CS 147 Introduction & Course Overview

Design Thinking for User Experience Design, Prototyping & Evaluation

Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2022

September 26, 2022
Hall of Fame or Shame?

Here Are 3 Things We're Watching This Week

- CDC Has New Info About Asymptomatic Spread of COVID-19
- Dwarf Giraffes May Be First Ever Documented
- Astronomical Triple Play: When to Watch
- U.S. Rocked by 2 Billion-Dollar Disasters Last Year
Weather.com

Need to click for weather

What is the “first read”? videos

not my local weather!

It used to be worse!
Hall of Fame or Shame?

weather.yahoo.com
Hall of Fame!

Good!
- aesthetic
- clean typography & icons

Bad!
- image is 1st read & ad 2nd?
- too much empty space!

weather.yahoo.com
Hall of Fame or Shame?
Hall of Fame!

bing.com/weather

Good!
less clutter
eye drawn to current temp

Bad?
maybe a little boring…
iOS yahoo weather

Good!

aesthetic

clean typography & icons

(image recedes to background w/ flick or tap)
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Who are We?
James Landay
he/him

- Professor in Computer Science at Stanford
  - formerly at Cornell Tech (1 year), University of Washington (12 years), & UC Berkeley (7 years)
  - spent 3 years as Director of Intel Labs Seattle
- PhD in CS from Carnegie Mellon ’96
- HCI w/ focus on ubiquitous computing, web design (tools, patterns, etc.), HAI
- Founded NetRaker, 1st in web experience management (sold to Keynote)
- Co-authored *The Design of Sites* with Doug van Duyne & Jason Hong
- Office Hours: TBD,
  schedule slots via [https://calendly.com/landay/landay-office-hours](https://calendly.com/landay/landay-office-hours)
- Email: landay@[insert usual Stanford email domain]
Nava Haghighi (Head CA)
she/her

- CS PhD (HCI), Dual master’s in CS + Design, Bachelor of Architecture
- In addition to design and CS, my work draws from critical theory and artistic practice to develop behavior change interventions.
- I brew and ferment lots of things (krauts, beverages, tempeh, miso)!
- Office Hours: Wed 11-noon, Fri 3-4 pm
undominate
designing for symbiosis

Well-being support and productivity tools are typically designed with an end-goal in mind that must be conquered. But what does it mean to, rather than domination, consider symbiosis? Instead of pushing users towards an end-goal, develop a solution that informs them on why they do what they do, considering other systems impacting the behavior.

In this studio we will reimagine existing health or well-being apps. What does it means to shift the focus of the app from obtaining an end goal or dominating our bodies and brains, to designing for understanding and awareness. Considering the human body and brain as a complex system that is itself part of a larger complex system. How can we support and bring a deeper understanding to this system?

potential examples to reimagine:
Fitness+, Notion, Pomodoro, Calendar
Emily Yang (Assistant Head CA)
she/her

• CS Master’s (HCI), Finance & Info Systems Undergrad @ UMD
• Interested in human-centered design, improving quality of life
• I love making homemade ice cream (25+ flavors to date!)
• Office Hours: Tues 2 – 3 PM and by appointment
Travel & Safety

After two years, the restrictions around traveling domestically and internationally have loosened up for many countries, while others are still maintaining very strict policies. It’s no surprise that many people globally are taking this opportunity to venture out again.

However, it’s inevitable that the social, cultural, and political landscapes in each country have changed, whether subtly or drastically, leading to potential risks in one’s safety. It’s also important to consider the perspectives of locals, other encountered travelers, and loved ones back home. In this new era, how can we use technology to support these various parties regarding travel and safety risks?

