# Crowdsourcing:
Beyond Label Generation

Jenn Wortman Vaughan

Microsoft Research

What do you think of when you think of crowdsourcing?
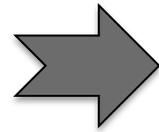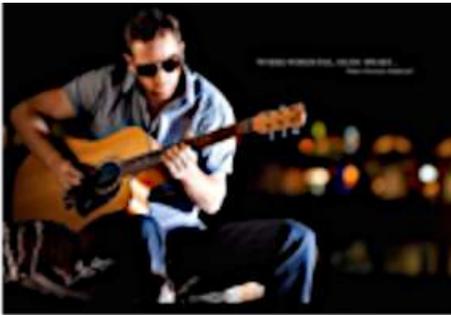
"Crowd"
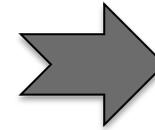
guitar

man

Are there better ways to make use of the crowd?

What other problems can the crowd solve?

Part 1: The Potential of Crowdsourcing

1. Direct Applications to Machine Learning

2. Hybrid Intelligence Systems

3. Large Scale Studies of Human Behavior
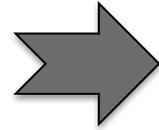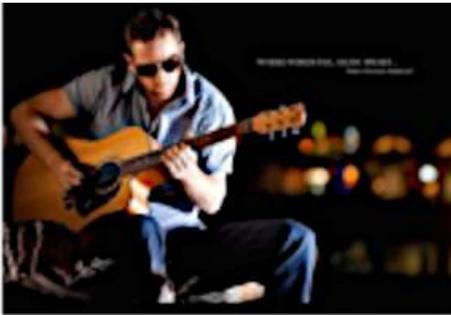
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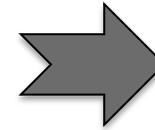
guitar

man

Part 2: The Crowd is Made of People

- What motivates workers?
- Are workers independent?
- Are workers honest?

What does this teach us about how to effectively interact with crowd?

Hint: Be respectful. Be responsive. Be clear.

Extensive notes, slides, and eventually video at

http://www.jennwv.com/projects/crowdtutorial.html

Part 1:
The Potential of Crowdsourcing

The Potential of Crowdsourcing

1. Direct Applications to Machine Learning

2. Hybrid Intelligence Systems

3. Large Scale Studies of Human Behavior

Generating Labeled Data

Learner

Learner

Aggregation of noisy labels

"dog" "dog" "cat"

"cat" "cat" "cat"

Learner

Aggregation of noisy labels

"dog" "dog" "cat"

"cat" "cat" "cat"

Model
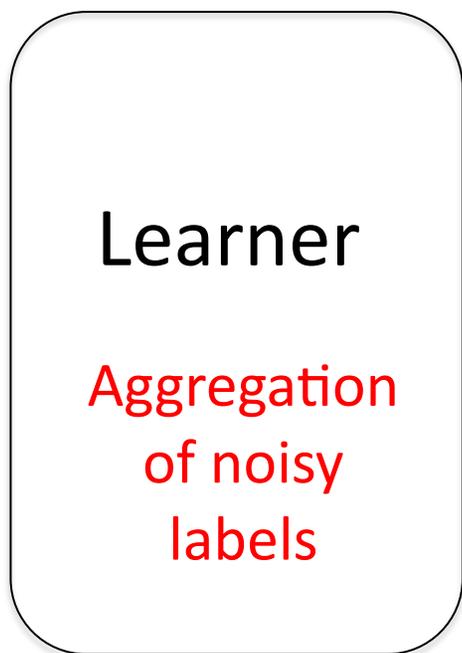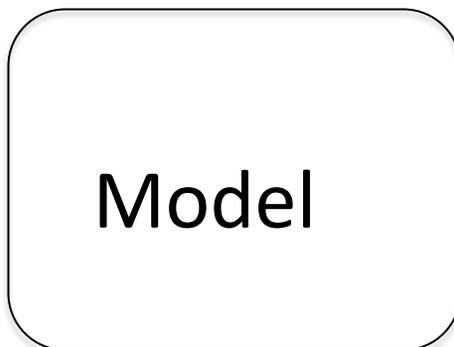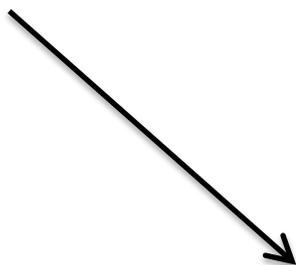
Used to annotate medical images, label text, extract and label features of scenes.

Inspired huge amounts of algorithmic work on aggregation.

The ultimate goal is to take humans out of the loop.
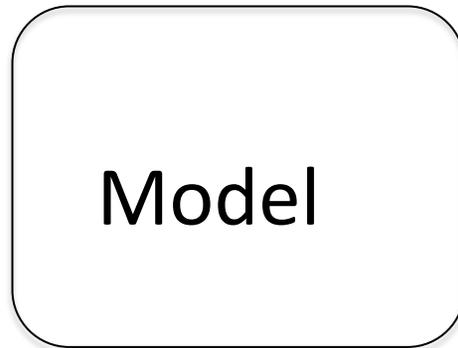
 → Model → "cat"

Crowdsourcing for Evaluation

Evaluating Topic Models
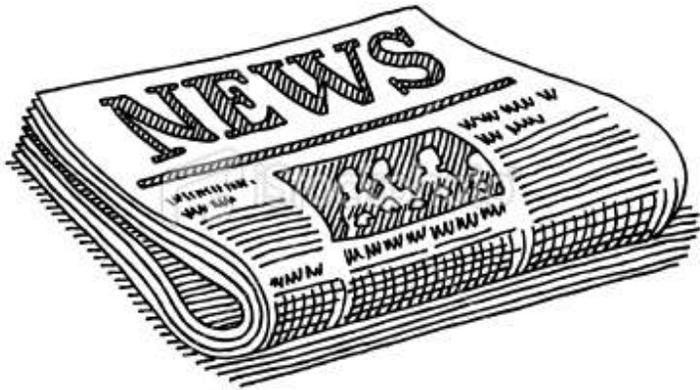
cheese
kale
bread
steak
mushroom
pizza
...

election
senate
bill
delegate
president
proposal
...

To be useful for data exploration or summarization, topics must be human-interpretable!

[Chang et al., 2009]

Evaluating Topic Models

Word intrusion task:

mushroom, kale, cheese, bread, election, steak

worker accuracy ⟷ human-interpretability

Previous measures of success (e.g., log likelihood of held-out data) do not imply interpretability!

[Chang et al., 2009]

Evaluating Topic Models

cheese
steak
mushroom
pizza
...

election
senate
bill
proposal
...

[Hu et al., 2014]
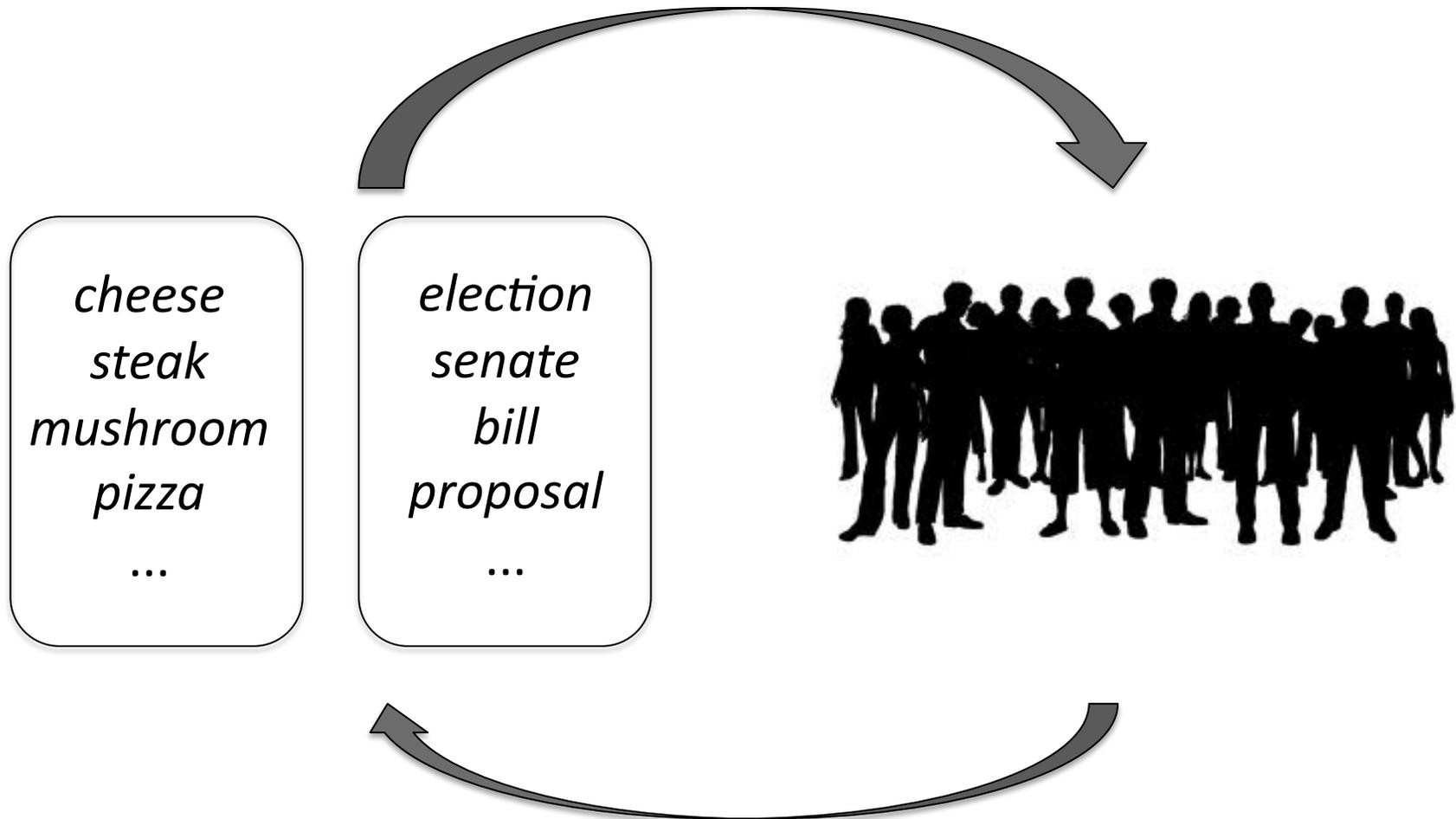
Human Debugging of Machine Learning Models

Human Debugging

- Semantic segmentation: partition an image into semantically meaningful parts, label each part

"cat"

[Parikh & Zitnick, 2011; Mottaghi et al., 2013]

Human Debugging

- Semantic segmentation: partition an image into semantically meaningful parts, label each part


CRF model
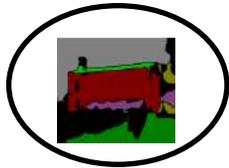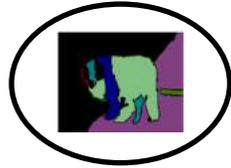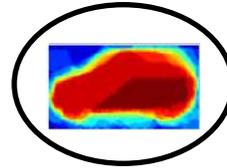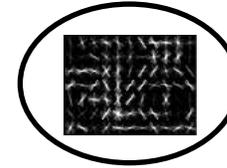
segment classifier   supersegment classifier   scene classifier   shape prior   object detector

Which component is the weakest link?

[Parikh & Zitnick, 2011; Mottaghi et al., 2013]
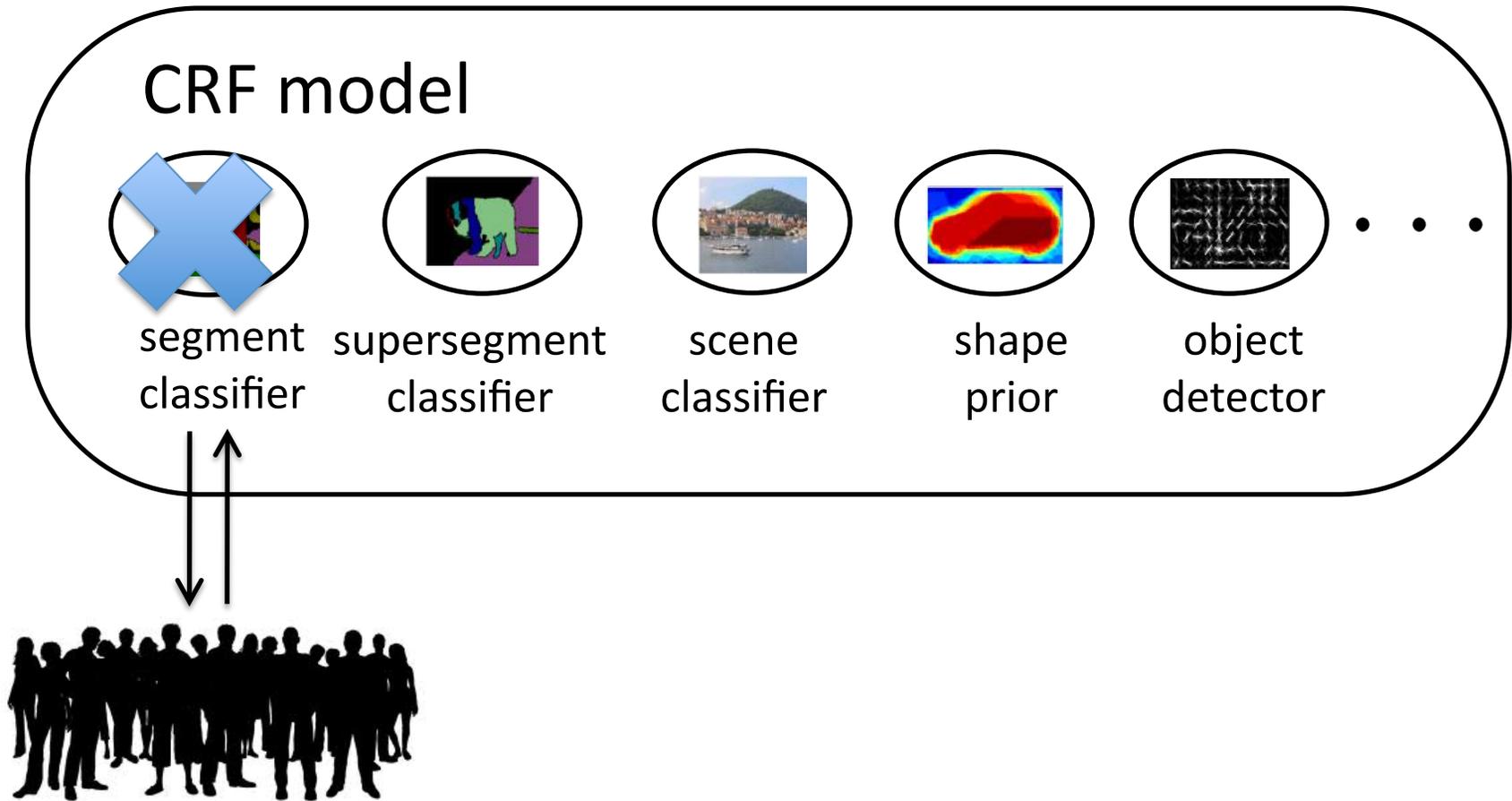
Human Debugging

