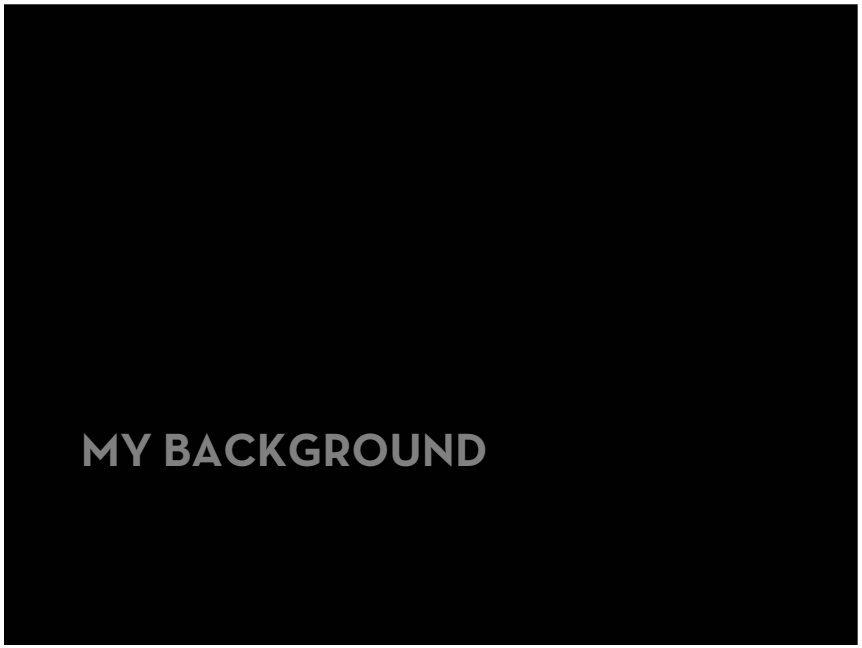
This course is a broad graduate-level introduction to HCI research. The course begins with seminal work on interactive systems, and moves through current and future research areas in interaction techniques and the design, prototyping, and evaluation of user interfaces. Topics include computer-supported cooperative work; audio, speech, and multimodal interfaces; user interface toolkits; design methods; evaluation methods; ubiquitous and context-aware computing; tangible interfaces; haptic interaction; and mobile interfaces.

Assistant professor in computer science, research in HCI and Visualization

Work in the HCI area

- Techniques, Tools, Systems for Data Analysis
- Grad work @ Berkeley

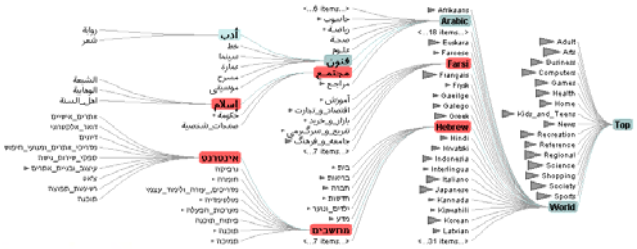



PhD from UC Berkeley

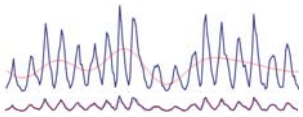
Our work on visualization techniques has developed new algorithms for optimizing graphical perception and novel interaction techniques for exploring large data sets. The goal of this line of research is to develop computational tools that facilitate analysis through effective visual encodings, layout algorithms, and interaction techniques.

Visualization Techniques

Improve visual analysis and communication via novel algorithms, encodings, and interactions



Degree-of-Interest Trees AVI 2004

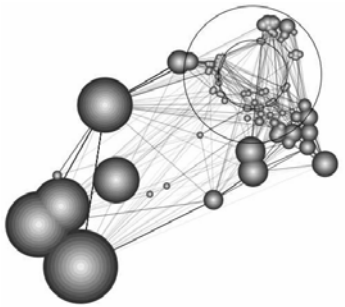


Optimizing Display Parameters InfoVis 2006

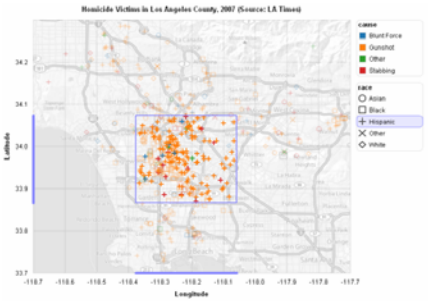
Our work on visualization tools has generalized visualization techniques into software toolkits supporting the creation and customization of novel visualizations. These toolkits have been downloaded over 90,000 times and used by corporations, designers, and the visualization research community. The goal is to improve graphical literacy by helping larger audiences become both consumers *and producers* of interactive visualizations.

Visualization Tools

Simplify creation and customization by crafting toolkits for interactive visualization

