EECS 330: Human-Computer Interaction

Northwestern University
Winter 2019

Welcome you to EECS 330: HCI
I think HCI is one of the most interesting, inspiring, and impactful fields of computer science
Really excited to share it with you
Before we get started…

Who am I?

Eleanor “Nell” O’Rourke
- Prefer: Nell / she / her

Background
- BA, Colby College
- 2 years at a medical software company
- PhD, University of Washington CSE
- Assistant Professor in CS+LS since 2016

Interests
- HCI, Educational Games, Classroom Technology
- Delta Lab – Co-Director

Who am I?

Sarah Van Wart

- Prefer: Sarah / she / her

Background

- BA, Yale University
- 10+ years working in Civic Tech
- PhD (expected 2019), Berkeley School of Information
- Lecturer (soon to be Assistant Professor of Instruction)

Interests

- HCI, learning and education, civic tech, youth, socio-political dimensions of computing

Agenda

- What is Human-Computer Interaction?
- Course Overview
- Project Theme
- Upcoming Assignments

Start by talking about HCI, what it is, and why I think it's the coolest part of computer science
Then, give a quick overview of the course
Then Sarah will talk about the theme for this quarter's team projects
And she'll give you some details about upcoming assignments

Agenda

- What is Human-Computer Interaction?
- Course Overview
- Project Theme
- Upcoming Assignments

Surge in Excitement about CS

There's a huge surge of excitement about CS right now.
Everyone's talking about how the tech sector is growing at an explosive rate, and that there are great job opportunities in the field
There's increasing interest in introducing CS earlier in students education
And, as we're all experiencing here at Northwestern, there's a huge growth in undergrad interest in CS
So why is everyone so excited about CS?

Computer science is exciting because we're seeing technology is transforming the human experience
It's changing how we communicate, through technologies like email, messaging, and slack
It's changing how we stay healthy, through technologies like fitbit and medical applications that track your blood pressure
It's changing how we stay in touch and share content through social media
And it's changing how we learn, through technologies like YouTube, Khan Academy, and Wikipedia

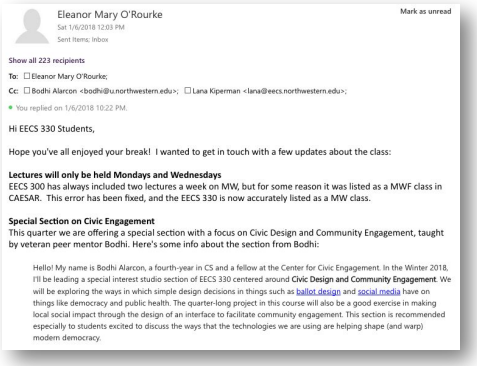
What is driving these transformations?

- Exciting advances in technology
  - Hardware, algorithms, artificial intelligence networking, sensors, databases
- Huge innovations in how humans interact with technology and with each other
  - At the end of the day, the impact is human
  - This tech wouldn't be transformative if it wasn't designed to support human needs
- Let's talk through some examples…

So what's driving these transformations?
Exciting advances in technology
Hardware, algorithms, artificial intelligence networking, sensors, databases
Huge innovations in how humans interact with technology and with each other
At the end of the day, the impact is human
This tech wouldn't be transformative if it wasn't designed to support human needs
Let's talk through some examples…

How we communicate

- Email – is it just physical mail made digital?



Eleanor Mary O'Rourke
Sat 1/6/2018 12:03 PM
Sent Items; Inbox

Mark as unread

Show all 223 recipients

To: ☐ Eleanor Mary O'Rourke;
Cc: ☐ Bodhi Alarcon <bodhi@u.northwestern.edu>; ☐ Lana Kiperman <lana@eecs.northwestern.edu>;

You replied on 1/6/2018 10:22 PM.

Hi EECS 330 Students,

Hope you've all enjoyed your break! I wanted to get in touch with a few updates about the class:

Lectures will only be held Mondays and Wednesdays
EECS 300 has always included two lectures a week on MW, but for some reason it was listed as a MWF class in CAESAR. This error has been fixed, and the EECS 330 is now accurately listed as a MW class.

