Workshop on Crowdsourcing

Data Science Workshop Series

Maribel Acosta, Amrapali Zaveri

Karlsruher Institut für Technologie

Maastricht University

Institute of Data Science

Introductions

- Instructors
- Participants

Agenda

9:15 - 10:00	Introduction to Human Computation
10:00 - 11:00	Microtask crowdsourcing fundamentals I
11:00 - 11:15	Coffee & Tea break
11:15 - 12:30	Hands-on I: designing a microtask on CrowdFlower
12:30 - 1:30	Lunch
1:30 - 2:30	Microtask crowdsourcing fundamentals II
2:30 - 3:30	Hands-on II: executing a microtask on CrowdFlower
3:30 - 4:00	Coffee & Tea break
4:00 - 4:30	Discussion of the results
4:30 - 5:15	Applications of crowdsourcing, summary and conclusion
5:15 - 5:30	Wrap-up and Feedback

Introduction to Human Computation

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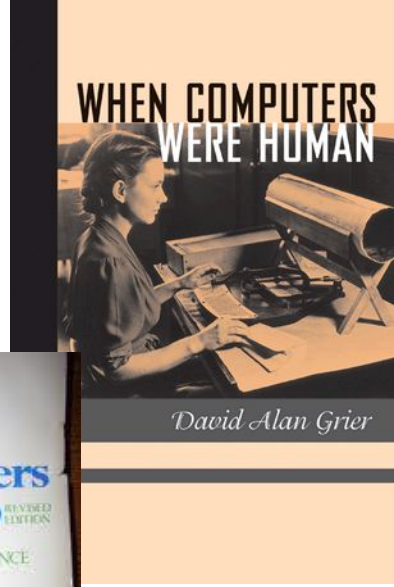
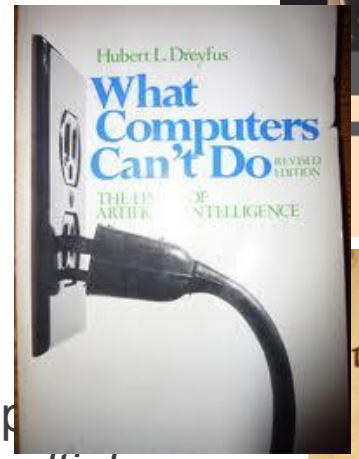
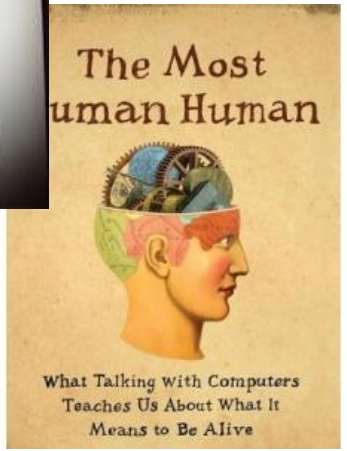
Human Computation Revisited

- **Outsourcing tasks that machines find difficult to solve to humans**
  - Difficult not the same as impossible
  - Accuracy, efficiency, cost