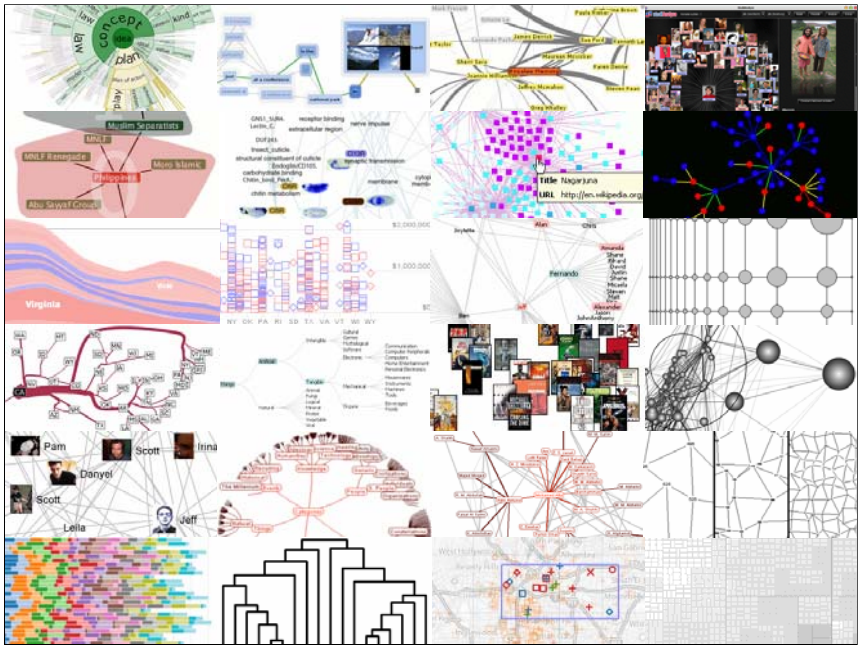


prefuse.org CHI 05, InfoVis 06



flare.prefuse.org 08

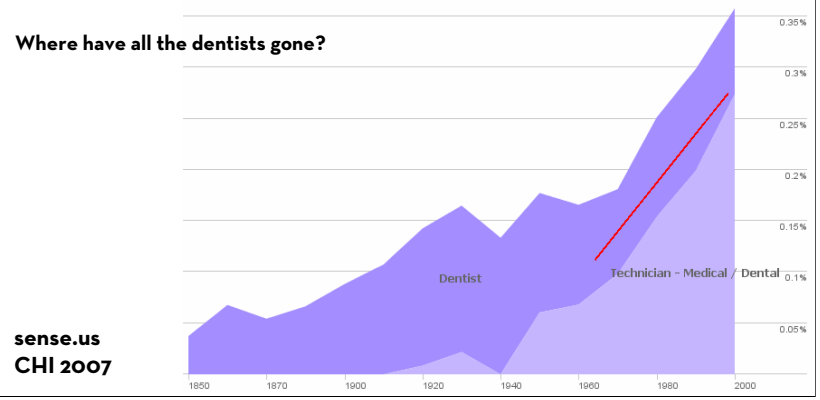
(gallery of visualizations that have been built using prefuse and flare)



We have then leveraged these tools to build analysis environments that enable distributed teams to collaboratively ask questions, posit hypotheses, and marshal evidence. User studies of our systems have found that exposing the social aspects of visualization can lead to extended and more effective explorations.

Social Data Analysis

Leverage the insights of multiple analysts with interfaces for collaborative data exploration



I'd like to do four things today.

- **HCI & Some Frontiers**
- Course Goals
- Pragmatics
- An exercise

The cognitive science and artificial intelligence pioneer Alan Newell defined computer science as “Computer science is the study of the phenomena surrounding computers … an empirical discipline … an experimental science”

This course provides a graduate-level introduction to human-computer interaction.

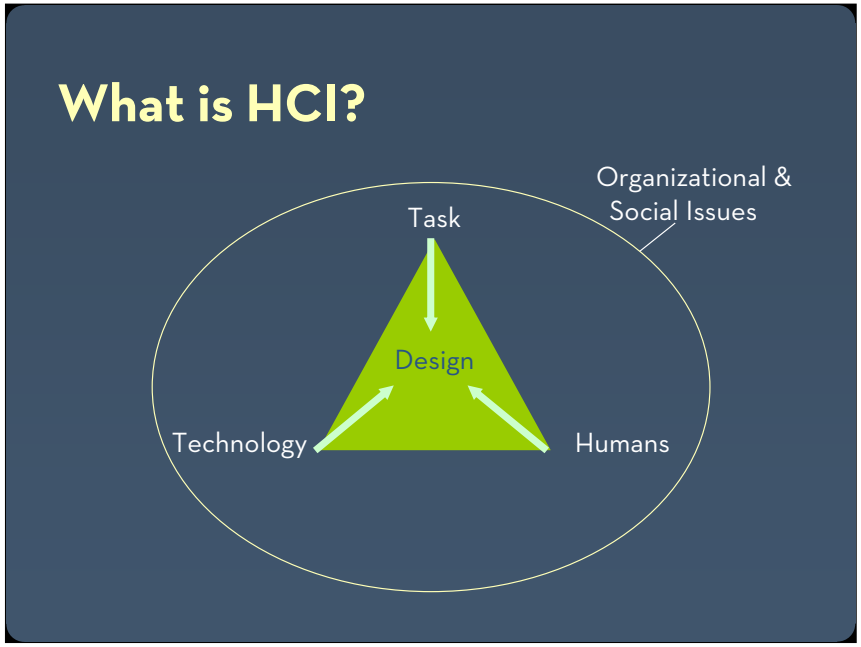
So the natural next question is, “what is human-computer interaction?”

Human-Computer Interaction, or HCI, is the study of the user experience of information technology. Or, to put it a bit more formally, it’s the design and evaluation of information technologies where the goal is user experience based. It is a field whose participants come from a number of different disciplines: the human sciences (cognitive science, psychology, and the social sciences), computer science, and the design disciplines (most notably graphic and industrial design).

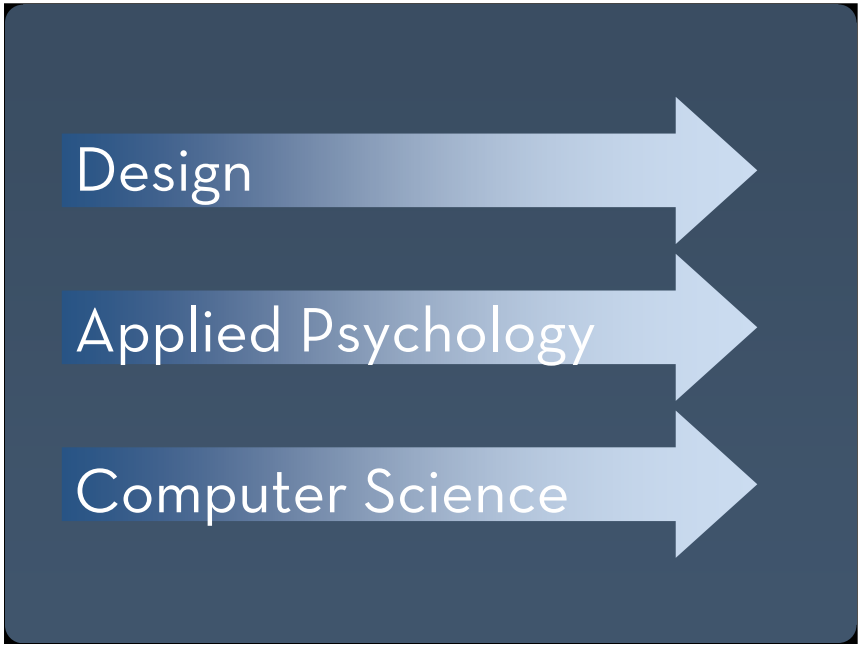
Examples of Tasks.

