CS 147 Introduction & Course Overview

Design Thinking for User Experience Design, Prototyping & Evaluation

Prof. James A. Landay
Computer Science Department
Stanford University

Autumn 2023

September 27, 2023
Hall of Fame or Shame?

ON OUR RADAR

Keeping An Eye On Still Active Atlantic

- 19 Tips: How The First 6 Years Could Impact You
- 5 Changes To Expect From The Weather This Fall
- Severe Threats Brew for Passengers On JetBlue Flight
- Last Chance With Hurricane Moon This Week — 2023’s Final Supermoon
- Heat Has Many Wondering “What Happened To Fall?”

weather.com
Hall of Shame!

weather.com
Need to click for weather
What is the “first read”? videos popups/ads not my local weather!

It used to be worse!
Hall of Fame!

Good!
- aesthetic
- clean typography & icons

Bad!
- image is 1st read
- too much empty space!
Hall of Fame or Shame?
Hall of Fame!

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)
CS 147 Introduction & Course Overview

*Design Thinking for User Experience Design, Prototyping & Evaluation*

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Computer Science Department
Stanford University

Autumn 2023
September 27, 2023
Who are We?
James Landay  
he/him  

- Professor in Computer Science at Stanford  
  - formerly at Cornell Tech (1 year), University of Washington (10 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: Mon 3:30-4 PM (390 Gates) or by appointment (slack me)  
- Email: landay@[insert usual Stanford email domain]
Matt Jörke
he/him

- 4th-year CS PhD (HCI x AI), CogSci & CS Bachelor’s at Berkeley
- I work on human-AI interaction and design technology to promote health & wellbeing
- I like making electronic music and playing with synthesizers 🎹
- **Office Hours:** Tue 3-4pm, Tue/Thu by appointment
Designing for Active Lifestyles

Physical activity is fundamental to health, reducing the risk of many chronic diseases. However, many in the US and globally fall short of meeting physical activity guidelines. **People face many unique barriers** to physical activity, such as physical limitations, geographic and environmental constraints, lack of resources or income, social pressures, fixed mindsets and health beliefs, and more.

Many existing health tools **embrace a “one-size-fits-all” approach**, assuming standard graphs and statistics will work for everyone. In this studio, we'll explore tools to address these unique barriers. How can we promote physical activity across demographics and abilities? How do we foster long-term, sustainable habits? And how do we bridge geographic and economic gaps in access to exercise?

**Examples:** Apple Health, Strava, Nike Training Club, Oura
Nancy Hoang
She/her

- M.S. and B.S. in CS HCI @Stanford
- I am passionate about accessibility in education, financial literacy, and mitigating food insecurity
- I am a huge fan of baking and run my own IG baking page
- Office hours: 8-9 PM Tuesday (Zoom) or via calendly
Unintentional Good

Balancing financial wellness, social responsibilities, and environmental conservation is a goal many strive for. Yet, convenience often takes precedence over these objectives.

In this studio we will address this dichotomy, focusing on practical strategies that seamlessly integrate our goals of positive change and growth into our daily lives without significant inconvenience.

Unintentional Good aspires to be aspirational for the lazy people in your life.

Studio Times: Fri 11:30-1:20, 1:30-3:20
Amelia Leon
she/her

- CS Coterm (AI), CS undergrad (theory)
- I am passionate about using technology to make education more accessible and equitable
- I enjoy painting
- Office Hours: Monday 10 - 11 AM & by appointment via calendly
**Accessing Healthcare**

The COVID-19 pandemic revealed just how fractured our healthcare system is, providing healthcare that is not equitable nor accessible to all. The supreme court overturning Roe v. Wade has had major consequences for peoples’ access to reproductive healthcare and has raised concerns about data privacy in personal health apps. Due to increased demand for OBGYN care, patients must often **wait months** for care at a women’s health clinic.

However, concerns about **long wait times** and **data security** are issues that most Americans have, especially low-income people who often have a limited number of providers who accept medicare and/or medicaid. How can we leverage technology to create applications that will make **healthcare more accessible and equitable** for everyone?

**Studio Times:** 9:30-11:20, 11:30-1:20

**Examples:** NURX, hers, Teladoc
Tiffany Lee
she/her

- CS Coterm (HCI) & B.S. Symsys (Human-Centered AI)
- Interested in how human centered design & technology can be applied to education and combat climate change
- Enjoyer of type 2 fun 🚴‍♂️🏃‍♀️🚣‍♂️
- Office Hours: Mondays 10:30-11:30am (zoom) & calendly.com/19tiffanylee/cs147
Unlocking Lifelong Learning

In a world changing faster than ever, lifelong learning is not just a choice but a necessity. Formal education systems generally account for just a fraction of one’s lifespan. How can we harness the potential of technology to facilitate lifelong learning journeys? This studio will explore how learning can be made accessible, engaging, and meaningful throughout one’s life while balancing technology education.

