CSE 60427: Human-Centered Computing Research

Class Meeting 2: Research questions and contributions

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Concepts, Values, and Methods for Technical Human-Computer Interaction Research

Scott Hudson

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Scott Hudson
Faculty at CMU (1997 -)
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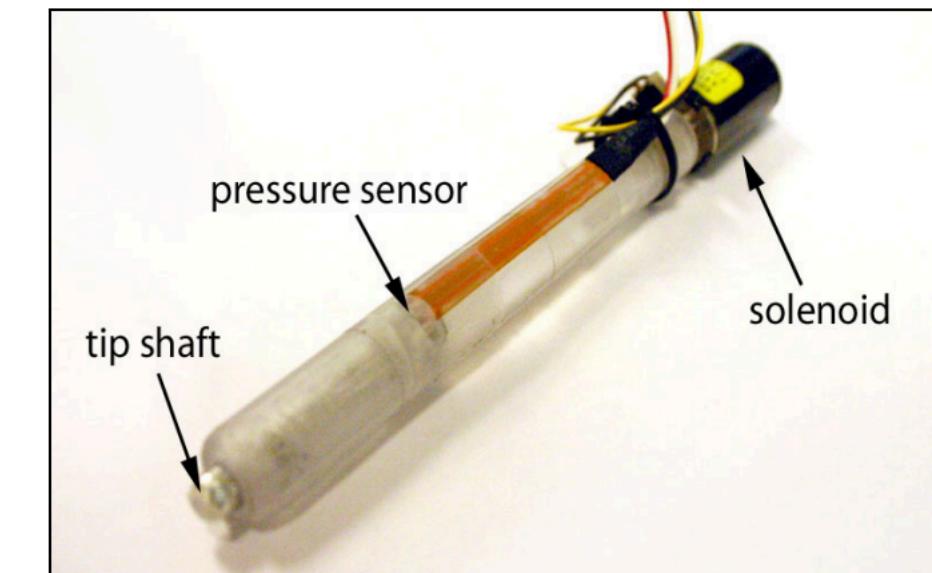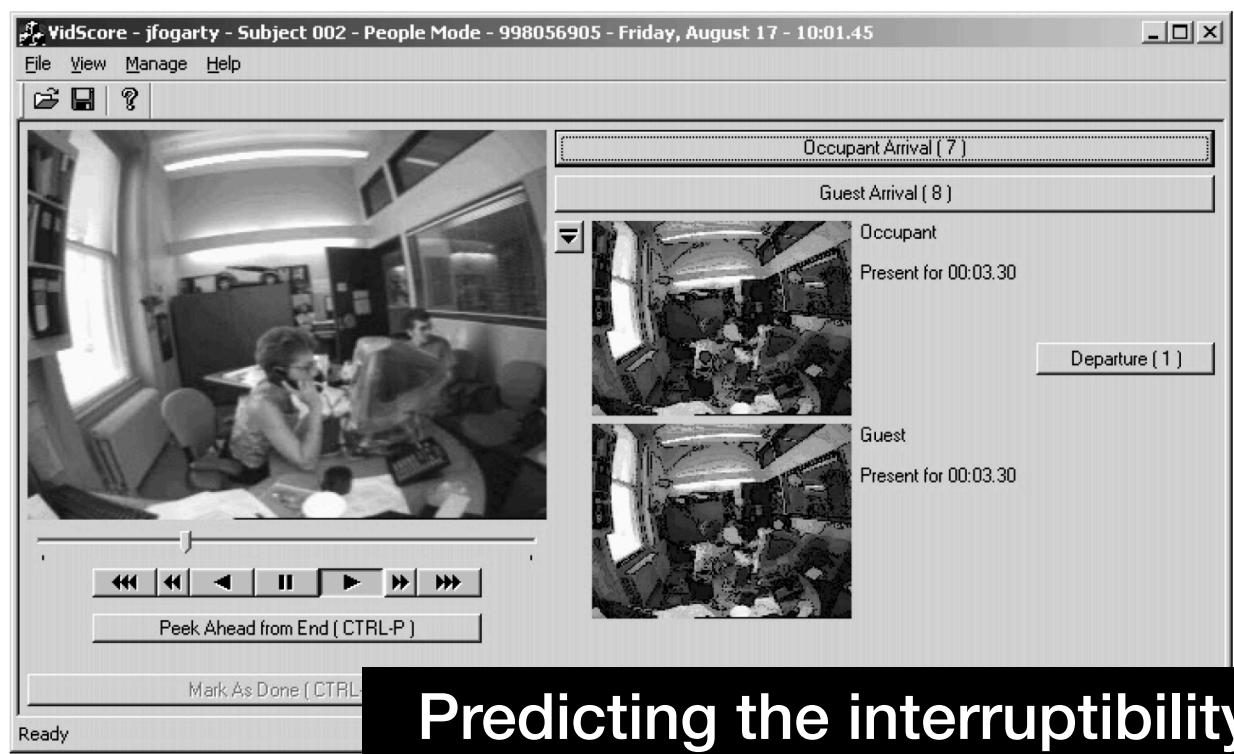
**Figure 1.** Haptic Pen – a tactile feedback stylus

