STANFORD HCI GROUP

Twitch Crowdsourcing: Crowd Contributions in Short Bursts of Time

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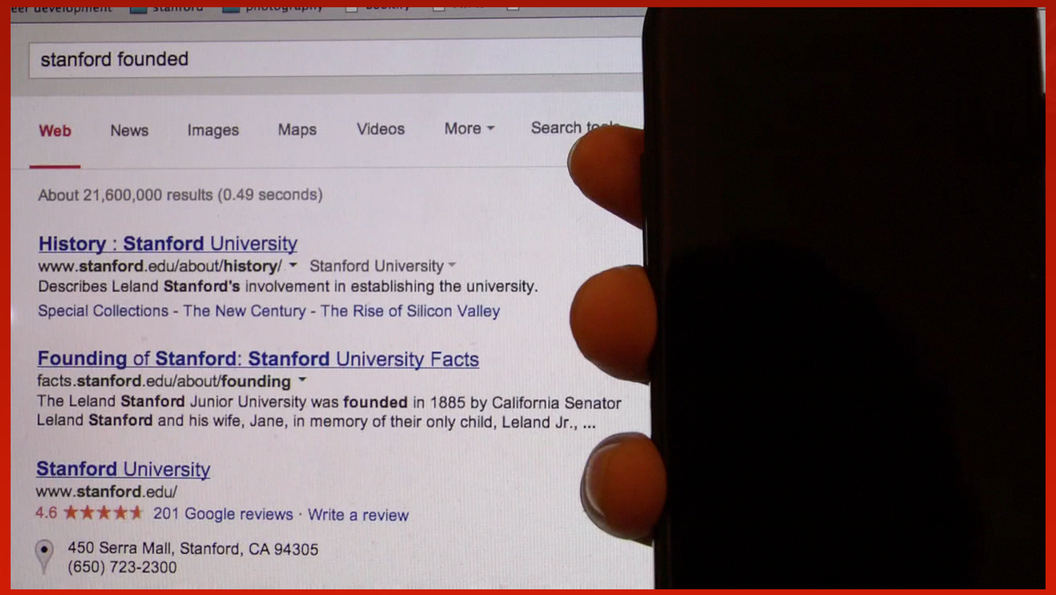


More time, fewer users

Crowdsourcing campaigns that cannot motivate participants will fail.

Lack of time is a primary reason experts do not contribute to sites such as Wikipedia.

Even small time requirements can deter users.

Taraborelli, D., Mietchen, D., Alevizou, P., and Gill, A. Expert participation on Wikipedia: barriers and opportunities. Wikimania 2011.
Luther, K. and Bruckman, A. Leadership in online creative collaboration. Proc. CSCW '08, (2008).
Ross, L. and Nisbett, R.E. The person and the situation: Perspectives of social psychology. Mcgraw-Hill, 1991
Nielsen, J. 1993. Usability engineering. Morgan Kaufmann.

Downtime? Check your phone.

People spend short bursts of time habitually checking their phones.

Oulasvirta, A., et.al. Interaction in 4-Second Bursts: The Fragmented Nature of Attentional Resources in Mobile HCI.. CHI '05,

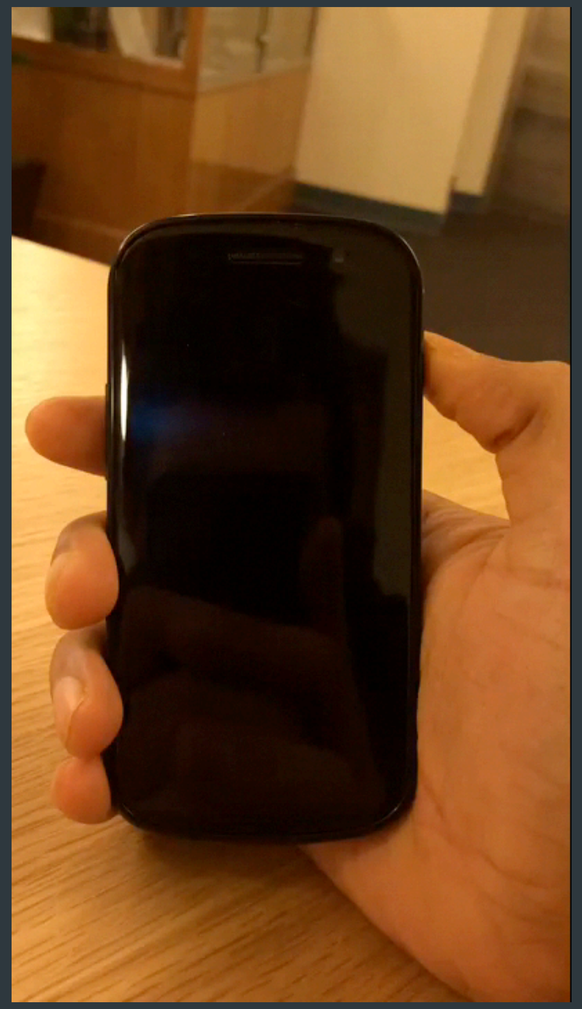
Can we **mobilize**
crowd participation
in **short bursts of time**?

Twitch Crowdsourcing

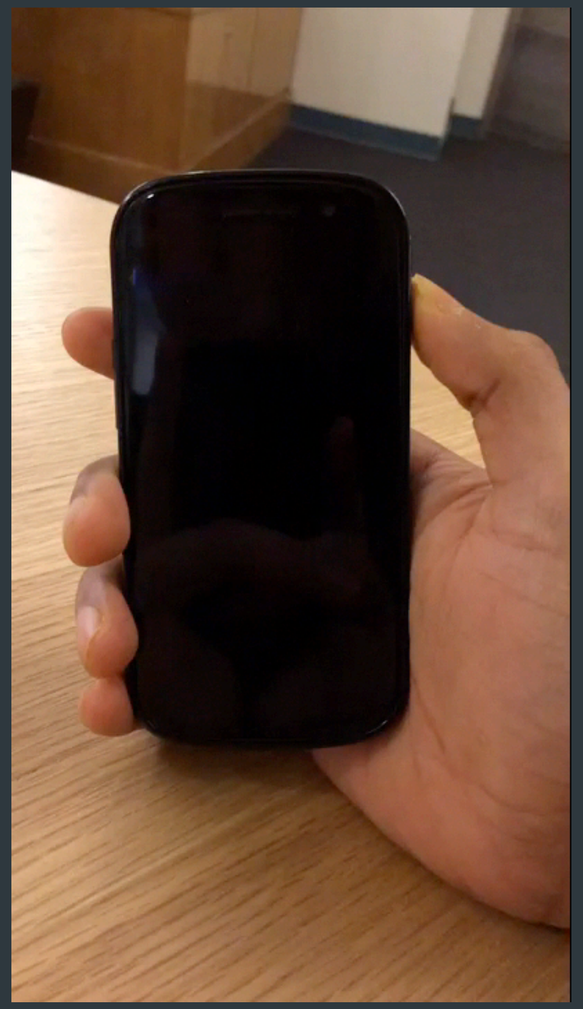
Quick volunteer crowd contributions in short bursts of time via mobile phone

Unlock: a captcha for your phone

Standard slide-to-unlock



Twitch Crowdsourcing



Mobile crowdsourcing

Applications such as mClerk allow the crowd to participate from their phones.

However, these tasks require roughly 30 seconds.

Gupta A., et. al. mClerk: Enabling Mobile Crowdsourcing in Developing Regions. Proc. CHI'12.
Eagle, N. txteagle: Mobile Crowdsourcing. Proc. IDGD'09.
Yan, T. et.al. mCrowd - A Platform for Mobile Crowdsourcing. Proc. SenSys '09, (2009).
Narula, P., et.al. MobileWorks: A Mobile Crowdsourcing Platform for Workers at the Bottom of the Pyramid. Proc. HCOMP '11.

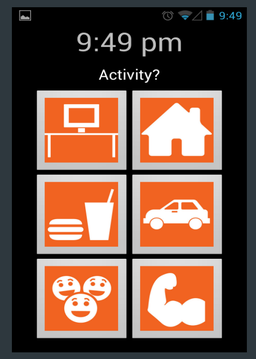
Possibile twitch applications

- Map human activity in the world
- Survey a population
- Micro-tutor a student
- Find the best images on the web
- Extract structure from the web
- Filter the news

Three design goals

- Understand human behavior
- Supplement artificial intelligence
- Capture subjective opinions

Twitch applications

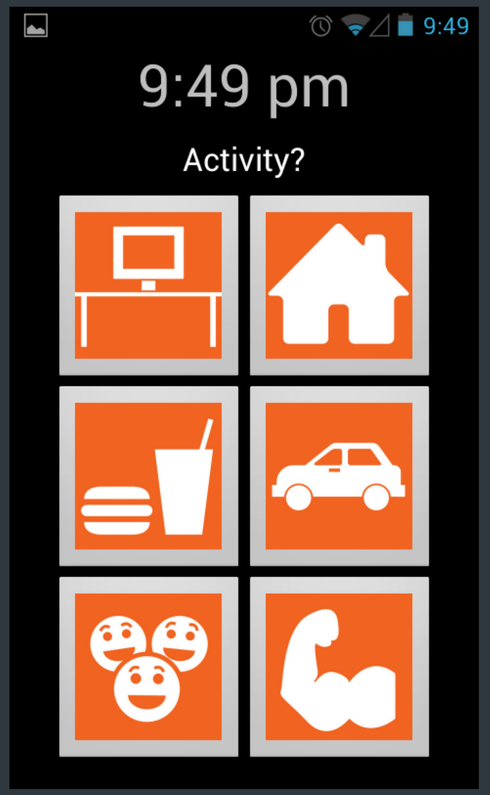


Census

Structuring the Web

Photo Ranking

Twitch applications



Census

Mapping human activities

Despite progress in understanding static elements of our physical world - we lack an understanding of human activity.

Yan, T., et.al. mCrowd - A Platform for Mobile Crowdsourcing. Proc. SenSys '09.
Froehlich, J., et al. UbiGreen: Investigating a Mobile Tool for Tracking and Supporting Green Transportation Habits. Proc. CHI'09.