Special Section on Civic Engagement
This quarter we are offering a special section with a focus on Civic Design and Community Engagement, taught by veteran peer mentor Bodhi. Here's some info about the section from Bodhi:

> Hello! My name is Bodhi Alarcon, a fourth-year in CS and a fellow at the Center for Civic Engagement. In the Winter 2018, I'll be leading a special interest studio section of EECS 330 centered around **Civic Design and Community Engagement**. We will be exploring the ways in which simple design decisions in things such as ballot design and social media have on things like democracy and public health. The quarter-long project in this course will also be a good exercise in making local social impact through the design of an interface to facilitate community engagement. This section is recommended especially to students excited to discuss the ways that the technologies we are using are helping shape (and warp) modern democracy.

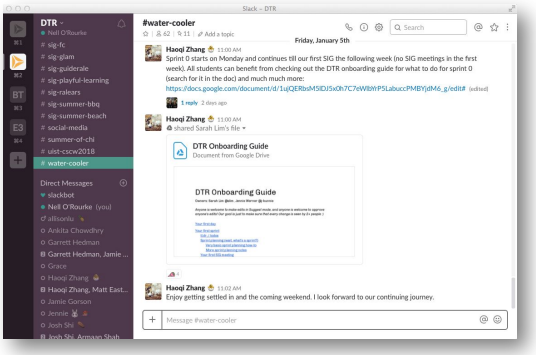
Supports new types Interactions:

- Multiple recipients
- Links to external content
- Conversation threading

So first, let's think about how we communicate. Email has totally changed how people communicate, particularly in the workplace
Is email just physical mail made digital with the support of the Internet and new network technology?
No – email has redefined what mail means, supporting new types of interactions like
multiple recipients
links to external content
conversation threading
Last year I sent an email to the whole class because we had some logistical issues with CAESAR
I sent it to 223 people, and linked to external content.

How we communicate

- Email – is it just physical mail made digital?
- Slack upsets the email market - why?



Supports new types of interactions:

- Chat-like interaction
- Channels
- Direct messages
- Multiple workspaces

So what about slack? Slack has upset the email market, shifting a lot of business communications to a new platform. Why?
Slack is notable not because of new advances in back-end technology, but rather in the new interactions that it supports

Slack has chat-like interaction that can be more natural than threading
It defines new ways of organizing conversations in channels
It still supports direct messages
Allows you to have multiple workspaces

These interactions create a very different experience than email that many people prefer

How we communicate

- Email – is it just physical mail made digital?
- Slack upsets the email market - why?
- Transformation in how we communicate is not just about tech…

Design of interaction patterns that match human communication needs make these technologies truly transformative

So for both email and slack, the transformation in how we communicate is not just about technical advances.
The design of interaction patterns that match human communication needs is what makes these technologies truly transformative.

How we keep in touch

- Facebook – just digital form of relationships?

Maybe originally…

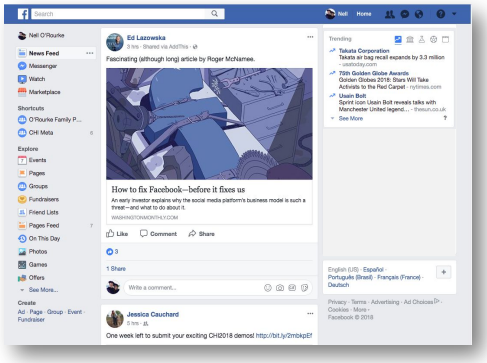
- Search for people at your school
- Find out who is in your classes
- See a visualization of your social network

So what about how we keep in touch outside of work? Let's consider Facebook. Is it just a digital form of existing personal relationships?
Maybe it started out that way… the original FB in 2004 advertised:

search for people at your school
find out who is in your classes
see a visualization of your social network

How we keep in touch

- Facebook – just digital form of relationships?
- Conceptual change in social networks



New interactions:

- Share and view multimedia content
- See trending topics
- Connecting with new people
- Supports discourse around content

But the current platform that FB has grown into involves a big conceptual change around what social networking means.