Enable haptic feedback on a stylus

Print soft things (e.g., teddy bears) with 3D printers

Predicting the interruptibility of users with sensors

Before touch:
circle-&-tap to trigger
right-click menu

Between touch:
'high jump' between
taps to select text

After touch:
Tap-&-circle for con-
tinuously zooming
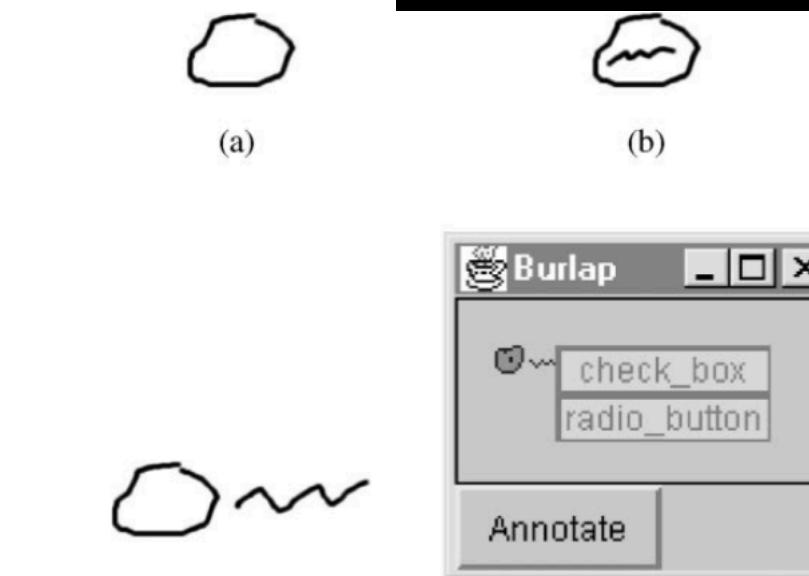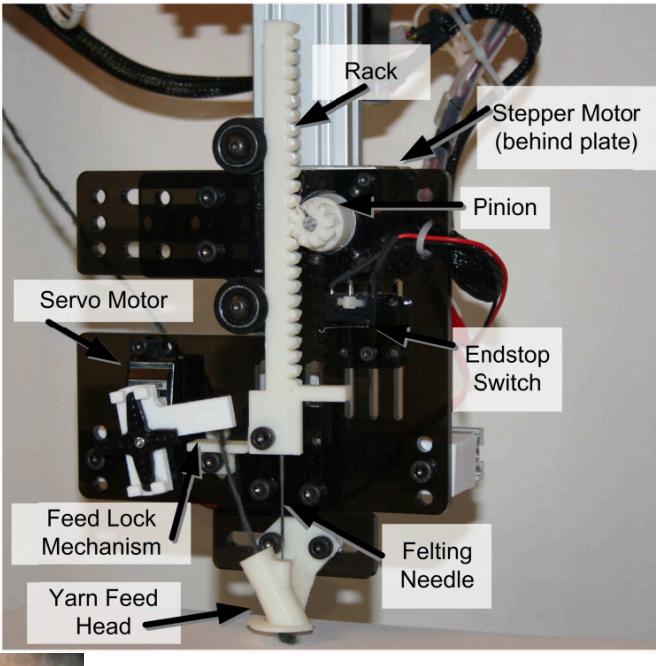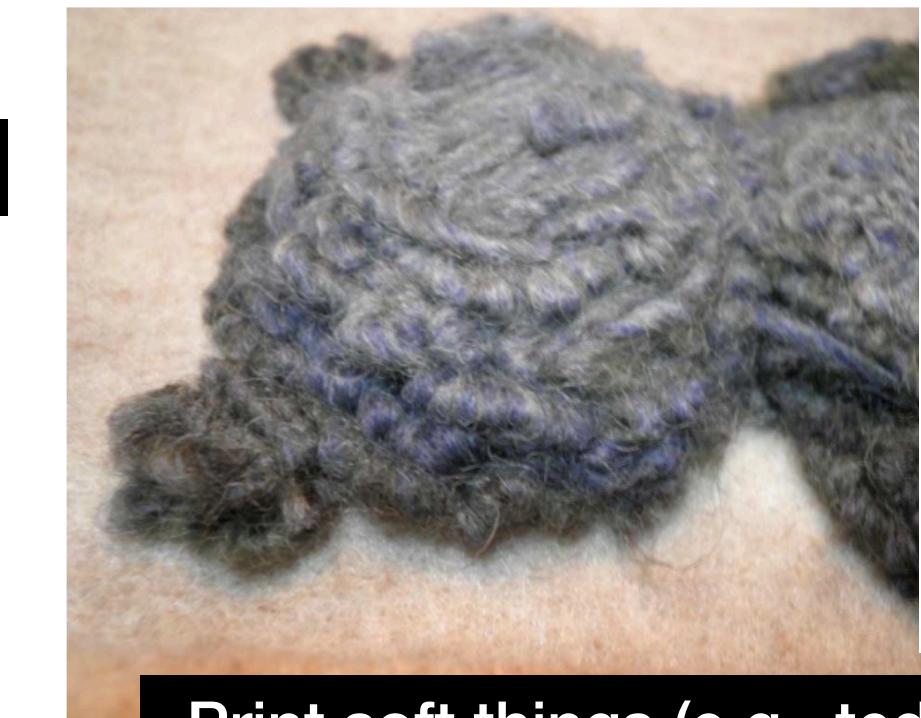
Combining touch with in-air gestures
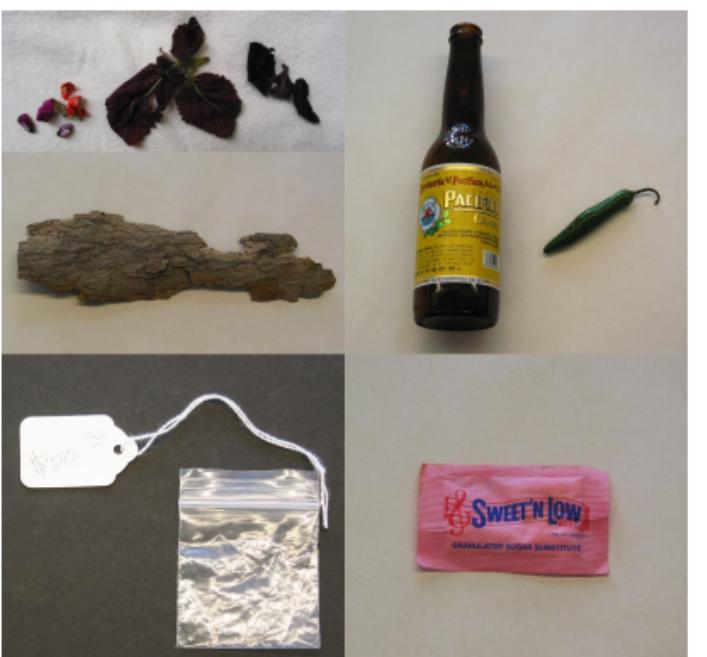
Disambiguation in speech and sketch inputs