CRF model

segment classifier   supersegment classifier   scene classifier   shape prior   object detector

[Parikh & Zitnick, 2011; Mottaghi et al., 2013]

Human Debugging

CRF model

segment classifier · supersegment classifier · scene classifier · shape prior · object detector · · ·

[Parikh & Zitnick, 2011; Mottaghi et al., 2013]

Human Debugging

CRF model

segment classifier • supersegment classifier • scene classifier • shape prior • object detector

[Parikh & Zitnick, 2011; Mottaghi et al., 2013]

Human Debugging

CRF model

segment classifier | supersegment classifier | scene classifier | shape prior | object detector
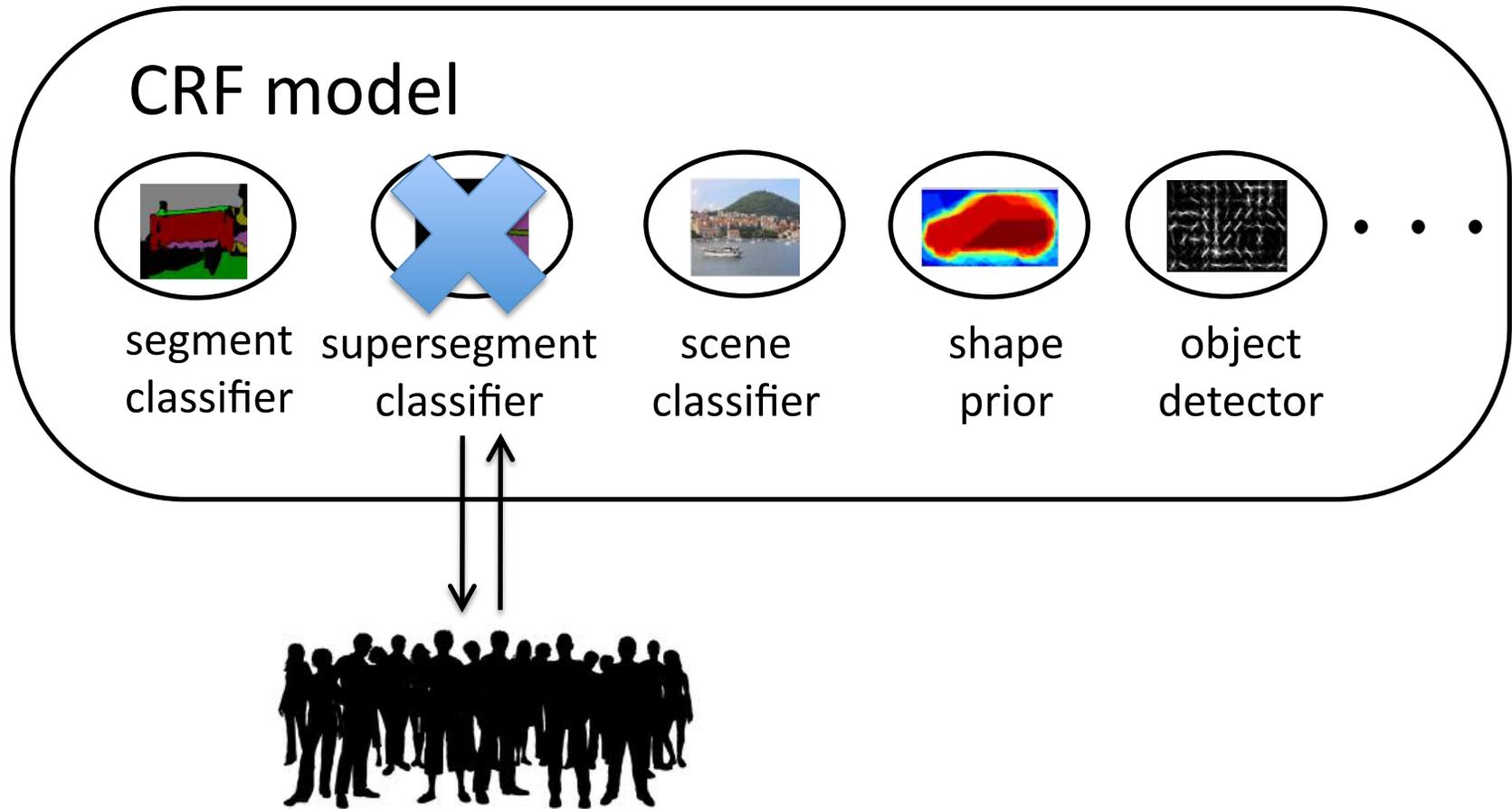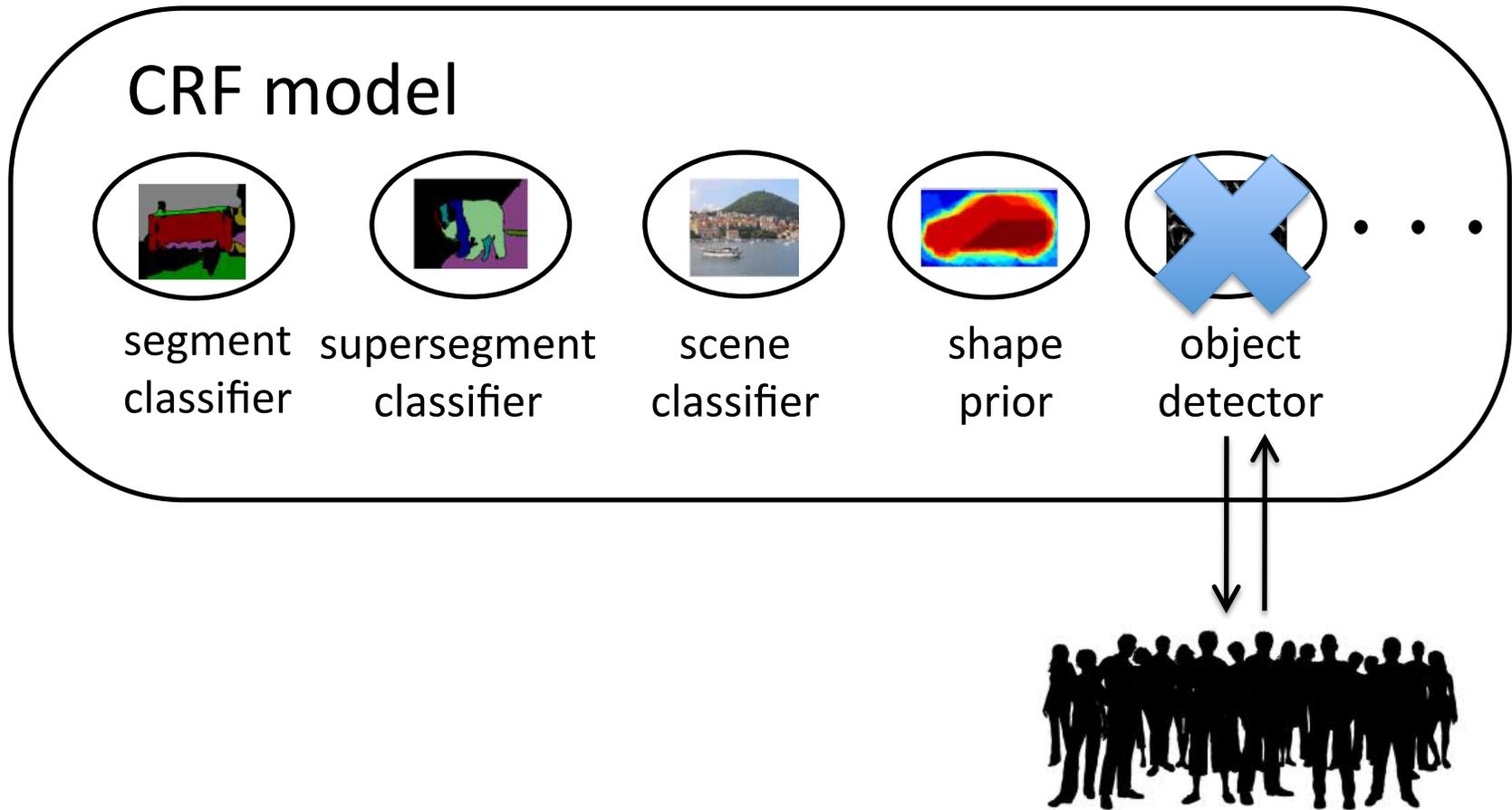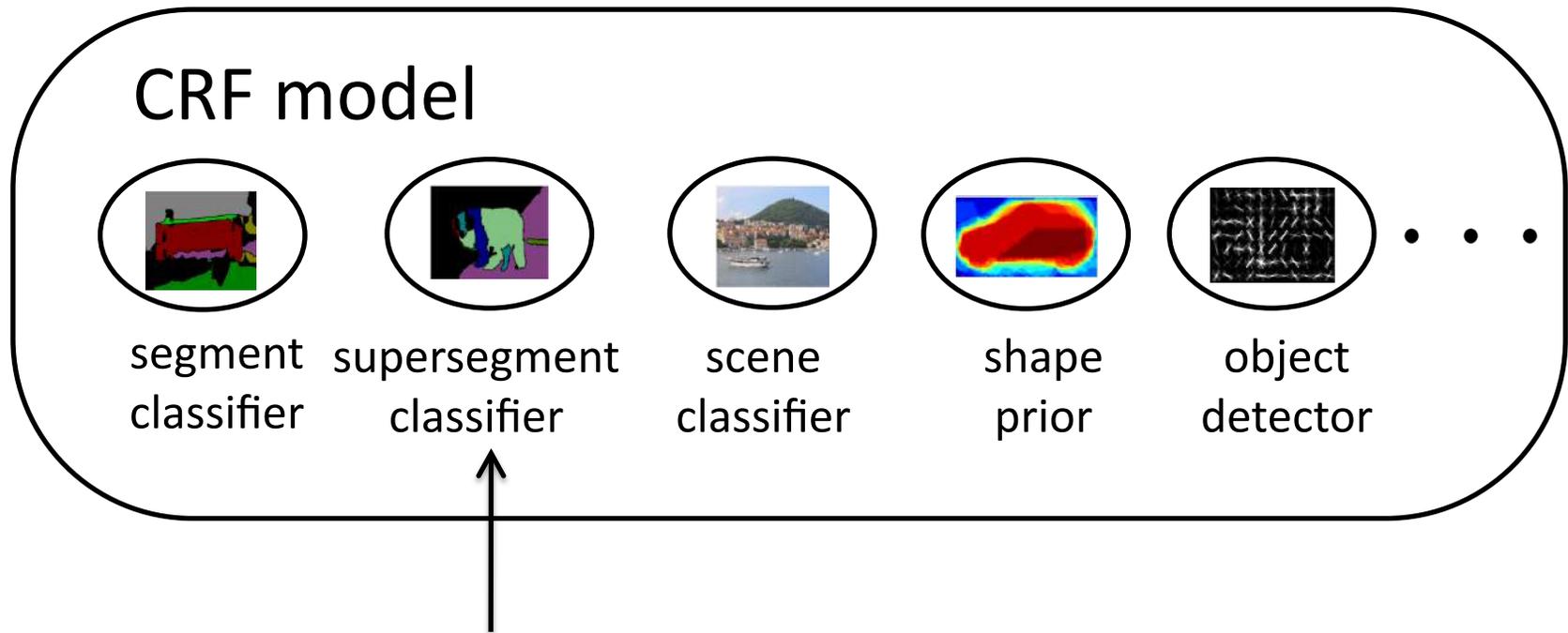
Humans less accurate at task, but system performance still improved

[Parikh & Zitnick, 2011; Mottaghi et al., 2013]

Crowdsourcing Similarity

Human Clustering

[Gomes et al., 2011]

Human Clustering

flags

no flags

[Gomes et al., 2011]

# Human Clustering

Democrats

Republicans

[Gomes et al., 2011]