High level: writing a paper, drawing a picture

Low level: copying a word from one paragraph to another, coloring a line

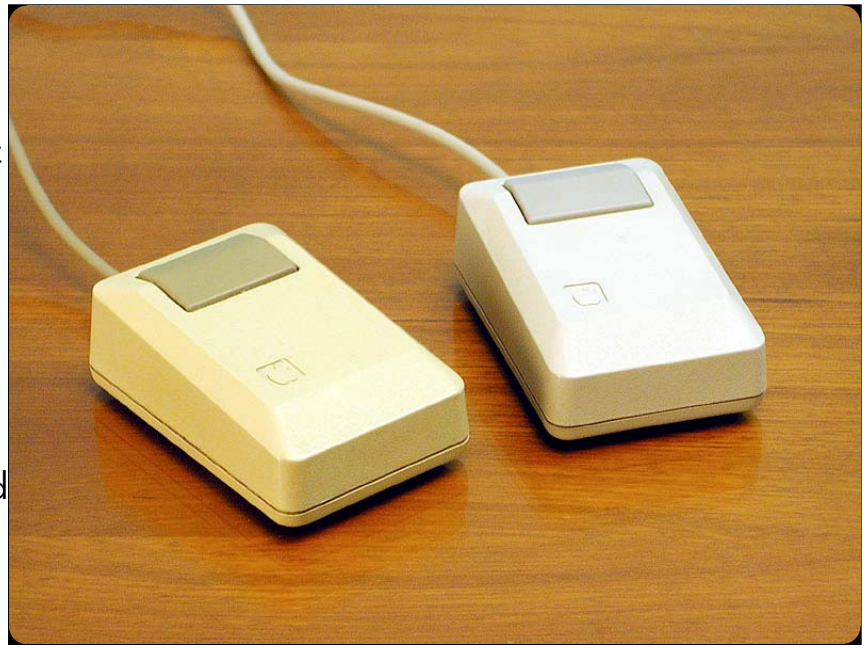


There are multiple strands, sometimes in parallel, sometimes cross-fertilizing.



{Why HCI research matters}

The inventions of the 1960s and 1970s – the desktop PC, hypertext, the graphical user interface, the mouse, and the internet – are now commonplace. From a research perspective, we can largely declare victory on user interfaces for **seated, able-bodied users, working individually on document processing tasks** – at least in the developed world. Herb Simon, Alan Newell, Ivan Sutherland, Butler Lampson, Doug Engelbart, and Alan Kay, and Vint Cert all won Turing awards for their efforts on the cognitive science, user interface developments, and systems research behind this work. Similarly, the basic idea of user-centered design is well known in the software industry today. This is a big win.



Major part of work for “real” programs: approximately 50% [Myers & Rosson ‘92]

Stanford graduates work on “real” software, intended for users other than “us”

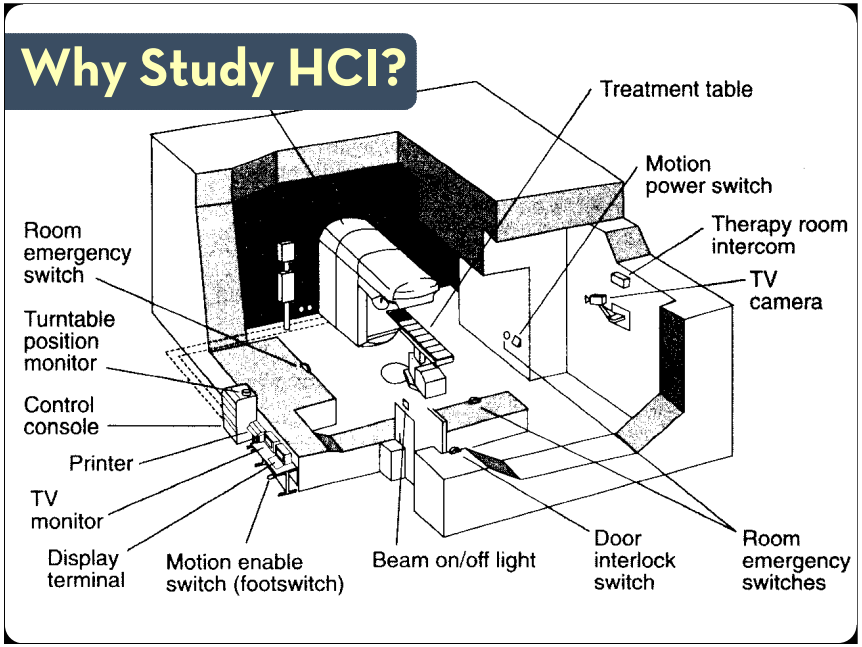
Bad UIs cost - money (5% ^ satisfaction -> 85% ^ in profits) - lives

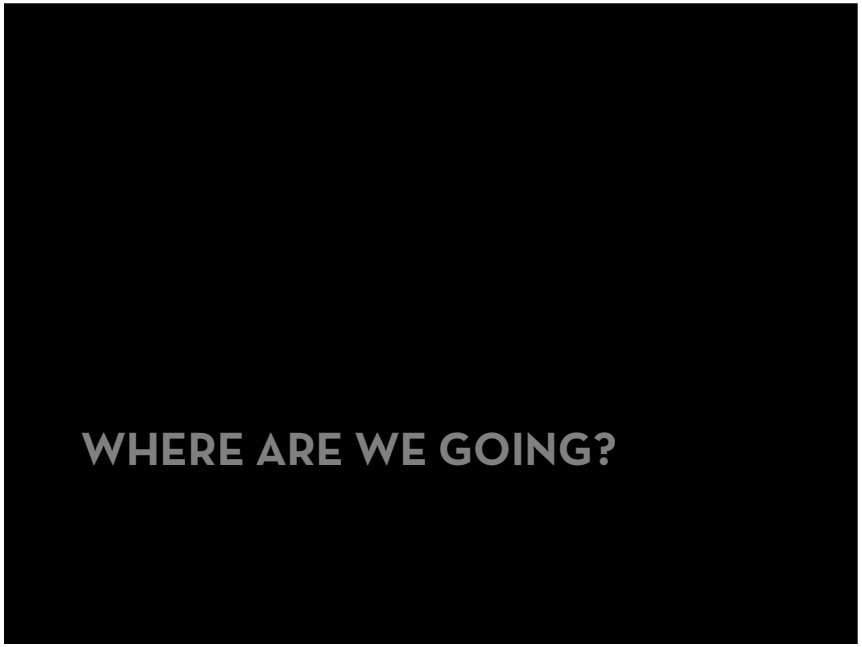
User interfaces are hard to get right

At this point, I see two primary opportunities for HCI research.