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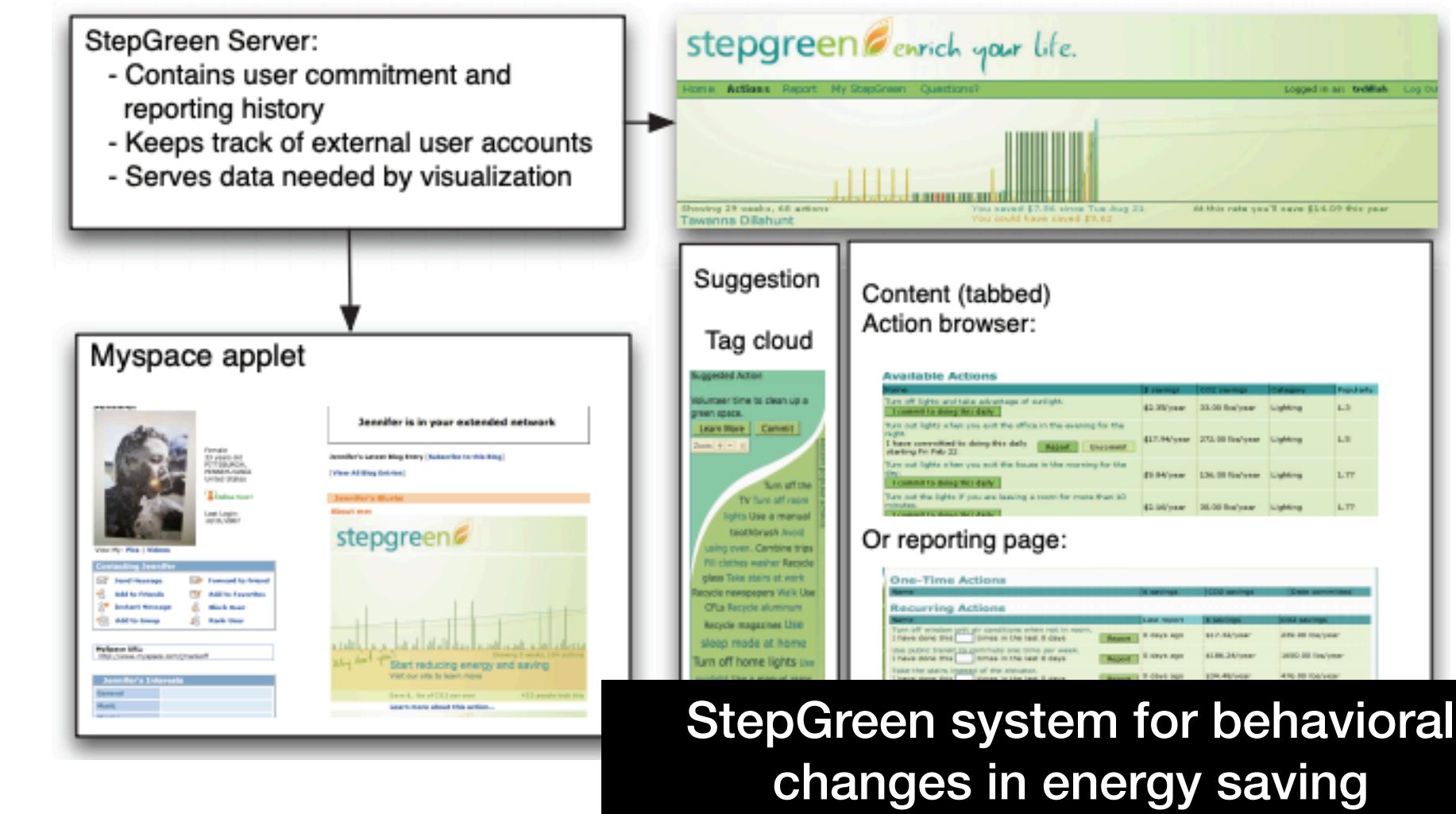
Jen Mankoff
Faculty at U Washington (2017 -)
Faculty at CMU (2004 - 2017)
Faculty at UC Berkeley (2001 - 2004)

