

## CRA Research Summary

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My past Computer Science research in HCI has investigated: (a) how to use large, coordinated crowds of people to create intelligent, low-latency systems for data analysis [2, 3, 4, 5], (b) using volunteer crowds of learners to generate new knowledge that previously required tedious expert labor [1], and (c) novel interfaces for intelligent text input on smartwatch devices.

My interest in HCI research first developed while working with Professors Walter Lasecki and Jeffrey Bigham on several crowdsourcing projects. The largest of these is Glance, a system that Prof. Lasecki and I built which uses a large coordinated crowd of parallel online workers to reduce the time it takes to perform video analysis (“coding”) from hours to minutes, making it possible for researchers to gain new insights into their data faster than before. I published two second-author papers related to Glance: an evaluation / presentation of the Glance system at UIST [3], and an investigation of the privacy implications of using a crowd of online workers to analyze video at CHI [2]. I also showed that Glance can be used to help evaluate the accessibility of websites in a paper that won the Student Research Competition at ASSETS [4] and went on to win 2nd place at the ACM SRC Grand Finals. This is a competition between the SRC winners of ACM conferences in all subfields of Computer Science, and I was recognized for this prize at the ACM Awards Banquet, the same ceremony in which they bestow the Turing Award. The Glance system has been received with a great amount of interest by dozens of researchers in the social sciences at Stanford, CMU, Michigan, and several other institutions. To facilitate Glance and other projects, I built LegionTools [5], a novel toolkit and UI for Amazon Mechanical Turk that makes it possible to recruit and manage multiple large real-time experiments. LegionTools is currently in use by research groups at CMU, Michigan, and Rochester.

After working on several crowdsourcing projects, I was excited to apply what I had learned to work on a problem I care about deeply: CS education. Last spring I worked with Prof. Philip Guo to lead our Codepourri project. Unlike in math or other sciences, step-by-step tutorials for computer programming have previously been difficult and tedious to create, as they required making a static representation of dynamic state in which a wide variety of possible steps can occur. Codepourri solves this problem; it enables people to easily create visual coding tutorials by annotating steps in an automatically generated program visualization, and uses a crowd of asynchronous learners to generate the annotations. We found that Codepourri could create even better tutorials than those created by experts. I was largely responsible for the direction, design, implementation, and evaluation of this project from its inception to its completion, and I published Codepourri as a first-author full paper at VL/HCC [1].

Most recently I was a research intern at Google working with Dr. Shumin Zhai on the Google Keyboard team. I led a research project that addressed the problem of creating an on-screen keyboard for smartwatches, which did not previously exist for either Android Wear or Apple’s iWatch. Further details of this project are currently Google-confidential. As well as significantly improving upon the state of the art, my findings were instrumental in making fundamental design and technical decisions regarding a product that will be used by millions of people. I report these findings in a first-author full paper submission to CHI, currently under review.

[1] **Mitchell Gordon**, Philip J. Guo. “Clarity: Creating Visual Coding Tutorials Using A Volunteer Crowd Of Learners.” in VL/HCC 2015. Atlanta, GA.

[2] Walter S. Lasecki, **Mitchell Gordon**, Winnie Leung, Ellen Lim, Jeffrey P. Bigham, Steven P. Dow. “Exploring Privacy and Accuracy Trade-Offs in Crowdsourced Behavioral Video Coding.” in CHI 2015. Seoul, Korea.

[3] Walter S. Lasecki, **Mitchell Gordon**, Malte Jung, Danai Koutra, Steven P. Dow, Jeffrey P. Bigham. “Glance: Rapidly Coding Behavioral Video with the Crowd.” in UIST 2014. Honolulu, HI.

[4] **Mitchell Gordon**. “Web Accessibility Evaluation with the Crowd: Using Glance to Rapidly Code User Testing Video.” ASSETS 2014, Student Research Competition. Rochester, NY.

[5] **Mitchell Gordon**, Jeffery P. Bigham, Walter S. Lasecki. “LegionTools: A Toolkit + UI for Recruiting and Routing Crowds to Synchronous Real-Time Tasks.” UIST 2015. Charlotte, NC.