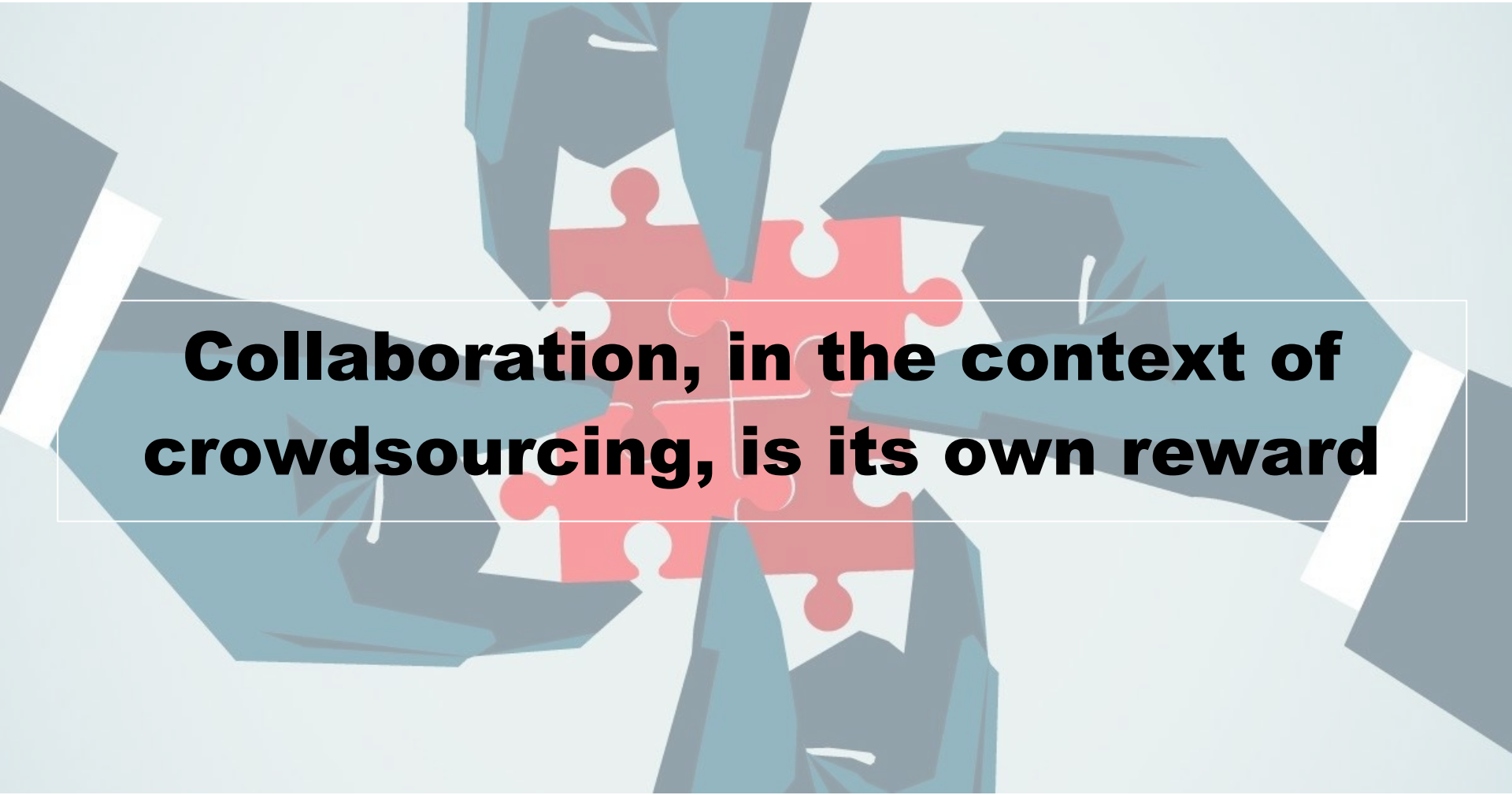
- **Historically humans were the first computers**
  - 17th century: Halley‘s commet
  - 19th century: computing factories
  - 20th century: professionalization of human comp
  - *Characteristics: division of labor, redundancy, multiple methods to find or check the correctness of a solution*







The best person to do a job is the person who most wants to do that job!


Collaboration, in the context of crowdsourcing, is its own reward


CROWDSOURCING is
OUTSOURCING on
STEROIDS

CS capitalizes on the deeply *social nature* of human behavior & on the fact that our interests are more diverse than our business cards