StepGreen system for behavioral changes in energy saving
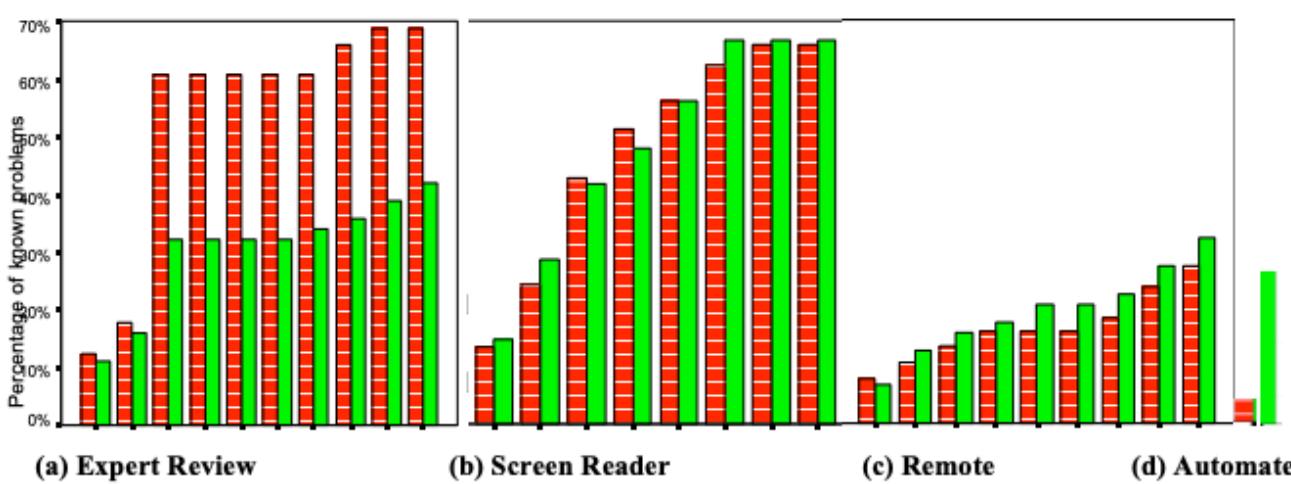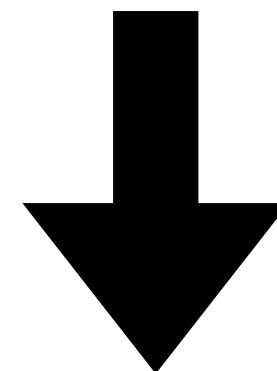
The role of media in diary studies

A comparative study of methods for assessing web page accessibility for the blind

The role of critical disability studies in HCI

Study the collective actions of "makers" in their action to COVID-19
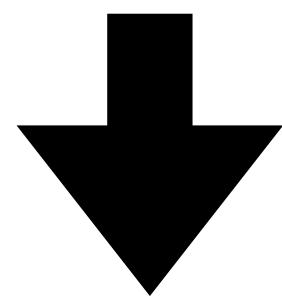
Technical HCI research vs. Other kinds of HCI research