Facebook supports new types of interactions like:

sharing and viewing multimedia content

seeing trending topics

connecting with new people around areas of interest

supporting discourse around content

Now we might think that FB doesn't support discourse effectively, or doesn't help people find content that differs from their own worldview

there's been a lot in the media about this especially related to the 2016 election

But what everyone's talking about is how people interact with and through FB – this is all design

How we keep in touch

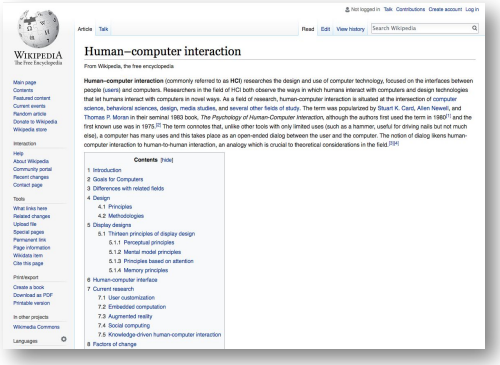
- Facebook – just digital form of relationships?
- Conceptual change in social networks
- Transformation in how we share and keep in touch is not just about tech…

Design of interactions to support connection, sharing, and discourse that make this technology truly transformative

So therefore, the transformation that we're seeing in how we share and keep in touch is not just about tech
It's the design of interactions to support connection, sharing, and discourse that make this technology truly transformative

How we learn

- Wikipedia – just a digital encyclopedia?



New interactions:

- Everyone can participate
- Low barrier to entry
- Harnesses the wisdom of the crowd

What about how we learn? Let's think about Wikipedia – is it just a digital version of an encyclopedia?
No – the content is created in a completely different way, by a crowd of volunteers rather than paid experts.
New interactions:

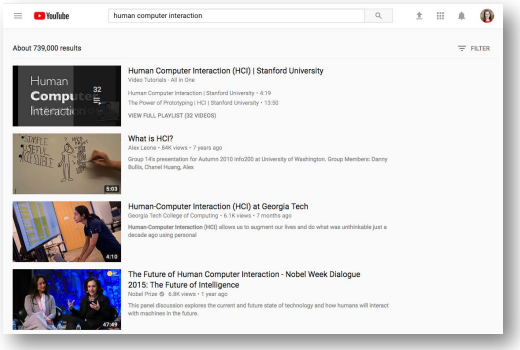
everyone can participate

low barrier to entry (at least there used to be…)

harness the wisdom of the crowd – that random person who is the world's expert on saved by the bell shares their knowledge

How we learn

- Wikipedia – just a digital encyclopedia?
- YouTube – just online TV?



New interactions:

- Everyone can participate
- Low barrier to entry
- Best content bubbles to the top

What about youtube? Is it just an online version of TV?
No – just like with Wikipedia, content is created by anyone and everyone
Best content bubbles to the top

How we learn

- Wikipedia – just a digital encyclopedia?
- YouTube – just online TV?
- Transformation in how we learn and gain access to content is not just about tech…

Design of interfaces that allow crowds to collaborate to produce new content makes this technology truly transformative

So therefore, the transformation in how we learn and gain access to new content is not just about advances in technology
It's the design of interfaces that allow crowds to collaborate and produce new content that makes this technology truly transformative

Take-Away Message

- Advances in the underlying technology have enabled all of these transformations.
- None of these systems would have had the same impact without innovations in how humans connect and interact.
- HCI is the branch of CS that studies how we can leverage tech innovations to transform human experiences.

Take-away
Advances in the underlying technology have enabled all of these transformations.
None of these systems would have had the same impact without innovations in how humans connect and interact.
HCI is the branch of CS that studies how we can leverage tech innovations to transform human experiences.

What is Human-Computer Interaction?

Understanding People

Understanding Technology

Designing Interactions that Support Human Needs

So what is HCI?
It's about understanding people – their needs, their environments, their constraints
It's also about understanding technology – what is possible, and how we can push the boundaries of how tech can serve humans
And ultimately it's about designing new interactions that effectively support human needs

What will you learn in this class?

- Methods for understanding humans (needfinding, interviews, observations)
- Methods for identifying human needs (contextual inquiry, task analysis)
- Methods for designing usable interfaces (iteration, paper prototyping)
- Methods for evaluating your designs (heuristic evaluation, user testing)

In this class, you're going to learn:
Methods for understanding humans (needfinding, interviews, observations)
Methods for identifying human needs (contextual inquiry, task analysis)
Methods for designing usable interfaces (iteration, paper prototyping)
Methods for evaluating your designs (heuristic evaluation, user testing)

What is the focus of the class?