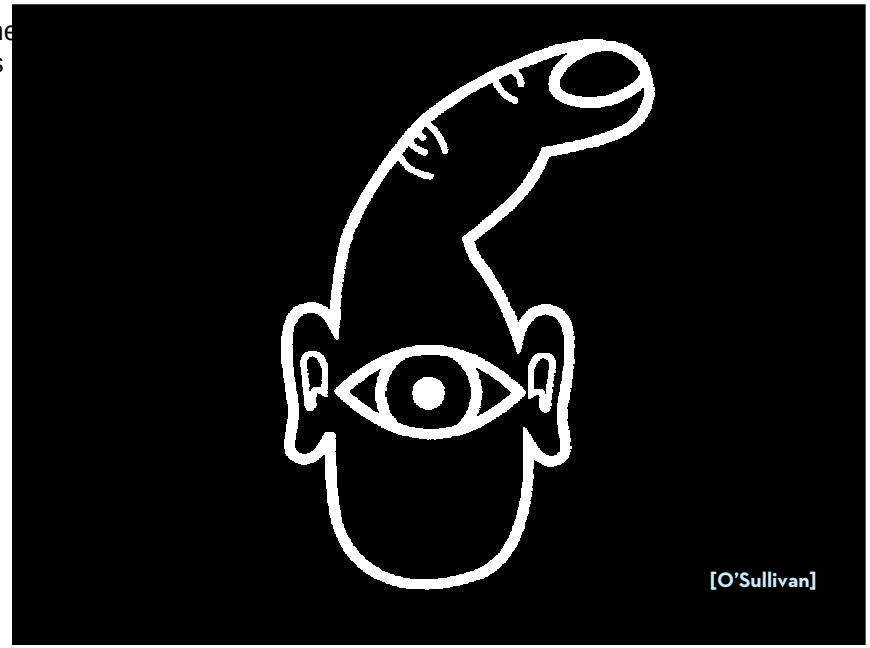
The first is that, despite all our successes, **the software industry still isn’t as good as it could be**. For example, venture funding operates on a model of a 10% success rate – the one company in 10 that’s successful covers the losses created by the other 9 that aren’t. There are several major factors that contribute to this, and one of the biggest is that a lot of software fails on the user experience front. The research labs of the 60s and 70s provided the technology and research methods that fueled the successes of the 90s, and similarly, I think that significant value can be mined from more contemporary research.

The second is that **changing** any one of the qualifiers in “user interfaces for seated, able-bodied users, working individually on document processing tasks in the developed world” yields a great many research opportunities. Much current research is in the area of ubiquitous computing, of systems that, move beyond the monitor frame and integrate themselves more deeply into the everyday world.




WHERE ARE WE GOING?

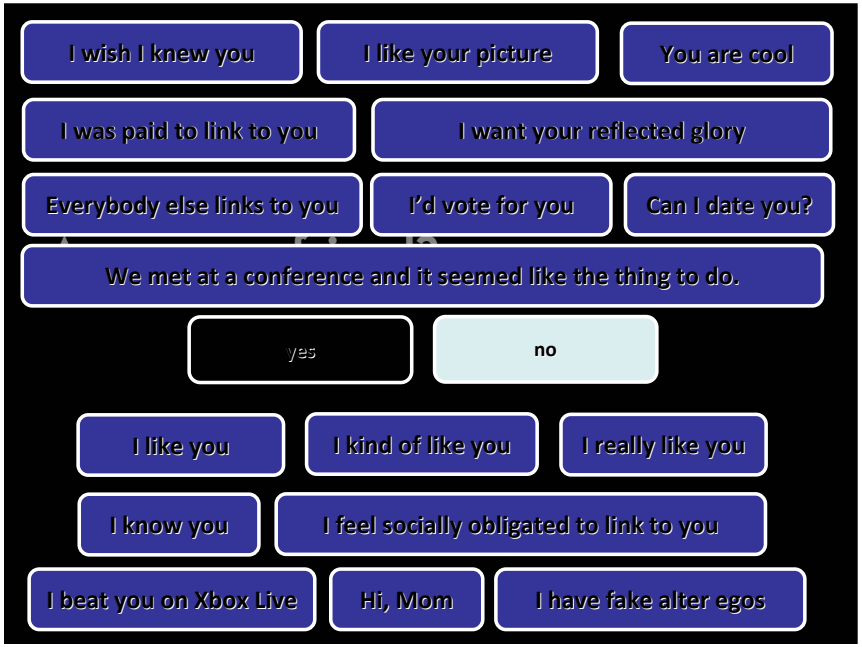
This is a drawing by Dan O'Sullivan. It shows how mental model, that my current PC has of me My computer knows I have an eye – but only one – it does know that I have two ears. It knows have a finger – but only one, maybe two – and it has no idea that I have a body. Given the richness our human experience in the physical world, it's shocking that our experience in the digital world is so limited.



For traditional desktop applications that target one-finger-man, good programming environments exist that have enabled legions of developers to create the content that helped put a PC on every desk. The goal of our group's research is to enable an analogous success for ubiquitous computing. Specifically, our interest lies in the move from tools for **technology experts** toward tools for domain experts, designers.

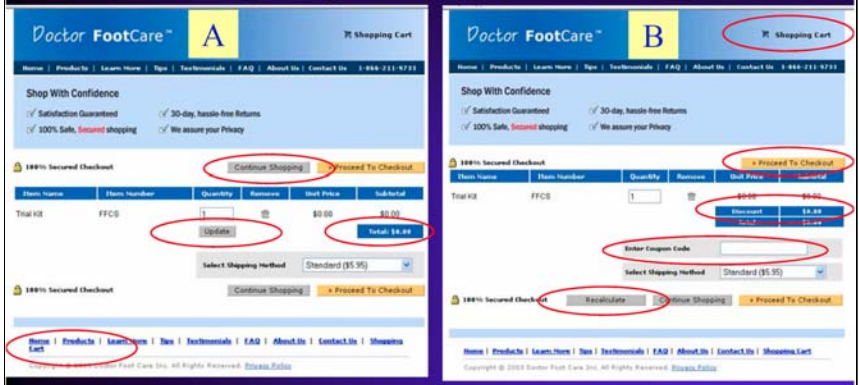
Similarly, social applications have a very limited model of human social relations. By human standards, most social networking sites believe us all to suffer from autism.

Many aspects of our lives are now mediated by computational technology. How does this technology affect to way we see and present ourselves and relate to others? How can we study these effects and purposefully design for these environments?



Checkout Page

The *conversion rate* is the percentage of visits to the website that include a purchase

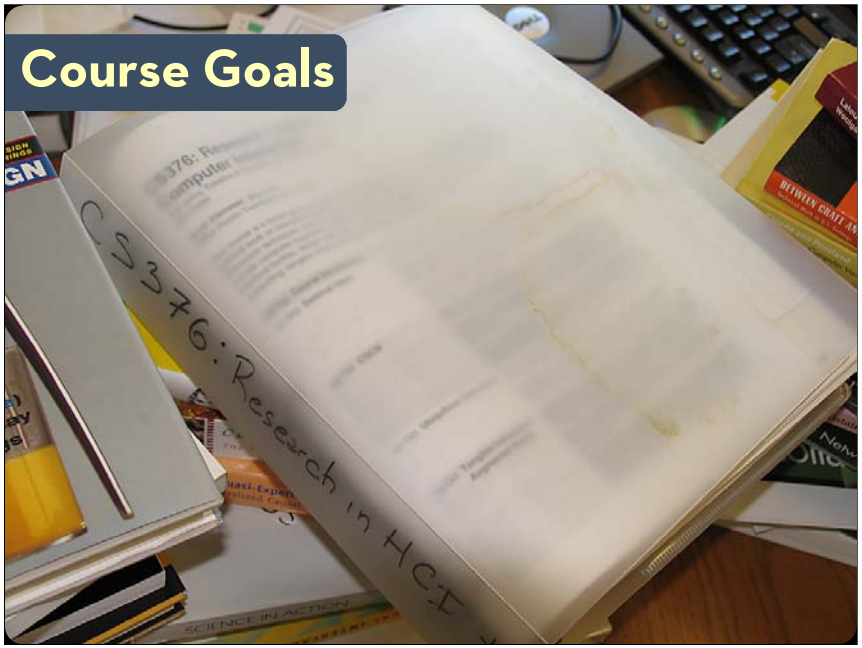


Which version has a higher conversion rate?