Examples: TripIt, Atlys, Travello, PackPoint, Eatwith
Jianna So (Assistant Head CA)
she/her

- CS Coterm (HCI), Product Design Undergrad
- Interested in accessibility, legal design & social impact
- I make laser-cut earrings in the PRL & projection art! ✨
- Office Hours: Mon 12:30 - 1:30 PM, Tues & Thurs by appointment
Keeping Culture Alive

Technology allows us to bring the past to life. AR experiences can show us what colors an ancient temple may have been painted 400 years ago, while language translation can help us learn languages we no longer speak.

How can we use technology to preserve and celebrate culture? This studio will focus on learning about culture through ethical research practices and working with communities to honor their experiences.

Examples:

- Woolaroo
- Chroma AR

Thursday: 5:30pm - 7:30pm
Friday: 9:30am - 11:20am
Maya Srikanth
she/her

- MSCS (AI), CS & Business Economics Management undergrad @ Caltech
- Interested in AI/design for climate change, generative models, computer graphics
- i’m a big fan of cats 🐱
- Office Hours: Friday (time TBD)
Habits for sustainable living

Can we move people to preserve the planet that sustains us, a few healthy habits at a time?

Climate change & environmental degradation are some of the most pressing issues we are facing. To make a lasting change for the better, we need to evolve both as a community and as individuals. How can we use technology, design, and (optionally) AI to raise awareness about climate change and help people cultivate habits for sustainable living? Applications include reducing food and water waste, encouraging vegan products/ green transportation, or even using art/music/journalism to educate and inspire people to make green lifestyle changes.

Examples: Too Good to Go, climateGAN, HappyCow, Lime JouleBug
Krishnan Nair
he/him

- MSCS (HCI), BS in Computer Science (HCI)
- Interested in educational technology and data visualization, and ethics of computing
- Hate bananas, love banana bread
- Office Hours: 10-11 Mondays, and by appointment (Slack)
Stepping Through Time

“Time is free, but it’s priceless. You can’t own it, but you can use it. You can’t keep it, but you can spend it. Once you’ve lost it you can never get it back.” - Harvey Mackay

One of the most common enemies we face is time. Whether we are lost in the past, fearful of the future or disconnected from the present, we commonly lack control of this most precious resource. This studio will focus on innovating ways that users interact with the past, present and future in order to embrace the time that they have. How can we use technology to truly own time: an entity that we commonly fail to grasp?

Studio: Friday 1:30-3:20
Kaitlyn Lee
she/her

- MSCS (HCI), BS in Computer Science @ Cal
- Interested in edTech and accessibility
- I’m an avid birdwatcher 🦜
- Office Hours: Wednesday 11:30AM-12:30PM, and by appointment
Equitable Healthcare

The effects of the ongoing COVID-19 pandemic have brought to light many disparities in healthcare treatment and access. Additionally, the prevalence of social media has also led to a rise in mental health issues as a result of its overuse and misuse, especially among teens and young adults. However, there are a multitude of barriers to both physical and mental healthcare, such as cost, ease of access, and social stigma. Beyond that, socioeconomic factors such as limited access to food and transportation, environmental quality, and inequity in employment and education further serve as barriers to health equity. In this studio, we will explore how we can utilize technology to make healthcare more accessible and equitable.

Studio: Friday 11:30AM - 1:20PM

Examples: Headspace, Teen Talk App
Michelle Xu
she/her

- CS Coterm (HCI), Economics Undergrad
- Interested in product design, optimizing for productivity
- I run a food Instagram and am always looking for new places to eat 🍜🍜
- Office Hours: Thursdays, 10-11 AM and by appointment
Finding Focus

With today’s increasingly sophisticated technology, it is easier than ever to send an email, share a photo, and organize an event, among other things. However, this can also come with an endless barrage of information that can affect our day-to-day productivity. Our inboxes are constantly flooded with emails that, for the majority of the time, aren’t directly relevant to us. We may set reminders on one app and meetings on another and get the two mixed up. We may want to focus, yet find ourselves distracted by notifications on social media. With our everyday lives easily susceptible to information overload, how can we find focus?