The Daily CROWDSOURCE
#1 site for crowdsourcing news

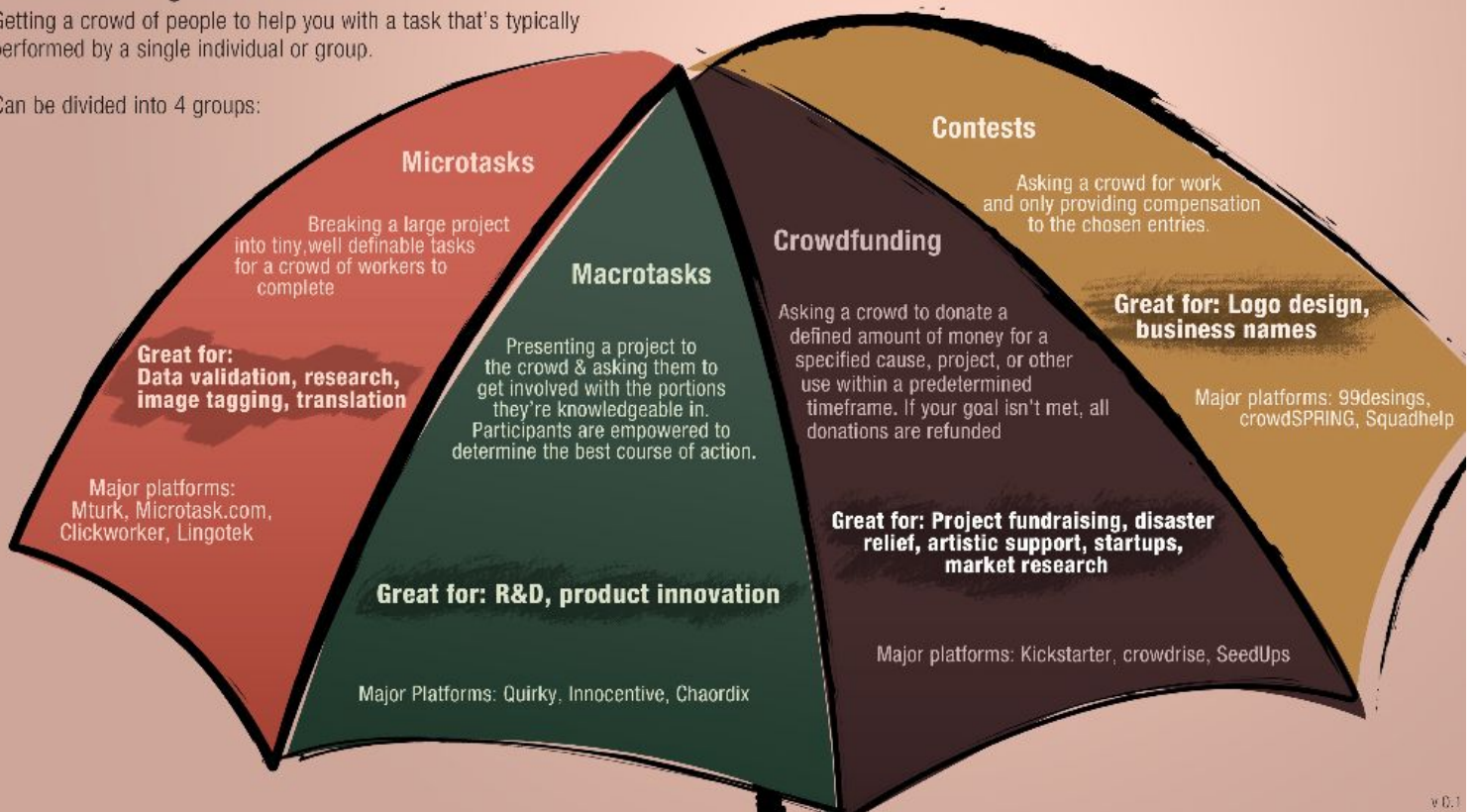
Crowdsourcing's proposed taxonomy. Learn more & voice your ideas at **http://dailycrowdsource.com/taxonomy**

Umbrella of Crowdsourcing

Crowdsourcing

Getting a crowd of people to help you with a task that's typically performed by a single individual or group.

Can be divided into 4 groups:



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WIKIPEDIA

The Free Encyclopedia

Citizen Science

WHAT IS OUTSOURCED

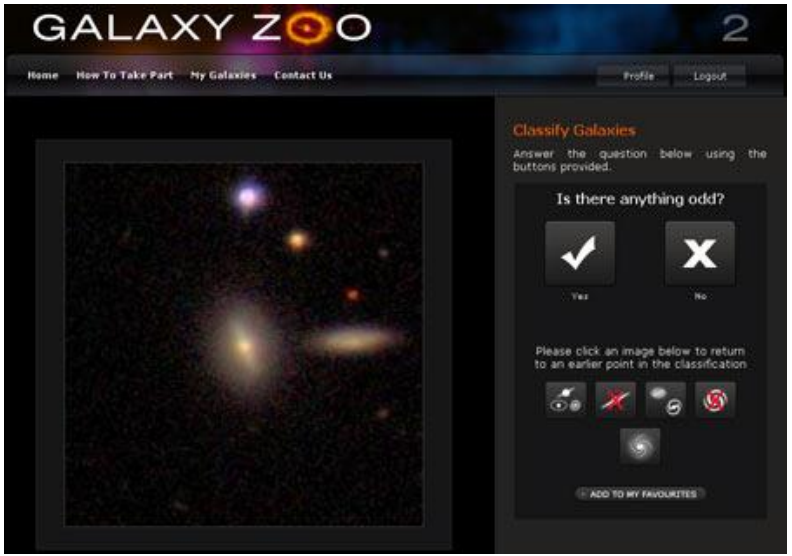
- Object recognition, labeling, categorization in media content