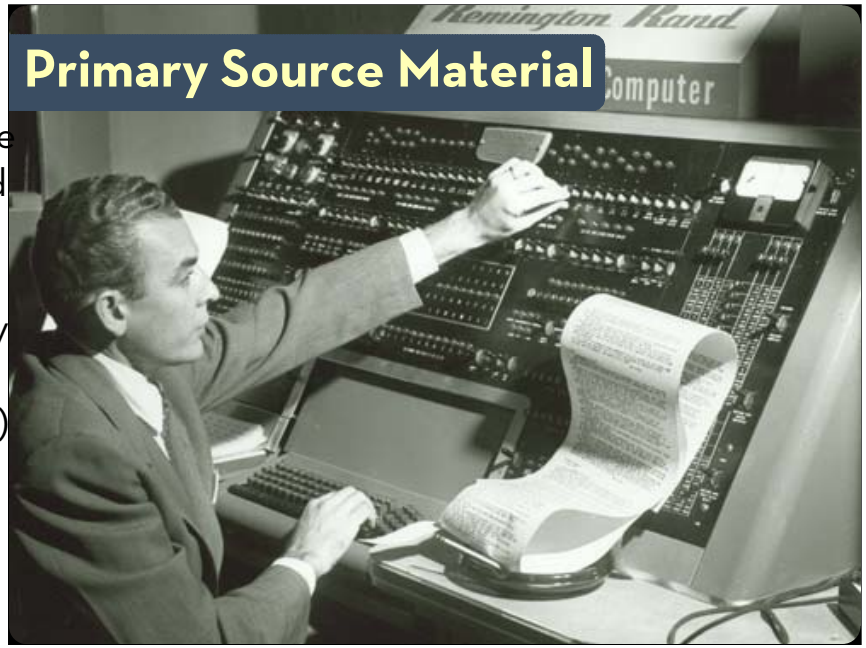
Example from Bryan Eisenberg's article on clickz.com

EXP

There are a couple of skills that I hope the course will help you learn. This course is designed with four goals.

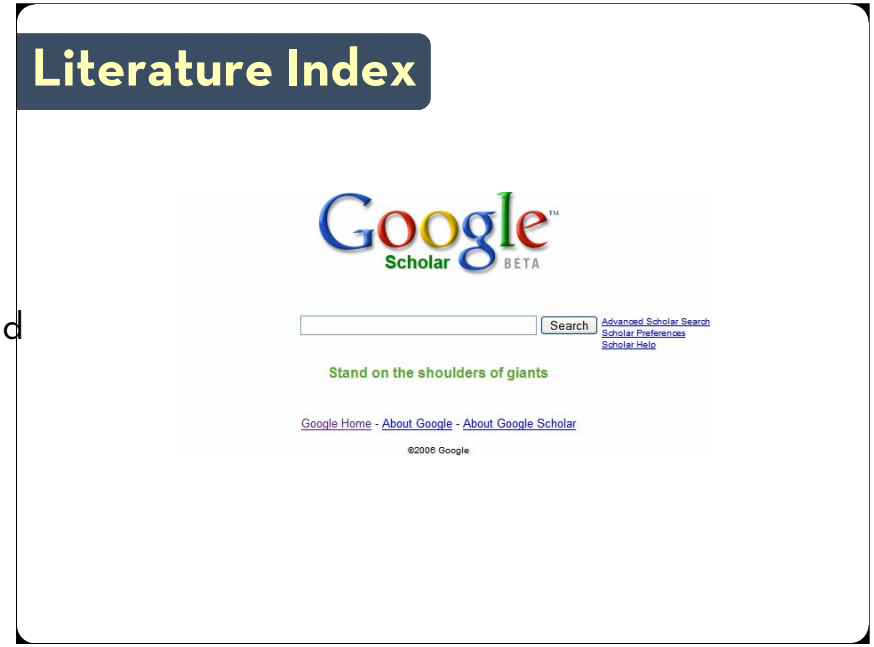


First, to use primary source material to tell the story of human-computer interaction. To learn about the big research ideas in the words of the people that came up with them. In reading about these ideas as they were developed, we get to see the original insight and passion. We'll also be entertained. By now, some of the original terms (information superhighway, anyone?) have become quaint, and some of the ideas seem hopelessly naïve. But – and this is really surprising – a lot of it is pretty on the mark. (Okay, that's why we're reading this stuff – the "dumb ideas in HCI" is a different course ☺) Also, reading the original parts helps provide an understanding of the intuitions that people had and the methods that they employed to get there.



The second is to provide an index into the HCI literature. What's the space of topics that people have worked on? What are the larger theoretical frameworks?

One of the goals in providing this index is that, by the end of the course, you'll be able to say, "I'm interested in X", say, speech user interfaces. We'll have a class on this on 5/25, so you can grab keywords, ideas, and authors from those papers, and start poking around google scholar. With speech UIs, as with any area, it won't be comprehensive – it'll be a toehold that hopefully provides enough of a zeitgeist of the field that you know what's out there and can go further if you want to.



The third goal of the course is to use these examples as a way of understanding research methods. There are many distinct types of research contributions in HCI, each employing different methods. For example, when Genevieve Bell of Intel is interested in the intersection of spirituality and technology, she employs **ethnographic** techniques to understand these issues. When Scott Hudson is interested in flexible software architectures for user interfaces, he employs an **existence proof** (building a system), along with **system tests** (apps built w/ the system, etc.) to demonstrate an architectural approach that enables a particular type of flexibility. And when Shumin Zhai is interested in high-performance pen input techniques, he employs a combination of **performance model analysis** and **laboratory user studies** to demonstrate the efficacy of a technique. Through the readings, we'll come to see successful examples that will help us understand what methodological approaches are suggested by different types of research questions.

Part of what makes this interesting is that while these activities are going on, you'll also be doing your own work, which helps situate the discussions about methodology, contribution, etc. in the context of actually doing a small piece of research.