Examples: [FocusMate](#), [Notion](#), [Trello](#), [Forest](#)

Studio: Friday, 1:30-3:20 PM
Some Norms for Lecture

- **COVID**
  - be *flexible* with us & each other. It is still a tough time for everyone & more so for some. Let’s respect that!
  - this **class is in person**, but if you are sick do not come & contact the teaching staff immediately so we can help you keep up with the course!
  - Stanford policy requires you to **wear a mask** except when speaking

- **Attendance**
  - in class **attendance required** as your team will work together every class
  - **video recording for those who are sick**, but available to all before the midterm

- **Participate**
  - two channels: using voice (raise your hand) & slack
  - **slack** (cs147-2022au) – you should have been invited
  - some voting with polleverywhere, but mainly slack
Join our Slack!

cs147-2022au.slack.com
What Do You Hope to Learn in CS147?

Put a few key phrases in the #lecture slack channel

* if you aren’t in our cs147 slack grid, direct message Ji ([jiannaso@stanford.edu](mailto:jiannaso@stanford.edu))

** For all **during** lecture activities & questions use the #lecture slack channel so we can see them. For questions outside of lecture time, use the #q-and-a channel.
BREAK
5 min
stretch, get water, eat, etc.
Outline

- Who are we?
- AI & User experience design
- Balancing design thinking & technology
- Design discovery & exploring ideas
- Rapid prototyping & evaluation
- Goals of the course
- Course format & schedule
- Course policies
AI Needs User Experience (UX) Design

- Tesla Model S “Autopilot”
- Future of autonomous cars
- How do we design the UX?
AI Needs User Experience (UX) Design

- Amazon Echo, Google Home & other Smart Speakers use Voice UI
- How do we design them to deal with natural human conversation?
- How do we design to support multimodal input? (e.g., + screen or vision)
AI Needs User Experience (UX) Design

• What is appropriate to show a patient?
• What should be the interface for the doctor?
• Is there a set of design patterns for these Smart UIs?

Computer vision-based skin cancer detection getting better and better
Balance
Approach to Application Design & Prototyping
Design Thinking Process

EMPATHIZE  DEFINE  IDEATE  PROTOTYPE  TEST

What is missing?
Iterating within stages & back to prior stages
How to Design and Build Good UIs

- Iterative development process
- Usability goals
- User-centered design
- Design discovery
- Rapid prototyping
- Evaluation
- *Programming*
Iteration

At every stage!

Design

Prototype

Evaluate
Usability

According to the ISO:

The *effectiveness*, *efficiency*, and *satisfaction* with which specified users achieve specified *goals* in particular *environments*.

This doesn’t mean you have to create a “dry” design
Usability/User Experience Goals

- Set goals early & later use to measure progress
- Goals often have tradeoffs, so prioritize

Example goals:
- Learnable
  - faster the 2nd time & so on
- Memorable
  - from session to session
- Flexible
  - multiple ways to do tasks
- Efficient
  - perform tasks quickly
- Robust
  - minimal error rates
  - good feedback so user can recover
- Discoverable
  - learn new features over time
- Pleasing
  - high user satisfaction
- Fun
User-centered Design

“Know thy User”

• Cognitive abilities
  - perception
  - physical manipulation
  - memory

• Organizational / educational job abilities

• Keep users involved throughout
  - developers working with target customers
  - think of the world in users’ terms
Accessible Design

• Different abilities
  - vision, hearing, cognitive, mobility
  - e.g., blind users with screen readers

• Moral and ethical purpose
  - inclusive design benefits everyone
  - e.g., sidewalk curb cuts

• Legal guidance
  - Americans with Disabilities Act (ADA)
User-centered Design: Needfinding

- Observe existing practices for inspiration
- Make sure key questions answered
- Ethical questions in design w/ underserved communities
Unpacking the Needfinding
Develop Point of Views (Person + Insight + Challenge)

Brainstorm on How Might We Solve

We were amazed to realize...
(what did you learn that's new?)