What makes a HCI research contribution **technical**?
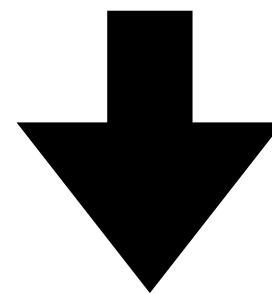
	Natural science approach	Engineering approach
Assumption	Online communities are natural phenomena to be understood	Online communities are socio-technical systems to be (partially) designed
Research Question	How do they operate?	How can we improve them?
Relation to theory	Community as a setting to develop and test theory	Theory is a tool to help design the community
Methods	Observation, surveys, log data and regression analysis with small numbers of variables and few interactions	Plus: experiments & simulations with more variables and higher-order interactions

Technical HCI research vs. Technical work that is *not* research

⬇
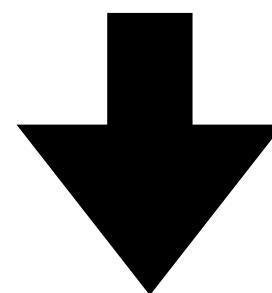
What makes a technical work **research**?

Technical HCI research vs. Technical work that is ***not*** research

⬇

What makes a technical work **research**?

⬇

What makes **good** technical HCI research?

Each of my group's papers now starts with a storyboard session at a whiteboard. I pretend to be a big-time Hollywood producer and ask the Ph.D. student or postdoc to play the role of would-be movie director pitching a new movie to me. Their pitch must answer three questions: What is the status quo? What is wrong with the status quo? How does this new paper go beyond the status quo?

McDonnell, 2017 (Science)

…and…but…therefore….

…and…but…therefore….

Current status quo:
scale of the impact
opportunity from enabling technology
user needs
current state of the literature

Problem:
limitation with existing solutions
  - too hard
  - too expensive
  - too slow
  - not scalable
  - not socially accepted

  …
gap in literature
lack of understanding
unmet user need

Specific to HCI: the "but" part often comes from formative user studies

…and…but…therefore….

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So how do you generate important RQs?

- Look at past work, esp future work and limitations

- Should be easy to convince someone it is important - esp outside the field (even your grandmother)

- Finding the gaps that previous researchers overlooked

- Problems you've experienced in your life that you want to fix

- Life observation - watch youtube videos, movies, scenarios you may not have encountered

- Futurist visions

- Topics that are in flux/new

- Theoretical contribution - how can a solution generalize

- Document your thoughts

- Talk to your community / target population

  ○ Directly talk to them

  ○ Go to places they are (reddit, youtube videos)

  ○ Look for hacks

  ○ Workshop/group session

- Look for previous answers in prior work

- Draw inspiration from other fields

- Adopting new methods/tools/software

- Stating your values - does the current state live up to those values?

- Ask senior researchers

Research Contributions in Human-Computer Interaction

 Jake Wobbrock   Julie Kientz

Jacob Wobbrock
Faculty at U Washington (2006 -)

Text entry method with trackball

Figure 3. Slide Rule uses multi-touch gestures to interact with applications. (1) A *one-finger scan* is used to browse lists; (2) A *second-finger tap* is used to select items; (3) A *flick* gesture is used to flip between pages of items or a currently playing song; (4) An *L-select* gesture is used to browse the hierarchy of artists and songs in the music player.

Multi-touch gestures for blind users

Figure 1. Unistroke gestures useful for making selections, executing commands, or entering symbols. This set of 16 was used in our study of $1, DTW [18,28], and Rubine [23].
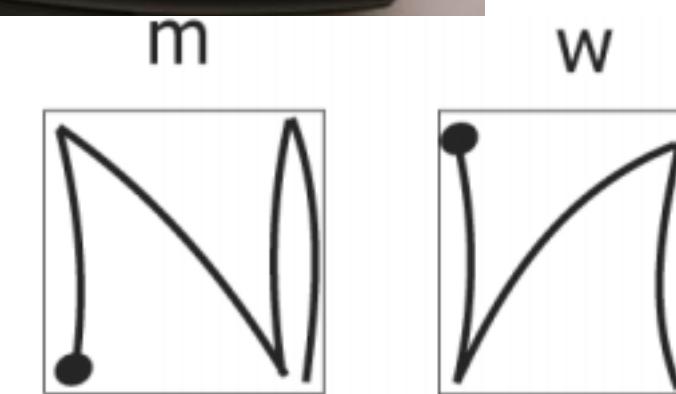
The $1 recognizer for gestures that require no libraries, toolkits, or training