- Human-Computer Interaction is broad
  Ubiquitous computing, crowdsourcing, data visualization, accessibility, social computing, sensors, mobile devices, application areas
- Methods apply across all types of HCI
- This class: HCI for web programming
- Some advanced topics later in the quarter

So as you might have noticed, HCI is really broad:
Ubiquitous computing, crowdsourcing, data visualization, accessibility, social computing, sensors, mobile devices, application areas
The methods that you're going to learn in this class will apply across all these different types of HCI
In this class, we're going to specifically focus on HCI for web programming
I'll touch on some more advanced topics later in the quarter to give you an idea of the breadth of the field

Agenda

- What is Human-Computer Interaction?
- Course Overview
- Project Theme
- Upcoming Assignments

Course Information

Prerequisites:	EECS 211
Course Website:	canvas.northwestern.edu/courses/88803
Discussion Forum:	piazza.com/northwestern/winter2019/eecs330
Lecture Times:	Mondays & Wednesdays, 1:00-1:50pm
Studio Sections:	Thursdays & Fridays
Office Hours:	Peer mentor office hours announced soon Email Nell and Sarah for appointment
Readings:	Posted on Canvas (no textbook)

Piazza – sign yourself up
Office hours – email me or Sarah for an appointment
Waitlist if you aren't enrolled - email us to get on it

Course Staff

Nell O'Rourke (Professor)	**eorourke@northwestern.edu**
Sarah van Wart (Professor)	**vanwars@northwestern.edu**
Abizar Bagasrawala	AbizarBagasrawala2020@u.northwestern.edu
Anna Deng	AnnaDeng2020@u.northwestern.edu
Armaan Dhingra	ArmaanDhingra2020@u.northwestern.edu
Cori Pitiger	CoriPitiger2019@u.northwestern.edu
David Latimore	DavidLatimore2019@u.northwestern.edu
Gabriel Caniglia	GabrielCaniglia2019@u.northwestern.edu
Richard Huang	RichardHuang2019@u.northwestern.edu
Sanfeng Wang	SanfengWang2020@u.northwestern.edu
Vishal Giridhar	VishalGiridhar2020@u.northwestern.edu
Shu Han	ShuHan2020@u.northwestern.edu

Contact info for all the course staff
We have a fantastic set of peer mentors who will be leading your studio sections
Email both me and Sarah if you want the fastest response!

Studio Sections

Studio	Time	Location	Peer Mentor
70	Thursday 1-2pm	Tech LG68	David Latimore
62	Thursday 2-3pm	Tech F280	Vishal Giridhar
61	Thursday 3-4pm	Tech M349	Shu Han
66	Thursday 4-5pm	Tech M349	Richard Huang
64	Friday 12-1pm	Tech LG68	Abizar Bagasrawala
72	Friday 12-1pm	Tech MG28	Gabriel Caniglia
MSAI	Friday 1-2pm	Tech L170	Armaan Dhingra
68	Friday 1-2pm	Tech MG28	Cori Pitiger
69	Friday 1-2pm	Tech M349	Sanfeng Wang
65	Friday 2-3pm	Tech LG68	Anna Deng

Attendance is required!

Studio sections are one of the most important parts of this course
Opportunity to meet in smaller groups, participate in more interactive learning experiences
You'll get feedback from your peer mentor and other students on your team project.
So because of this, attendance at studios is required.

Team Projects

- Teams of 4 students
- Form teams within your section
- If you want to swap sections, use Piazza
- We'll go over team formation process Wed

Individual Assignments (40%)

- HW1: HTML & CSS (10%)
- HW2: Javascript (10%)
- HW3: User Interface Critique (10%)
- HW4: Graphic Design Critique (10%)

Team Project (50%)

- P1: Project Brainstorm & Proposal (5%)
- P2: Interviews & Observations (5%)
- P3: Tasks & Features (5%)
- P4: Paper Prototype (7.5%)
- P5: Computer Prototype 0 (2.5%)
- P6: Computer Prototype 1 (2.5%)
- P7: Computer Prototype 2 (2.5%)
- P8: Computer Prototype 3 (2.5%)
- P9: Final Prototype & Presentation (17.5%)

Grading

- Design is subjective, and so is this course
  - We use detailed rubrics to guide grading
  - Wow us with your work, not with complaints
- Team project is designed for feedback
  - Prototypes are a way for you to get feedback
  - Must act on feedback as part of continuing to refine and develop your project (final is 17.5%)
  - Focus on process and getting feedback means that final grades are more “quality of result”

