

Human Computer Interaction: Introduction

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Outline

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A brief introduction

A little bit about me



- 1960s (California): Born, Los Angeles.
- 1970s (Washington State): Farm hand, rural Washington.
- 1980s (Las Vegas): High school student; Deadhead; game designer and programmer for Westwood Studios; Emacs user.
- 1990s (Las Vegas): Semi-professional musician; bartender; sports pub bouncer; car counter; math tutor; Math/CS dual Bachelors/Masters student (large cardinal set theory and image processing); Deadhead, Senior Network Analysis, US Department of Energy.
- Early 2000s (Amsterdam): PhD student, University of Amsterdam; Deadhead.
- Late 2000s (New York/Florence/Rome): Postdoc Renselaer Polytechnic Institute; Deadhead; postdoc University of Florence; Senior Development Chief, Food and Agriculture Organization of United Nations.
- Early 2010s (Florence/Barcelona): Project Leader, Computer Vision Center, Barcelona; Adjunct Professor, Universitat Autonoma de Barcelona; Head of Research Unit, Media Integration and Communication Center, University of Florence, Ramon y Cajal Fellow, Computer Vision Center, Barcelona; Deadhead.
- Today: Professor of Information Engineering, University of Florence.

- **Document image understanding:** style-based interpretation of document layout and content, low-level degradation estimation, inverse halftoning.
- **Video surveillance and security:** tracking, active camera control, foveal scheduling, face recognition in the wild.
- **Object and action recognition:** local pyramidal features, color representations for object recognition, semi-supervised and transductive approaches.
- **Multimedia for cultural heritage:** visual profiling of museum visitors, knowledge management for cultural heritage resources, personalizing cultural heritage experiences, human-computer interaction.
- **Person re-identification:** iterative sparse ranking, semi-supervised approaches to local manifold estimation.
- **Other random interests:** functional programming languages, operating systems that don't suck, long-distance bicycle touring, Emacs, the Grateful Dead.

- Teaching (and learning) is most effective when it is an interactive give-and-take rather than a stand-here-and-preach.
- My job as professor is to put my knowledge and know-how at your disposition.
- Your job as students is to suck every last bit of knowledge out of me in these 14 weeks.
- If you don't understand something, **interrupt me** and ask me to clarify.
- I will also expect your active participation in the lectures.
- I won't pretend that "there is no such thing as a stupid question."
- Better: *there should be no question you are too afraid or too shy to ask.*
- [I know this much parable]

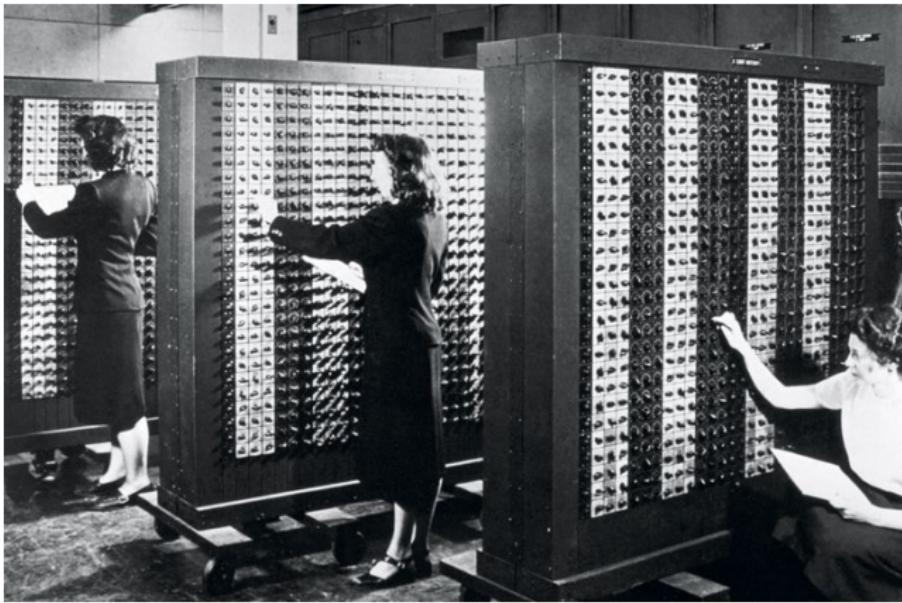
Some history

What is HCI?

