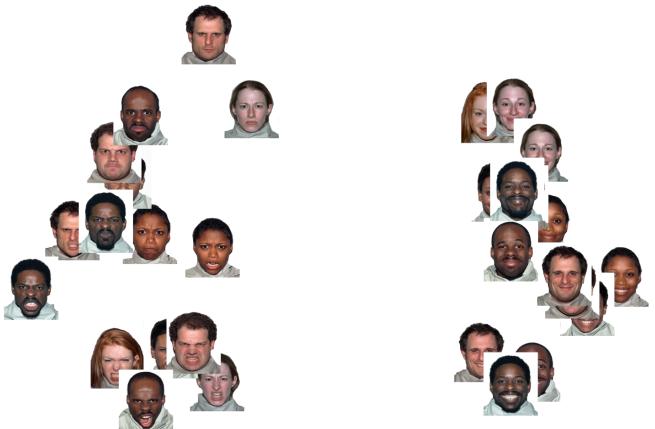
## ML Researchers

Air Force Research Lab  
uses NEXT for active  
image classification.



## Experimentalists

UW Psychology uses  
NEXT to find the best  
algorithms for adaptive  
data collection in cognitive  
science.



Practice

## Practitioners

The New Yorker uses  
NEXT to crowd-source  
the weekly cartoon  
caption contest.

## THE NEW YORKER CARTOON CAPTION CONTEST

A cartoon strip from The New Yorker's weekly cartoon caption contest. It shows a man in a suit standing at a podium, speaking into a microphone. A woman in a dress stands behind him, smiling. Another man in a suit is visible in the background. The cartoon is framed by a white border.

And may I introduce my wife,  
Janet, joining us from  
Minneapolis.

Of course you can speak off the  
record.

	nextml / NEXT
	aashish24 / NEXT
	abiswas3 / NEXT
	alphaprime / NEXT
	aniruddhabj / NEXT
	AvinWangZH / NEXT
	ayonsn017 / NEXT
	caomw / NEXT
	connectthefuture /
	crcox / NEXT
	dconathan / NEXT
	robinsonkwame /
	jattenberg / NEXT
	jimwmg / NEXT
	justicelee / NEXT
	juthawong / NEXT
	liamim / NEXT
	mllewis / NEXT
	NandanaSengupta /
	naveendennis / NE
	pedmiston / NEXT
	samim23 / NEXT
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	BhargavaA / NE
	suchow / NEXT
	sumeetsk / NEXT-1
	widoptimization-wi /
	worldbank / NEXT



## Example problem

# THE NEW YORKER



[Bob Mankoff](#)



**YOUR CAPTION**

Enter your caption (250 characters or fewer):

The New Yorker has to find the funniest caption from ~5,000 captions



# Interface

newyorker.com

## THE NEW YORKER

Please rank the entries for this Cartoon Caption Contest image, then click the “Done” button. You can rank as many or as few captions as you like, but five is too few and five thousand is way too many.

*“He handed me the briefcase and told me to cook the books.”*

UNFUNNY      SOMEWHAT FUNNY      FUNNY

<http://www.newyorker.com/cartoons/vote>

<http://nextml.org/captioncontest>



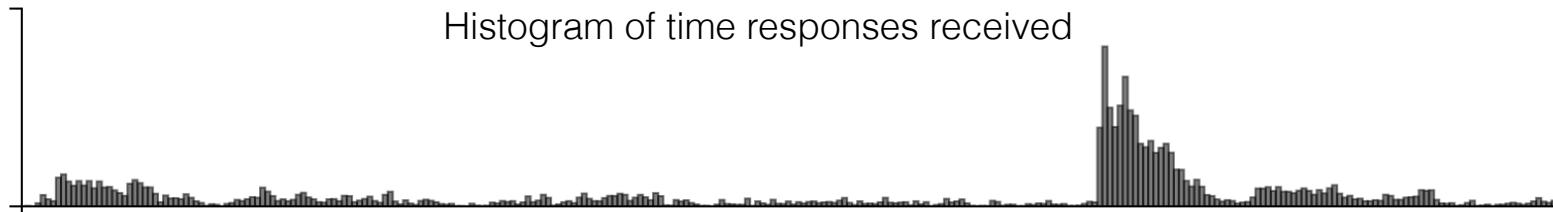
# Dashboard

NEXT Experiment Dashboard      ec2-34-208-101-150.us-west-2.compute.amazonaws.com