The EdgeWrite text entry method

The Ability-Based design method

"yeah it's *insert raining emoji* a lot recently!"
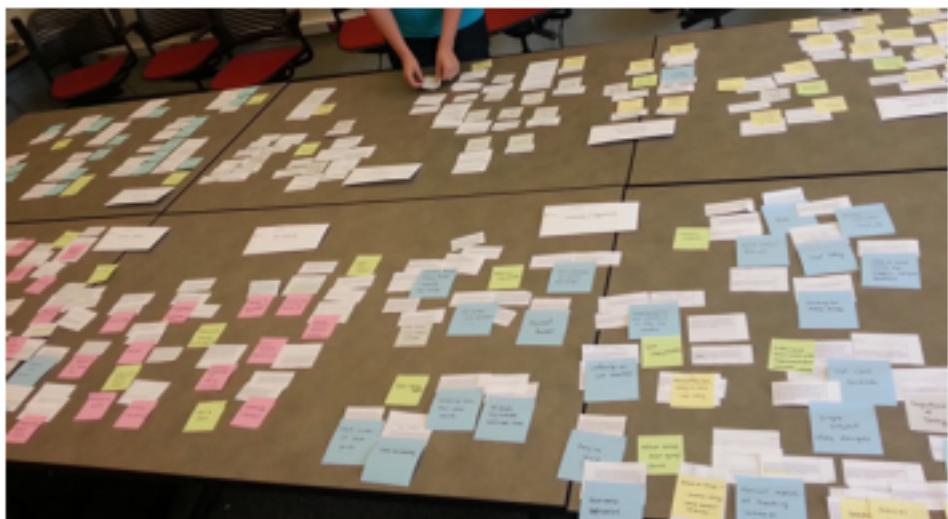
"yeah it's *emoji umbrella with rain drops* a lot recently! *Emoji suggestions available.*"