- Human-computer interaction (HCI) emerged as a discipline in the 1980s.
- Initially it was specialization of computer science that embraced cognitive science and human factors engineering.
- It has expanded rapidly for three decades, and now attracts professionals from many other disciplines.
- We can think of HCI as **human-centered informatics**, if we wish.
- HCI is concerned with how humans interact with computers, and how computers interact with humans.

Some history

From the very beginning there was clearly a need for human-computer interaction...



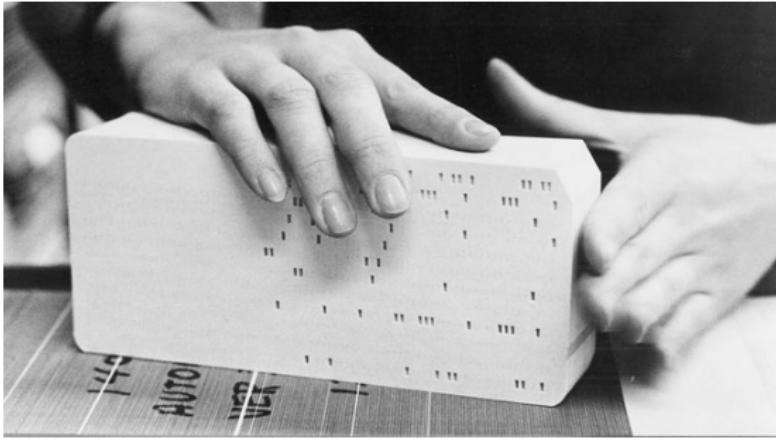
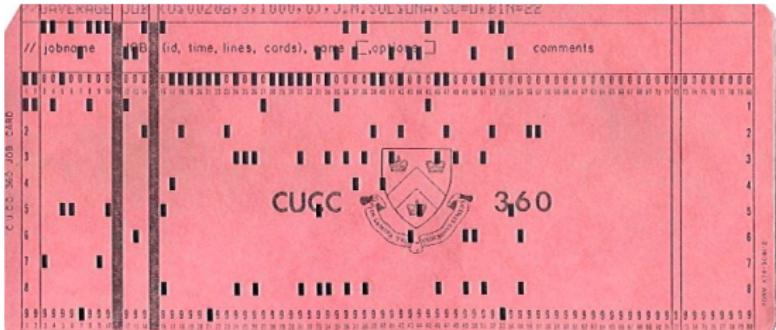
Punched-card I/O



What to do when data is orders of magnitude larger than memory?



Useful, and oh so inconvenient



If only there were a way to TELE-type

The teletype had already been in use, but we quickly learned how to use it with computers for input/output.



When it rains, it pours



Why use paper, when you can use television? The **dumb terminal** revolutionized HCI and gradually metamorphosed into the modern PC.



Not just about better hardware

Does anyone recognize this person?



The compiler radically changed HCI



- In 1951, Grace Hopper invented the first compiler of a high-level programming language.
- This paved the way for hardware-independent programming languages.
- It is difficult to overstate the significance of this contribution to HCI.