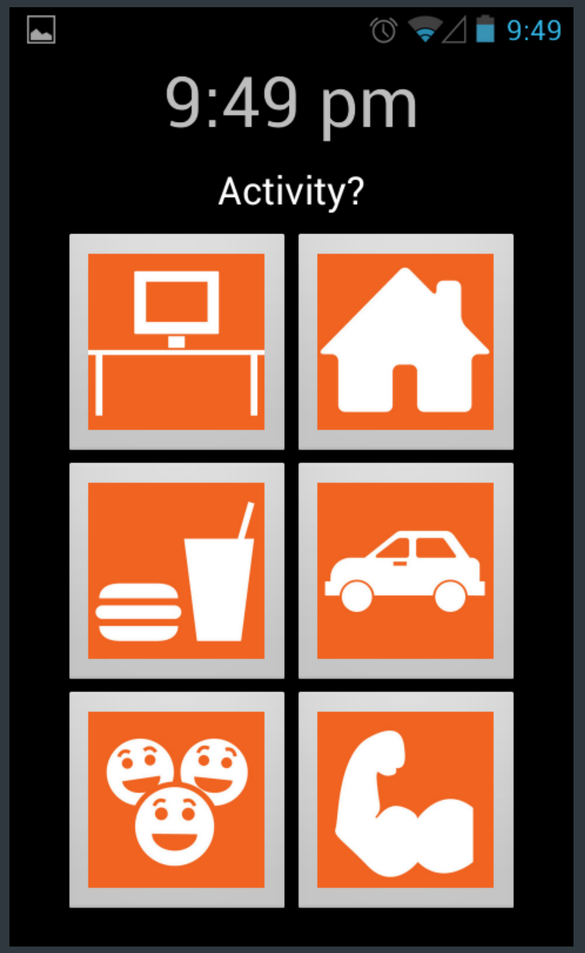
Mapping human activities

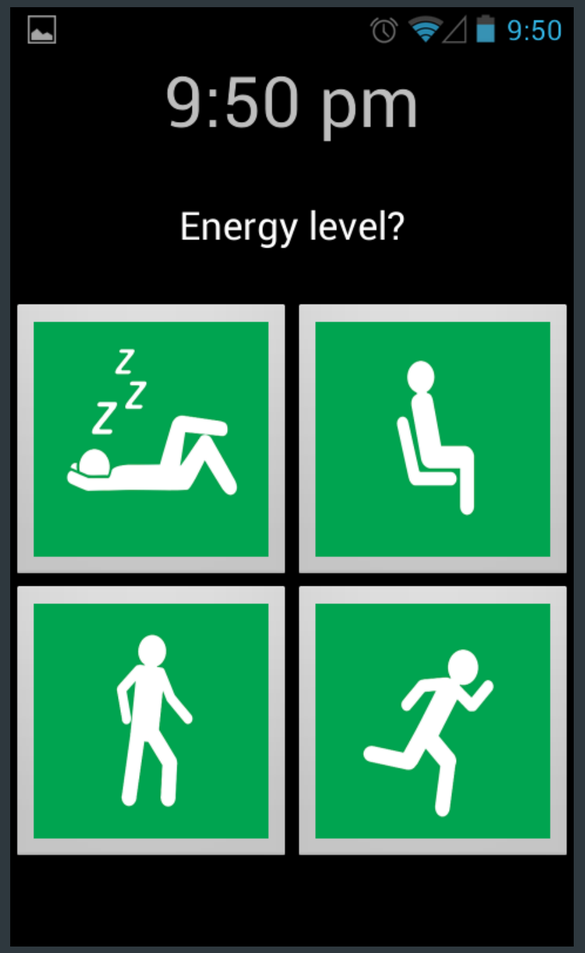
Census creates a human-centered equivalent of Google Street View, populated with peoples' activities

Yan, T., et.al. mCrowd - A Platform for Mobile Crowdsourcing. Proc. SenSys '09.
Froehlich, J., et al. UbiGreen: Investigating a Mobile Tool for Tracking and Supporting Green Transportation Habits. Proc. CHI'09.

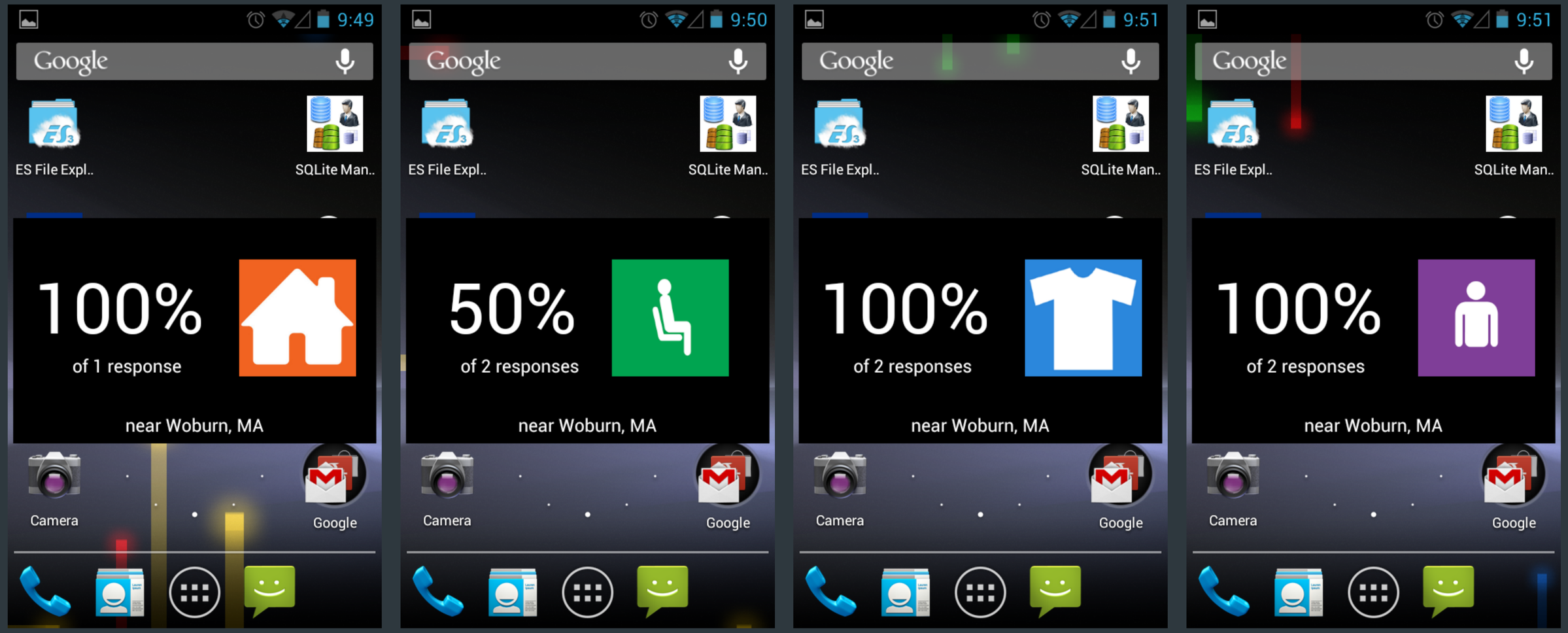
Census: how many people around?