WHO IS THE CROWD

- Anyone

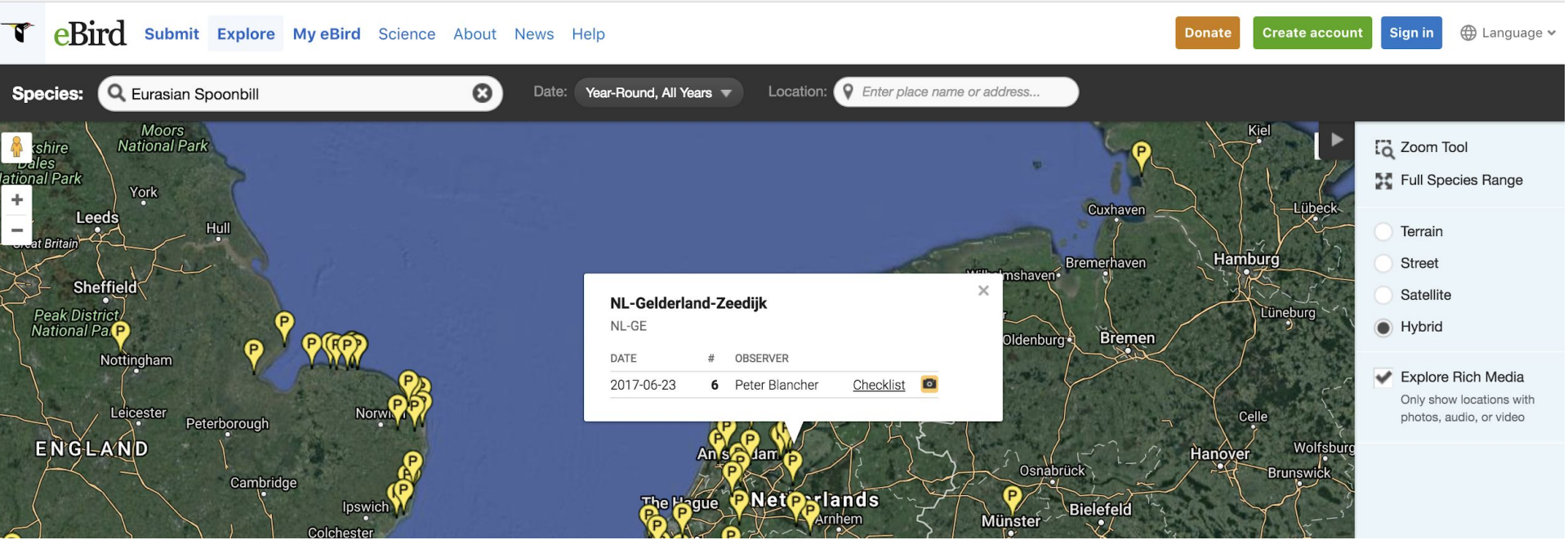
HOW IS THE TASK OUTSOURCED

- Highly parallelizable tasks
- Every item is handled by multiple annotators
- Every annotator provides an answer
- Consolidated answers solve scientific problems



https://www.innocentive.com/

https://mark2cure.org/



https://ebird.org

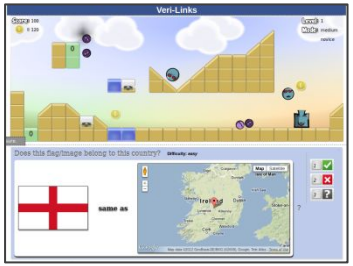
GAMES WITH A PURPOSE (GWAP)

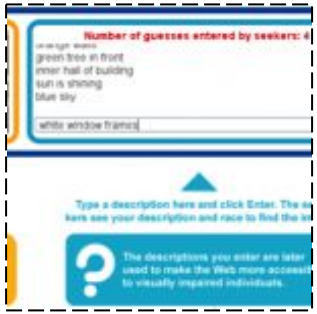
Human computation disguised as casual games