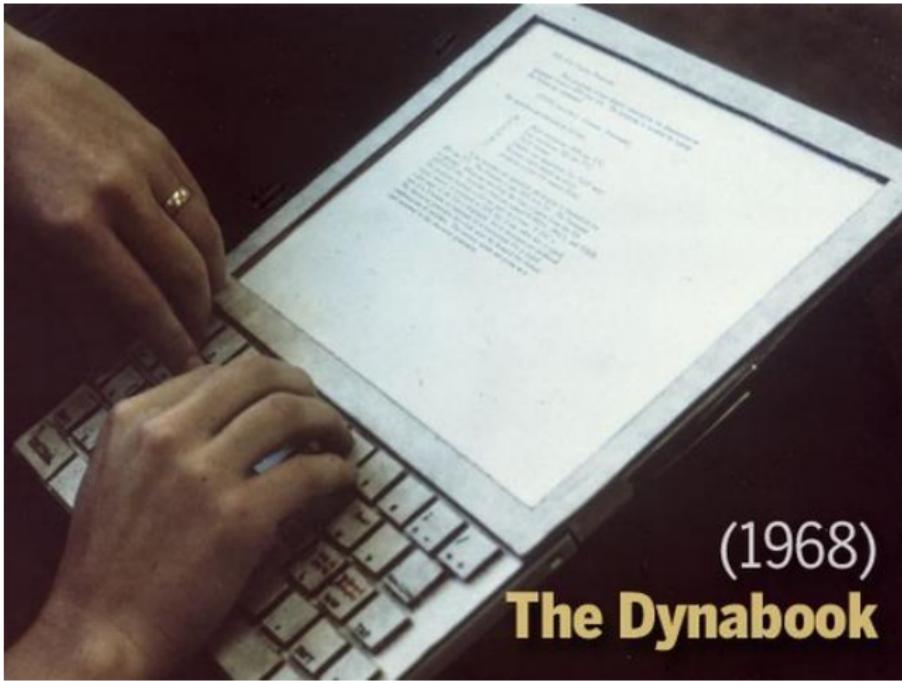
Breaking the physical barrier

Use a physical proxy to represent (and control) virtual elements of the interface. The birth of the Graphical User Interface.



The birth of HCI as design

Envisioned by Alan Kay: the Dynabook was at least a decade ahead of its time.



This was as close as they could get

The Xerox Alto was the first (semi-) commercially available graphical workstation. It didn't live up to the vision of the Dynabook, but the **vision** was important.



A 40-year-old desktop



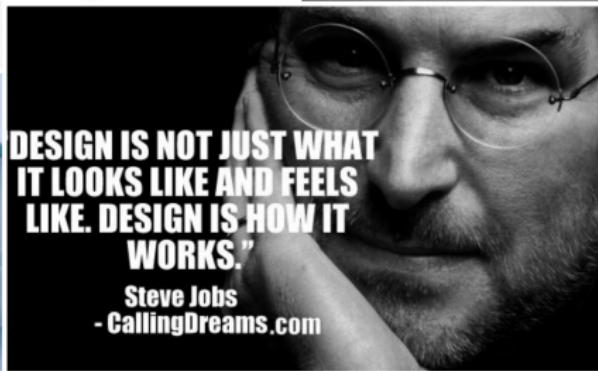
We can see the first iterations of many elements we take for granted in modern GUIs.



The inheritor of the Dynabook



Steve Jobs with Apple took **design** to its limits over the last forty years.



A timeline emerges

- 1950s-1960s: Getting data in, getting data out. Concentration on improving low-level HCI.
- 1970s: The rise of the Personal Computer. The broad project of cognitive science, which incorporated cognitive psychology, artificial intelligence, linguistics, cognitive anthropology, and the philosophy of mind, had formed at the end of the 1970s.
- 1980s: Graphical User Interface (GUI). Interfaces designed for easier understanding of computers. Before GUI, there was a command prompt by which command was given to the computers. GUI started the graphical interface which is easy to use, understand, visualize, and it improved the working environment.
- 1990s The Internet and Collaborative works. Communication among people and computers became easier, and computers and their interfaces became highly decentralized.
- 2000s: Mobile Computing. Mobile and Smart Phones offer a wide range of services that blur the divisions between computers and between people and groups.
- 2010s: The Social Computer. Social networks and social applications radically distribute interactions and puts computers in role as *mediators* of interaction between other agents.
- Today: accelerating change. Wearable computing devices, ubiquitous computing, the Internet of Things, natural interaction, surface-based computing, learning.