The final goal of the course is to teach reading, writing, technical presentation, and critical thinking skills through your participation in these activities.

Writing

Technical Presentation

Critical Thinking

We're not going to be very sympathetic to "I didn't understand the paper."

We will try to give some intuitions ahead of time when possible.

Expected background

- In general, there are no pre-reqs. That said, the course does assume...
- Sufficient background to complete a mini-research project (of your own choosing)
- The recognition-based interface readings presume basic linear algebra
- The toolkit readings presume basic programming knowledge
- You can get through without that background, but those readings will likely take longer

SYLLABUS

Course Overview

1 APR	Seminal Ideas
7-9 APR	Ubiquitous & Tangible Computing
14-16 APR	Collaborative & Social Software
21-30 APR	Research Theory & Methods
5-7 MAY	Design Methods & Tools
12-21 MAY	Human Modalities
26-28 MAY	User Interface Technology

Administrivia

Course Info

Tuesdays & Thursdays 12:50-2:05pm, GESB 134

http://cs376.stanford.edu

cs376@cs.stanford.edu

My Info

Office Hours: Tuesdays 11:15am-12:15pm, Gates 375

http://hci.stanford.edu/jheer

jheer@cs.stanford.edu

Exceptions:

Next week I will be away at CHI and Ed Berdahl will teach class

Lecture Format

12:50-1:25 I'll present the area

1:25-2:05 Student-led discussion

HCI literature

- Conferences papers (CHI, UIST, CSCW, ...)
- Journal articles (TOCHI, HCI, ...)
- ~4 papers/week

Grading

30% Paper Critiques
30% Participation & leading in-class discussion
40% Projects

Grading

- Breakdown
- Subjectivity
- Feedback

Readings

- Post your critiques by 7:00am
- Turn off your phone and email
- Go to somewhere undisturbed

Reading: Come prepared

- Post your critiques by 7:00am
- I strongly suggest hiding in the library, distraction-free

Three "positive" topics and one "criticism" for each paper (or three "I like"s and one "I wish", for those familiar with that terminology).

Each topic should be a short paragraph (about 4 sentences in length).

We're very open to students trying something innovative or different during the discussion they lead (*e.g.* having everyone spend 10 minutes building paper prototypes for the *Prototyping* discussion). However, if you are going to do something like this, please talk to us about it several days beforehand (e-mail cs376@cs with your plan) so that we can help you determine if it is appropriate and achievable in the amount of time you plan to spend.

Writing Critiques

Which ones you have to write

- Annotated on course syllabus

How to write a good critique

- Why the paper does/doesn't seem important
- Observations of novel methodology or methodology that seems suspect
- Aspects of the paper that you disagree with or which trigger skepticism
- Why the paper is/isn't effective at getting its message across
- How the paper changed your opinion or outlook on a topic

This goes to both Greg and I. Send everything course related here.

cs376@cs.stanford.edu

DISCUSSANTS

We will start taking requests *Thurs* after class

Discussants

Each student is required to lead a discussion

Submit slides/notes *instead of* your critique

Lead a ~40 min in-class discussion

- *Briefly* summarize readings (≤ 10 min)
- Identify points of interest, be prepared to spur and lead in-class discussion

Incorporate critiques submitted by the class

cs547: HCI Seminar

Fridays 12:30-2:00pm, Gates B01
http://hci.stanford.edu/seminar/

This quarter's guests include leading luminaries in collaborative interfaces, social computing, game design, and interactive art.

PROJECTS

Mini Research Projects

- The “doing” part of the course
- Working in pairs is (strongly) encouraged
- A project related to your research (or another course project) is great
  - Let me know if you do this
- We are happy to offer project suggestions

Project Timeline

10 APR	Find Partners
17 APR	Abstract Draft
1 MAY	Abstract Final with Related Work
22 MAY	Meeting
9 JUN	Project Presentation
11 JUN	2 Page Paper

Dynamic Speedometer: Dashboard Redesign to Discourage Drivers from Speeding

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Taemie Kim
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ABSTRACT
We apply HCI design principles to redesign the dashboard of the automobile to address the problem of speeding. We prototyped and evaluated a new speedometer designed with the explicit intention of changing drivers' speeding behavior. Our user-tests show that displaying the current speed limit as part of the speedometer visualization (i.e. the dynamic speedometer) results in safer driving behavior. Designing with the intent to achieve a particular behavior can be an effective approach for increasing the safety of mission-critical systems. This is an area in which HCI designers can have a significant impact.

Author Keywords
Dynamic Speedometer, Automobile Interfaces, Automobile Cockpit Design, Persuasive Technology, Captology, Speeding, Designing for Safety, Mission-Critical Systems.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Speeding increases the risk of a crash and the severity of related crashes and drivers' awareness of the speed limit alarming.

Speeding is a problem related to driver behavior. If we hope to save lives, reduce the number of accidents, associated costs, or even just the number of speeding tickets, we need to affect a change in the drivers' behavior by making them more aware of the speed limit and assisting them in realizing when they are speeding. Our goal for this research was to redesign the automobile dashboard to discourage drivers from speeding by appealing to their self-motivation to drive safely.

RELATED WORK
The most common example of a system that encourages drivers to slow down and follow the speed limit is the Speed Monitoring Awareness and Radar Trailer (SMART). The SMART speed trailer shows the driver the posted speed limit and the driver's current speed. If the driver is driving faster than the posted speed limit, the sign flashes in order to attract the driver's attention. The speed trailer causes drivers to slow down, albeit, temporarily [4, 5].

There is active research in the area of Behavior-Based Safety (BBS) sponsored by the Federal Motor Carrier

groupTime: Preference-Based Group Scheduling

Mike Brzozowski[1], Kendra Carattini[2], Scott R. Klemmer[1], Patrick Mihelich[2], Jiang Hu[3], and Andrew Y. Ng[2]
[1] Stanford University HCI Group [2] Stanford University AI Lab [3] Stanford Dept. of Communication
353 Serra Mall, Stanford, CA 94305, USA 450 Serra Mall, Stanford, CA 94305
{zozo, kendrajc, srk, mihelich, ang}@cs.stanford.edu huj@stanford.edu

ABSTRACT
As our business, academic, and personal lives continue to move at an ever-faster pace, finding times for busy people to meet has become an art. One of the most perplexing challenges facing groupware is effective asynchronous group scheduling (GS). This paper presents a lightweight interaction model for GS that can extend its reach beyond users of current group calendaring solutions. By expressing availability in terms of *preferences*, we create a flexible framework for GS that preserves *plausible deniability* while exerting social pressure to encourage honesty among users. We also propose an ontology that enables us to model user preferences with machine learning, predicting user responses to further lower cognitive load. The combination of visualization/direct manipulation with machine learning allows users to easily and efficiently optimize meeting times. We also suggest resulting design implications for this class of intelligent user interfaces.