Crowd Clustering
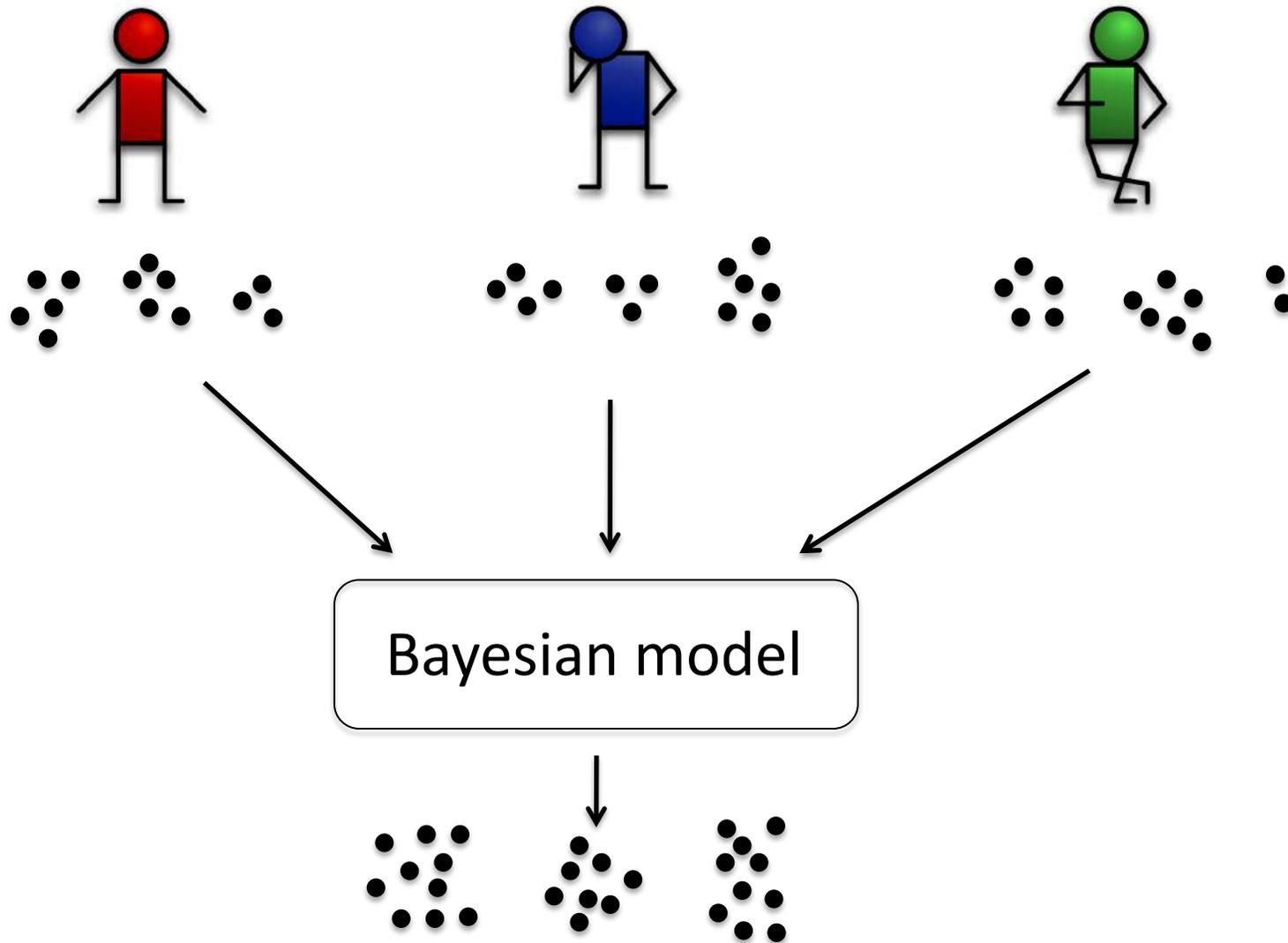
[Gomes et al., 2011]

The Potential of Crowdsourcing

1. Direct Applications to Machine Learning

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Hybrid Intelligence for Speech Recognition

Crowd-Based Closed Captioning

MOTHERS WILL TUCK IN THEIR KIDS,
PUT AN ARM AROUND THEIR

Is it possible to provide real-time closed captioning of lectures, meetings, or other day-to-day conversations?

[Lasecki et al., 2012]

Crowd-Based Closed Captioning

Scribe
System Overview

Speech

Flash Media Server

has a two-fold axis

we have a crystal

have a crystal that has

Merging Server

Crowd Corrections

Merged Captions

Caption Stream

Speech Source
we have a crystal that has a two-fold axis ...

Output
we have a crystal that has a two-fold axis
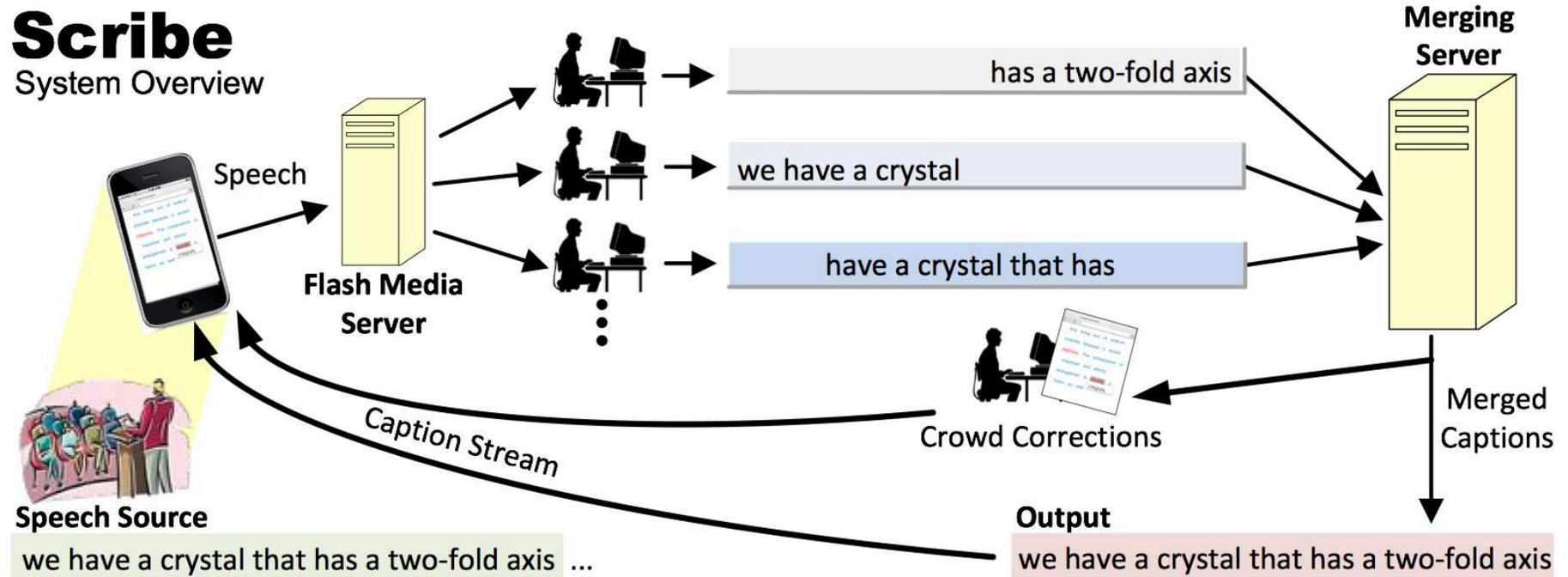
The system merges real-time partial inputs from dynamic, untrained crowds to outperform individuals

[Lasecki et al., 2012]

Hybrid Intelligence for Constrained Optimization

Cobi: Communitysourced Scheduling

A big constrained optimization problem with no access to the constraints!

[projectcobi.com]

1. Committeesourcing

2. Authorsourcing

3. Scheduling

4. Attendeesourcing

[projectcobi.com]

Authorsourcing

Your Paper: **A Pilot Study of Using Crowds in the Classroom**

1. Tell us your name: (as it appears in the paper)

crowdsourced clustering!

**2. We've identified 10 papers that may be similar to yours.
Tell us how they would fit in a session with your paper:**

**Crowdfunding inside the Enterprise: Employee-Initiatives for
Innovation and Collaboration**   [abstract]

◯ Great in same session
◯ Okay in same session
◯ Not sure if it should be in same session
◯ Should not be in same session

87% response rate!

[projectcobi.com]

Scheduling

The system solves an optimization problem to propose a schedule, but chairs retain control.

[projectcobi.com]

Hybrid Intelligence for Writing

The Selfsourcing Process

1. Collect content

2. Organize content

3. Turn content into writing

[Teevan et al., 2016]

Collect Content

The MicroWriter breaks writing into microtasks.

Microtasks can be shared with collaborators.

Microtasks can be done while mobile.

Collaborative writing typically requires coordination.

Collaborators can be known or crowd workers.

People have spare time when mobile.

Structure turns big tasks into small microtasks.

Microtasks make it easy to get started.

[Teevan et al., 2016]

Organize Content

collaboration

microtask

mobile

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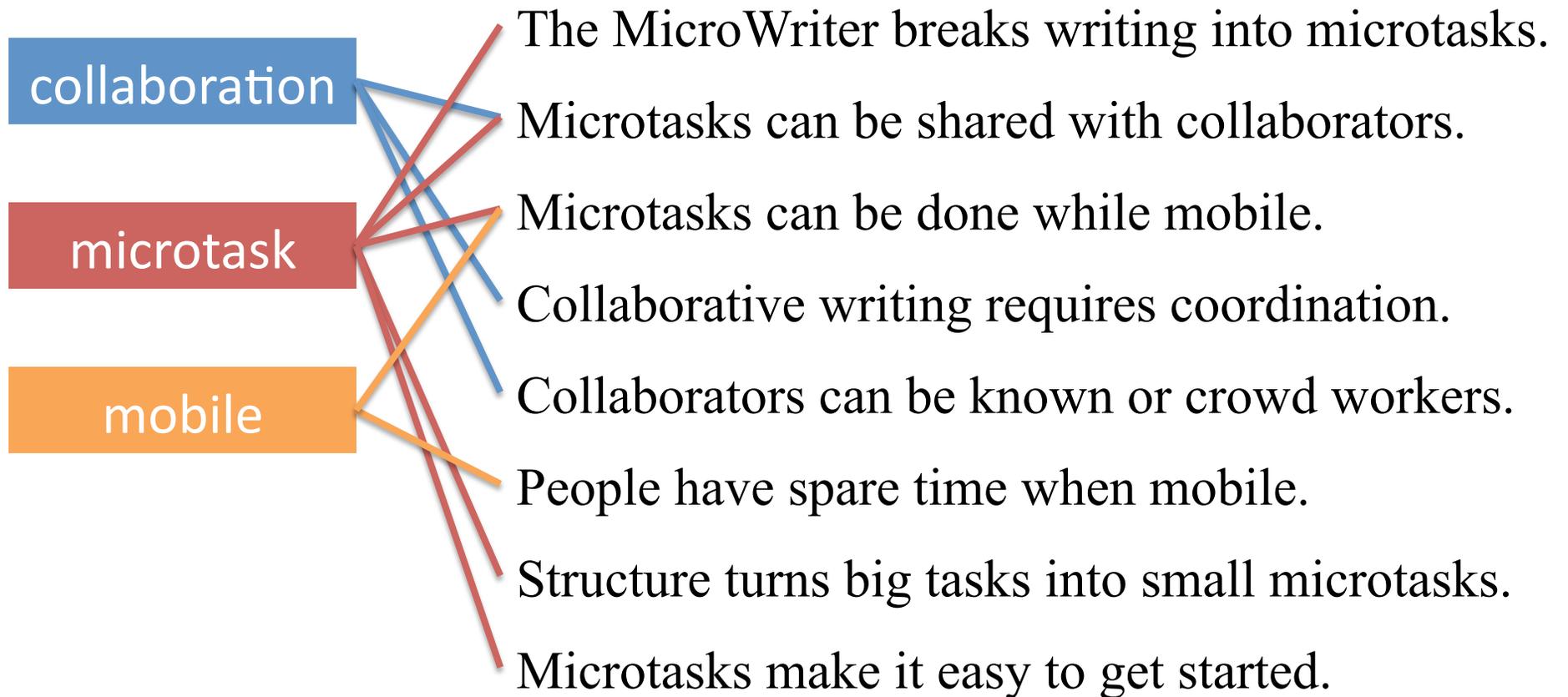
Turn Content into Writing

collaboration
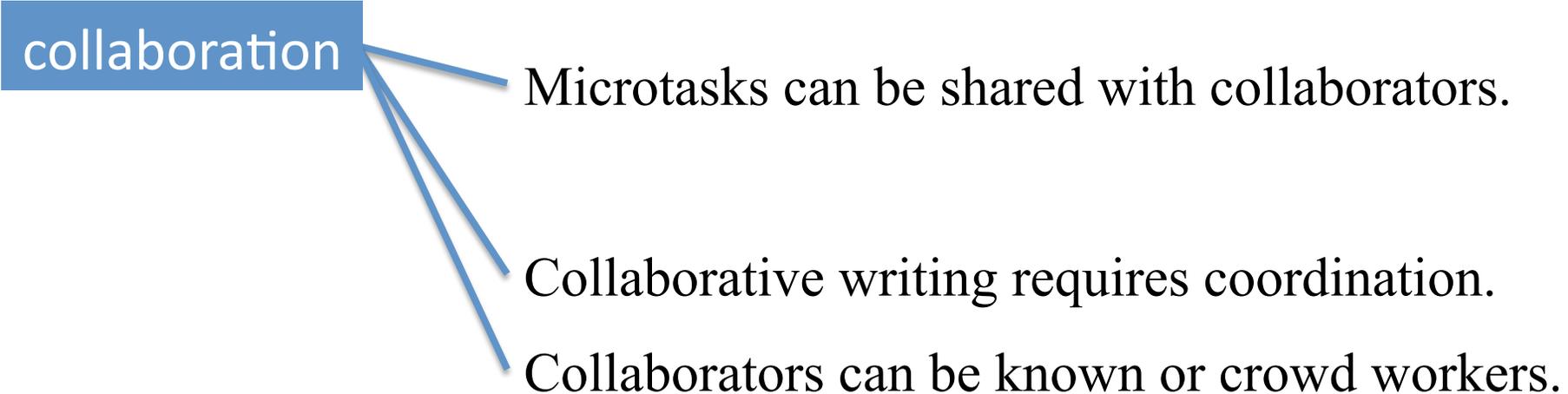
Microtasks can be shared with collaborators.