NEXT - b85faed0ebbd9c6256bdcaa5f2951a

**NEXT** EXPERIMENT SYSTEM

Histogram of time responses received



Experiment Info

**Start date:** 2017-06-26 14:39:13.745959 UTC  
**Dashboard data generated:** <1 minute ago  
**Number of participants:** 14111  
**Number of answers:** 423367

**Rankings** ?

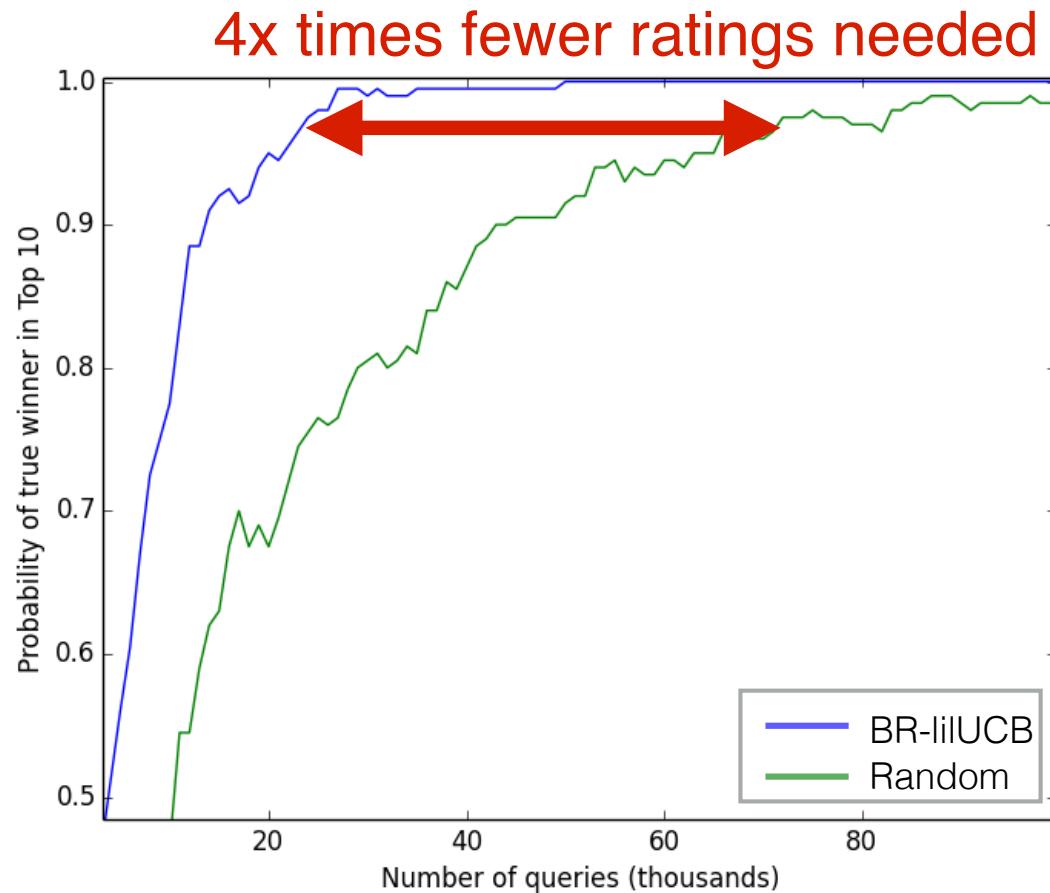
KLUCB

Download CSV

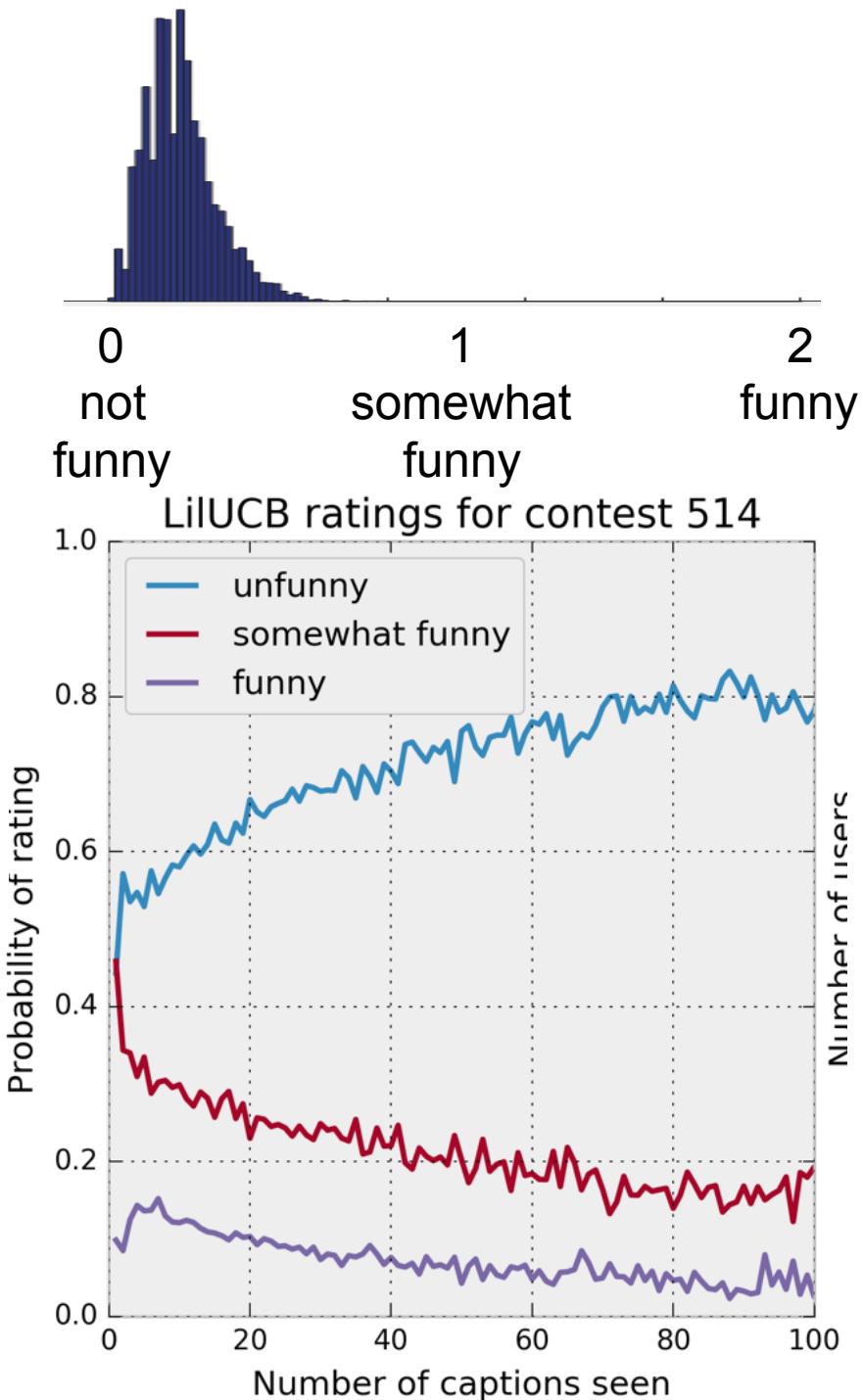
Rank	Target	Score	Precision	Count	Unfunny	Somewhat Funny	Funny
1	I'd better give it a little longer. It's a really tough case.	2.0921	0.0135	3107	751	1319	1037
2	He told me to cook the books, but didn't say for how long.	1.9946	0.0113	4458	1280	1922	1256
3	Hopefully cooking the books works better than laundering the money.	1.9777	0.0177	1880	577	768	535
4	Something t	Data from contests: <a href="https://github.com/nextml/caption-contest-data">https://github.com/nextml/caption-contest-data</a>				1568	1336
5	No, I won't be going back to work on Monday. Why?	1.9679	0.0123	3864	1193	1602	1069