Twitch activity tasks

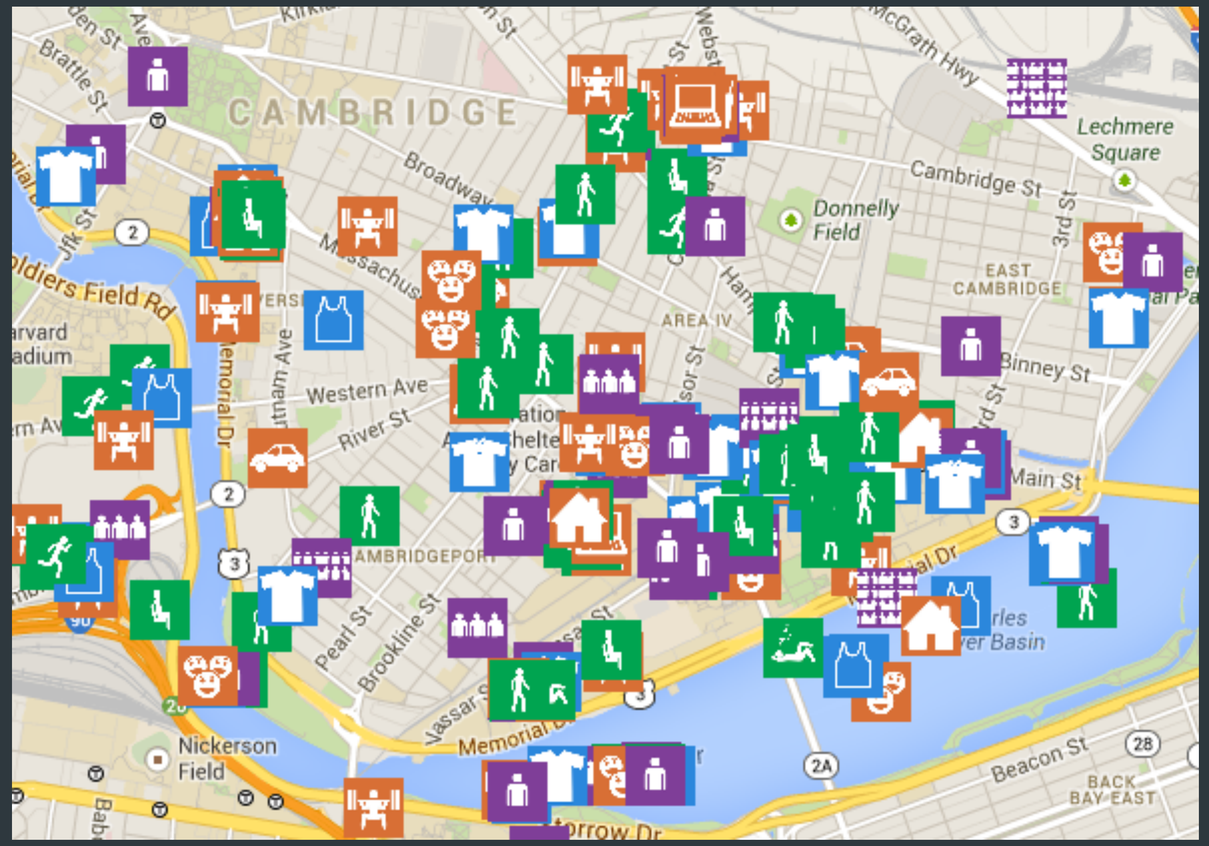




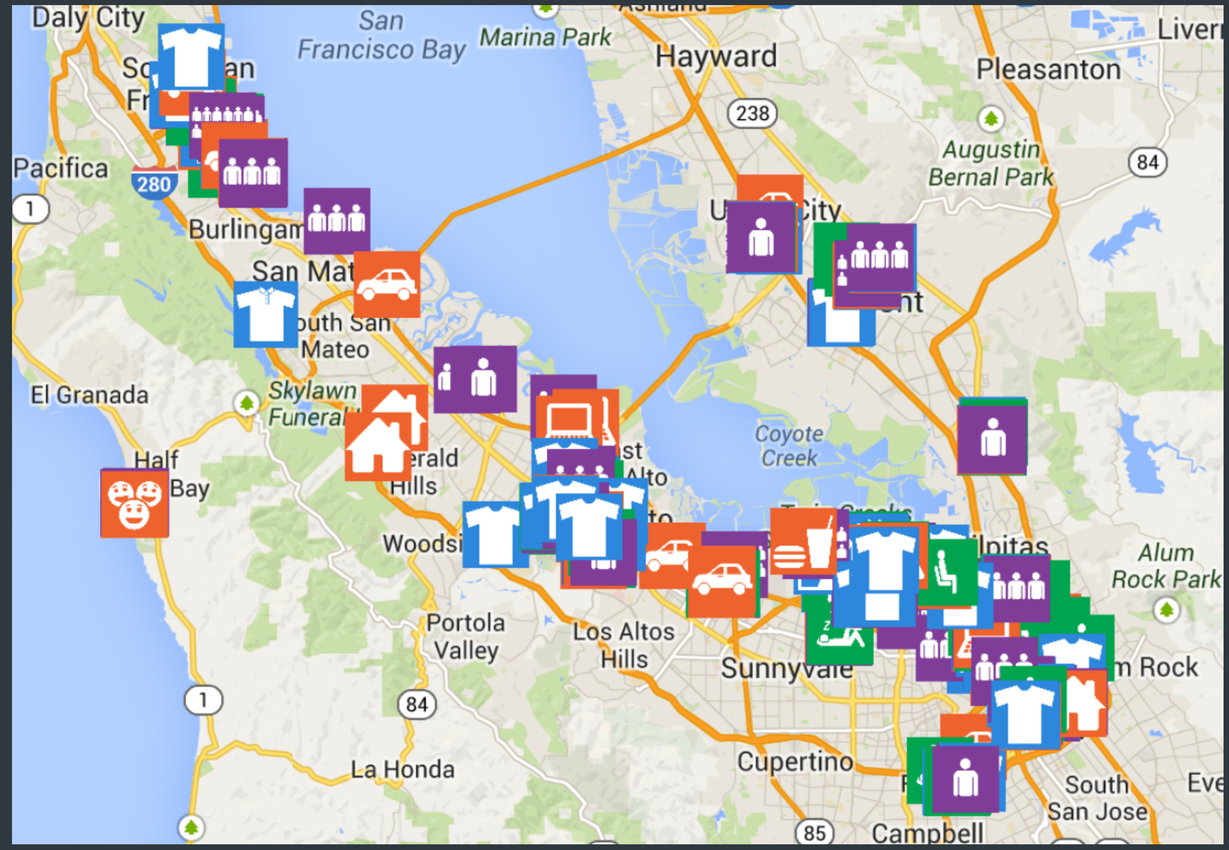
Instant feedback



Activity map



Cambridge, MA

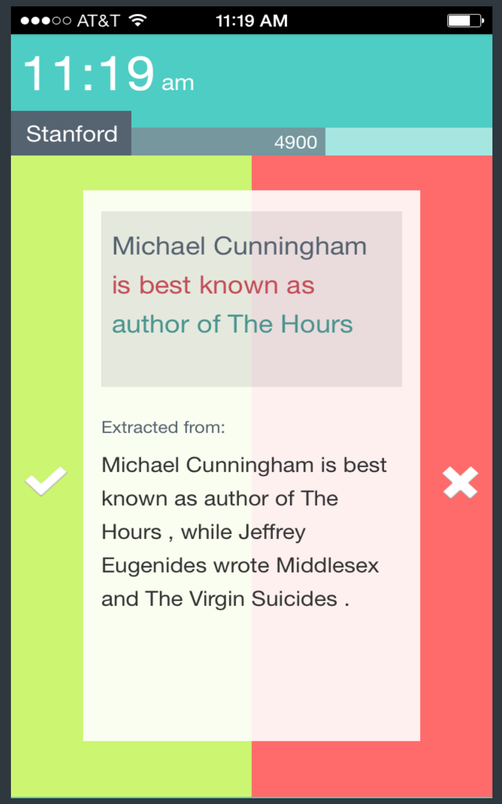


Bay Area, CA

Activity map

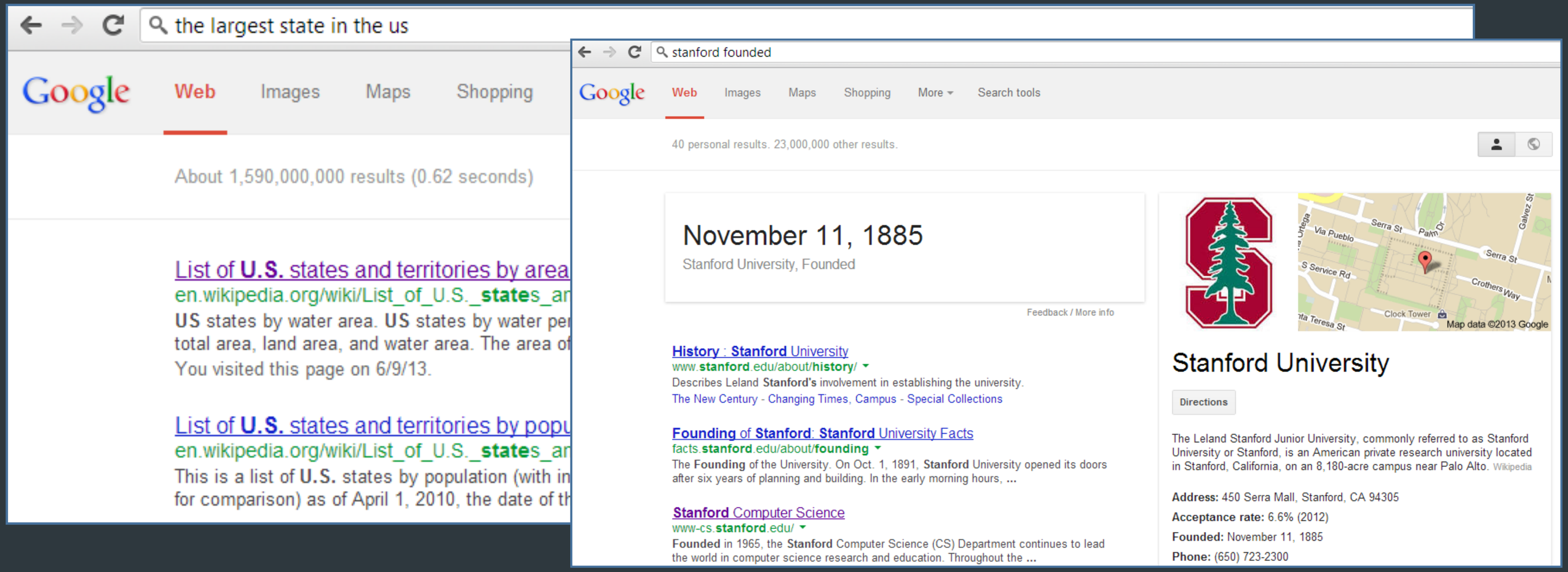
World

Twitch applications



Structuring the Web (STW)

Factual queries require structured data



Fader, A., et.al. Identifying relations for open information extraction. Proc. EMNLP '11.
Freebase. http://www.freebase.com/

Structured data requires verification

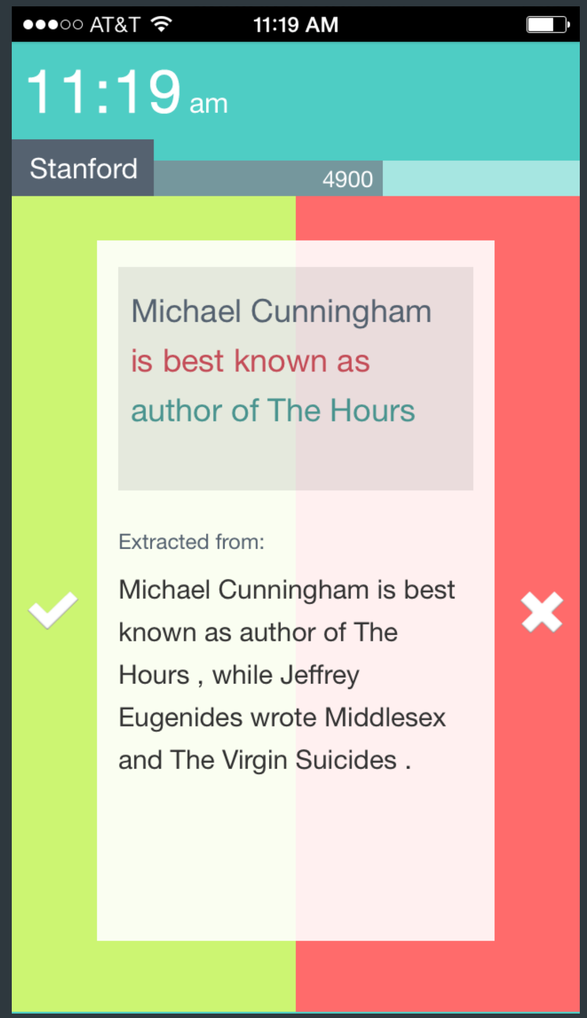
Algorithms guess facts by reading the web, but they are noisy.

Could people verify facts on topics they care about?

Structuring the Web

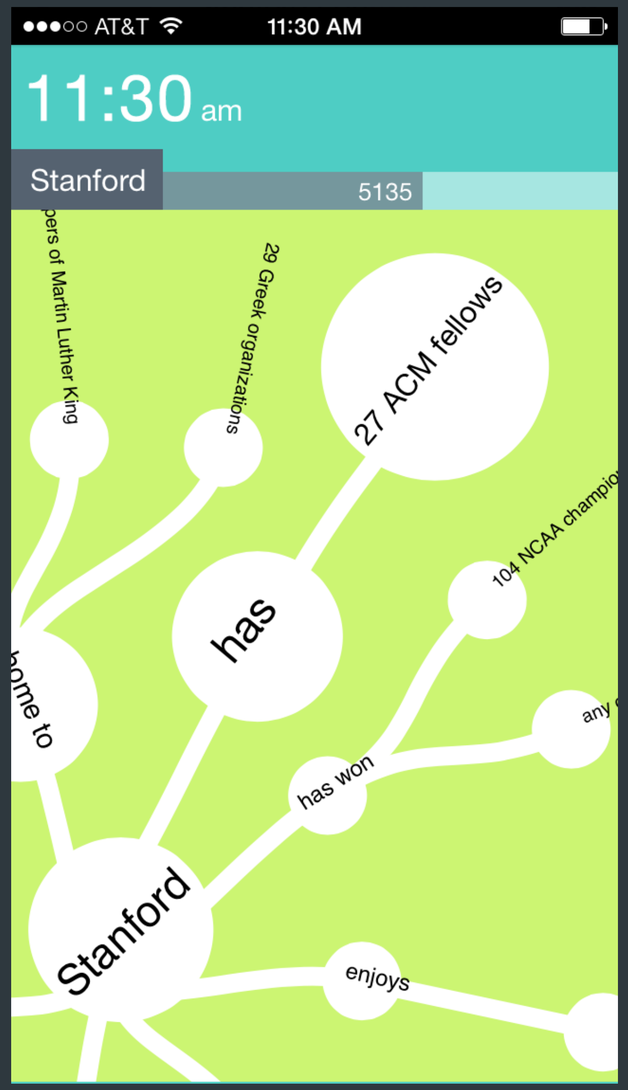
ReVerb:

Open Information Extraction Software




```
$ echo “Michael Cunningham is best known as author of The Hours" |
    ./reverb -q | tr '\t' '\n' | cat -n
 1  stdin
 2  1
 3  Michael Cunningham
 4  is best known as
 5  author of The Hours
 ..
 12  0.9999999997341693
```

Structuring the Web



Source text: “Stanford has 27 ACM fellows”