Collaborative writing requires coordination.

Collaborators can be known or crowd workers.

Collaborative writing typically requires coordination, but microtasks are easy to share with collaborators without the need for coordination. The collaborators can be known colleagues or paid crowd workers.

[Teevan et al., 2016]

Turn Content into Writing

Structure makes it possible to turn big tasks into a series of smaller microtasks. For example, the MicroWriter breaks writing into microtasks. These microtasks make the larger task easier to start.

Collaborative writing typically requires coordination, but microtasks are easy to share with collaborators without the need for coordination. The collaborators can be known colleagues or paid crowd workers.

People have spare time when mobile, and these micromoments are ideal for doing microtasks.

[Teevan et al., 2016]

The ~~Self~~sourcing Process
Crowdsourcing

1. Collect content

2. Organize content

3. Turn content into writing

- Steps 2 & 3 could be down by crowdworkers, traditional ML/AI approaches, or a combination

- Author takes final pass, no need for perfection

[Teevan et al., 2016]

Hybrid Intelligence for Information Aggregation

Combinatorial Prediction Markets
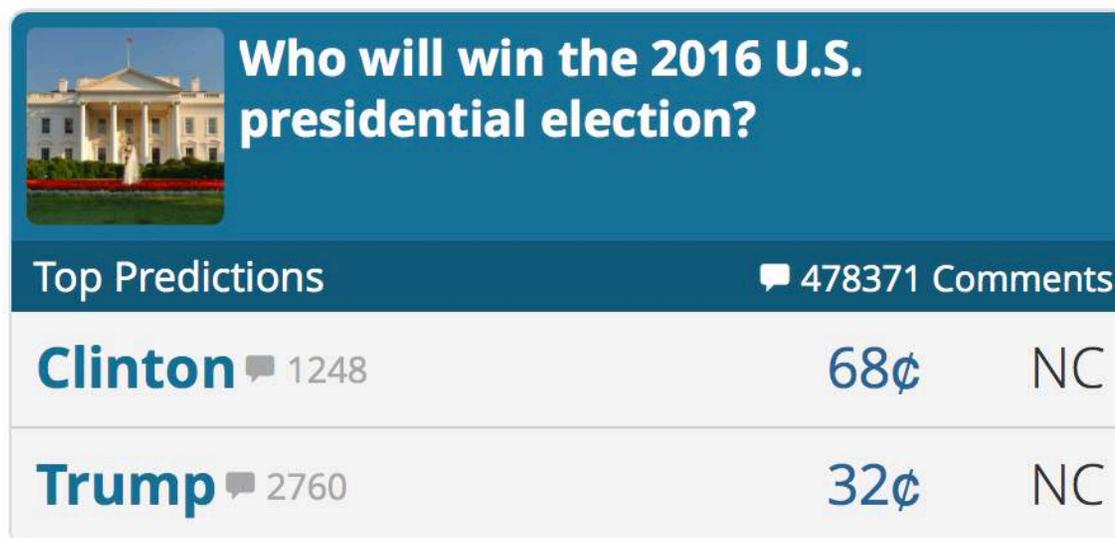
Who will win the 2016 U.S. presidential election?

Top Predictions | 💬 478371 Comments

Clinton 💬 1248	68¢	NC
Trump 💬 2760	32¢	NC

source: PredictIt.org

Payoff would have been $1 if Clinton won. If probability of Clinton winning was *x*, I should have

- Bought at any price less than $*x*
- Sold at any price greater than $*x*

Market price captures crowd's collective belief

[Abernethy, Chen, Vaughan, 2013]

Combinatorial Prediction Markets
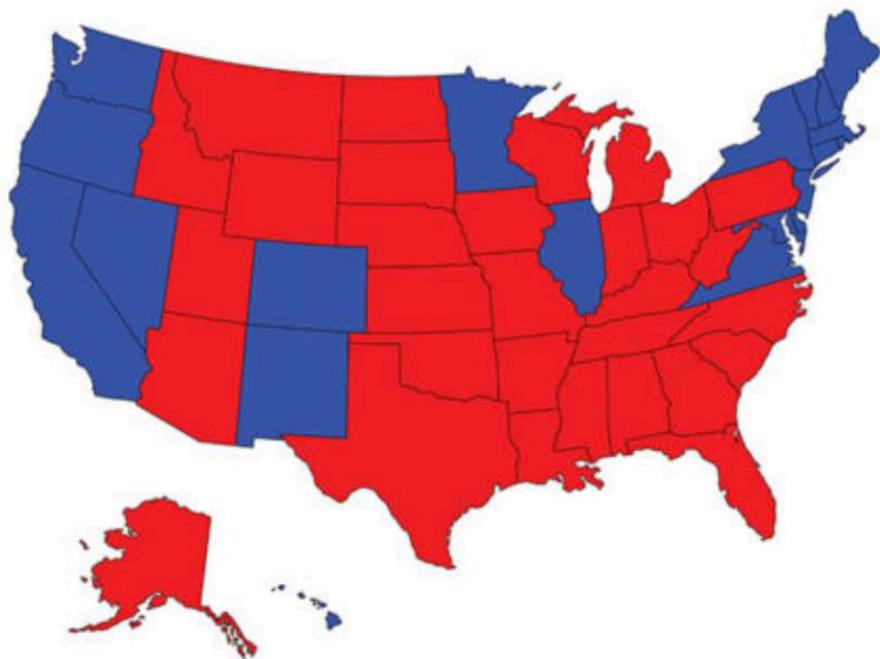
Chance of Democrat winning North Carolina?

Chance of Republican winning Ohio or Pennsylvania?

Challenges: liquidity, computational issues, …

Can combine optimization techniques with human input to generate coherent prices (and therefore coherent predictions) over large outcome spaces

[Abernethy, Chen, Vaughan, 2013]

Hybrid Intelligence in Industry

The Potential of Crowdsourcing

1. Direct Applications to Machine Learning

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User Studies for Security Research

How well do Internet users understand security risks?

p@ssw0rd   vs.   pAsswOrd

Who tries to guess passwords?

Only 14% mentioned both strangers *and* familiar people as threats

[Ur et al., 2016]

User Studies to Improve the Communication of Numbers

Q: How many times larger is a trillion than a million? Would you say...

- One Thousand Times- **18%**
- Ten Thousand Times- **12%**
- One Hundred Thousand Times- **21%**
- One Million Times- **21%**
- Ten Million Times- **17%**
- Don't Know- **12%**

This report presents the findings of a telephone survey conducted among a national probability sample of 1,001 adults comprising 501 men and 500 women 18 years of age and older, living in private households in the continental United States. Interviewing for this CARAVAN® Survey was completed during the period April 23-26, 2009.

[Barrio et al., 2016]

Perspectives

- Is a one hundred billion dollar cut to the US federal budget big or small?

- One hundred billion dollars is about...
  - 3% of the 2015 US federal budget
  - 1/6 of annual US spending on military
  - 30% of the net worth of Beyoncé
  - $5 for every person in New York state

[Barrio et al., 2016]

Step 1: Perspective Generation

Six months of New York Times front page articles

64 quotes with measurements

370 crowd-generated perspectives with incentives for quality

Workers rated other workers' perspectives for helpfulness

Chose the highest-rated perspectives

[Barrio et al., 2016]

Perspective Examples

- The Ohio National Guard brought 33,000 gallons of drinking water to the region.

- To put this into perspective, 33,000 gallons of water is about equal to the amount of water it takes to fill 2 average swimming pools.

[Barrio et al., 2016]

Perspective Examples

- They also recommended safety programs for the nation's gun owners; Americans own almost 300 million firearms.

- To put this into perspective, 300 million firearms is about 1 firearm for every person in the United States.

[Barrio et al., 2016]

Step 2: Perspective Experiments

- Randomized experiments run on 3200+ subjects on AMT to test three proxies of comprehension
  - Recall
  - Estimation
  - Error detection

- Support found for the benefits of perspectives across all experiments
  - Example: 55% remembered number of firearms in US with perspective, only 40% without

[Barrio et al., 2016]

User Studies for Online Advertising

The Cost of Annoying Ads

vs.

Advertisers pay publishers to display ads, but annoying ads cost publishers page views.

How much do annoying ads cost publishers in dollars?

[Goldstein et al., 2013]

The Cost of Annoying Ads

vs.

Step 1: Use the crowd to identify annoying ads.

[Goldstein et al., 2013]

Good Ads

[Goldstein et al., 2013]

Bad Ads

[Goldstein et al., 2013]

Step 2: Estimate the Cost

- Workers asked to label email as spam or not

- Shown good, bad, or no ads; paid varying amounts per email

- *How much more must a worker be paid to do the same tasks when shown bad ads?*

What is your Credit Score?

Excellent
750 - 840

Good
660 - 749

Fair
620 - 659

Poor
340 - 619

I Don't Know
????

Find out INSTANTLY!

FreeScore.com.

Hi!

We have a new product that we offer to you, C_I_A_L_I_S soft tabs,

Cialis Soft Tabs is the new impotence treatment drug that everyone is talking about.Soft Tabs acts up to 36 hours, compare this to only two or three hours of Viagra action! The active ingredient is Tadalafil, same as in brand Cialis.

Simply disolve half a pill under your tongue, 10 min before sex, for the best erections you've ever had!

Soft Tabs also have less sidebacks (you can drive or mix alcohol drinks with them).

You can get it at: http://onlinegenericrx.com/soft/

No thanks: http://onlinegenericrx.com/rr.php

Mortgage Rates Hit Record Lows!

Click Your State

Bad Credit OK

LowerMyBills.com

AL AK AZ AR CA CO CT DE DC FL GA HI ID IL IN IA KS KY LA ME MD MA MI MN MS MO MT NE NV NH NJ NM NY NC ND OH OK OR PA RI SC SD TN TX UT VT VA WA WV WI WY

[Goldstein et al., 2013]

Step 2: Estimate the Cost

- Good ads lead to about the same number of views (emails classified) as no ads

- Costs more than $1 extra to generate 1000 views of bad ads instead of no ads or good ads

- Takeaway: Publishers lose money by showing bad ads unless they are paid significantly more to show them

[Goldstein et al., 2013]

Summary of Part 1

1. Direct Applications to Machine Learning

2. Hybrid Intelligence Systems

3. Large Scale Studies of Human Behavior

Part 2:
The Crowd is Made of People

Traditional computer science tools let us reason about programs run on machines (runtime, scalability, correctness, ...)
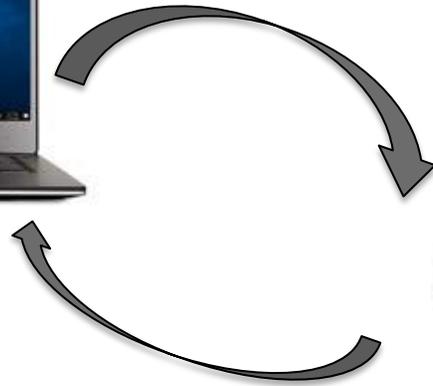
What happens when there are humans in the loop?

Need a model of human behavior. (Are they accurate? Honest? Do they respond rationally to incentives?)

Wrong assumptions lead to suboptimal systems!
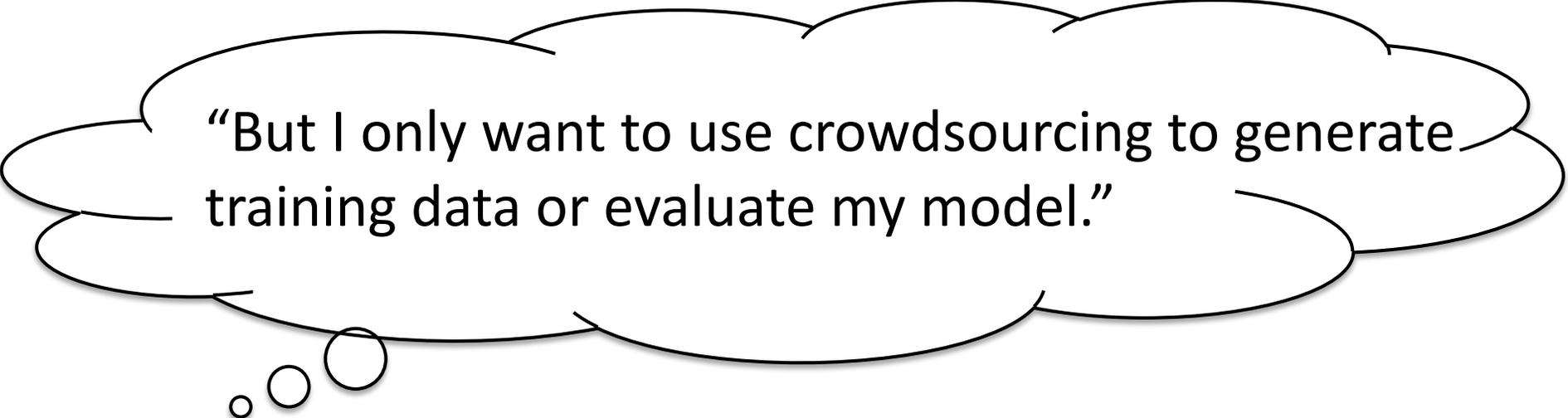
"But I only want to use crowdsourcing to generate training data or evaluate my model."