https://github.com/nextml/caption-contest-data

# Experimentalist Benefits



# Data



# Software enhancements



# Goal: enable this feedback loop

Adaptive  
sampling  
algorithms

Crowdsourcing

NEXT

**real-world data**  
participant fatigue,  
label quality, algorithm  
delays

Enabling this feedback loop requires  
software that is **easy to use** by both parties

fewer responses  
more accurate models



# Software uses

By default, NEXT has adaptive algorithms for the 3 default question types

Select face on the bottom most similar to the face on top



Pool based triplets

NEXT can also be used with REST API

Cardinal Bandits



*"Sorry, everything goes out one ear and out the other."*

UNFUNNY

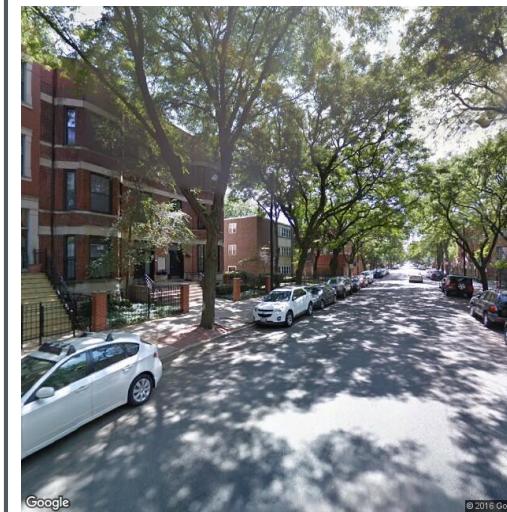
SOMEWHAT FUNNY

FUNNY

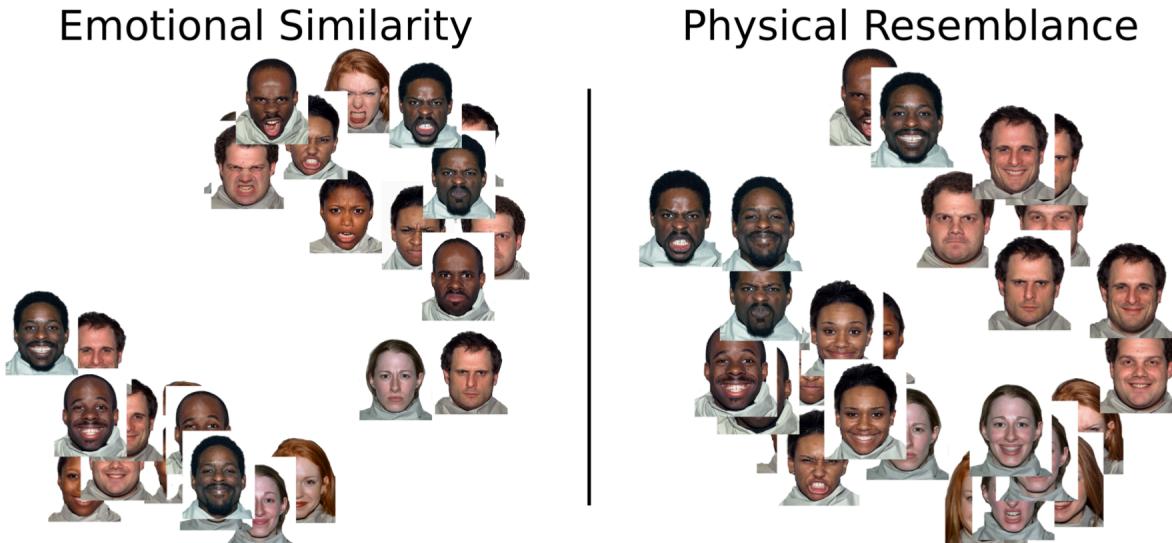
comic by [P. C. Vey](#)