Tasks are divided into parallelizable atomic units (challenges) solved (consensually) by players

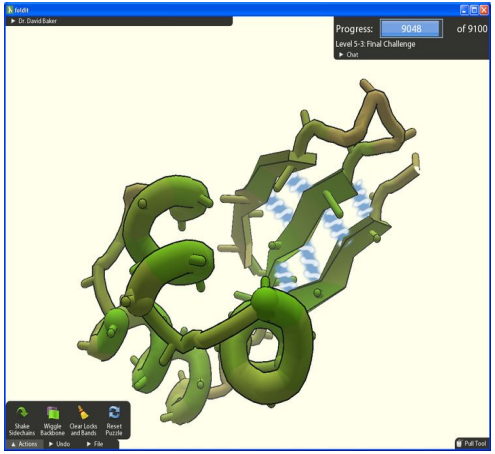
Game models

- Single vs. multi-player
- Selection agreement vs. input agreement vs. inversion-problem games





EXPLICIT VS. IMPLICIT CONTRIBUTION - AFFECTS MOTIVATION AND ENGAGEMENT



Users aware of how their input contributes to the achievement of application's goal (and identify themselves with it)

vs.

Tasks are hidden behind the application narratives. Engagement ensured through other incentives.

WHAT IS OUTSOURCED

- Tasks based on human skills not easily replicable by machines (visual recognition, language understanding, knowledge acquisition, basic human communication etc)

WHO IS THE CROWD

- Open call
- Call may target specific skills and expertise
- Requester typically knows less about the workers than in other work environments

HOW IS THE TASK OUTSOURCED

- Explicit vs. implicit participation
- Tasks broken down into smaller units undertaken in parallel by different people
- Coordination required to handle cases with more complex workflows
- Partial or independent answers consolidated and aggregated into complete solution

MICROTASKS - WHAT & WHY?

TIME 

- Highly **parallelizable** tasks
- Work is broken down into smaller — ‘micro’ — pieces that can be solved independently

MONEY $ $ $

- Tasks based on **human skills** not easily replicable by machines
- Non-expert workers can perform the tasks with a minimal payment

Consolidated answers solve scientific problems !!

CrowdFlower

figure eight

Business Data

Collect data on businesses at massive scale

Content Moderation and Curation

Quickly find both good and bad user generated content

Ranked

Boost conversions with better search results

Content Generation

Improve your search engine ranking with quality content

Custom solutions

We help businesses of all sizes automate really big custom projects

Customer and Lead Data Enhancement

Increase sales by knowing more about your customers

Sentiment and Opinion Analysis

Know exactly what people are saying about you

Categorize

Categorize products, businesses, videos, events, & more

Surveys

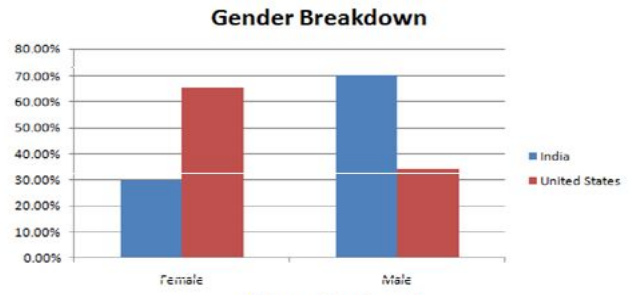
Find and interact with highly-qualified digital consumers