Understanding the crowd can teach you
- How much to pay for your tasks and what payment structure to use
- How much you really need to worry about spam
- How and why to communicate with workers
- Whether your labels/evaluations are independent
- How to avoid common pitfalls

The Crowd is Made of People

- Crowdworker demographics
- Honesty of crowdworkers
- Monetary incentives
- Intrinsic motivation
- The network within the crowd

Best practices! Tips and tricks!

Amazon Mechanical Turk

Workers

Requesters

Crowdworker Demographics

Basic Demographics

[mturk-tracker.com]
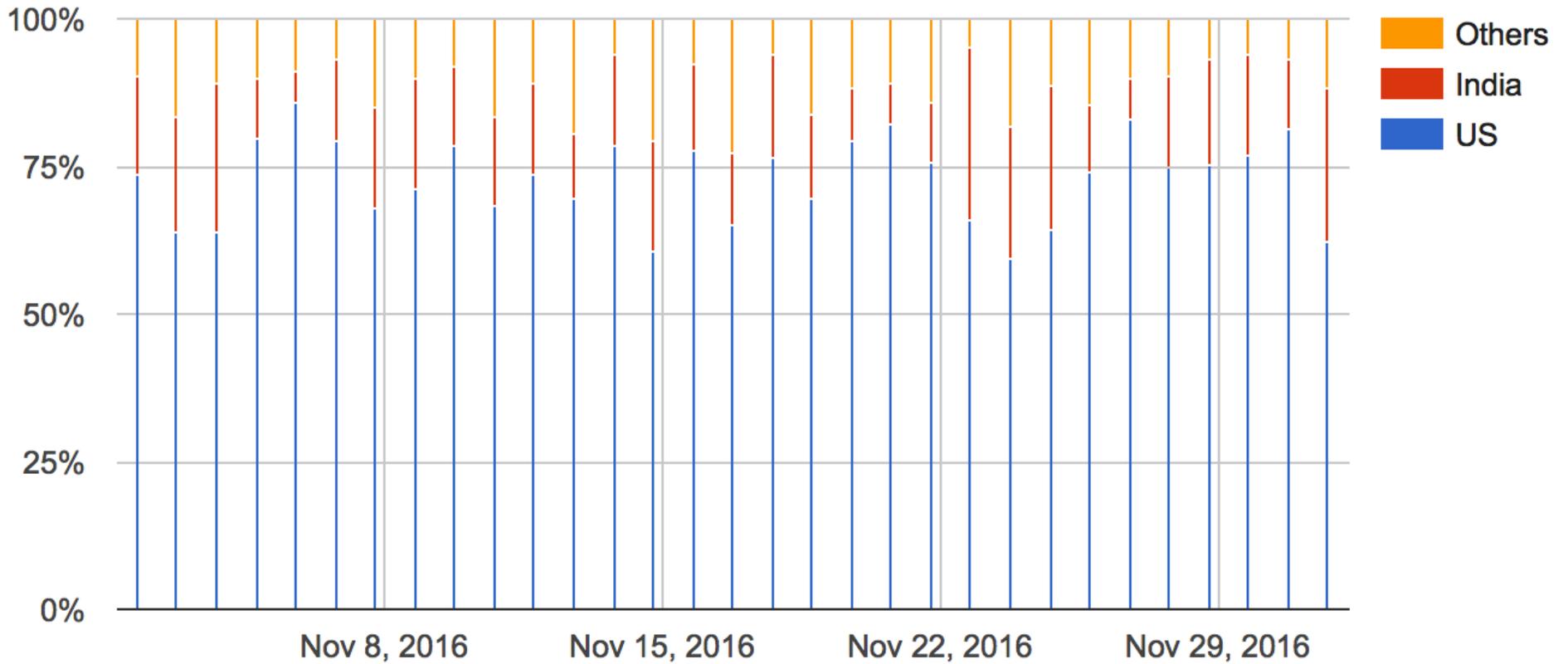
Basic Demographics

- 70-80% US, 10-20% India

- Roughly equal gender split

- Median (reported) household income:
  – $40K-$60K for US workers
  – Less than $15K for Indian workers

[mturk-tracker.com]
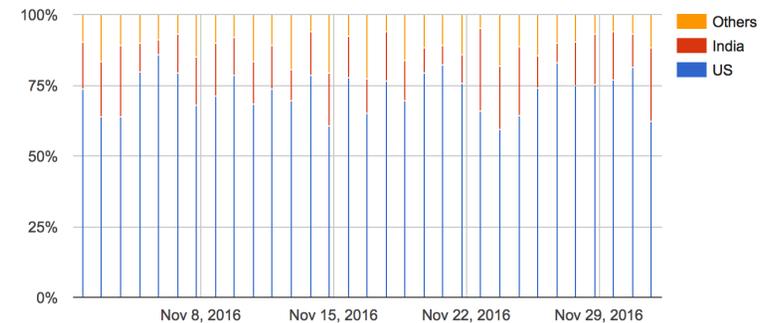
Spammers Aren't Such a Big Problem

Experimental Paradigm

- Ask participants about demographics
  - Sex, Age, Location, Income, Education

- Ask participants to **privately** roll a die (or simulate it on an external website) and report the outcome

$$payment = \$0.25 + (\$0.25 * roll)$$

- If workers honest, mean reported roll should be about 3.5... What do you think the mean was?

[Suri et al., 2011]

Baseline

- Average reported roll higher than expectation
  - M = 3.91, *p* < 0.0005

- Players under-reported ones and twos and over-reported fives

- **But many workers were honest!**

- Similar to Fischbacher & Huesi lab study
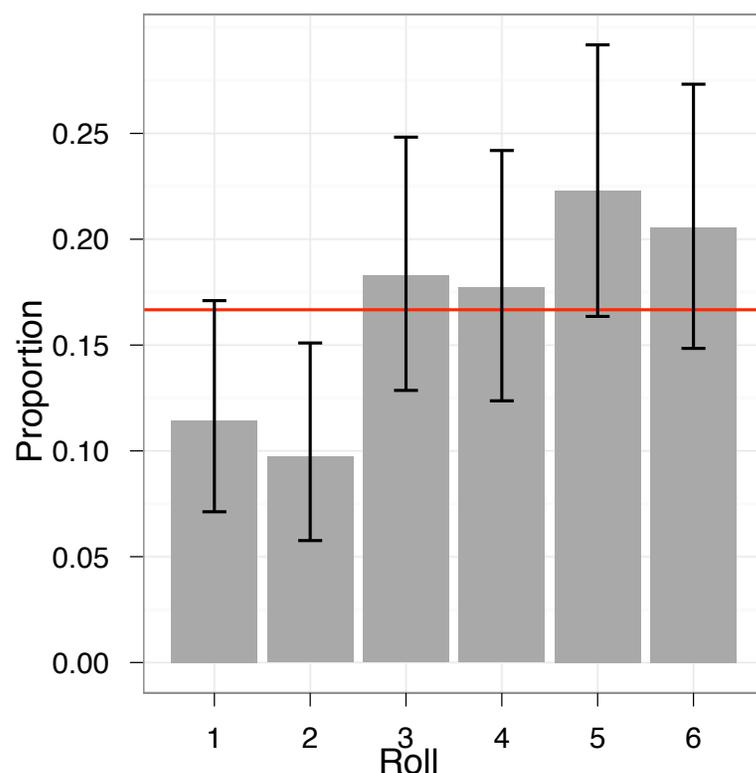
[Suri et al., 2011]

Thirty rolls

- Overall, much less dishonesty

- Average reported roll much closer to expectation
  - M = 3.57, $p < 0.0005$

- Only 3 of 232 reported significantly unlikely outcomes

- Only 1 was fully income maximizing (all sixes)

- **Why is this the case?**
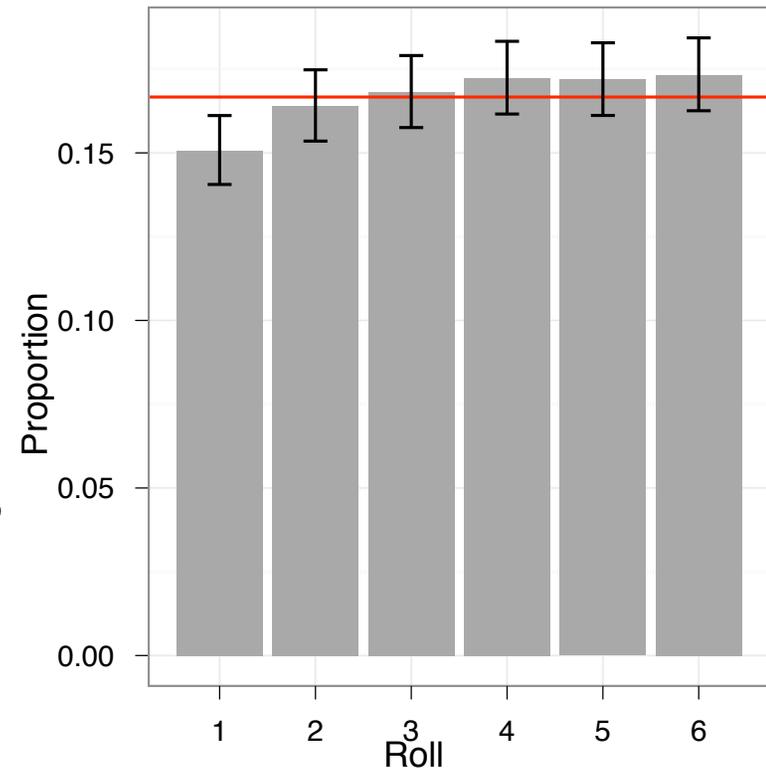
[Suri et al., 2011]

Takeaways & Related Best Practices

- Most workers are honest most of the time.

- But some are not. You should still use care to avoid attacks.

Monetary Incentives

How much should you pay?

A useful trick:

- Pilot your task on students, colleagues, or a few workers to see how long it generally takes.

- Use that to make sure your payments work out to at least the US minimum wage.

Benefits:

- It's the decent thing to do!

- It helps maintain good relationships with workers.

Can performance-based payments improve the quality of crowdwork?

Proofread this text, earn $0.50

Earn an extra $0.10 for every typo found

[Ho et al., 2015]

Prior Work on Crowd Payments

- Paying more increases the quantity of work, but not the quality [MW09, RK+11, BKG11, LRR14]
- PBPs improve quality [H11, YCS14]
- PBPs do not improve quality [SHC11]
- Bonus sizes don't matter [YCS13]

[Ho et al., 2015]

Performance-Based Payments

We explore **when**, **where**, and **why** performace-based payments improve the quality of crowdwork on Amazon Mechanical Turk.

[Ho et al., 2015]

Can PBPs work?

- Warm-up to verify that PBPs can lead to higher quality crowdwork on some task.

- Test whether there exists an implicit PBP effect: workers have subjective beliefs on the quality of work they must produce to receive the base payment, and so already behave as if payments are (implicitly) performance-based.

[Ho et al., 2015]

Can PBPs work?

- Task: Proofread an article and find spelling errors.

1: Nearly every group of animals has its giants, its species which tower above
2: their fellows as Goliath of Gath stood head and shoulders above the Philistine
3: hosts; and while some of these are giants only in comparision with their
4: fellows, belonging to families whose members are short of stature, others are
5: sufficently great to be called giants under any circumstances. Some of these
6: giants live to-day, some have but recently passed away, and some ceased to be
7: long ages before man trod this earth. The most gigantic of mammals—the
8: whales—still survive, and the elphant of to-day suffers but little in
9: comparison with the mammoth of yesterday; the monstrous Dinosaurs, greatest of
10: all reptiles—greatest, in fact, of all animals that have walked the
11: earth—flourished thousands upon thousands of years ago. As for birds, some of
12: the giants among them are still living, some existed long geologic periods ago,
13: and a few have so recently vanished from the scene that their memory still
14: lingers amid the haze of tradition. The best known among these, as well as the
15: most recent in point of time, are the Moas of New Zealand, first brought to
16: notice by the Rev. W. Colenso, later on Bishop of New Zealand, one of the many
17: missionaries to whom Science is under obligations. Early in 1838, Bishop
18: Colenso, while on a missonary visit to the East Cape region, heard from the
19: natives of Waiapu tales of a monstrous bird, called Moa, having the head of a
20: man, that inhabited the mountain-side some eighty miles away. This mighty bird,
21: the last of his race, was said to be attened by two equally huge lizards that
22: kept guard while he slept, and on the approach of man wakened the Moa, who
23: imediately rushed upon the intruders and trampled them to death. None of the
24: Maoris had seen this bird, but they had seen and somewhat irreverently used for
25: making parts of their fishing tackle, bones of its extinct relatives, and these
26: bones they declared to be as large as those of an ox.
27:
28: About the same time another missionary, the Rev. Richard Taylor, found a bone
29: ascribed to the Moa, and met with a very similer traditition among the natives of
30: a near-by district, only, as the foot of the rainbow moves away as we move
31: toward it, in his case the bird was said to dwell in quite a diffrent locality
32: from that given by the natives of East Cape. While, however, the Maoris were

- We randomly insert 20 typos
  - sufficiently -> sufficently
  - existence -> existance
  - ...