Readings & Quizzes

- Short readings for each class
- Designed to push your thinking about HCI, design, usability, and your project
- Short (1-3 question) quizzes on readings during lecture
- All readings will be posted on Canvas

Readings – articles, book chapters, research papers
Designed to push your thinking
Short quizzes – help you test your own understanding, incentive for doing the reading, highlights most important take-aways

Won't be held at the very beginning of class – I know some people are coming from across campus

Participation (10%)

- Studio Participation (5%)
  - Peer Mentors will take attendance in studio
  - You get one free pass (we'll drop lowest grade)
- Class Participation (5%)
  - Reading quizzes
  - You get 3 free passes (drop lowest 3 grades)

Collaboration Policy

- Team assignments should be a team effort
- Individual assignments should be completed individually
- It's OK to get help from the web, peer mentors, and other students
- It's not OK to share or copy written work (including code)

Only your team members should be committing your work to github!

Late Policy

- 10% off for up to 24 hours late
- 20% off for 24-48 hours late
- Assignments more than two days late will not be accepted under most circumstances.

Late assignments will not be accepted for full credit. If the deadline says 11:59pm, get it in by that time.
We'll take 10% of for submissions that are turned in up to 24 hours late
20% for submissions turned in between 24 and 48 hours late.
Under most circumstances we will not accept any assignments that are more than two days late.
Please get in touch with us early if there are any circumstances that will affect your ability to turn in work on time.

Agenda

- What is Human-Computer Interaction?
- Course Overview
- Project Theme
- Upcoming Assignments

So every quarter this class has a different theme for the quarter-long projects

Project Theme: Behavior Change

Behavior change refers to any modification or transformation of human behavior.

- Individual behaviors (e.g. exercise, sleep, diet, finances, Internet use, study strategies)
- Community behaviors (e.g. carbon footprint, political activism, volunteering)

This quarter the theme is **behavior change**

Behavior change refers to any modification or transformation of human behavior.

Individual behaviors (e.g. exercise, sleep, diet, finances, Internet use, study strategies)

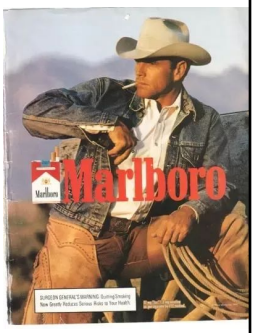
Community behaviors (e.g. carbon footprint, political activism, volunteering)

Case Study: Cigarettes

Large behavior shifts can transform society

- 42% of Americans were smokers in 1965
- 17% of Americans were smokers in 2014

What caused this shift?



This quarter the theme is **behavior change**

Behavior change refers to any modification or transformation of human behavior.

Individual behaviors (e.g. exercise, sleep, diet, finances, Internet use, study strategies)

Community behaviors (e.g. carbon footprint, political activism, volunteering)

This theme is great because it's really broad – you can work on a design to change a behavior that is meaningful to you

And it's exciting because changes in behavior can really transform society. As an example:

42% of Americans were smokers in 1965

17% of Americans were smokers in 2014

Case Study: JUUL

Co-founders Adam Bowen and James Monsees first created a company called Ploom **while they were product-design grad students at Stanford University** before founding JUUL.

A sleek, tech-inspired design that resembles a USB flash drive; comes in flavors (e.g. mint, mango and crème brulee) which are proven to appeal to young people and facilitate initiation of tobacco product use (Truth)

Sales of JUUL grew more than seven-fold from 2016 to 2017, posing danger to youth (CDC)

Source: https://en.wikipedia.org/wiki/JUUL

This quarter the theme is **behavior change**

Behavior change refers to any modification or transformation of human behavior.

Individual behaviors (e.g. exercise, sleep, diet, finances, Internet use, study strategies)

Community behaviors (e.g. carbon footprint, political activism, volunteering)

This theme is great because it's really broad – you can work on a design to change a behavior that is meaningful to you

And it's exciting because changes in behavior can really transform society. As an example:

42% of Americans were smokers in 1965

17% of Americans were smokers in 2014

Case Study: Takeaway

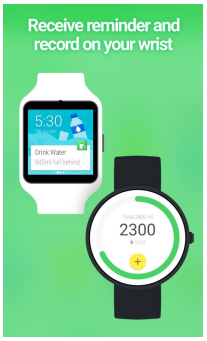
Design — including tech design — can promote both positive and negative behaviors (depending on your vantage point)

- How can you foster the kinds of behaviors that you really value?
- How do the apps and technologies that you use try to manipulate your behavior?