Author Keywords
Machine learning, supervised learning, intelligent user interfaces, group scheduling, group calendaring

ACM Classification Keywords
H5.3. Information interfaces and presentation (*e.g.*, HCI): Group and Organization Interfaces. K.4.3. Organizational Impacts: Computer-supported collaborative work.

People use calendar artifacts as *memory prostheses* for events and tasks [23, 26]. A calendar serves as a "world-word" [30] mapping, by *describing* a fixed schedule (*e.g.*, "September 5 is Labor Day"), and as a "word-world" mapping, by *prescribing* things that should occur (*e.g.*, "Pay bills"). However, items on a calendar do not always directly translate to actual activity [36].

In the context of group scheduling (GS), calendars serve as communication tools; a form of "distributed cognition" [20]. Finding a time that a group of people can meet together is often aided by some expression of each participant's calendar, whether in spoken dialogue, email or instant messaging text, or in some visual representation.

Current Group Calendaring Systems

Traditional group calendaring systems (GCS) such as Microsoft Outlook and Lotus Notes present an explicit representation of users' schedules (typically whether they are free or busy) [3, 5]. For a group of users, finding a time to meet is simply a matter of choosing a time that all users appear to be free.

Yet, this binary view of availability is often inadequate to describe users' actual *preferences*. Palen's research found that scheduling has come to be viewed as "less an 'optimizing' task and more often a 'satisficing' task" [27]. As a result, suboptimal meeting times are selected. Worse, people

Wizard of Oz for Participatory Design: Inventing a Gestural Interface for 3D Selection of Neural Pathway Estimates

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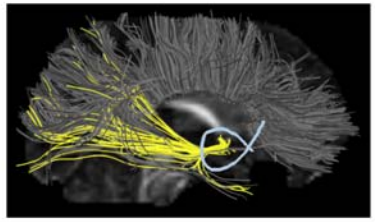

CHI 2006, April 22–27, 2006, Montréal, Québec, Canada.
ACM 1-59593-298-4/06/0004.

Abstract
This paper describes a participatory design process employed to invent an interface for 3D selection of neural pathways estimated from MRI imaging of human brains. Existing pathway selection interfaces are frustratingly difficult to use, since they require the 3D placement of regions-of-interest within the brain data using only a mouse and keyboard. The proposed system addresses these usability problems by providing an interface that is potentially more intuitive and powerful: converting 2D mouse gestures into 3D path selections. The contributions of this work are twofold: 1) we introduce a participatory design process in which users invent and test their own gestural selection interfaces using a Wizard of Oz prototype, and 2) this process has helped to yield the design of an interface for 3D pathway selection, a problem that is known to be difficult. Aspects of both the design process and the interface may generalize to other interface design problems.

Keywords
Participatory design, Wizard of Oz prototyping, 3D selection, gestural interfaces, brain visualization.

Castaway: A Context-Aware Task Management System

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CHI 2006, April 22-27, 2006, Montréal, Québec, Canada.
ACM 1-59593-298-4/06/0004.

Abstract
This paper describes the development of Castaway, a context-aware task management system. Specifically, we describe a three-week field study with thirty-five participants, the results of which illuminate the nature of people's recorded tasks. We further describe in detail iterations made to our task management interface, including a map-based view, and the insights gained that will inform future design and development.

Introduction

The increasing ability to both track people's movements and sense the environment combined with the growing ubiquity of mobile devices has lead to an exciting acceleration of research and development of context-aware computing. One potentially powerful context-aware application is the mobile management and receipt of personal tasks. Our vision of Castaway consists of three parts: 1) support for the fast and convenient input of tasks the instant they are conceived; 2) a lightweight, flexible tool to view and manage these tasks; and 3) a system for reminding users of their tasks at precisely the right place and/or time. Here we describe our progress in developing the second component. Although prior research has explored task management and the delivery of context-relevant information [1, 2, 3], the current work

VACA: A Tool for Qualitative Video Analysis

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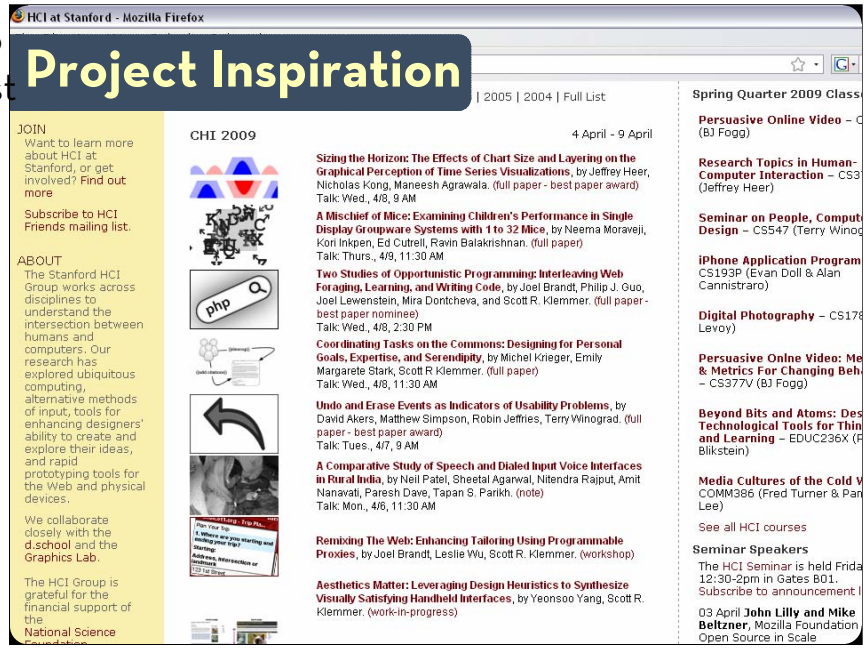
CHI 2006, April 22-27, 2006, Montreal, Canada.
ACM 1-xxxxxxxxxxxxxxxxx.

Abstract
In experimental research the job of analyzing data is an extremely slow and laborious process. In particular, video and audio data of human behavior are difficult to analyze, as this type of information does not lend itself to automation. Here we present VACA, an open source tool for qualitative video analysis. VACA presents video annotations on a timeline interface and integrates external sensor data to improve the rate at which analysis can be performed. A comparative study is run against commonly used video analysis tools, and results are reported.