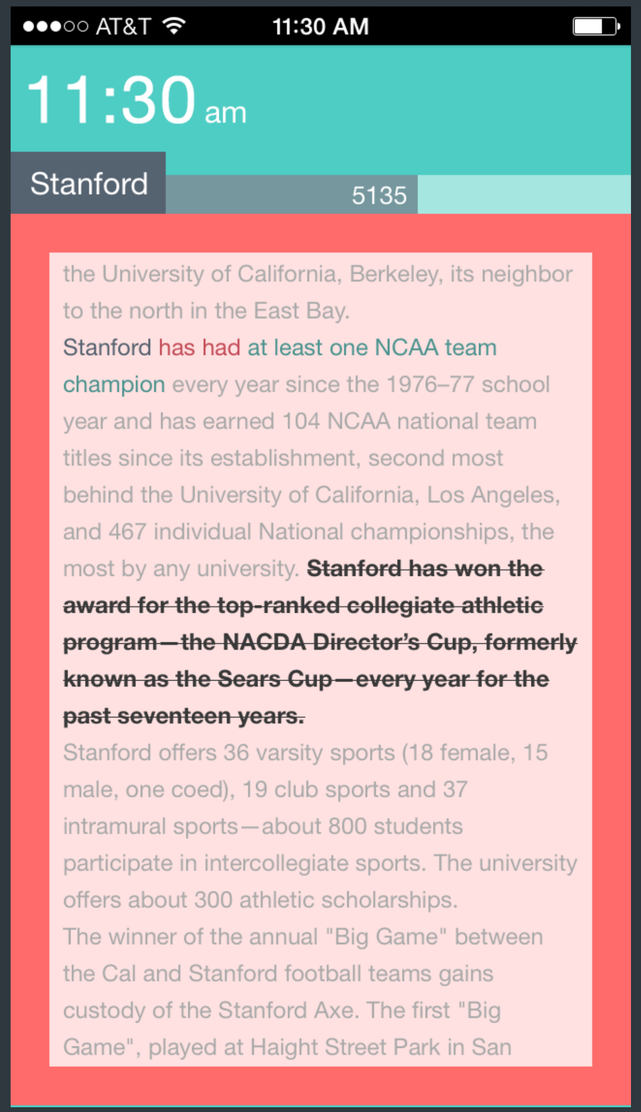
Extraction format: {Subject} {Relationship} {Object}

Extraction: {Stanford} {has} {27 ACM fellows}

ReVerb Confidence Score: 0.94

Verifying a web extraction animates a new branch onto the knowledge graph

Structuring the Web



Source text: "Jr. , who died of typhoid two months before his 16th birthday ."

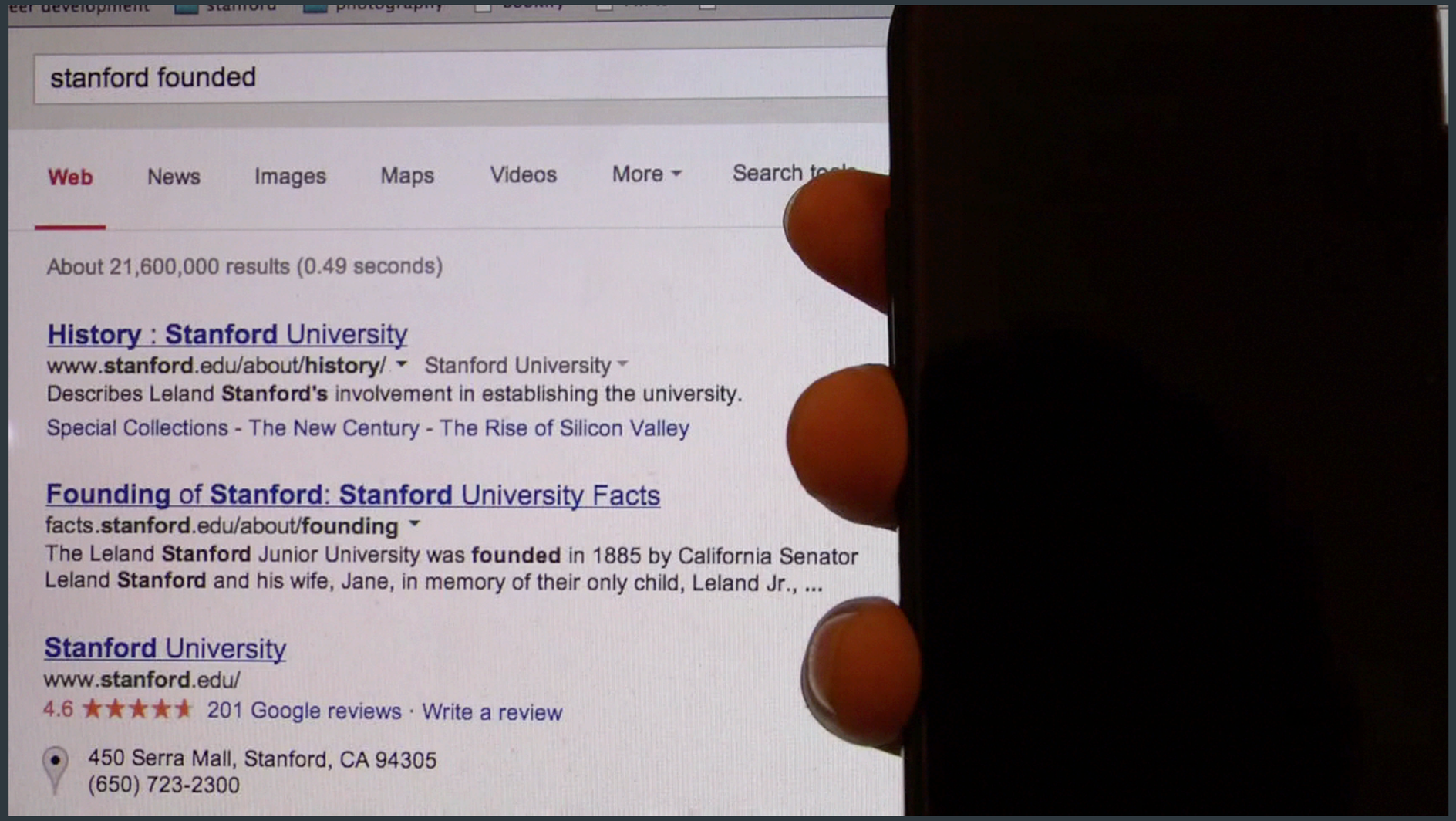
Extraction format: {Subject} {Relationship} {Object}

Extraction: {Jr.} {died of} {typhoid two months}

ReVerb Confidence Score: 0.63

Rejecting the extraction shows how far the user is in the article

Structuring the Web demo



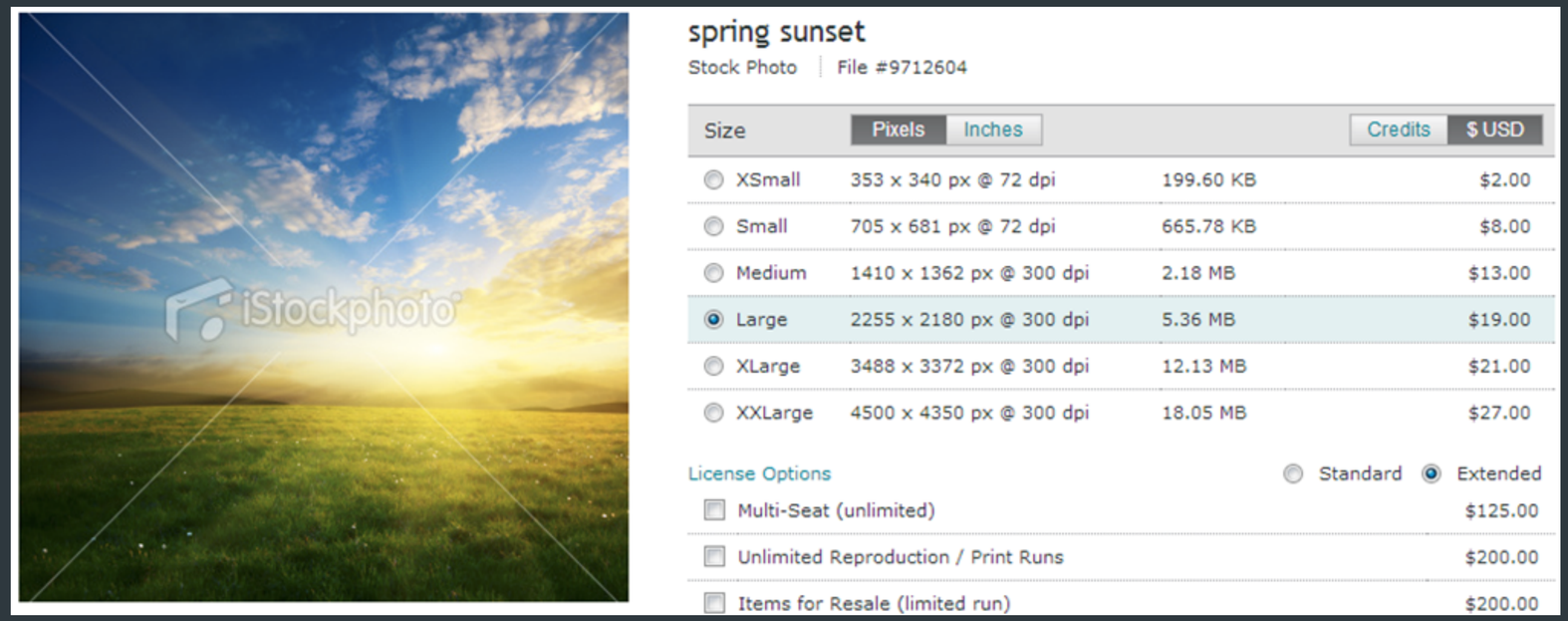
The vision: to be able to eventually contribute towards factual query results.

Twitch applications

Photo Ranking

Computer vision and photography

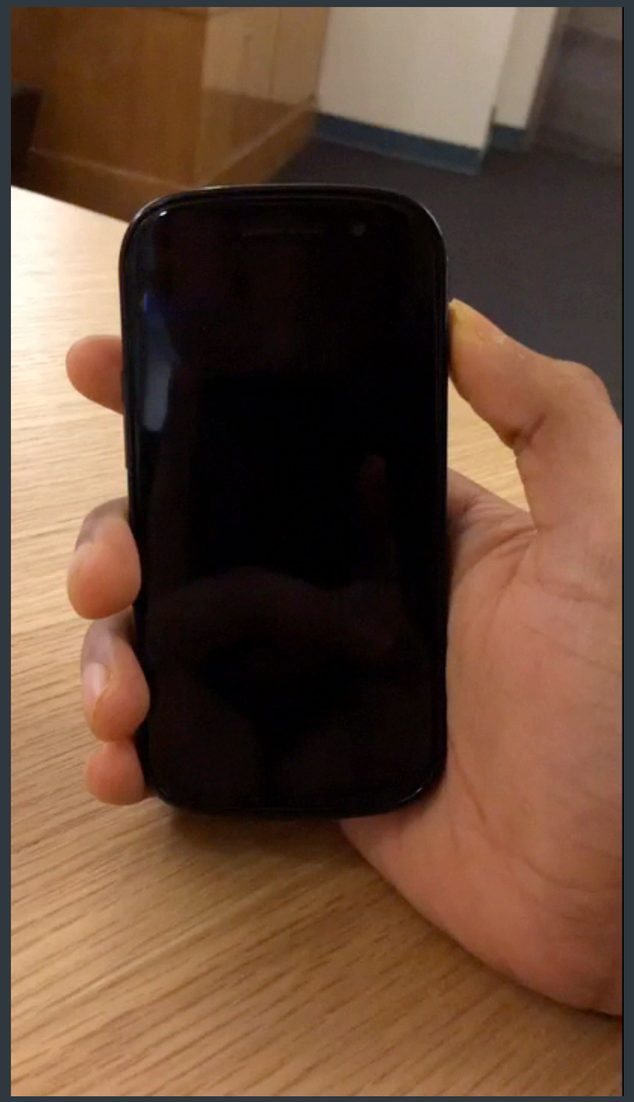
Matchin: photo ranking



iStockphoto: stock photography

Hacker, S. . et. al. Matchin: Eliciting User Preferences with an Online Game. Proc. CHI'09.
iStockPhoto. http//www.istockphoto.com.