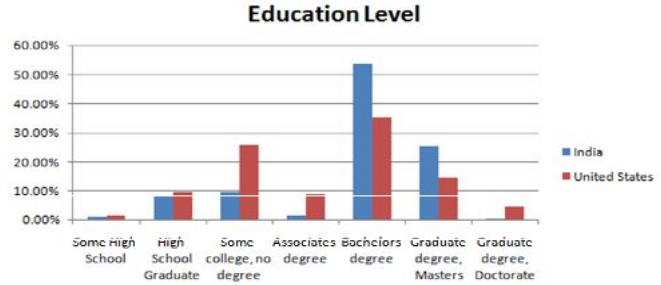
Builder

Advanced user? Developer? Build your own crowdsourcing projects

LARGE, BUT NOT ALWAYS DIVERSE CROWD

amazon mechanical turk
Artificial Artificial Intelligence





Country of residence

- United States: 46.80%
- India: 34.00%
- Miscellaneous: 19.20%

SIGNIFICANT AMOUNT OF RESOURCES AND TIMELY DELIVERY

CrowdFlower

figure eight

COMPLEX WORKFLOWS CANNOT ALWAYS BE DIRECTLY IMPLEMENTED

WHAT IS OUTSOURCED

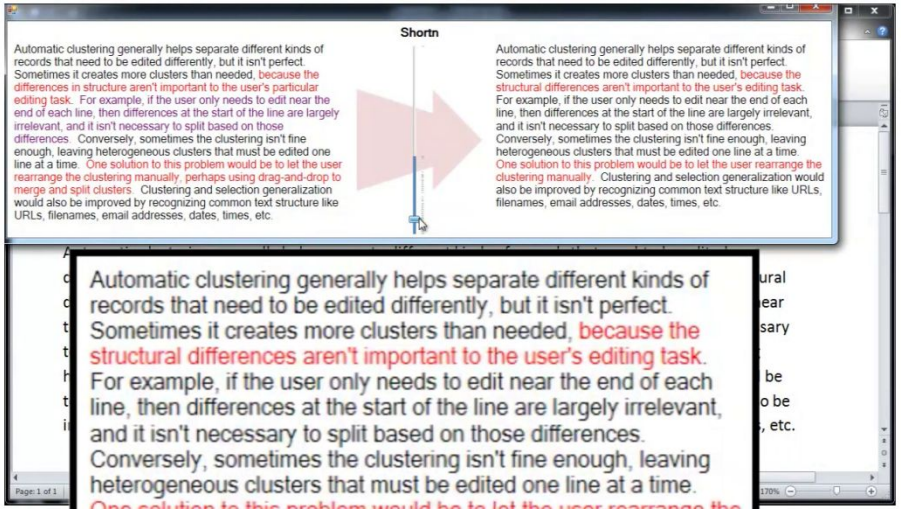
- Text shortening, proof-reading, open editing

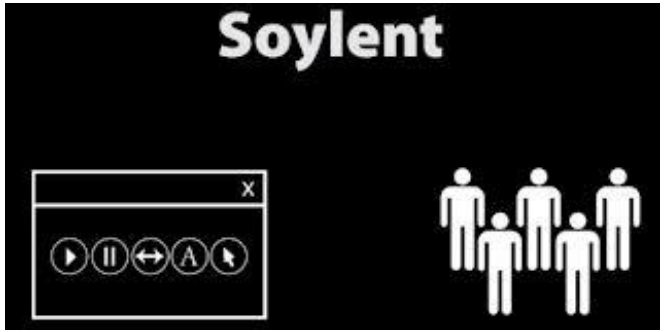
WHO IS THE CROWD

- MTurk

HOW IS THE TASK OUTSOURCED

- Text divided into paragraphs
- Select-fix-verify pattern
- Multiple workers in each step





http://www.youtube.com/watch?v=n_miZqsPwsc

ALIGNING INCENTIVES IS ESSENTIAL

Motivation: driving force that makes humans achieve their goals

Incentives: ‘rewards’ assigned by an external ‘judge’ to a performer for undertaking a specific task

- Common belief (among economists): incentives can be translated into a sum of money for all practical purposes.

Incentives can be related to both extrinsic and intrinsic motivations.

Extrinsic motivation if task is considered boring, dangerous, useless, socially undesirable, dislikable by the performer.

Intrinsic motivation is driven by an interest or enjoyment in the task itself.