Dueling Bandits

Select the street that looks safer



After NEXT link sent to crowdsourcing service,  
results can be generated!



## Result requirements

0. Web browser
1. Amazon AWS account
2. ZIP of targets (e.g., images)
3. Experiment description (which has good documentation!)

More detail on documentation:  
<https://github.com/nextml/NEXT/wiki>



## Key messages

1. Adaptive sampling reduces data collection cost.
2. NEXT is a crowdsourcing data collection tool that can use adaptive sampling techniques
3. NEXT is easy\* to use by experimentalists, algorithm developers and practitioners, and a mathematical background is not required.
4. NEXT develops experimentalist engagement to aid research and to gain feedback to improve the software

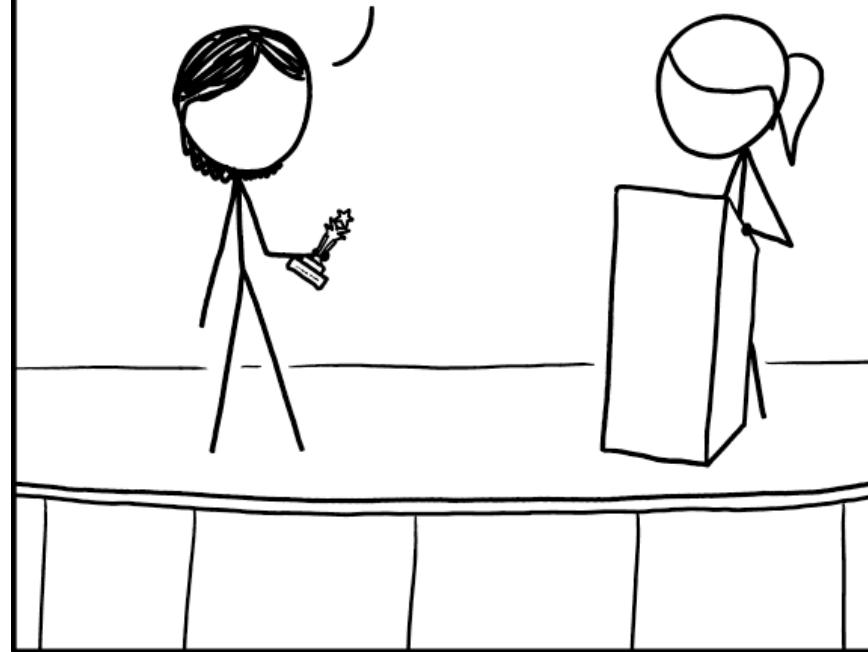


\* NEXT has been created by an academic research group in collaboration with psychologists

I'D LIKE TO THANK MY DIRECTOR,  
MY FRIENDS AND FAMILY, AND—  
OF COURSE—THE WRITHING MASS  
OF GUT BACTERIA INSIDE ME.

I MEAN, THERE'S LIKE ONE OR  
TWO PINTS OF THEM IN HERE;  
THEIR CELLS OUTNUMBER MINE!

ANYWAY, THIS WAS A  
REAL TEAM EFFORT.



<https://speakerdeck.com/stsievert/elucid8-next-talk>

<https://xkcd.com/1543/>