Voice input of emoji for blind users
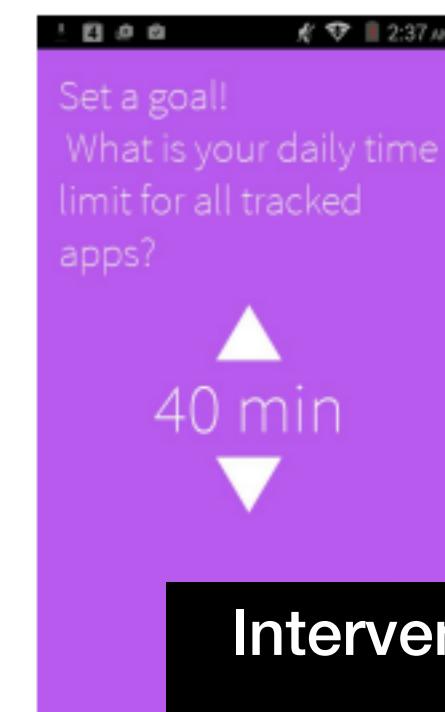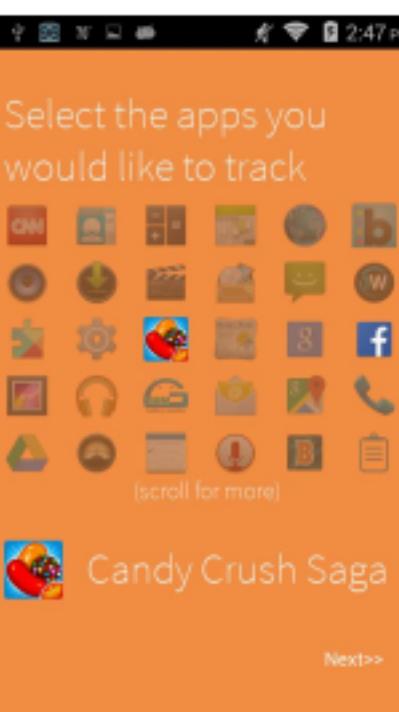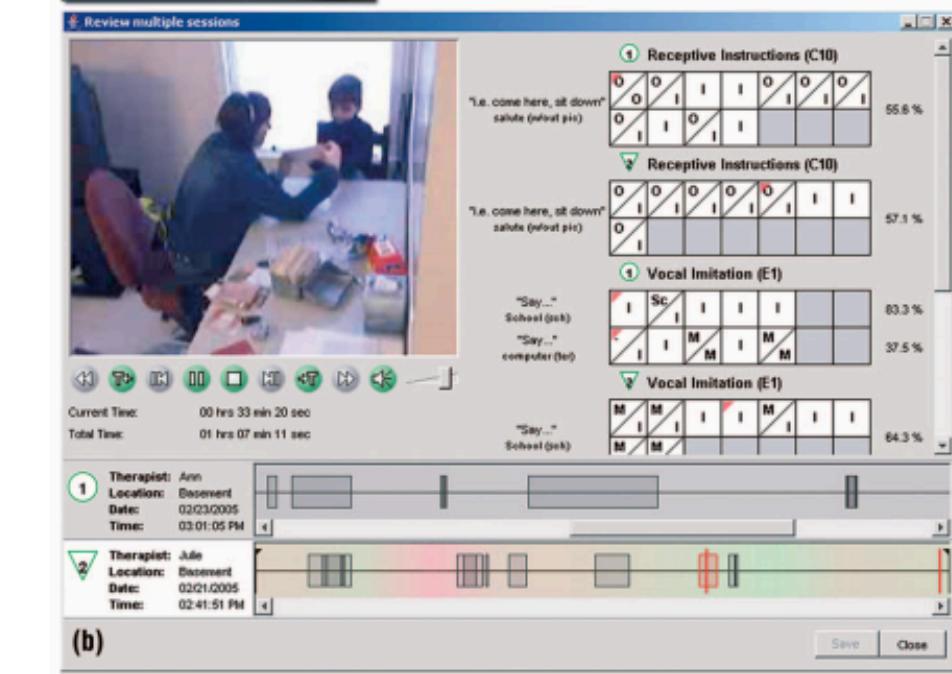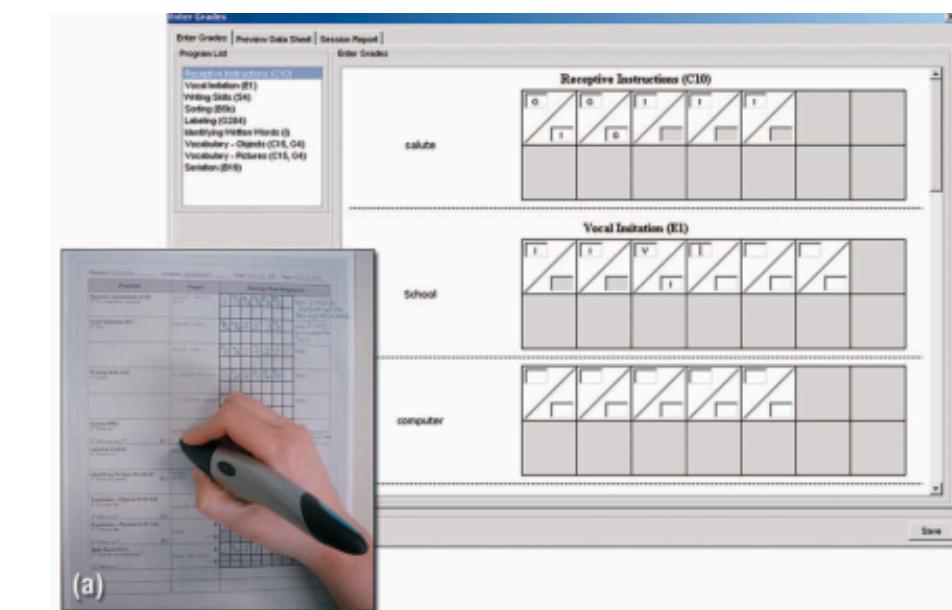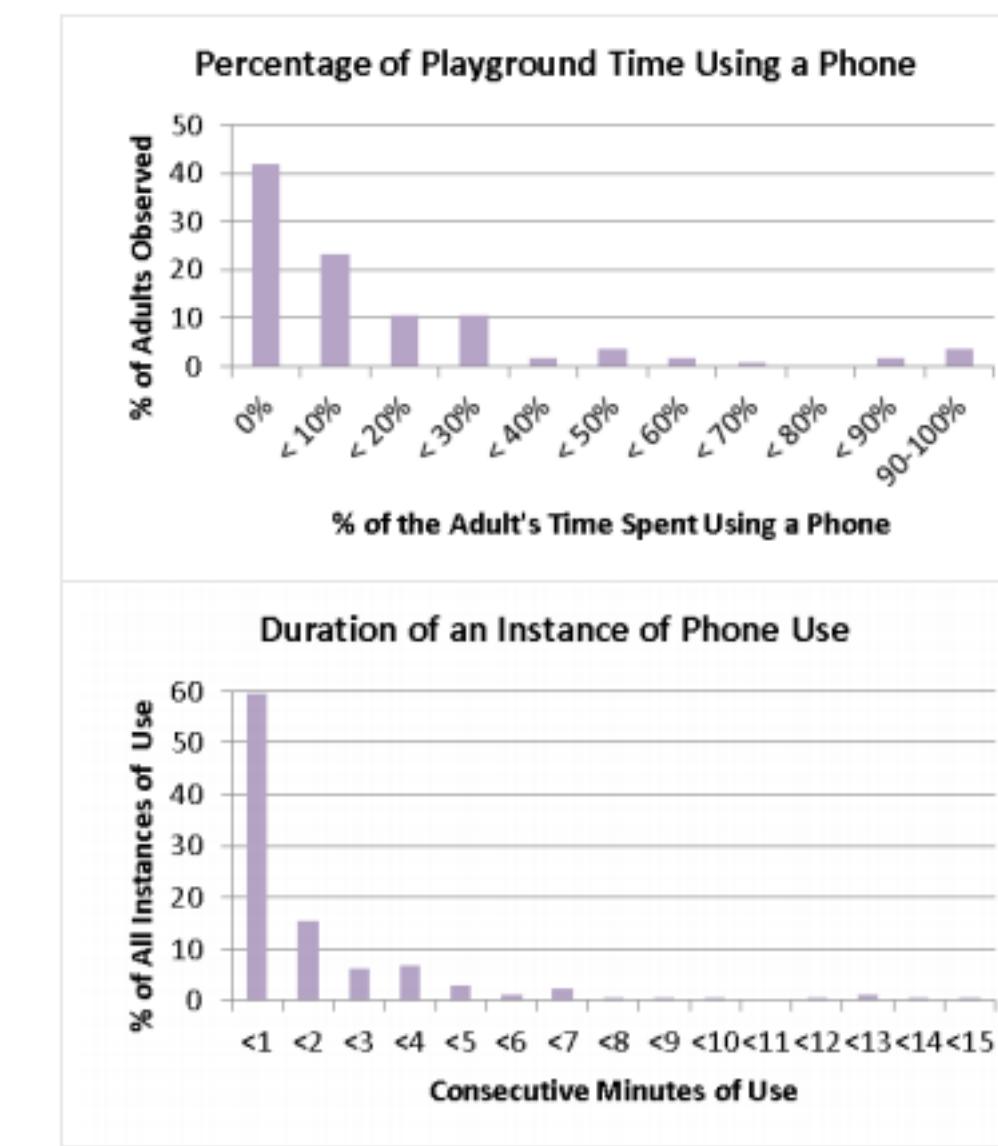
Julie Kientz
Faculty at U Washington (2009 -)
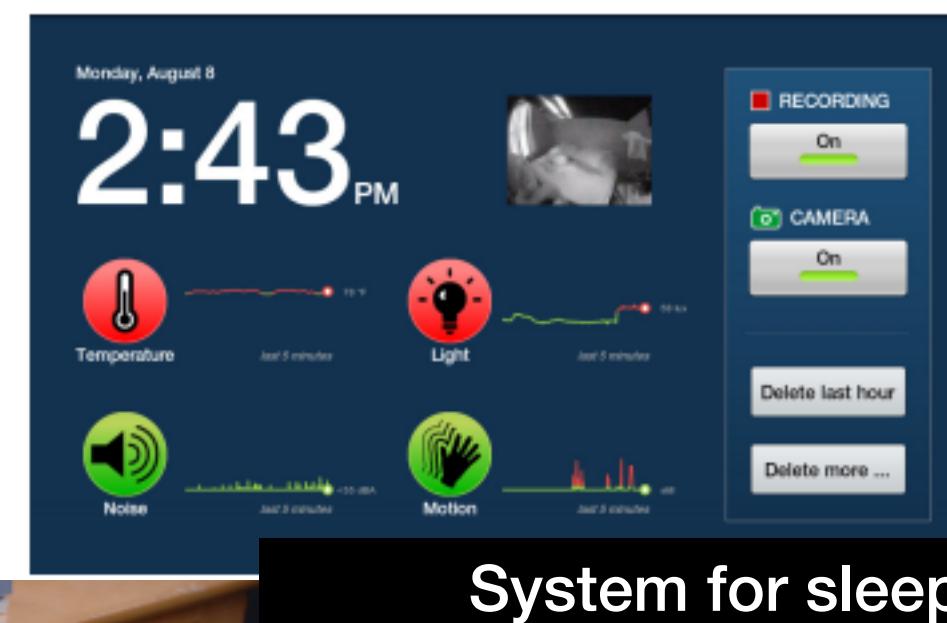
Understand how quantified-sellers collect and explore personal data

Observation of phone usage of parents when caring for children at the playground

System for caregivers to log behavioral data of children with special needs

Intervention for limiting smartphone usage

System for sleep tracking and understanding

Types of research contributions

1. Empirical: <u>new knowledge</u> through findings based on <u>observation and data gathering</u>

2. Artifact: the creation of new systems, architectures, toolkits,…

3. Methodological: new knowledge or technique about <u>how we do research</u>

4. Theoretical: new or improved <u>concepts, definitions, models, principles, or frameworks</u>

5. Dataset: <u>new and useful corpus</u> for the benefit of the research community

6. Survey: meta-analysis and synthesis of work on a research topic with the <u>goal of exposing research trends and gaps</u>

7. Opinion: <u>change the minds</u> of readers through <u>persuasion</u>