- Useful properties:
  - Quality is measurable
  - Exerting more effort -> better results

[Ho et al., 2015]

Can PBPs work?

Base payment: $0.50; Bonus payment: $1.00

Three Bonus Treatments:
- *No Bonus:*   no bonus or mention of a bonus
- *Bonus for All:*   get the bonus unconditionally
- *PBP:*   get the bonus if you find 75% of the typos found by others

Two Base Treatments:
- *Guaranteed:*   guaranteed to get paid
- *Non-Guaranteed:*   no mention of a guarantee

[Ho et al., 2015]
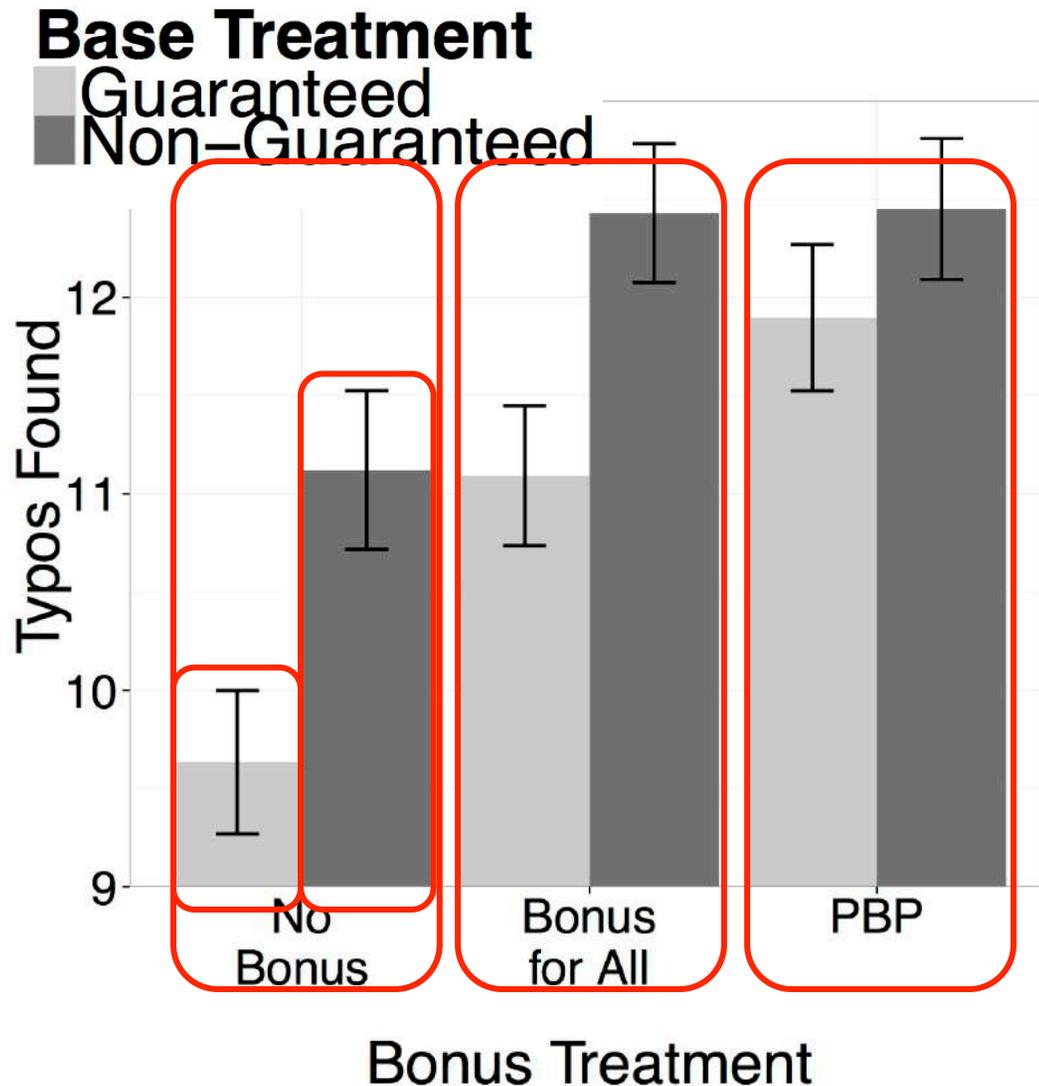
Can PBPs work?

- Results from 1000 unique workers

- Guaranteed payments hurt (implicit PBP)

- PBPs improve quality

- Unlike in prior work, paying more also improves quality

[Ho et al., 2015]

Under what conditions do PBPs work?

Bonus threshold (585 unique workers)

- $0.50 base + $1.00 bonus for finding *X* typos
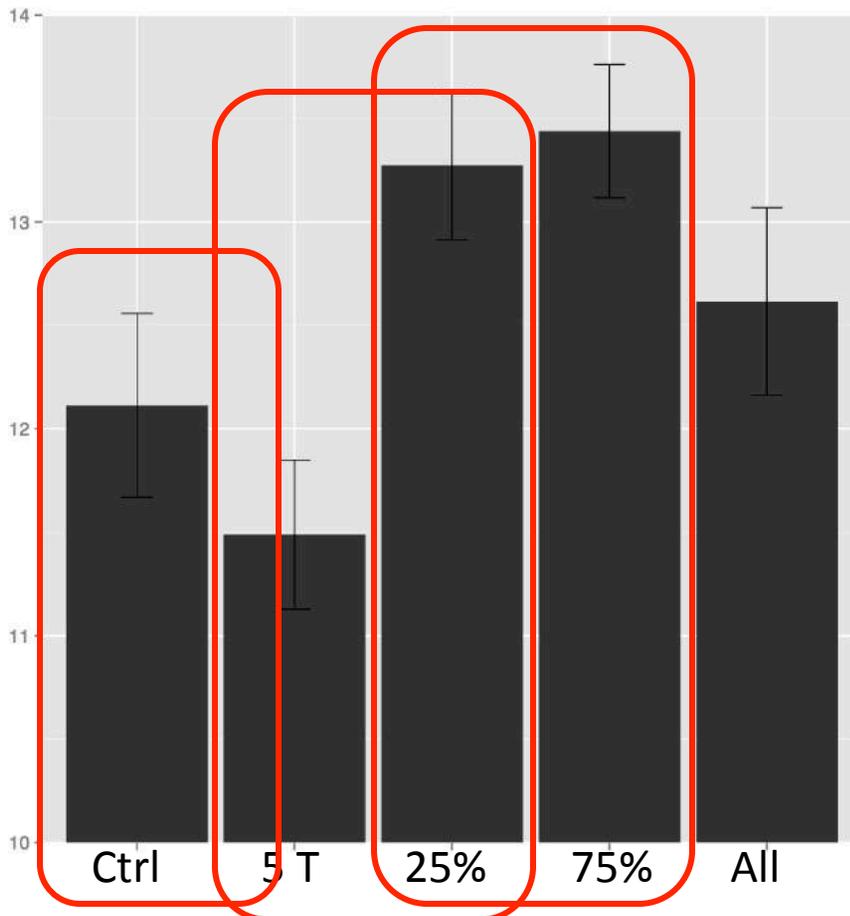
- PBPs work for a wide range of thresholds

- Subjective beliefs (5 typos vs. 25% of typos) can improve quality

[Ho et al., 2015]

Under what conditions do PBPs work?

Bonus amounts (451 unique workers)

- $0.50 base + $X bonus for finding 75% of typos

- PBPs work as long as the bonus is large enough

could explain Shaw et al., 2011

could explain Yin et al., 2013

[Ho et al., 2015]
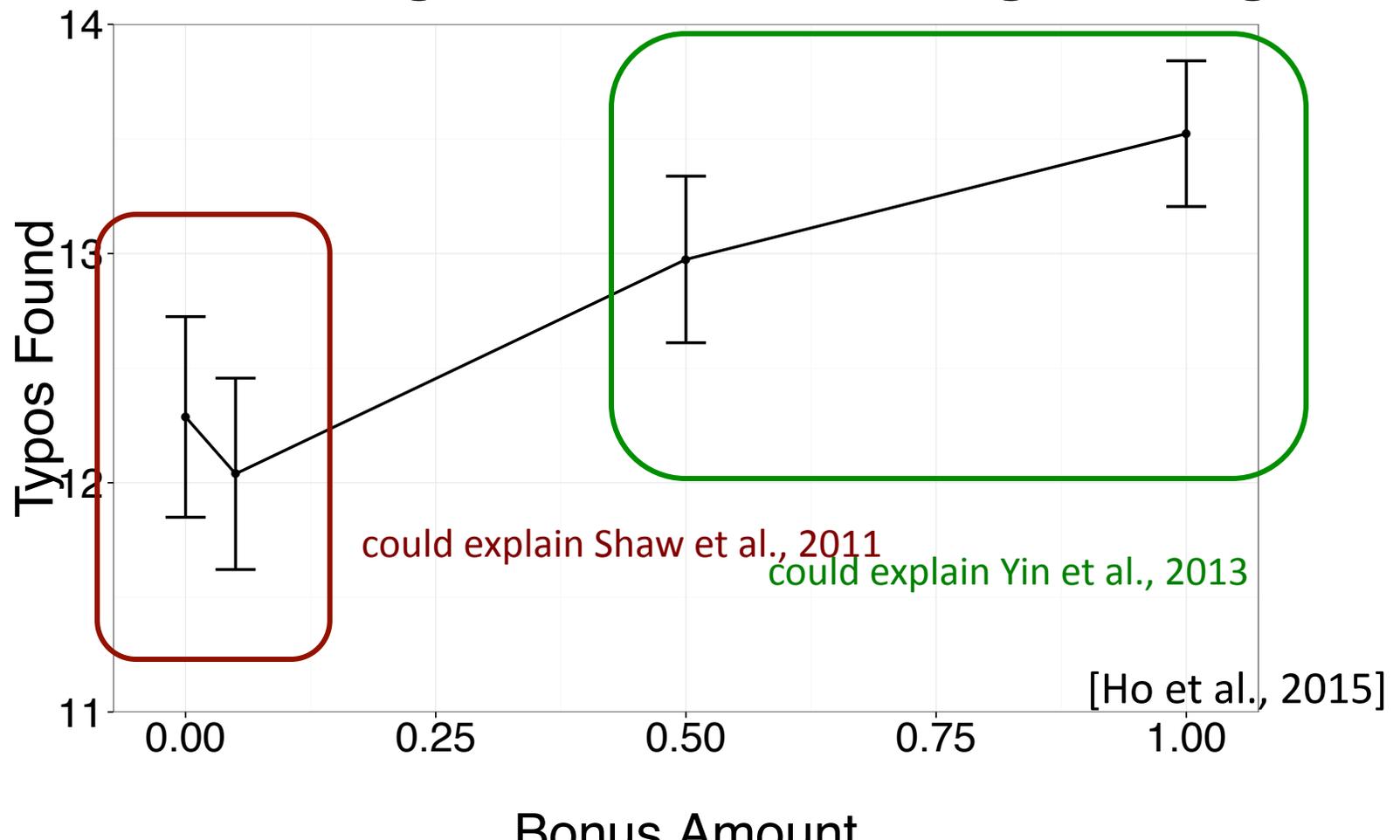
Which tasks do PBPs work on?

- What properties of a task lead to quality improvements from performance-based pay?

- Some pilot experiments on audio transcription suggested that
  - PBPs improve quality for effort-responsive tasks
  - It is not always straight-forward to guess which tasks are effort-responsive

[Ho et al., 2015]

Which tasks do PBPs work on?
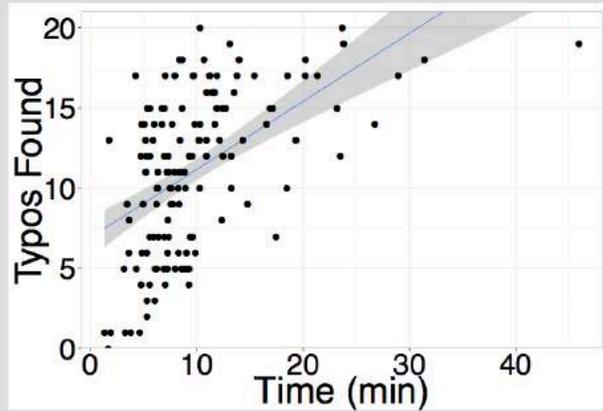
proofreading
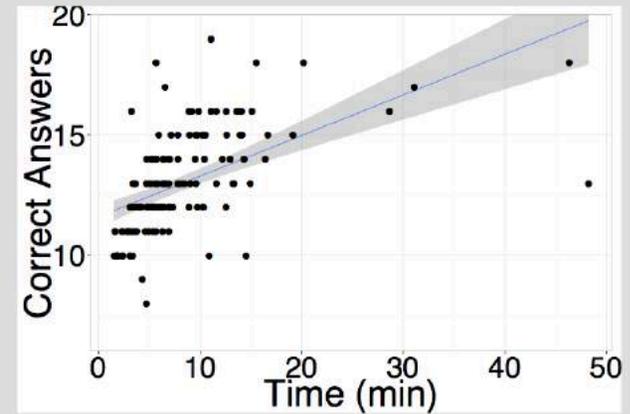
Spotting differences
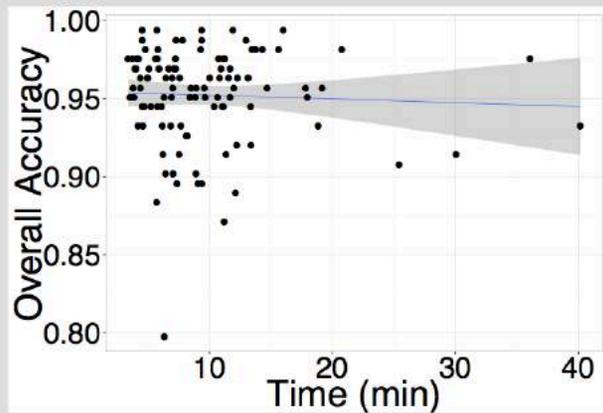
Handwriting recognition

Audio transcription

[Ho et al., 2015]
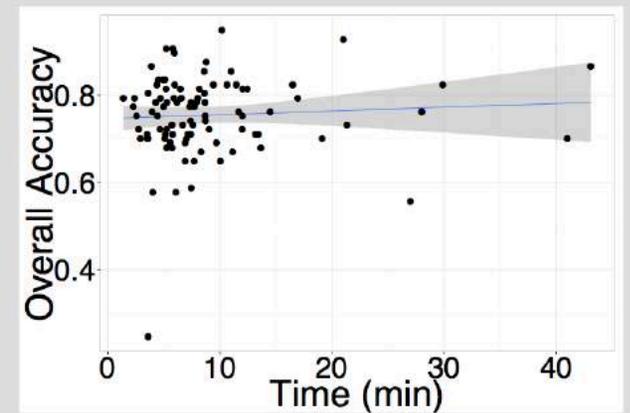
Takeaways & Related Best Practices

- Aim to pay at least US minimum wage. Pilot your task to find out how long it takes.