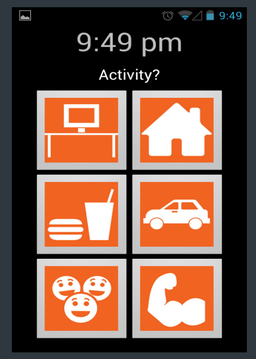
Photo Ranking demo



Rank the photo you like better,
every time you unlock your phone

Photo Ranking

Twitch applications



Census

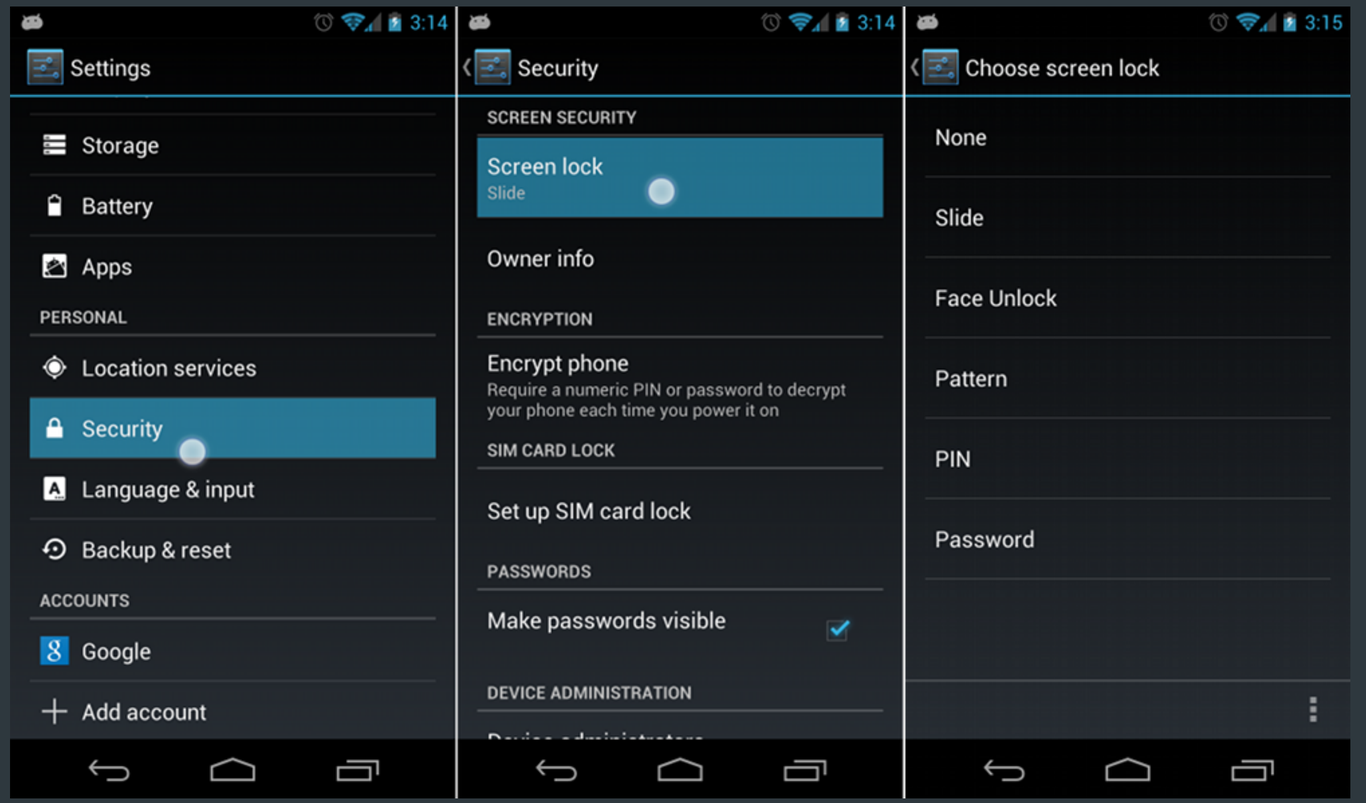
Structuring the Web

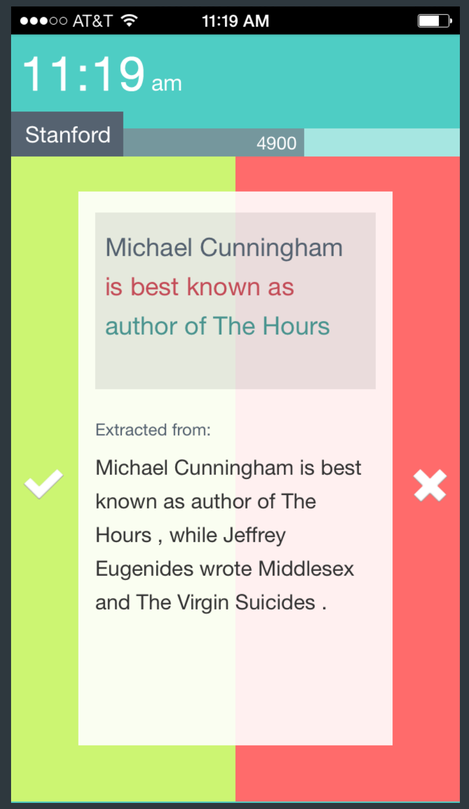
Photo Ranking

Implementation

Twitch unlock screen is implemented as an Android home-screen replacement application. Twitch can replace or complement the user's password screen.

Default unlock screen





Twitch unlock screen

http://developer.android.com/index.html

Evaluation

Thesis: Twitch Crowdsourcing enables tasks that can be completed in 1-2 seconds.

Evaluation metrics

- Quick completion
- Low cognitive load
- Length of active engagement

Twitch deployment

- After initial trials, introduced to Stanford and MIT communities.
- Later deployed as a public app on Google Play, and collected data for a month.

Evaluation

We ran 3 different evaluation studies on:

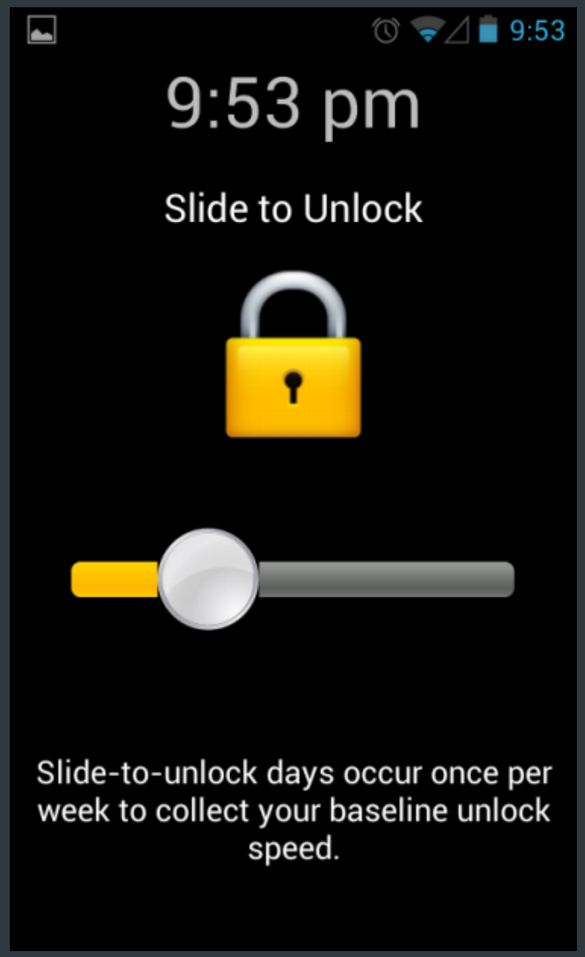
- Naturalistic Usage
- Speed
- Cognitive Load

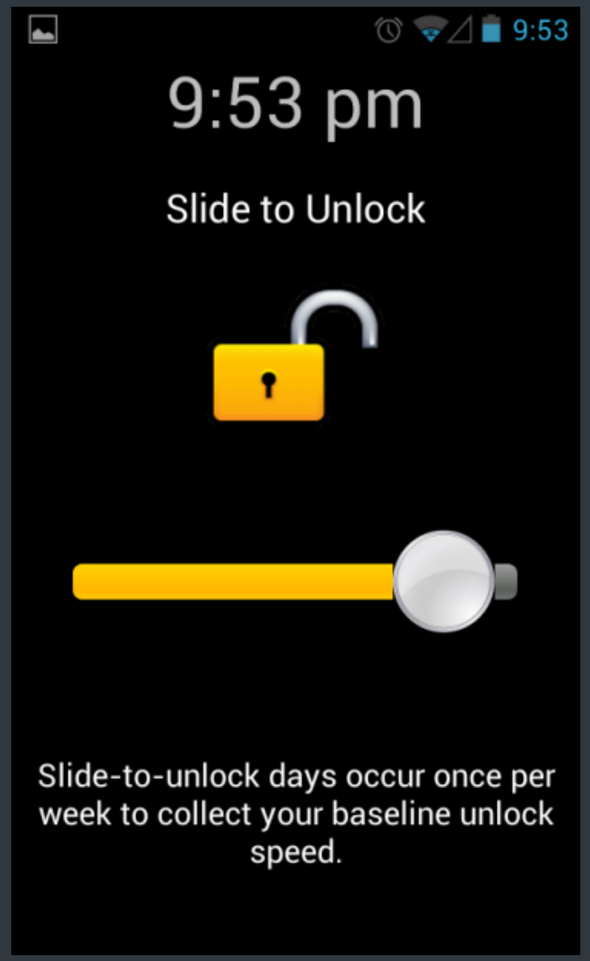
Over 1,000 downloads

- Our sample: 82 volunteer users from the first month
- 50% uninstall rate (standard for App store)
- 31 days of average active use for the remaining 50% of installs

- 11,000 Twitch tasks over one month (100,000 as of today)
- Users unlock their phone 37% of the time they press the unlock button