Think not only how you can foster the kinds of behaviors that you really value; but also know that **companies are trying to manipulate your behavior**! (Click bait, staying on the site longer, making things addictive, etc.).

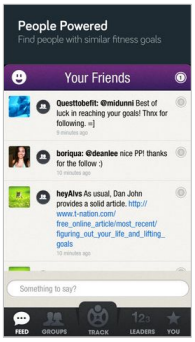
Behavior Change Technology

Support behavior change through new interactions



Reminders

Data Tracking



Social Support

Tech is shifting the behavior change landscape

Potential to support behavior change in new ways through new types of interaction

- Goal setting and reminders
- Social support from friends and community
- Behavior tracking to support reflection

Technology could succeed where decades of social and educational programs have failed

Let's talk through a couple of examples

Behavior Change Examples

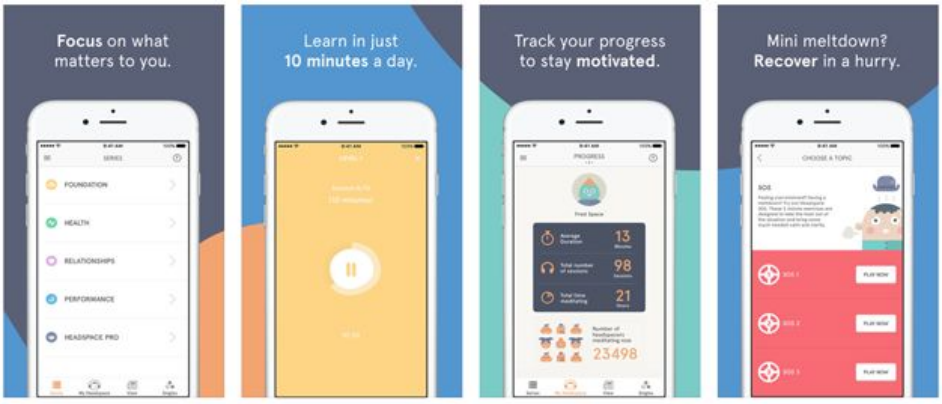
fitbit.com

Fitbit is the first thing that comes to mind when you say “behavior change”
Uses sensors to track steps, heartbeat, displays that data for you in a dashboard through the web
Also provides ways to compare your activity to friends, compete through leaderboards
Data: automatically collected via sensors
Motivation: data tracking and social

But this device is not without its critiques:

- https://www.thedailybeast.com/the-dark-side-of-your-fitbit-and-fitness-app
- http://time.com/4517033/fitness-tracker-fitbit-zip-exercise/

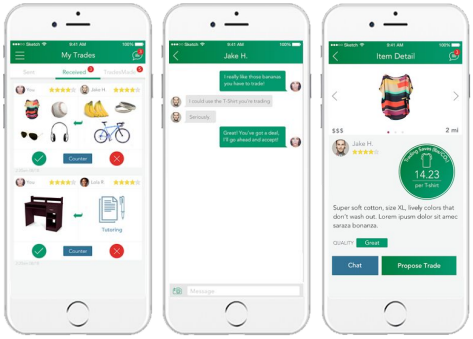
Behavior Change Examples



headspace.com

Headspace is another interesting example. It's an app designed to help people develop a habit of meditating every day
While fitbit provides value because it tracks your data, Headspace provides value because of the content it provides
There are hours and hours of unique meditations, tailored to different human needs like focus, pain management, or gratitude
Data: tracks your use of the app, streaks
Motivation: data tracking and social