- Performance-based payments can improve quality for effort-responsive tasks. Pilot to check the relationship between time and quality.

- Bonus payments should be large relative to the base. The precise amount and precise criteria for receiving the bonus don't matter too much.

Intrinsic Motivation

Work That Matters

- Three treatments:
  - **control:** no context given
  - **meaningful:** told they were labeling tumor cells to assist medical researchers
  - **shredded:** no context, told work would be discarded

- Meaningful -> **quantity** up, but **quality** similar
- Shredded -> **quality** down, but **quantity** similar

[Chandler and Kapelner, 2013]

Takeaways & Related Best Practices

- Workers produce more work when they know they are performing a meaningful task.

- But the quality of their work might not improve.

- Gamification and explicitly stoking workers' curiosity can also increase productivity.

The Communication Network Within the Crowd

Assumption: Crowdworkers are independent

[Yin et al., 2016]

In reality workers talk and collaborate

Ethnographic field studies show that crowdworkers...

Help each other with administrative overhead

Share tasks and reputable employers

Recreate social connections and support

M.L. Gray, S. Suri, S.S. Ali and D. Kulkarni. The Crowd is a Collaborative Network. *CSCW* 2016

N. Gupta, D. Martin, B.V. Hanrahan and J. O'Neil. Turk-life in India. *Group* 2014

[Yin et al., 2016]

A Communication Network

What is the scale?   What is the structure?   How is it used?

[Yin et al., 2016]

Our goal: Open the black box of crowdsourcing to map the communication network of crowdworkers

[Yin et al., 2016]

Why is it challenging?

The network is not accessible from the API so we can't simply download, crawl, or scrape it!

Want to map the network in a way that

#1 Elicits only "true" edges

#2 Elicits as many true edges as possible

#3 Preserves workers' privacy

[Yin et al., 2016]

A Web App

- Workers self-report their connections

- Provides some value back to the workers so that it's in their best interest to report as many true connections as possible

Create a nickname for yourself

Complete a brief demographic survey (8 questions)

Tell us a little about your personal experience with MTurk (2 questions)

Swap nicknames with Turkers you know

Explore the global Turker network!
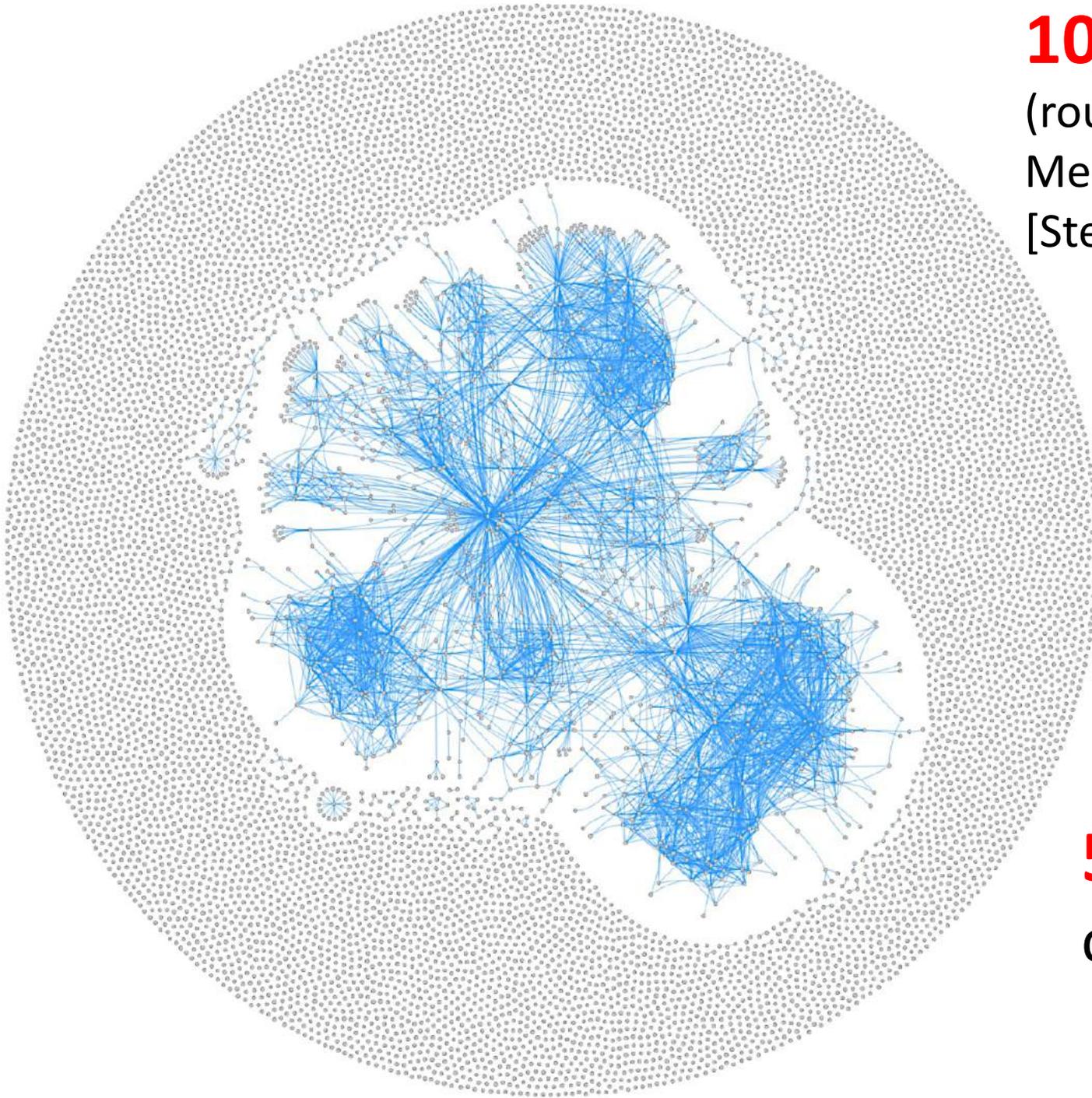
[Yin et al., 2016]

10,354 workers
(roughly a census of
Mechanical Turk
[Stewart et al. 2015])

5268
connections

[Yin et al., 2016]
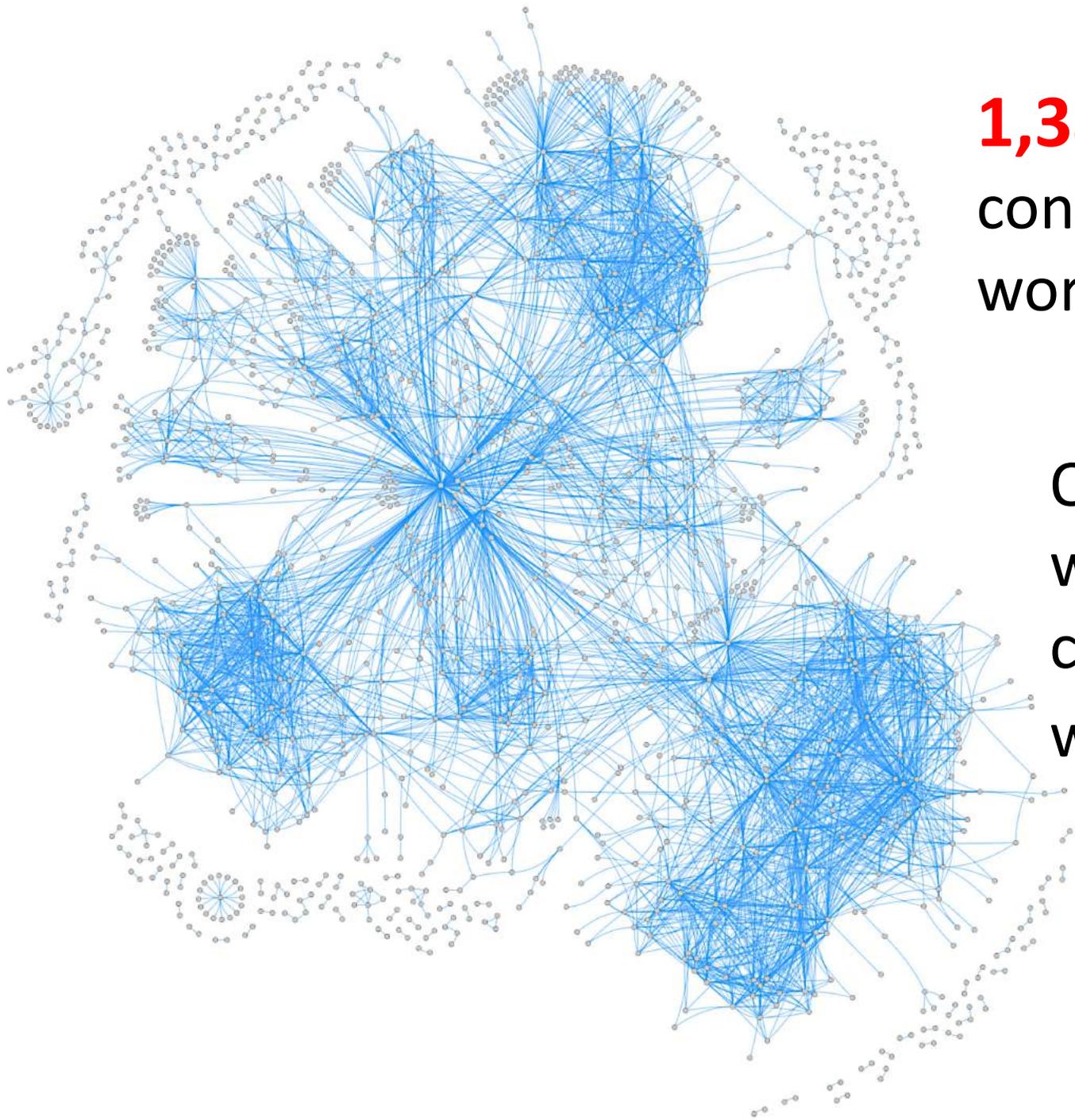
1,389 (13%) connected workers

On average, workers communicate with **7.6** others

Max degree is **321**

[Yin et al., 2016]
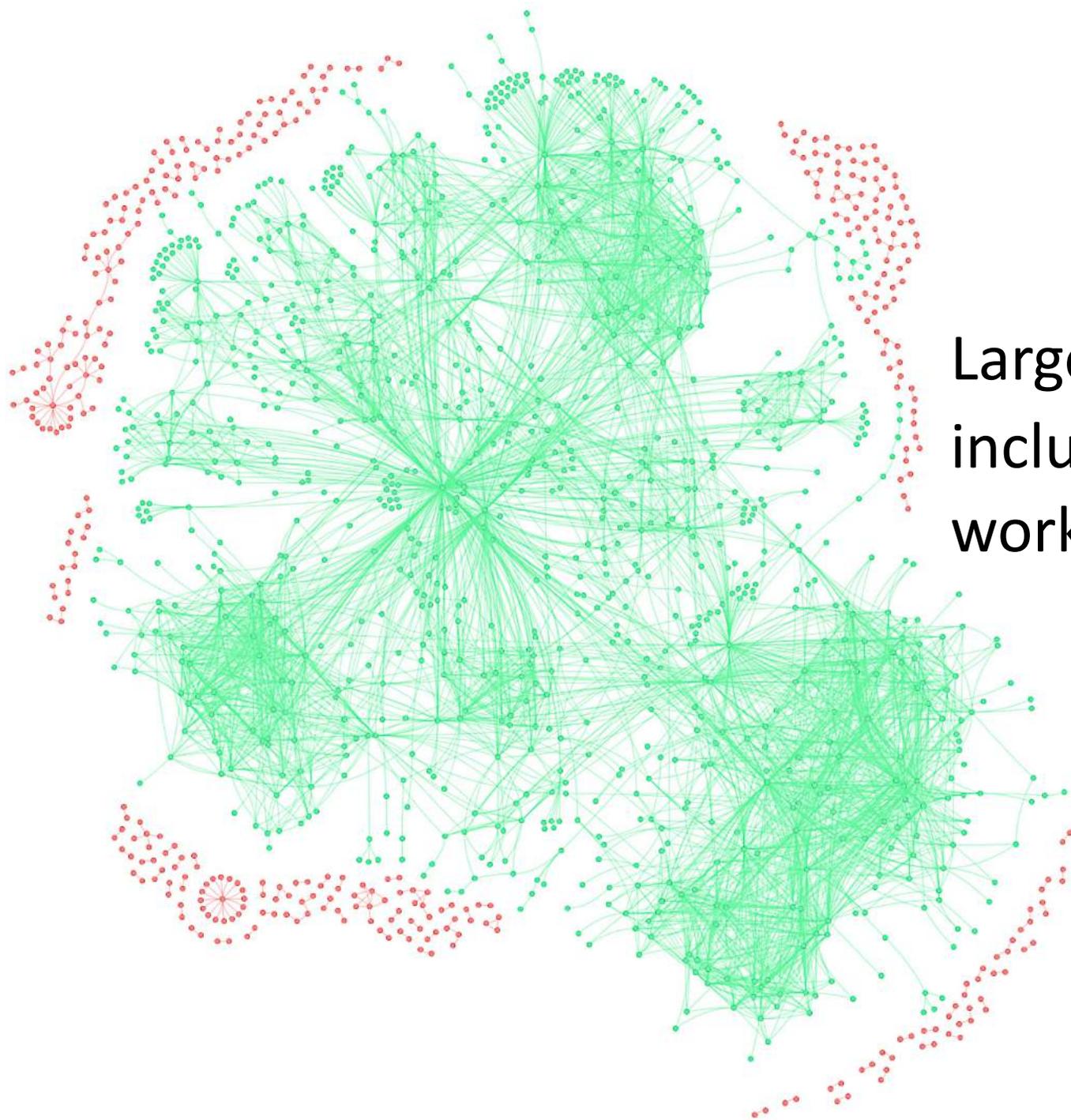
Largest component includes **994 (72%)** workers

[Yin et al., 2016]

A Network Enabled By Forums

- **59%** of all workers and **83%** of connected workers reported using at least one forum.