That thanks to the boat owner's mentorship, trust, and discipline of the fishing lifestyle and connection to nature, he had turned his life around from drug addict back to a job to someone with skills and can be a role model.

It would be game-changing to...
(frame up an inspired challenge for yourself. Don't dictate the solution.)

All of us could take a risk to see a spark in others and nurture it into a purposeful transformation.

HMW bring routine (and discipline) less?
Sketching & Storyboarding
Sketching & Storyboarding

Selecting an Interface

How do we motivate users to complete goals?

"Gamification" vs. "Social Media"
Concept Videos

- Illustrate context of use rather than specific UI
- Quick & inexpensive
- Forces designers to consider details of how users will react to the design
Concept Videos: Planning Storyboards

TURNING POINT: INTRO RAMBL

UGH!

Rambl

Popular location 2

Popular location 3

Drip coffee

Artisanal coffee

Cold brew
Concept Videos: Planning Storyboards

Spice
Concept Videos

CoCo
Rapid Prototyping

• Build a mock-up of design so you can test it
• Low fidelity techniques
  - paper sketches
  - cut, copy, paste
• Interactive prototyping tools
  - HTML, Balsamiq, Axure, proto.io, Sketch+Marvel, Modao, etc.
• UI builders
  - Expression Blend + Visual Studio, Xcode Interface Builder, etc.
Low-fi Prototyping & Testing

Flutter

give  find  seed

notifications

new discussion on your item

Photo

*could I use this in

my art project?*

new addition to your
items journey!

Bricklet

"used in theatre project..."

clear

Photo

East Palo Alto

*could I use this in my art project?

Interesting! Tell me more!

Flutter
Low-fi Prototyping & Testing ➝ Final Hi-Fi Prototype
Low-fi Prototyping & Testing

barefoot

memo
Interactive Prototypes
Medium Fidelity

Sex Academy
Interactive Prototypes

Hi-Fidelity

Autumn 2022

Design Thinking for User Experience Design, Prototyping & Evaluation
Interactive Prototypes

Hi-Fidelity

BookEd

Sprout

Pebble

Good morning, Cathy.

Upcoming Appointment

Physical Examination

Friday March 5, 2021

No Interpreter scheduled

Arrive by 9:15 AM

Starts at 9:00 AM

Palo Alto Allergy Department

Find an interpreter

Past Interpreters

Gabrielle S

Sherry T

Morah B

Week 30 Info

Week 30 Symptoms

Fatigue, morning sickness, and more

What You Should Know:

Paternity Leave

A brief look into employer policies, alternatives, and more.

Communicating with Your Partner: Tips

Ensuring healthy communication throughout pregnancy and beyond
Interactive Prototypes

Hi-Fidelity

• Does this mean at the quality to go in an app store?
  - for a few yes, but for most no (this is not a requirement & many will push to this in CS194H)

• You will be building a real app (with code)
  - not a click-thru prototype (e.g., using Figma or InVision)

• It should support most of your functionality

• But it might be missing
  - polish
  - back-end implementation
    • maybe data stored locally, social networks incomplete, etc.

• CS (intended) majors should have pre-reqs (106B/X, 142/193P/193A or experience building apps)
  If not…
CS47 – Cross-Platform Mobile Development

- Create a mobile app on both iOS & Android using the React Native framework in just 10 weeks
- Tuesday/Thursday 3 – 4:20 PM, 2 Units C/NC
- You can dual use CS47/CS147 projects!
- Course web site: [https://web.stanford.edu/class/cs47/](https://web.stanford.edu/class/cs47/)
- Apply here by Friday, 9/30 at 6 PM
Evaluation

- Test with real customers (participants)
  - w/ interactive prototype
  - low-fi with paper “computer”

- Low-cost techniques
  - expert evaluation (Heuristic Evaluation)
  - online testing
Goal of CS 147