Course overview

Multidisciplinary

- HCI is an inherently multidisciplinary field.
- Many factors and areas of expertise combine to ensure usability.



A content-based compromise



- It is not feasible to cover so many diverse topics in a single semester course.
- It is also questionable if it is even *desirable* to cover all of these topics.
- This course is part of a *laurea magistrale* in **engineering**, and this will impart certain constraints on the design of the course.
- There will be a strong **applied** element to most of the topics we will cover.
- We will concentrate on **building interfaces**, and all students will be expected to participate in programming advanced user interfaces as part of the final exam.
- We *will* cover important topics from design, psychology, and cognitive science.
- However, always with an eye towards **how to apply them in real application scenarios**.

Course topics

Design topics

- Interaction design: how to design interactions and interventions.
- Modeling the user: how to not irritate people.
- Needfinding: making sure you address a **need**.
- Usability analysis and testing.

Technical topics (designing and building UIs)

- The elements of Graphical User Interface programming.
- Paradigms: Model-View-Controller (MVC), Functional Reactive Programming (FRP).
- We will explore these topics in depth with a series of **laboratories**.

Latest and greatest (academic HCI)

- Selected papers from current research in HCI.
- Student presentations.

Administrivia

Course schedule

TUE: 11:15 – 13:15 (11:15 – 12:45, no pause)

THU: 11:15 – 13:15 (11:15 – 12:45, no pause)

FRI: 11:15 – 13:15 (11:15 – 12:45, no pause)

Office hours

- Office: Santa Marta, room 540 (SM)
- Office: Viale Morgagni 65 (MICC)

Tuesday (SM): 14:00 – 15:00

Wednesday (MICC): 11:00 – 12:00

Thursday: (SM): 14:00 – 15:00

By appointment: andrew.bagdanov [at] unifi.it

NO LESSONS WEEK OF 10 OCTOBER



- During the week of 10 October I will be attending ECCV 2016.
- Consequently, there will be NO LESSONS this week.
- That is, the lessons on October 11, 13 and 14 are **cancelled**.

- You will find the (empty, for now) course Moodle here:
<https://e-1.unifi.it/course/view.php?id=2159>
- Actually, I have no idea if that link will work, but you can search for course Moodles starting from here: <https://e-1.unifi.it/>
- The password for signing up is: **HCI2016-2017**
- The course Moodle will be the **only** method of communication about course topics, publishing of lesson slides, course announcements, etc.
- That is, it will be the only method of mass communication about course information. E-mail can still be used for individual communication.
- Please make sure you sign-up. Actually, maybe someone can test signing up with this password during this lesson...

Student assessment: single oral exam

9 CFU:

- A twenty-minute presentation of a project, typically a fully-realized user interface that has been developed according to the practices and through all the stages discussed in the course; and
- a selection of technical and theoretical questions drawn from all course lectures.

6 CFU:

- a ten-minute presentation of a project of limited scope, typically a mock-up prototype of a user interface design developed according to the best practices of needfinding, prototyping and usability assessment discussed in the course; and
- a selection of technical and theoretical questions from a reduced set of topics from the course lectures (included topics will be announced at the beginning of the semester).

Student evaluation (projects)

Projects

- For projects you may work in groups of two. Please ensure that individual contributions to the overall work are clearly identifiable.
- Projects will be evaluated based on how well the methodologies in the course are followed in developing an interface from idea, through needfinding and prototyping.
- You are **strongly** encouraged to discuss your planned project with me before beginning, and to develop the idea for your final project **during** the course of the lectures rather than waiting until the end.