**Studio Times:** 12:30-2:20, 2:30-4:20

Example Screenshots from: Duolingo, Coursera, MasterClass
Grace Zhou
she/her

- CS coterm and undergrad (HCI)
- Interested in designing for journalism/media, AI, and content creation
- Interned in instructional design and growth design in addition to UX
- Love watching movies and always working on a script
- Office Hours: Tuesdays 10-11am (Zoom) and by appointment via Calendly
Preserving the Past

New technologies allow us to preserve history more easily than ever. We can record our family’s stories for future generations to see and hear, snap pictures and share the memories with others, even visit historical sites without leaving our homes. In this studio, we will explore ways to capture and revive the past. How can we leverage digital capabilities to preserve and cherish our histories? How can we save our memories and cultures so they endure?

Examples: Ancestry, Civilisations AR, 1 Second Everyday

**Studio Times:** Fri 11:30-1:20, 1:30-3:20
Jin-Hee Lee
she/her | they/them

• B.A.S. Symbolic Systems (HCI) | Music (Vocal Performance)
• M.S. Computer Science (HCI)
• I sing! Opera, jazz, R&B, musical theater, whoever will have me.
• My summers: teaching virtually, PM internship in SF, studying opera in Italy. Still figuring things out. Talk to me about any of these.
• Office Hours: TBD | Calendly
Harmonious Ties: Connection Through Music

To me, music has always been the lifeblood of human connection; it presents a shared language that allows us to communicate in a unique way. So how is it that, as the music world grows bigger and widens our domain for potential connection, meaningful music-based connections seem to be harder to attain?

In the music industry, collaboration is key — a lead singer might have assembled a band that needs a drummer, a songwriter might need an extra pair of ears on an unreleased single, or a listener of a niche genre might want to connect with others who appreciate it.

In this studio, students will be tasked with facilitating human connection through music. The target audience can range from passionate listeners to full-time musicians. How can we allow people to make harmonious ties in and through music?

**Studio Times:** Fri 10:30-12:20, 1:30-3:20
Star Doby
she/her/hers

- B.S., M.S. Computer Science (HCI) Coterm
- Interested in education technology, social computing, and accessibility design
- Feeling like a Figma expert after my UI/UX internship this summer 😎
  Talk to me about new & cool features (e.g. variables, dev mode, autolayout)
- Office Hours: TBD | Calendly
Many people have benefited from active digital spaces that hold tons of **crowdsourced knowledge**. From trying to answer burning questions to having deep philosophical discussions to sharing memes, people have different motivations for participating in these online communities. What design decisions help keep these communities flourishing and alive? **How can information be connected to those who need it?** How can users be incentivized to share knowledge with others? In this studio, students explore how different communities within a domain could benefit from **knowledge sharing**.

Examples: Ed Discussion, Fizz, Quora, Reddit, Stack Overflow, SkillShare

**Studio Times:** Fri 9:30-11:20, 12:30-2:30
Join our Slack!

cs147-2023au.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 Matt (joerke@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

DESIGN

TECHNOLOGY
Approach to Application Design & Prototyping
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

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Unpacking the Needfinding

say

think

feel

Potluck

do
Unpacking the Needfinding
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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?)

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?
Experience Prototype to Test Assumptions

Struggle Bus
Experience Prototype to Test Assumptions

eMotion
Sketching & Storyboarding
Sketching & Storyboarding

Selecting an Interface

How do we motivate users to complete goals?

"Gamification" vs. "Social Media"
Sketching & Storyboarding

house
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
Concept Videos: Planning Storyboards
Concept Videos

daha
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, Figma, Modao, etc.
- UI builders
  - Expression Blend + Visual Studio, Xcode Interface Builder, etc.
Low-fi Prototyping & Testing

StoreaTime

UnCover
Low-fi Prototyping & Testing

ENTIRE SYSTEM

Send It
Low-fi Prototyping & Testing
Low-fi Prototyping & Testing
Low-fi Prototyping & Testing

barefoot

memo
Interactive Prototypes

Medium Fidelity

Home
Welcome, Sarah
How are you feeling?