*Learn to design, prototype, & evaluate UIs*

- Tasks, activities & practices of prospective users
- Cognitive/perceptual constraints affecting design
- Techniques for brainstorming, ideation & prototyping
- Methods for evaluating UI designs
- Importance of iterative design for usability
- Technology used to prototype UIs

- *How to work together as a team*
- *Communicating results to a group*
Course Format

- Interactive lectures → you speak!
- Each week
  - 2 lectures on techniques & background
    - 60-80 minutes of lecture
    - 20-30 minutes team meeting each lecture → you need to be here to work with your team
    - 10-20 minutes for in class exercises
  - 1 studio with hands-on activity or team presentation
- Quarter-long project
- Readings, Videos, Podcasts
- Course material will be online
  - slides, exercises, readings, schedule
- Have fun & participate!
Projects

• Each team will propose a UI-oriented project
  - fixing something broken or a completely new idea
  - based on team needfinding

• Theme
  - each Thursday/Friday studio has a theme
  - all projects mobile/wearable/off desktop

• Groups
  - 3-4 students to a group (4 preferred)
  - work with students w/ different skills
  - CS students should have had 142/193p/193a or equivalent (non-majors need not)
    • If not, take CS47, learn ReactNative, dual use project for CS47/147
  - groups meet in class & studio weekly

• Cumulative
  - apply several HCI methods to one interface

• If you let your team down, we will lower your grade
Design Studios

Teams attend small weekly studio (9-16 students)
- critique/feedback in more intimate environment
Project Process Timeline

- **Autumn 2022**
- **Week 2**: Needfinding
- **Week 3**: Experience Prototypes & Testing
- **Week 4**: Concept Video
- **Week 5**: Low-fi Prototype
- **Week 6**: Medium-fi Prototype
- **Week 7**: Heuristic Evaluation
- **Week 8**: High-fi Prototype
- **Midterm**
- **Week 9**: Concept Video
- **Week 10**: Project Fair
- **...**
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**WEEK 1**

- 25: Fill out studio preference form, due by class 9/28
- 26: Assignment 1 (Needfinding) released, due in studio 10/6 or 10/7
- 27: Assignment 2 (Define) released, due in studio 10/13 or 10/14
- 28: Assignment 3 (Ideate) released, final due 10/30 at 11:59 PM
- 29: Assignment 4 (Explore) released, due in studio 10/10 or 10/21
- 30: Assignment 5 (Video) released, due in studio 10/27 or 10/28
- 1: A4 Video Revisions (optional)

**WEEK 2**

- 9: Working on Assignment 1 (Needfinding), presented in studio 10/6 or 10/7
- 10: Concept Videos
- 11: Exploration
- 12: Early Stage Prototyping
- 13: James 1000, in class work
- 14: A2 Presentation, Tasks
- 15: A2 Presentation, Tasks

**WEEK 3**

- 16: Assignment 4 (Video) presented in studio for critique 10/20 or 10/21
- 17: Assignment 5 (Low-fi & Test) released, due in studio 10/27 or 10/28
- 18: A4 Video Revisions
- 19: James 1000, Film Fest!
- 20: Video Crit, Sketching
- 21: Visual Info Design
- 22: A5 Presentation, Design Systems

**WEEK 4**

- 23: Assignment 4 (Low-fi & Test) released, due Monday 11/7 at 5 PM
- 24: Assignment 5 (Med-fi) released, due Monday 11/7 at 5 PM
- 25: Designing the Future
- 26: Human Abilities
- 27: Visual design, midterm review
- 28: Assignment 6 (High-fi) released, due Monday 11/21 at 5 PM

**WEEK 5**

- 29: Assignment 6 (High-fi) released, due Monday 11/21 at 5 PM

**WEEK 6**

- 30: Assignment 3 Website checkpoint due in studio 11/3 or 11/4
- 31: Heuristic Evaluation
- 1: Conceptual Modeling
- 2: A9 Heuristic Evaluation
ASSIGNMENTS OVERVIEW

See corresponding colors on the calendar to see when these projects will occur during the quarter.