MEASURING PERFORMANCE CAN BE CHALLENGING

WHO AND HOW

- Redundancy
- Excluding spam and obviously wrong answers
- Voting and ratings by the crowd
- Assessment by the requester
- Where does the ground truth come from and is it needed
    - Note: improving recall of algorithms

WHEN

- Real-time constraints in games
- Near-real-time microtasks,

HOW ARE THE RESULTS VALIDATED

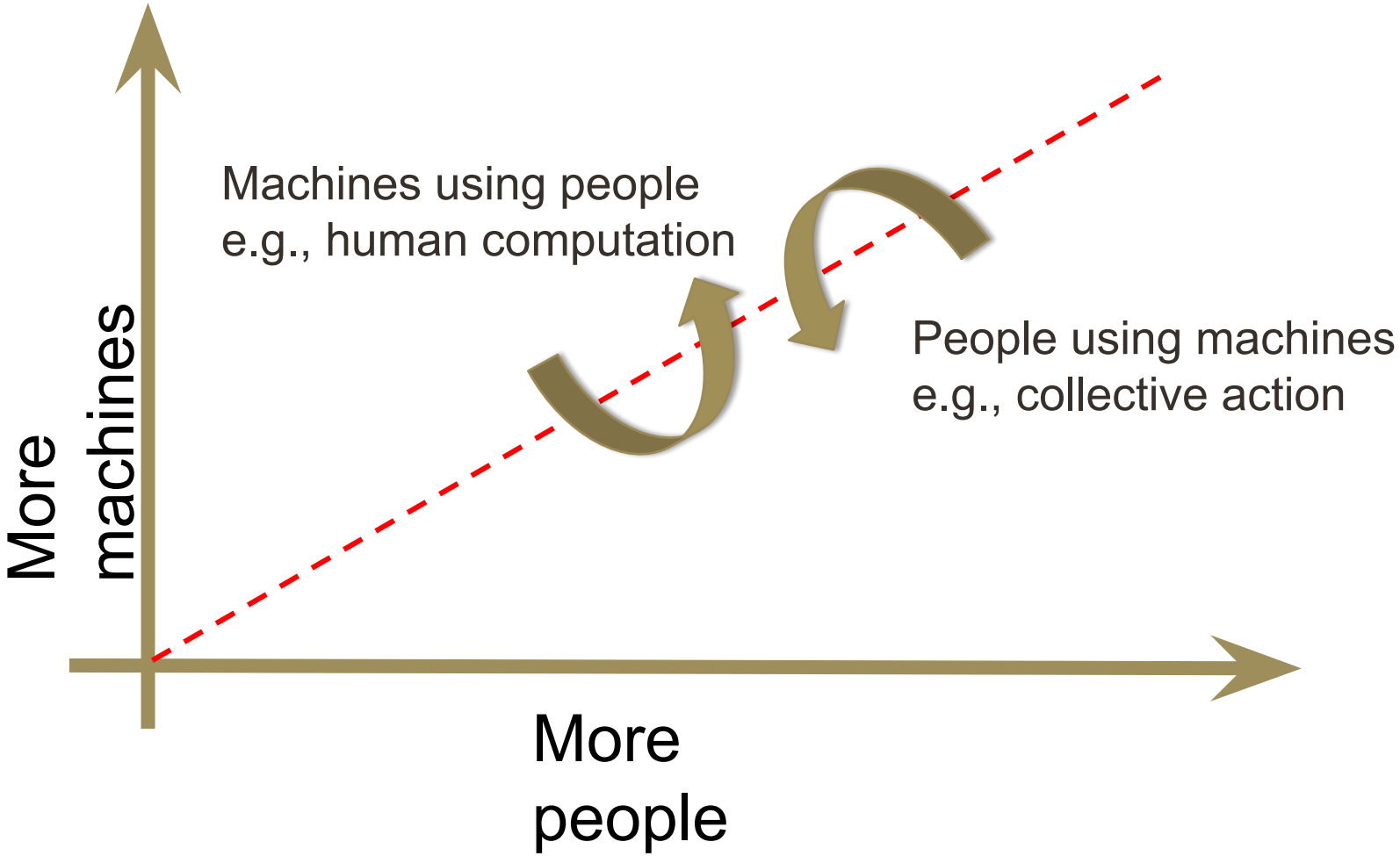
- Solutions space closed vs. open
- Performance measurements/ground truth
- Statistical techniques employed to predict accurate solutions
  - May take into account confidence values of algorithmically generated solutions