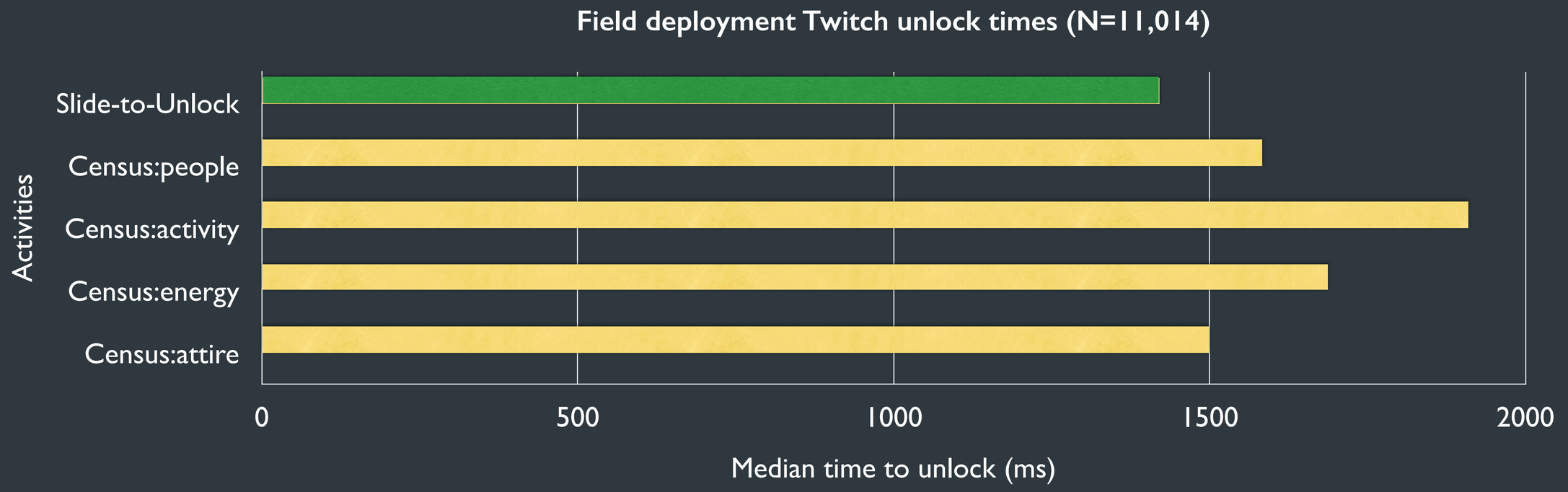
Control condition: slide-to-unlock





During weekends, users saw slide-to-unlock instead of twitch tasks.

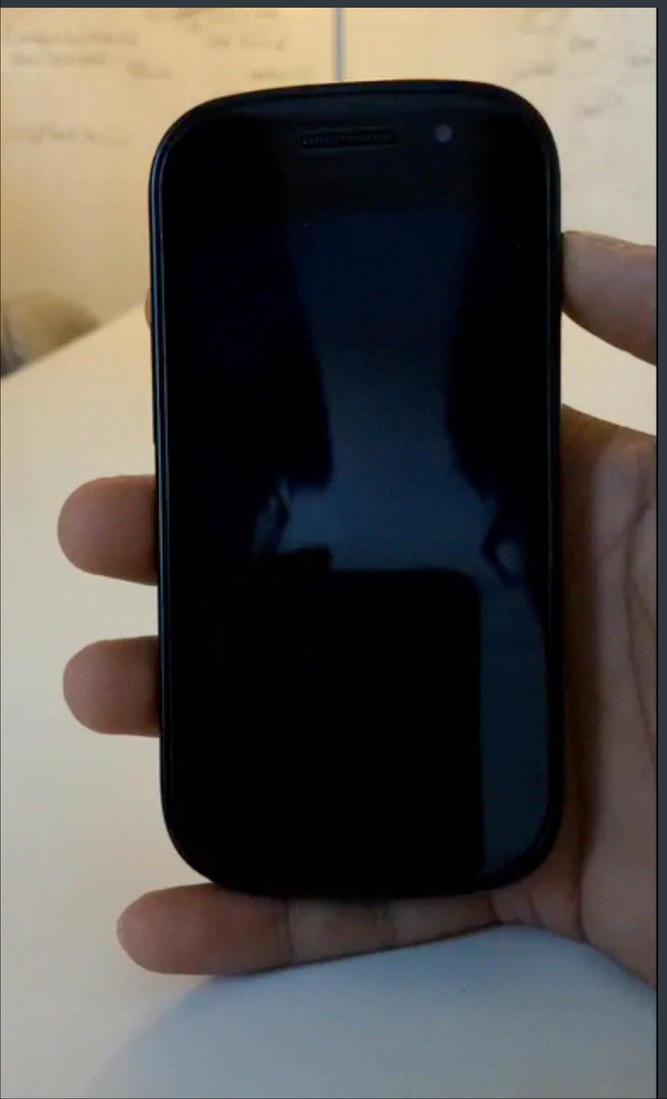
Most twitch tasks are equally fast as slide to unlock



Friedman test revealed a significant effect of Twitch activity on unlock time: $\chi^2(4)=24.4$, $p<.001$.

Post-hoc paired Wilcoxon signed rank tests revealed that only **Census:activity is slower than slide-to-unlock**: $p<0.05$.

Cognitive load study

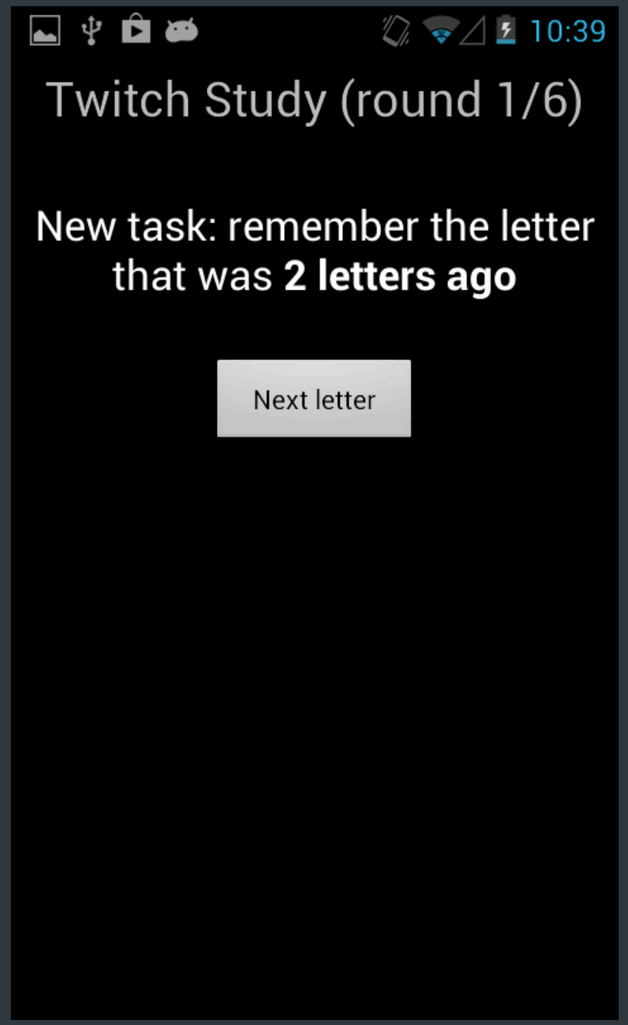


Do Twitch tasks decrease performance on a working memory task?

Instrument: 2-back test

Ophir, E., et.al. Cognitive control in media multitaskers. PNAS 106, 37 (2009), 15583–7.

Cognitive load study: walkthrough



Cognitive load study: walkthrough

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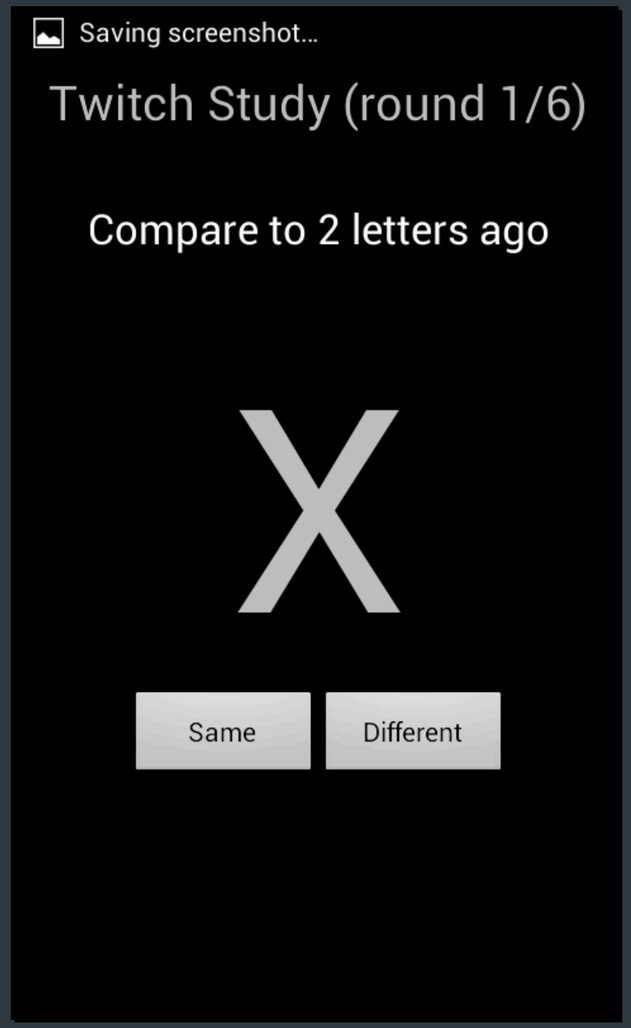
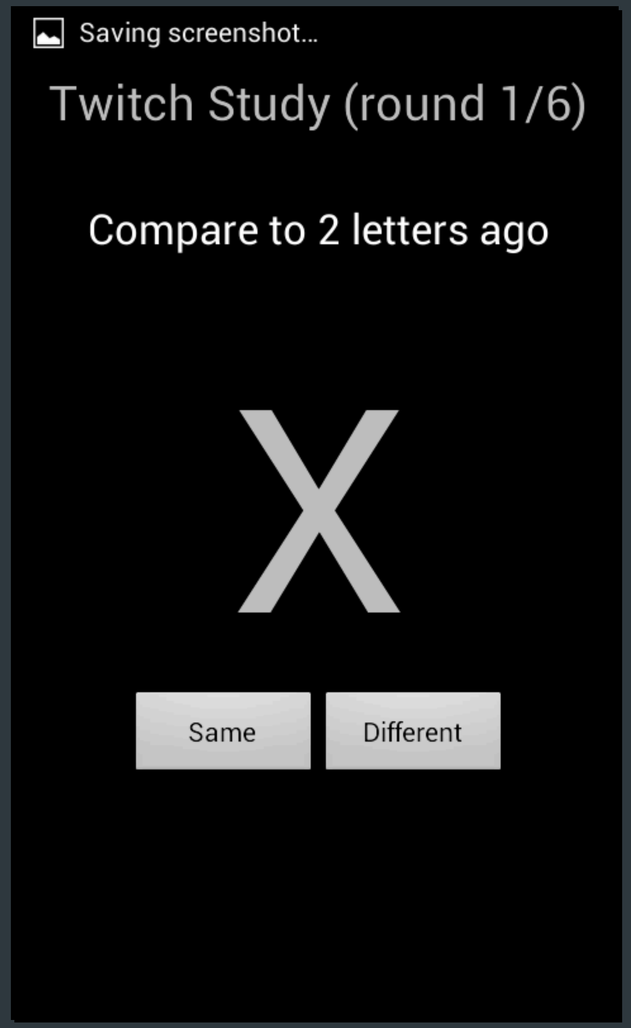