Meditate
9:41

Get ready to meditate with your group
Celia and Lily are ready
I want to meditate on my own

Meditate
9:41

Meditate
9:41

Great job!
Everyone in your group meditated today.

Meditate
9:41

Meditate
9:41

Compliments screen that notifies you if your entire group has completed the task and of any continuing stress.

Home screen with a mood check-in and tasks for the day.
Meditation preview screen to see which friends are available and adjust audio and video settings.
Group meditations screen that shows a synced guiding video and your friends’ videos.

Kokoro
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**Interactive Prototypes**

**Medium Fidelity**

**Medium Task:** Schedule and edit an event at your garden

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**GardenShare**

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

Sex Academy
Interactive Prototypes

Hi-Fidelity

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Interactive Prototypes

Hi-Fidelity

BookEd

Sprout

Pebble

Good morning, Cathy.

Upcoming Appointment

Physical Examination

- Friday March 5, 2021
- No interpreter scheduled

Find an interpreter

Past Interpreters

Add a review

Reviewed

Reviewed

Sound Evolution

GO TO ORIGIN

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…
CS147L – Cross-Platform Mobile Development

• Create a mobile app on both iOS & Android using the React Native framework in just 10 weeks
• Tuesday/Thursday 1:30 – 2:50 PM, 3 Units
• You can dual use CS147L/CS147 projects!
• Course web site: http://hci.st/cs147L
• Preference given to graduating seniors & CS147 students
• Apply here by Thursday, 9/28 at 11:59 PM
  http://hci.st/cs147L-A0
Evaluation

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

- Low-cost techniques
  - expert evaluation (Heuristic Evaluation)
  - online testing
Learning 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 CS147L, learn ReactNative, dual use project for CS147L/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

- 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
- Week 9: Midterm
- Week 10: Project Fair
## CS 147 AU23 COURSE TIMELINE

<table>
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<tr>
<th>SUN</th>
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### WEEK 1

**SEP**

- **24**: 27 Intro
- **25**: Studio preference form (due @ 5PM)
- **28**: Design Discovery (watch recording)
- **30**: Design Project 0

Assignment 1 (Needfinding) released, due in studio 10/5 or 10/6

### WEEK 2

**OCT**

- **1**: Define
- **2**: Ideate
- **6**: A1 Presentation, POVs
- **7**: Special event

Assignment 2 (Define) released, due in studio 10/12 or 10/13

Working on Assignment 1 (Needfinding), presented in studio 10/5 or 10/6

### WEEK 3

- **8**: Concept Videos
- **9**: Exploration
- **10**: A2 Presentation, Tasks
- **11**: Assignment 3 (Website) released, final due 11/20 @ 11:59PM

Working on Assignment 2 (Define), presented in studio 10/12 or 10/13

### WEEK 4

- **15**: Early Stage Prototyping
- **16**: Human Abilities
- **17**: A3 Critic, Sketching
- **18**: Video Crit, Sketching

Assignments 5 (Low-fi & Test) released, due in studio 10/19 or 10/20

Working on Assignment 4 (Video), presented in studio for critique 10/19 or 10/20

### WEEK 5

- **22**: Visual Info Design
- **23**: Film Fest!
- **24**: A4 Presentations, Design Systems
- **25**: A5 Presentations, Design Systems

Assignments 6 (Low-fi) released, due Monday 11/6 @ 5PM

Working on Assignment 5 (Low-fi & Test), presented in studio 10/28 or 10/27

### WEEK 6

- **29**: Conceptual Models
- **30**: Heuristic Evaluation
- **31**: Midpoint Review w/ outside experts

Assignment 8 (Med-fi) released, due Monday 11/6 @ 5PM

*Visual design workshop 1 (Figma skills) this week

*Visual design workshop 2 (Design systems) this week

*Accessibility workshop this week
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 projects 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 be used to support your team's feedback.

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 and then create a prototype of a single concept. You will then develop your low-fi prototype and run a usability test.

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 12/8 (6:30-9:30 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 in person
  - If you have a small conflict (less than 30 min), we will consider how to resolve it
    • fill out http://bit.ly/cs147-23au-conflicts for us to review & approve conflicts
  - we drop 1 studio miss w/ pre-approved excuse, after that it comes out of your participation grade
  - if you get sick, we will figure it out. Contact me & our head CA (Matt)
Exit Ticket


Due within 24 horus ➔ Thur 9/28 3:30 PM
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 (watch this lecture video online before Friday studio)
  - https://hci.stanford.edu/courses/cs147/2023/au/lectures/02-design-discovery.mp4
• Monday: Ideate

• Read
  - 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)