Behavior Change Examples



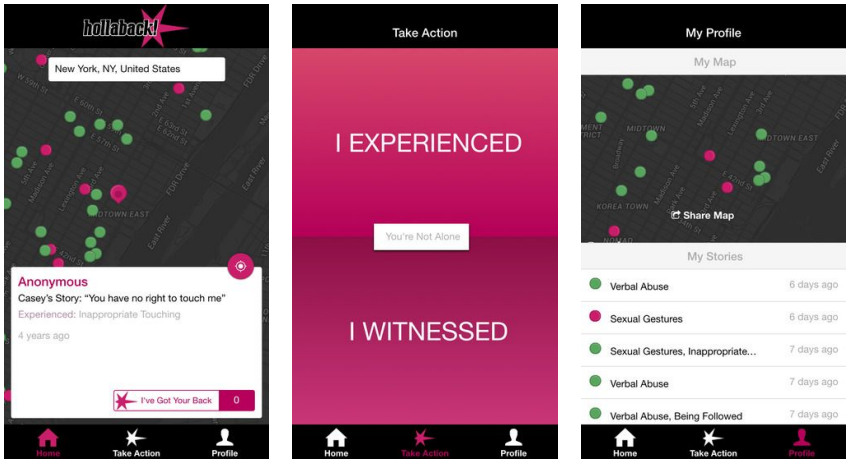
trademade.com

TradeMade is a totally different type of app.
It's designed to encourage people to stop buying new things, and instead trade with people in their community

- browse and upload an item
- propose a trade
- chat, meet up, make it happen

Goals – reduce landfill waste, lower carbon footprint
Motivation – reduce the effort to find used items, lower barrier to entry

Behavior Change Examples



ihollaback.org

Like trade made, there are also apps that are all about changing culture — i.e. behavioral norms about what is acceptable and not acceptable. Not only about reporting, but also about providing support, and bearing witness to the pervasiveness of problematic behavior.

- Crowdsourcing
- Information visualization
- Sharing details and photos
- Commenting (to provide support)
- Connection with offline non-profit organizations; other ways of getting involved

From their website:

Our mission is to build safe, inclusive public spaces by transforming the culture that perpetuates discrimination and violence.

We carry out this mission by building the power of people to create long-lasting impacts in the movement for social justice.

Behavior Change Examples

Mobile Justice CA is an easy way to record and report interactions with law enforcement. All footage and reports submitted through this app will be sent immediately to your local ACLU affiliate.

mobilejusticeca.org

Holding power and authority accountable.

Behavior Change Summary

- Lots of behaviors you can target
  - Individual-level behaviors
  - Collective behaviors and norms
- Provide value through many interactions
  - Data collection, reporting, and awareness **Fitbit, Hollaback!, ACLU**
  - Access to resources (online/offline, ideal/material) **Headspace, Hollaback!, ACLU**
  - Reduce effort to change behavior **TradeMade**

Lots of behaviors you can target
    Behaviors that an individual wants to change
    Behavior change that would benefit society at large scale
Provide value through many interactions:
    Automatically collect data (Fitbit)
    Provide access to resources (Headspace)
    Reduce effort to change behavior (TradeMade)

Agenda

- What is Human-Computer Interaction?
- Course Overview
- Project Theme
- Upcoming Assignments

Readings have been posted

Canvas >

Assignments > // Scroll Down

Readings >

Reading: Behavior Change Technology

Reading questions are on Canvas:

1. https://www.theguardian.com/sustainable-business/behavioural-insights/true-potential-technology-change-behaviour
2. https://techcrunch.com/2013/07/13/why-behavior-change-apps-fail-to-change-behavior/
3. https://thedecisionlab.com/quantified-self-lead-behaviour-change/

Reading

- Reading: articles on behavior change
  - Recognising the true potential of technology to change behaviour (The Guardian)
  - Why Behavior Change Apps Fail To Change Behavior (TechCrunch)
  - Does the Quantified-Self Lead to Behaviour Change? (The Decision Lab)
- Reading Quiz: in class on Wednesday

Reading questions are on Canvas:

1. https://www.theguardian.com/sustainable-business/behavioural-insights/true-potential-technology-change-behaviour
2. https://techcrunch.com/2013/07/13/why-behavior-change-apps-fail-to-change-behavior/
3. https://thedecisionlab.com/quantified-self-lead-behaviour-change/

Assignments

- P1.1: Project Brainstorm
  - Come up with three project ideas
  - Each idea is short (two sentences)
  - Due Thursday 12pm (before first section)
- Studio 1 – Project Brainstorming Activity
- P1.2: Project Proposal
  - One page proposal of your favorite project idea
  - Due Sunday at midnight