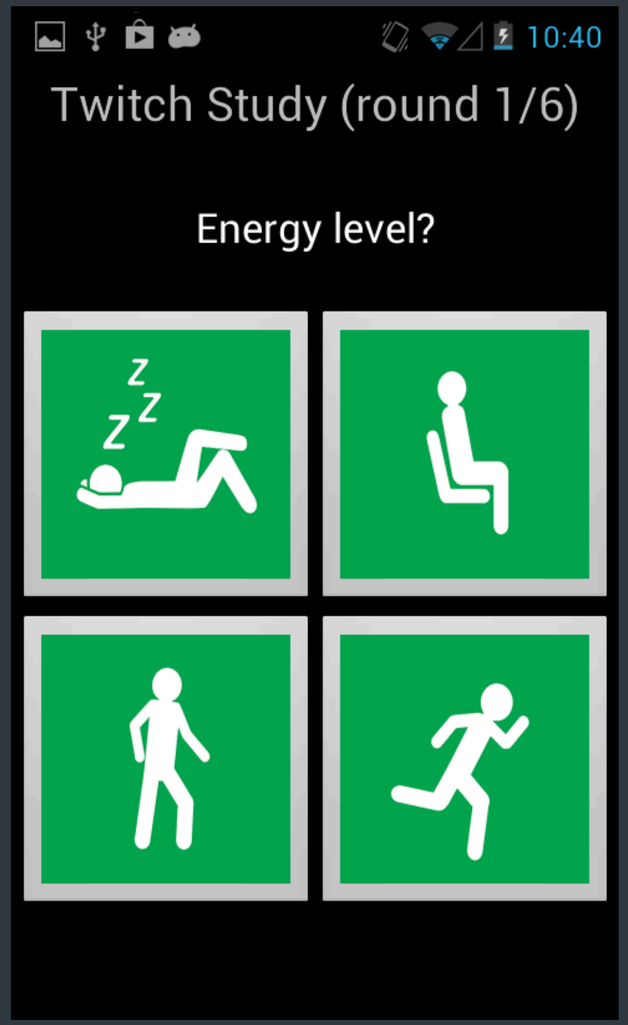
Cognitive load study: walkthrough



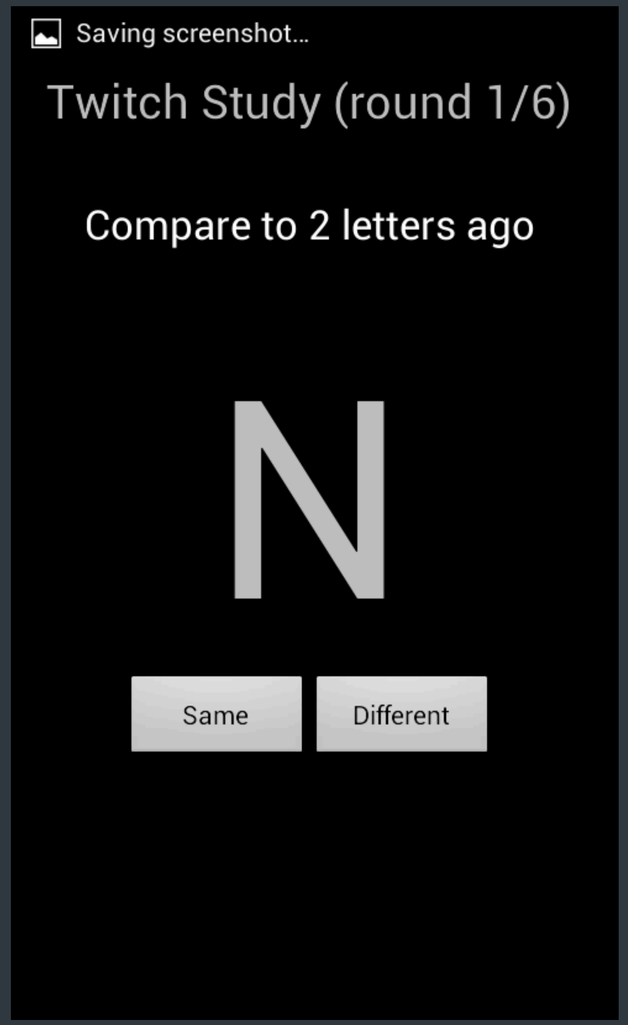
Different!

