CS 5306
INFO 5306: Crowdsourcing and Human Computation

Lecture 6
9/7/17
Haym Hirsh
People posting to social media on smartphones can be viewed as an organic sensor network for public health data, picking up information about the spread of disease, lifestyle factors that influence health, and pinpointing sources of disease. We show how a faint but actionable signal can be detected in vast amounts of social media data using statistical natural language and social network models. We present case studies of predicting influenza transmission and per-city rates, discovering patterns of alcohol consumption in different neighborhoods, and tracking down the sources of foodborne illness.
Tuesday, October 3, 4:15 (after class), Gates G01
Star Wars Uncut

Star Wars Uncut: Director's Cut
from Casey Pugh
Four Dimensions for Crowdsourcing/HComp Systems

- Overt vs Covert
- Knowledge about people is used or advanced?
- Advances our knowledge about designing/building such systems?
- What it does:
  - Collecting
  - Collaborative Creation
  - Smartest in the Crowd
  - Collaborative Decisions
  - Micro-Labor
  - Mining User Behavior
    - Search logs
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“Financial incentives and the performance of crowds”

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```javascript
ideas = []
for (var i = 0; i < 5; i++) {
    idea = mturk.prompt(
        "What’s fun to see in New York City?
        Ideas so far: " + ideas.join("", "
    
    ideas.push(idea)
}

ideas.sort(function (a, b) {
    v = mturk.vote("Which is better?", [a, b])
    return v == a ? -1 : 1
})
```
"Turkit: human computation algorithms on mechanical turk"

Crash-and-Rerun programming model
"Turkit: human computation algorithms on mechanical turk"

Crash-and-Rerun programming model

People are so slow relative to a program that it’s cheap to rerun a program and used cached values for the human parts
"Turkit: human computation algorithms on mechanical turk"

```plaintext
quicksort(A)
    if A.length > 0
        pivot ← A.remove(once A.randomIndex())
        left ← new array
        right ← new array
        for x in A
            if compare(x, pivot)
                left.add(x)
            else
                right.add(x)
        quicksort(left)
        quicksort(right)
        A.set(left + pivot + right)

compare(a, b)
    hitId ← once createHIT(...)a...b...
    result ← once getHITResult(hitId)
    return (result says a < b)
```
"Turkit: human computation algorithms on mechanical turk"

```javascript
quicksort(a) {
    if (a.length == 0) return
    var pivot = a.remove(once(function() {
        return Math.floor(a.length * Math.random())
    }));
    var left = [];
    var right = [];
    for (var i = 0; i < a.length; i++) {
        fork(function() {
            if (vote("Which is best?", [a[i], pivot]) == a[i]) {
                right.push(a[i])
            } else {
                left.push(a[i])
            }
        })
    }
}
join()
fork(function() {
    quicksort(left)
})
fork(function() {
    quicksort(right)
})
join()
a.set(left.concat([pivot]).concat(right))
```
"Turkit: human computation algorithms on mechanical turk"

- Incremental programming
- Retroactive print line debugging
- Repeated polling for an answer with the `crash` primitive
- Sandbox vs normal mode
- Block specific users
- Online web interface
"Turkit: human computation algorithms on mechanical turk"

We consider a corpus of 20 TurKit experiments run over the past year, including: iterative writing, blurry text recognition, website clustering, brainstorming, and photo sorting. These experiments paid turkers a total of $364.85 for 29,731 assignments across 3,829 HITs.
"Turkit: human computation algorithms on mechanical turk"

Wikipedia itself may be viewed as a human computation algorithm. Each article involves many humans adding, improving and moderating content.
His current experiments involve using TurKit to run genetic algorithms where humans perform both the mutation and selection steps. For instance, he has evolved pleasant color palettes by having some turkers change various colors in randomly generated palettes, and other turkers select the best from a small set of color palettes.

(Karl Sims)
"VoxPL: Programming with the Wisdom of the Crowd"

Generality / Power Tradeoff

TurKit: Full programming
VoxPL: Estimating n values
"VoxPL: Programming with the Wisdom of the Crowd"
"VoxPL: Programming with the Wisdom of the Crowd"

• Francis Galton
"VoxPL: Programming with the Wisdom of the Crowd"

• Francis Galton
  • Estimating the weight of an ox
"VoxPL: Programming with the Wisdom of the Crowd"

- Francis Galton
  - Estimating the weight of an ox
  - Eugenics
"VoxPL: Programming with the Wisdom of the Crowd"

- L₁ median:
  - Point that yields the lowest average distance to all points
  - This is the name even if you’re using Euclidean distance
"VoxPL: Programming with the Wisdom of the Crowd"

• Built in statistical reasoning
  • What range you want your estimate to be in?
  • With what probability do you want the answer to be correct?
  • What’s your maximum budget?
"VoxPL: Programming with the Wisdom of the Crowd"

• Bootstrap method:
  • $X$: $n$ points
  • Assume some probability distribution $D$ across them
  • For $i=1$ to $m$
    • Sample points from $X$ according to $D$ $n$ times
  • Generates $X_1, \ldots, X_m$
  • Compute estimated value for each $X_i$, then use variance to get overall confidence
"VoxPL: Programming with the Wisdom of the Crowd"
"VoxPL: Programming with the Wisdom of the Crowd"

• “VoxPL’s initial sample size is 12 by default”
• “the sample size doubles after each iteration”
These results show that the choice of estimator can have a significant impact on cost depending on the stringency of the quality constraints; here, the median is more expensive for loose quality constraints, but cheaper for tighter constraints.
Readings for Tuesday


Course Projects

• Whatever size team you want
  • 2: Great
  • 1: Convince me that you can get it done alone and it will be significant
  • 3: Awkward size, convince me that it will work
  • 4 or more: Better be substantial, have a well thought out work plan

• Team building event: Sep 12 7pm Phillips 203
Course Projects

• Project 1: Gain some insight in some facet of some crowdsourced system, along the lines of Tuesday’s readings

• Project 2:
  • Build a human computation / crowdsourcing system
  • Gain knowledge about how elements of human behavior impact the design of such systems
  • Most important: How will you get the people?
  • Amazon Mechanical Turk: You pay

• Final product: A technical paper

• Seek published paper? Need human subjects certification
Assignment 1: Human Subjects Certification
Due: Thursday, September 12


• Submit copy of human subjects certificate