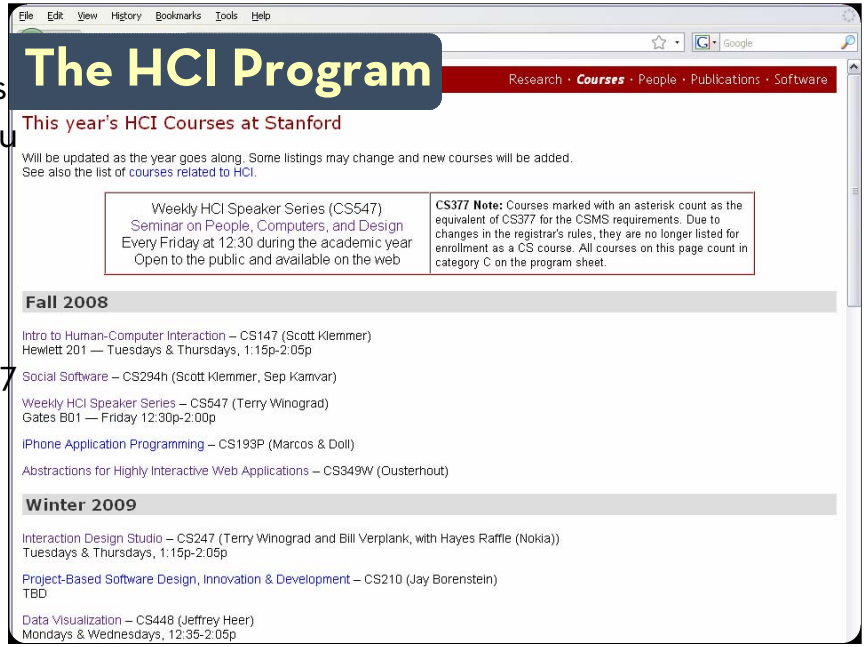
Keywords
Video analysis, annotation, behavioral research.

Introduction
Most disciplines of behavioral study require a significant degree of human observation, either in a lab or in the field. Many of these studies use video as their data medium, as video is perhaps the richest of the recording media. Because the data is very rich, it requires a large amount of time to analyze the qualitative content. Usability and human behavioral researchers analyze video data by watching videos on

The solution to finding a good project is the same as the solution to anything else: the web. I'd suggest two sites for inspiration – the first is google scholar, the second is the HCI group home page. The first can give you a sense of research projects broadly, the second can give you a sense of what's going on here. And this is important because scaffolding off an existing project here gets you up and running faster with both the technology infrastructure and the intellectual ideas.

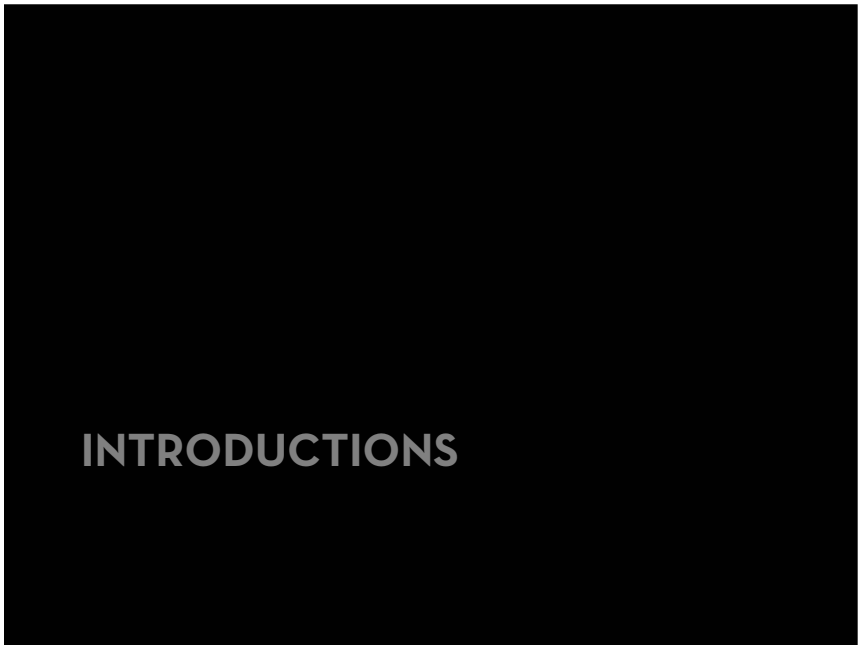


The HCI program offers a number of courses. For students interested in HCI research – this will be primarily graduate students and a few aspiring graduate students – this is the place to be. As you saw, it's very reading-heavy, and the project is more about "doing a mini-research project" than "learning iterative design". For a basic introduction to HCI, I suggest CS147, which Scott Klemmer is teaching this fall. For a course primarily focused on the "hands-on, do iterative design" part of things, I suggest CS247 (which has CS147 as a pre-req) – typically CS247 is taught in the winter.

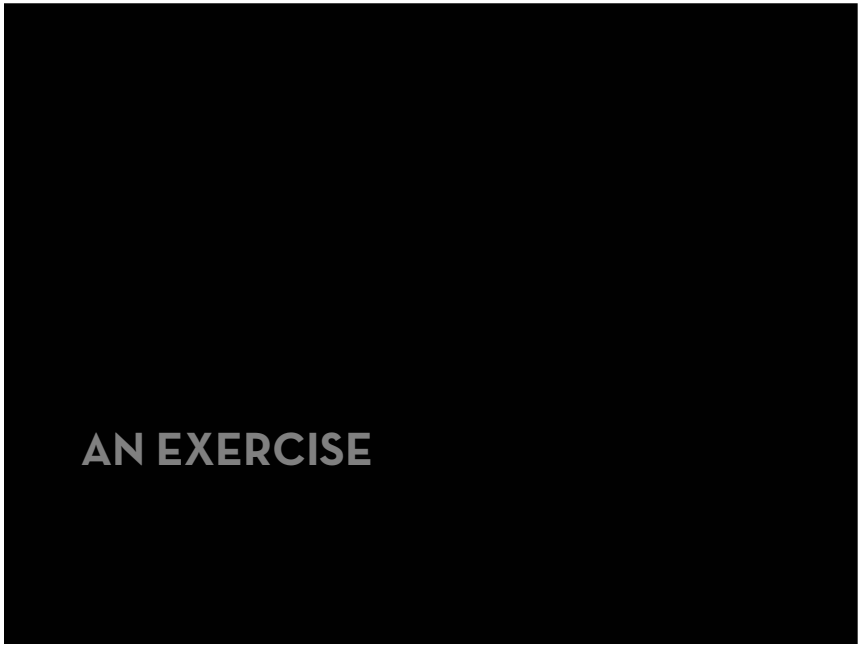



Questions?

Name, major, favorite spring break activity



Write down your own definition of “research”. Then we’ll discuss!



Next Time... Seminal Ideas

As We May Think
Vannevar Bush

Direct Manipulation Interfaces
Edwin L. Hutchins, James D. Hollan, and Donald A. Norman

User Technology: From Pointing to Pondering
Stuart K. Card and Thomas P. Moran