Cognitive load study: walkthrough

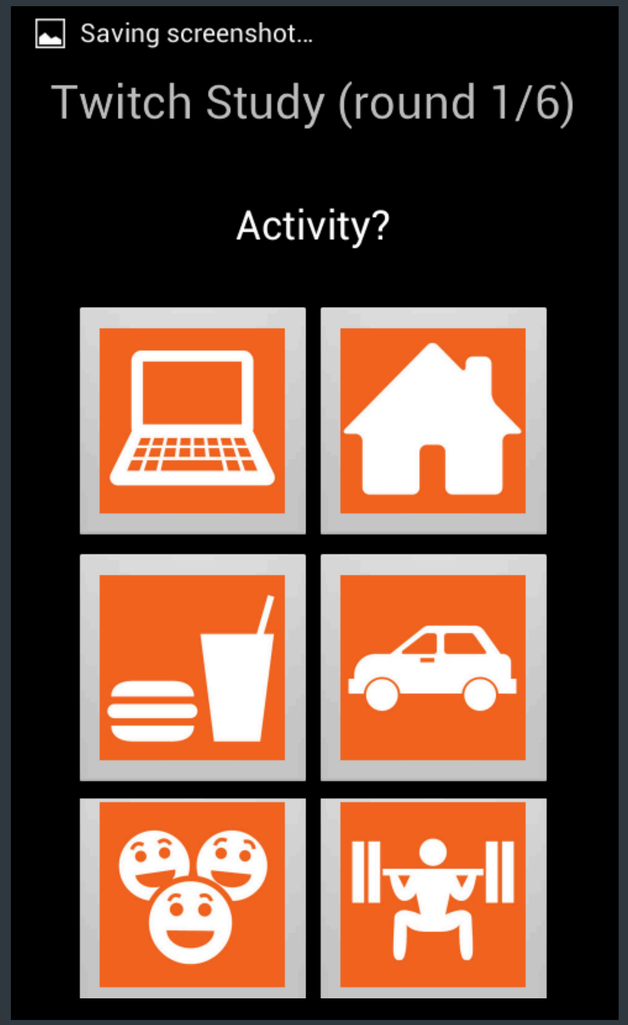
Cognitive load study: walkthrough



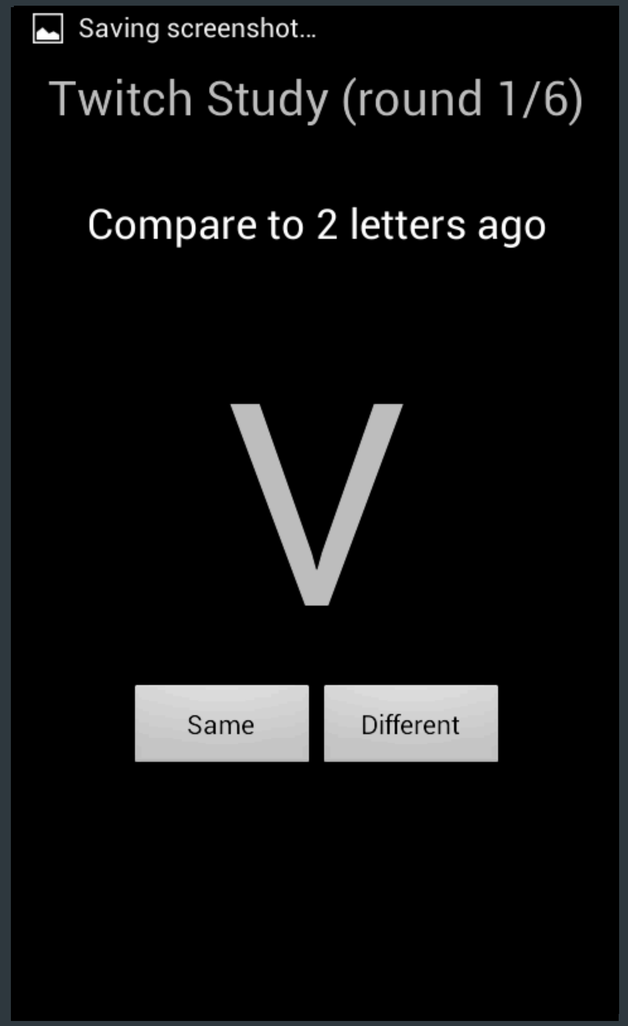
Cognitive load study: walkthrough



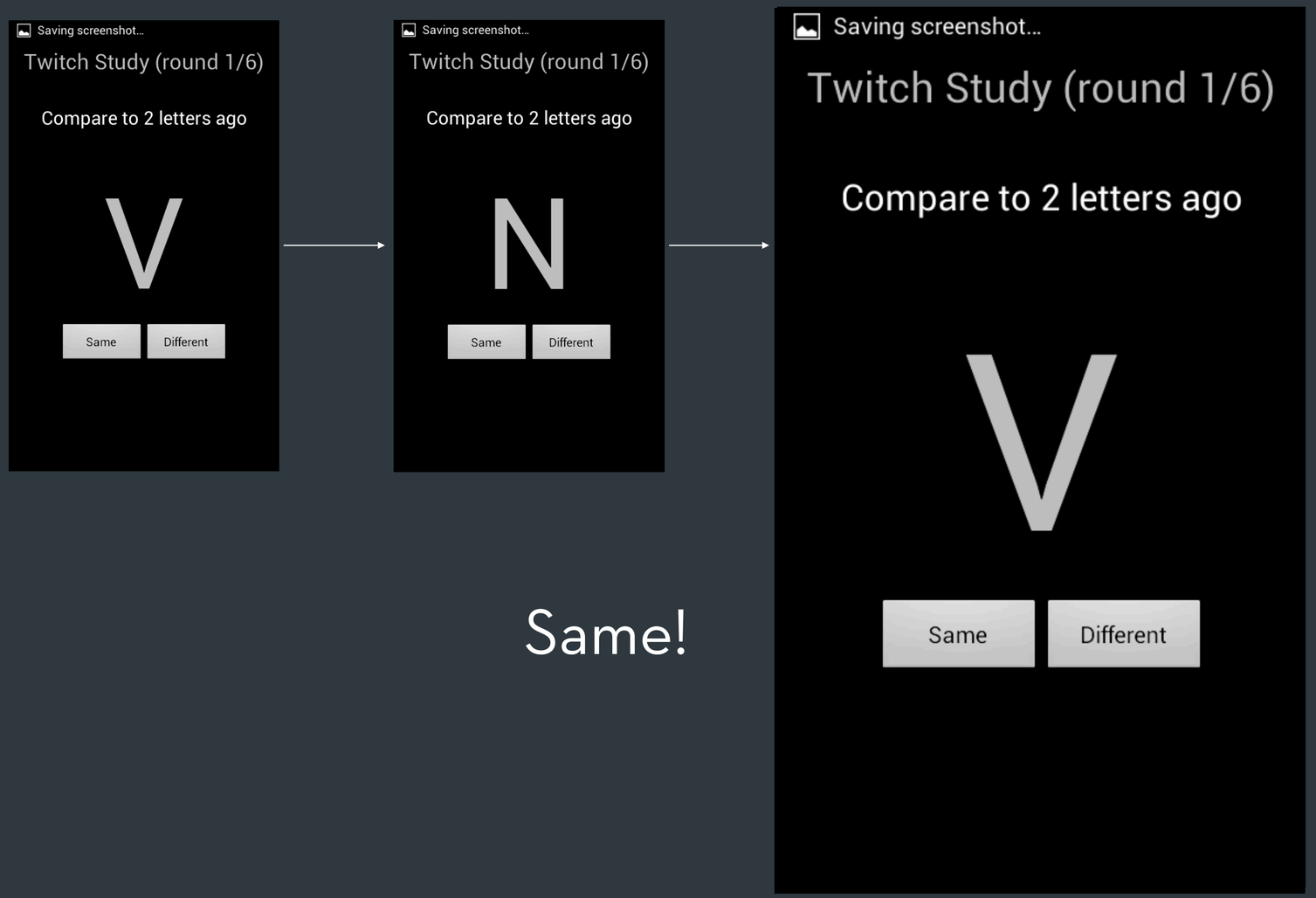
Cognitive load study: walkthrough



Cognitive load study: walkthrough



Cognitive load study: walkthrough



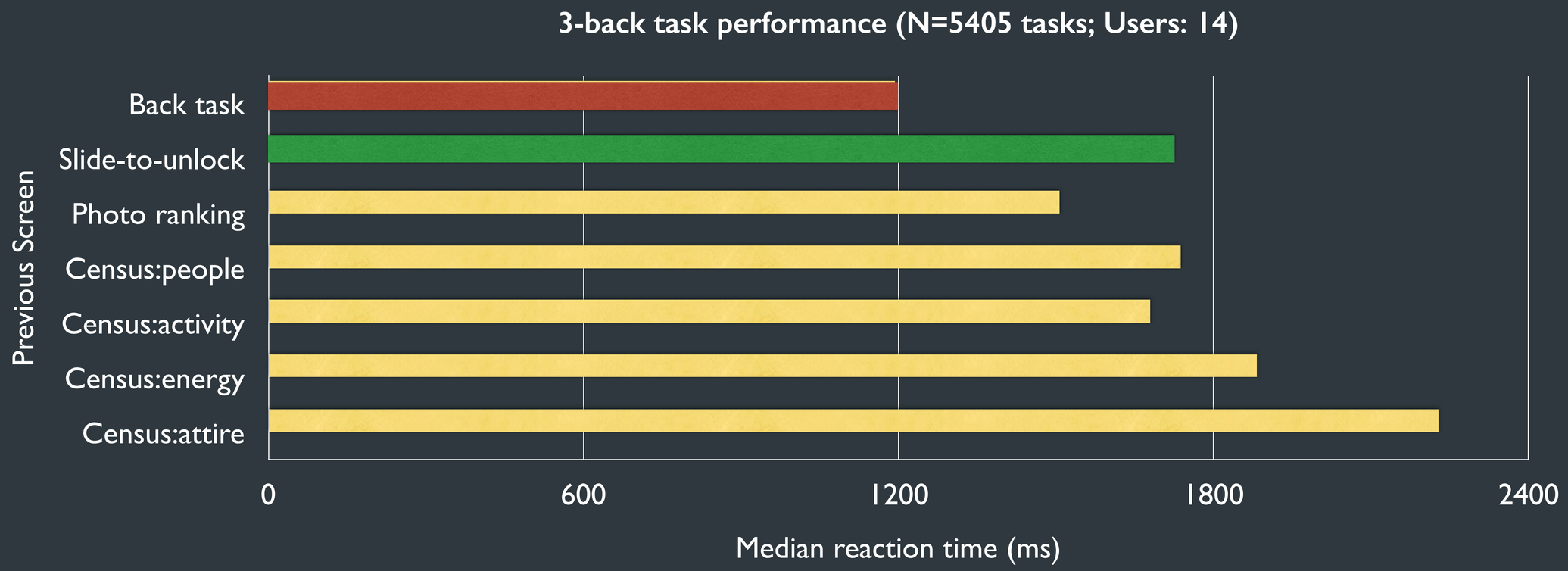
Same!

Cognitive load study: measures

Measured the effect of Twitch tasks on reaction time and accuracy

Ophir, E., et.al. Cognitive control in media multitaskers. PNAS 106, 37 (2009), 15583–7.

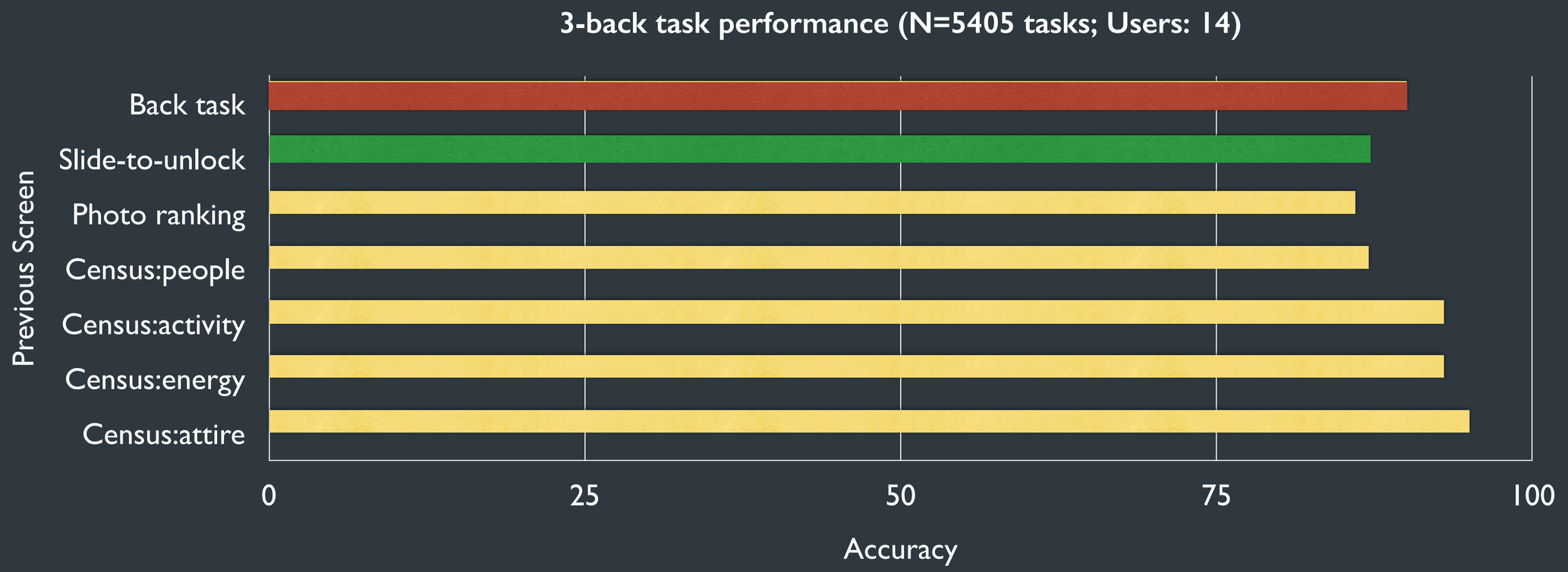
Twitch tasks increase reaction time no more than slide-to-unlock



Two-way ANOVA on Twitch activity and task type revealed a significant effect of Twitch activity on reaction time: $F(6, 5378)=25.8$, $p<.001$.

Post-hoc Tukey test: **no significant difference** between Twitch tasks and slide-to-unlock.

Twitch tasks do not impact accuracy



Logistic regression predicting accurate response: **no significant effect of Twitch activity.**

Discussion

Will people continue completing twitch crowdsourcing tasks over a long period of time?

Discussion

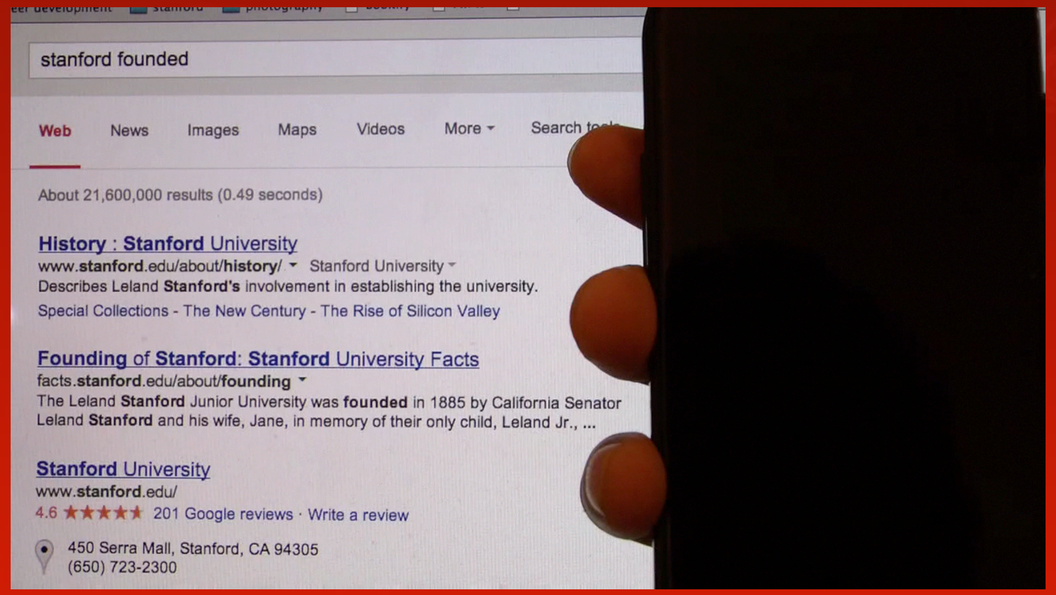
Tasks become repetitive if the user is in the same location for a long period of time.

Future work

- End-user authored microtasks
- Intelligent task assignment
- Twitch as an experience sampling science platform

Conclusion

Twitch crowdsourcing tasks:

- Are fast,
- Incur low cognitive load, and
- Contribute to worthwhile goals.

twitch.stanford.edu
hci.stanford.edu