Assignment 1
Needfinding
In this assignment you will plan, develop, and execute the first needfinding round for your quarter-long team project. You will present your interview plan (methodology), data gathered from your initial interviews, and the key insights and inferences you have made. You will capture this analysis in an empathy map that you will share in your studio presentation.

Assignment 2
POVs and Experience Prototypes
You will revisit the findings from A1, interview more participants based on a deeper focus, and formulate points of view for your potential users. From there, you will craft several “How Might We” statements to frame the problem area and intended design goal. Based on the best HMW statements, you will brainstorm several solutions. You will then create and test 3 “experience prototypes” to learn more about these ideas.

Assignment 3
Website
The goal of this assignment is to learn how to present your work in a professional, engaging, and appealing manner. Previous students have used their websites to talk about their project when on the job hunt! Your website will be hosted on Stanford AFS.

Assignment 4
Concept Video
The goal of this assignment is to continue to learn how to brainstorm novel design ideas and turn these ideas into a concept video. You will start by conducting market research to find other apps in your space (ensure you’re thinking up a novel product). You will then shoot a video that will help you to form ideas best.

Assignment 5
Low-fi Prototype and Usability Test
Learn how to use low-fi prototyping in the early stages of UI design. You will first sketch many different design realizations

Assignment 6
Interactive Medium-fi Prototype
Learn how to build medium-fidelity, interactive prototypes of UI ideas using an interactive UI design tool. Understand the tradeoffs compared to low-fi prototyping or even creating a prototype through coding. You will revise your UI ideas based on the insights from your low-fi prototype user testing and feedback from your studio peers and CA. Then, you will use interactive tools to
Books

We will give you web links to all necessary readings/videos

Recommended textbook (if you need one)

*Designing the User Interface: Strategies for Effective Human-Computer Interaction* by Shneiderman et. al, 6th edition (2016)
Assignments

**Individual**
- 1 presentation each
- 1-2 written (handed in online)
- class & studio participation (graded)
  - in class exit tickets to show you came to lecture & are paying attention

**Group**
- 10 assignments
  - 4-5 presentations with 3-4 write-ups + video + poster
  - all group work handed in online
    - team web site & online submission site
Grading

• A combination of
  - individual assignments & presentation (10%)
  - class/studio participation (10%)
  - midterm (20%)
  - group project (60%)
    • presentations/poster (group component)
    • project write-ups

• No final
  - must be present at project fair on Friday 12/9 (6-9 PM)
**Tidbits**

- **Late Policy**
  - no lates on group assignments
  - individual assignments lose one letter grade/day

- **Course web site**

- **Studio preferences & team signups (you do *not* need a team in advance!)
  - due Wed at 5 PM

- **Attendance**
  - you are expected to be in lecture & studio synchronously (and eventually in person)
  - If you have a small conflict (less than 30 min), we will consider how to resolve it
  - we drop 1 studio miss, after that it comes out of your participation grade
  - if you get sick, we will figure it out. Contact me & our head CA (Nava)
Summary

• UX design is an important part of most software

• Getting the interface right is hard, but…

• Solution is *Iterative Design* including repeated cycles of
  - Design
  - Prototyping
  - Evaluation
Next Time

• Design Discovery

• Read
  - Margaret Gould Stewart, From tecnho-optimism to techno-realism: What it means to innovate responsibly
  - Adams, 4 Steps to Successful Brainstorming, Forbes, 2013
  - Holtzblatt & Beyer, Ch. 3 from Contextual Design
  - d.school’s Empathy Fieldguide
  - If any readings are password protected, it should be “hcid”

• Watch
  - ABC News Nightline IDEO Deep Dive, July 1999 (22 minutes)
  - optional: ABC News, IDEO Design Thinking, January 2013 (13 minutes)