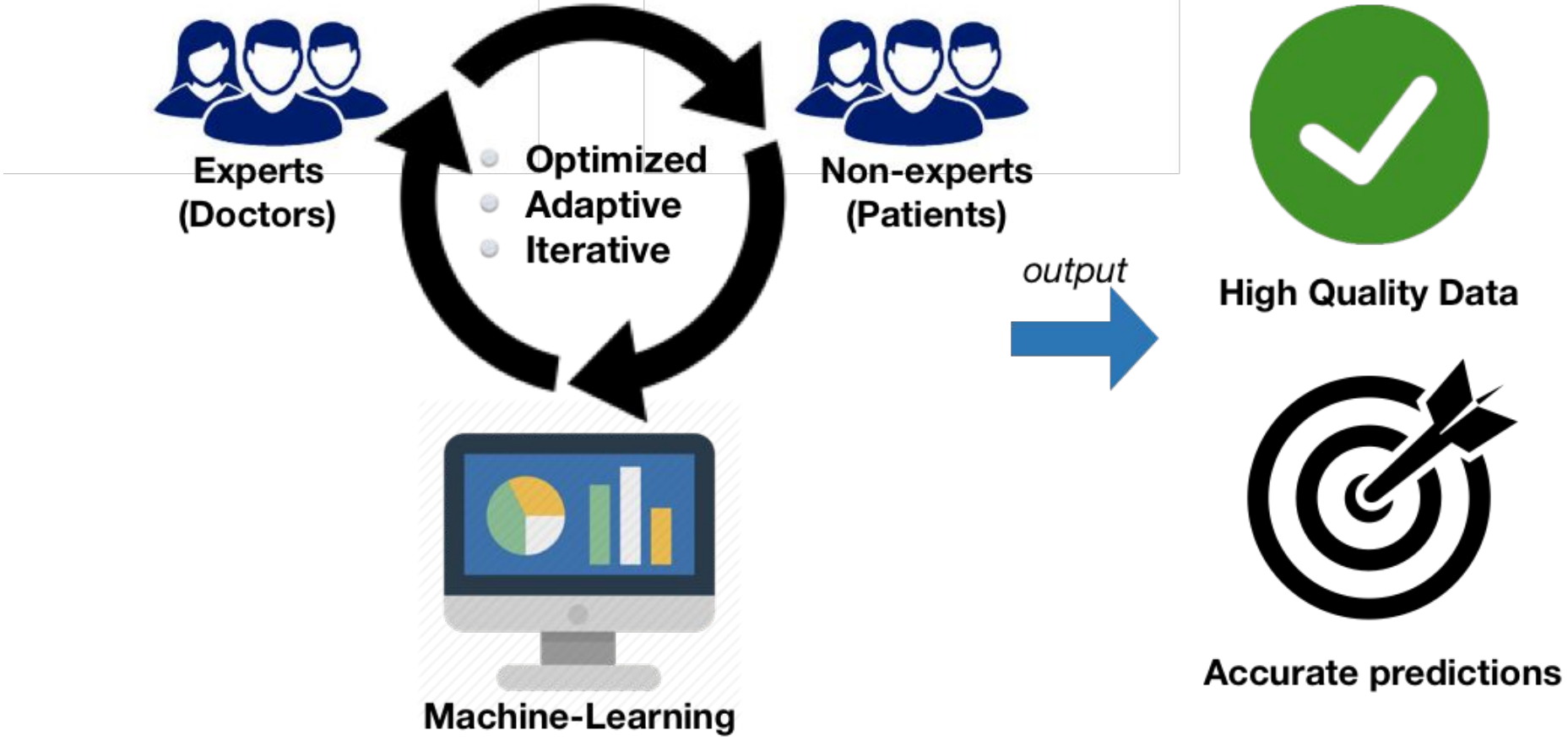
HOW CAN THE PROCESS BE OPTIMIZED

- Incentives and motivators
- Assigning tasks to people based on their skills and performance (as opposed to random assignments
- *Symbiotic combinations of human- and machine-driven computation, including combinations of different forms of crowdsourcing*

HYBRID WORKFLOWS

Combining Humans & Machines


Machines using people
e.g., human computation
People using machines
e.g., collective action
More machines
More people


Experts
(Doctors)
Optimized
Adaptive
Iterative
Non-experts
(Patients)
output
High Quality Data
Accurate predictions
Machine-Learning

Acknowledgements

Slides adapted from the tutorial “Microtask Crowdsourcing to Solve Semantic Web Problems” by Gianluca Demartini, Elena Simperl, and Maribel Acosta at ISWC 2013.
Source: https://github.com/maribelacosta/crowdsourcing-tutorial

Thank You !

Questions?