- **90%** of all edges are between pairs of workers who communicate via forums, and **86%** are between pairs who communicate *exclusively* through forums.

[Yin et al., 2016]

Forums Create Subcommunities
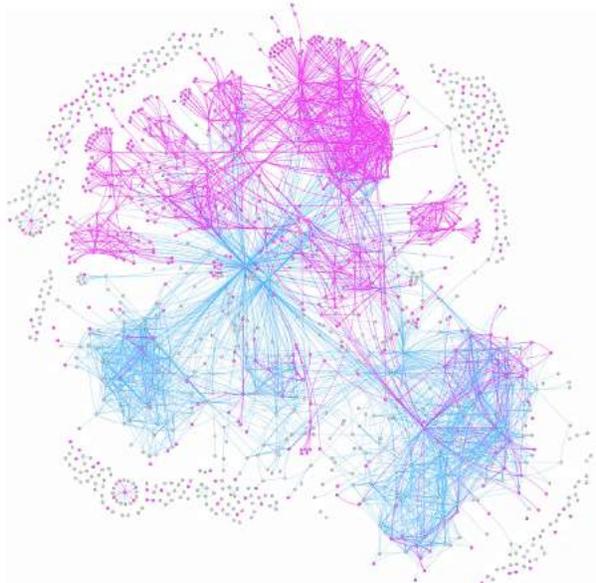
Reddit HWTF
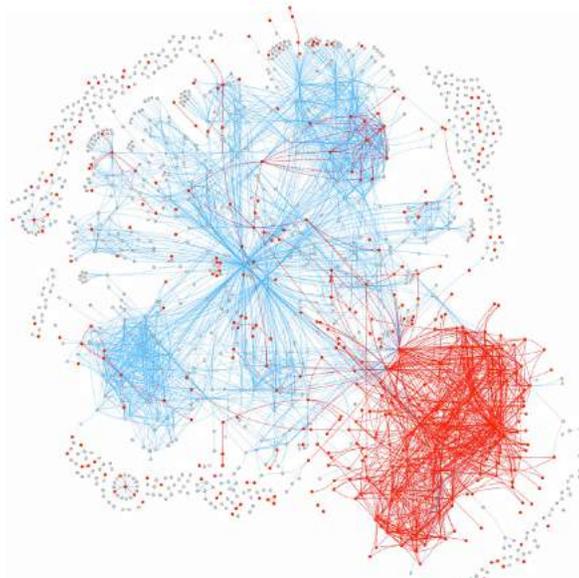
MTurkGrind
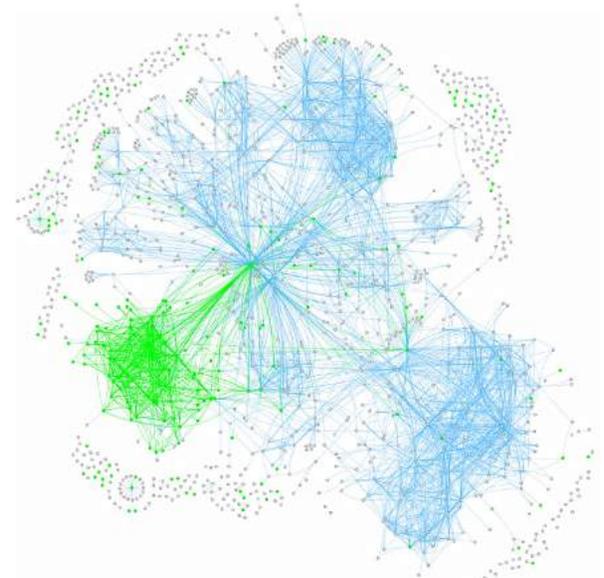
TurkerNation
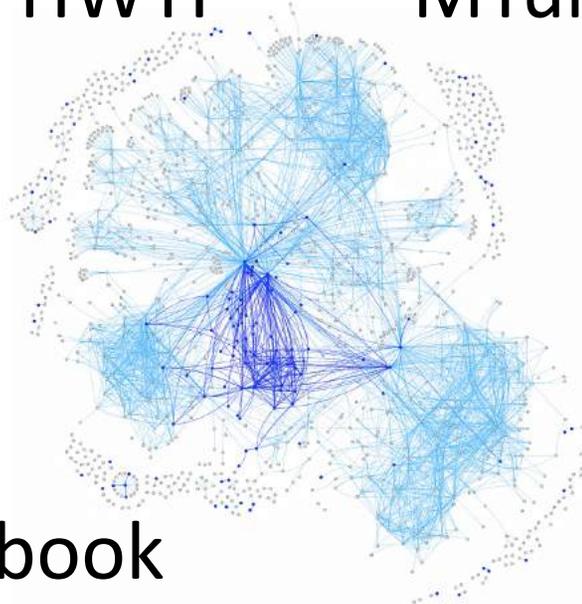
Facebook
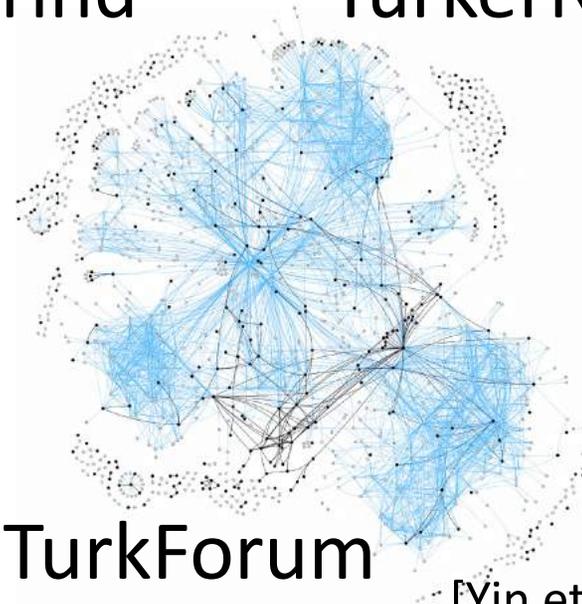
MTurkForum

[Yin et al., 2016]

Subcommunities Are Different
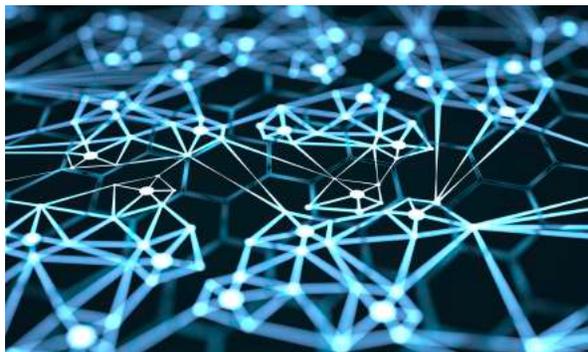

Topological Structure: How tightly connected is each subcommunity?

Temporal Dynamics: Do relationships endure over time?

Communication Content: Is communication social or strictly business?

[Yin et al., 2016]

Measures of Success

Property	Connected	Unconnected
Be active > 1 year	55%	46%
Use forums	83%	56%
Master	11%	7%
Approval rate	98.6%	97.4%

Connected workers were also more likely than unconnected workers to find our task early.

[Yin et al., 2016]

Takeaways and Related Best Practices

- Forum usage is widespread. Forums are the virtual "water coolers" of crowdworkers.

- Engage with workers on forums. Introduce yourself. Introduce your tasks.

- Actively monitor forum discussion about your task. When appropriate, request that workers do not discuss your task. Monitor anyway.

- Be careful about assuming independence!

Additional Best Practices

Conducting behavioral research on Amazon's Mechanical Turk

Winter Mason · Siddharth Suri

Maintain Good Relationships with Workers

- Set aside time to actively monitor your requester email account and respond to questions.

- Approve work quickly.

- Avoid rejecting work except in the most extreme of circumstances.

Tips to Make Your Project Run Smoothly

- Pilot, pilot, pilot! Test your task on your collaborators, other colleagues, and eventually small batches of workers.

- Iterate as many times as needed.

If you remember one slide from this talk, remember this!

Tips to Make Your Project Run Smoothly

- Create clear instructions. Include quiz questions if needed. Pilot them and collect feedback.

- Create an attractive and easy-to-use interface. Pilot this too!

- Ask workers for feedback. Ask them to report bugs. Conduct exit surveys when appropriate. Workers generally want to help!

Thanks…

To Chien-Ju Ho, Andrew Mao, Joelle Pineau, Sid Suri, Hanna Wallach, and especially Ming Yin for extensive discussions and feedback

To Dan Goldstein, Chien-Ju Ho, Jake Hofman, Roozbeh Mottaghi, Sid Suri, Jaime Teevan, Ming Yin, Haoqi Zhang, and all of their collaborators for the use of material from their slides

And to all the people who sent me pointers to cool research… this tutorial was a crowdsourced effort!

Extensive notes, slides, and eventually video at

http://www.jennwv.com/projects/ crowdtutorial.html

On the Market


Chien-Ju Ho
Cornell
(Tuesday poster)
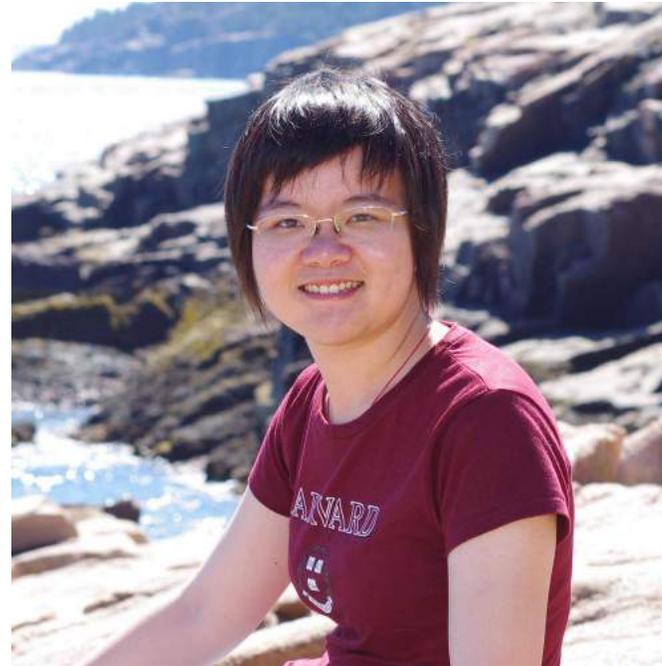
Ming Yin
Harvard

NIPS Workshop on Crowdsourcing and Machine Learning, this Friday
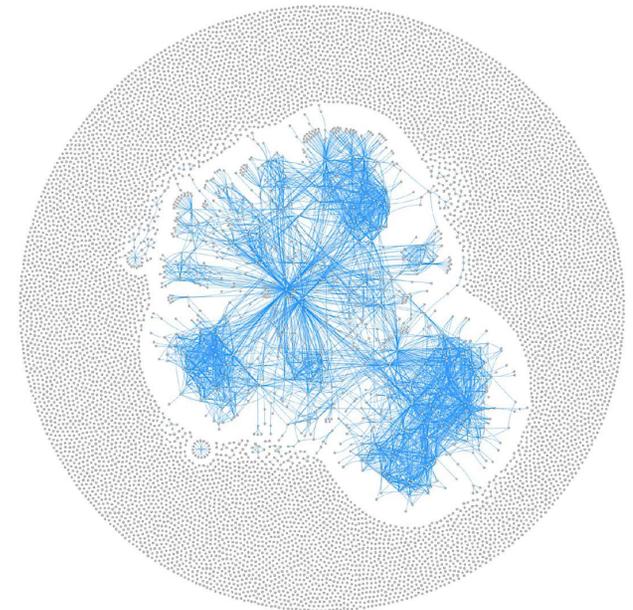
http://crowdml.cc/nips2016/

HCOMP 2017

October 24-26 in Quebec
Deadline in May
Chairs: Adam Kalai and Steven Dow

Poster session 1:30-3:30pm today, open to all!

jenn@microsoft.com
http://jennwv.com
@jennwvaughan