Types of projects envisioned

- **Technical:** low-level GUI functionality.
- **Standard:** a well-executed interface implementation.
- **Scientific:** a study and re-implementation of an advanced topic.

When users are other programmers

- The **technical** project is one in which a **need** is identified in the context of HCI tools themselves.
- The project will be an implementation of some sort, ideally released to the open source community via github at the end.
- **Example 1:** an implementation of a new type of widget in the Kivy (or other) framework.
- **Example 2:** a binding of FRP Observables to Kivy UI components.
- **Risks:** that the project becomes a poorly-executed hacking exercise (*una spippolata*).

Projects: standard

Everything just right

- The **standard** project should cover the basic stages of needfinding, prototyping, mock-up, and implementation.
- It should results in fully-realized and implemented user interface or user interface components (not necessarily pretty).
- **Example 1:** interfaces to navigate the wildly confusing and unclear forms and procedures for requesting reimbursement for travel expenses; interviews with users (professors and administrative personnel); expense entry interfaces; prototype form generation.
- **Example 2:** fine-grained (microservices) toolset for ATAF commuters; interviews with commuters of different demographics (age, frequency, etc); identification and prototyping of multiple microservices (e.g. quick overview, where does this line really go?, etc).
- **Risks:** project gets overwhelmed with “legwork” (e.g. conducting interviews).

Projects: scientific

Bold and innovative

- A **scientific** project should address a topic of current research in the Human Computer Interaction field.
- It should conform to the accepted best practices in the research field in terms of datasets, experimental protocols, and experimental evaluation.
- It should ideally be based on a published article from the current literature on HCI (the $+ \varepsilon$ model).
- **Example 1:** an approach for determining a user's intention to interact on the basis of his posture and movement in the field of view (dataset and approaches selected from literature).
- **Example 2:** a content suggestion interface that uses user profiling based on Reddit (or other) user ratings (profiling approach selected from literature on user profiling).
- **Risks:** that becomes a vague discussion of “massimi sistemi”.

Planning and evaluation

- Writing good user interfaces is extremely difficult.
- You will be evaluated not only on the interface implementation, but on how well you apply the guidelines covered in the course.
- I am not a believer in setting random, impossible goals for students.
- That is why it is important to *develop the idea and plan for the project during the course*.

Project execution

- I will collect a list of project ideas during the first half of the course.
- These will be published in the course Moodle.
- We also have four **Android tablets** that can be used for projects.
- There may also be the possibility to do the project in collaboration with a company.

- All lectures for the course will be in Italian, with slides and other course material in English.
- However, in response to an initiative by the Rector of the University of Florence, I will be introducing some content in English.
- Specifically, the **Latest and Greatest** sessions (approximately every two weeks).
- These semi-formal discussions I will conduct in English.
- I will present an overview of the selected paper, with my observations and criticisms.
- You may react (and interact) in Italian, of course, though I **highly** recommend you take this opportunity to improve your English conversation skills.

Interaction design revisited

- We already commented that HCI borrows from a vast array of disciplines.



But what is HCI?

HCI is an academic discipline.

- Academic HCI studies **people** interacting with **technology**.
- This is (usually) studied at an abstract level.

HCI is a design discipline.

- A large part of HCI is about designing **interactions** and **interventions** involving people and technology.
- Note that I don't talk about designing **interfaces**.

HCI is an engineering discipline.

- A well-thought and well-designed human-computer interface must eventually be **built**.
- HCI also encompasses all of the engineering paradigms and practices for **implementing** human-computer interfaces.
- There is significant overlap with **software engineering** in this aspect.

Homework

Exercise 1.1: Don Norman: How good design makes us happy

- Design and happiness
- The curse of logic

Exercise 1.2: Doug Engelbart's "Mother of all Demos"

- Visionary hypertext workstation

Exercise 1.3: Vannevar Bush's "As We May Think"

- Modern reprint
- Scan of original magazine (entertaining)