Three main threads in the program

- Ethical and social issues in computing
- CS/IS Application areas:
  - Information architecture
  - Human-computer interaction — Usability Testing
  - Data science
  - Artificial intelligence (natural language processing, information retrieval, machine learning)
- Computer programming

Human-Computer Interaction

- The study of the design, evaluation, and implementation of interactive computing systems for human use and the major phenomena surrounding them
- Observing the human's interaction with the technology and designing novel interaction/technology are both essential
- Three parts: the person, the computer, and the ways they work together

H. Rosenbaum, Indiana University
S. Krug, *Don't Make Me Think*

Who is the "human" in HCI?

The user—a person with a laptop, a group working together or remotely, a series of people working in sequence…

A person or persons trying to get a job done using computing technology

The "human" in HCI

- Physiology
  - What are the physiological constraints?
    - How small can a mobile device keypad be and still be usable?
    - Is a keypad the best type of input device for _____?
- Cognitive psychology
  - What is the role of sensory perception?
    - Improved legibility of hypertext (font, background, colors) result in improved reading comprehension
    - Distinguishable sounds indicate whether a task has been successfully completed
  - What is the role of memory?
    - Interface design can take advantage of short term memory by providing appropriate stimuli for recall

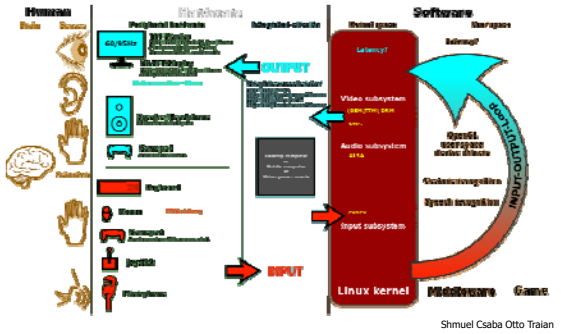
The "computer" in HCI

- A computer
- Computer clusters, grid computing
- Mobile devices
- Embedded computing
- Ubiquitous computing

- Websites, computer games, etc.

The "interaction" in HCI

- Two directions:
  - We initiate actions when using technology
  - We respond to actions initiated by technology
- Technology allows us to interact indirectly with one another
- Contextual understanding
  - Study context in which actions and events occur
  - Deliver information at appropriate times/places



Shmuel Csaba Otto Traian

Overall goals of HCI

- Design and develop systems that are usable, efficient, and safe
- Design and develop systems that are intuitive
  - Allow people to use them with a minimum of change and disruption
- Make data exchange between people and machines less stressful and less prone to misunderstandings

Overall goals of HCI

- Design and develop systems that are usable, efficient, and safe
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HCI draws from many fields

- Computer science
- Behavioral science
- Ergonomics (human factors)
- Engineering and design
- Language and communication
- Sociology

Current topics in HCI

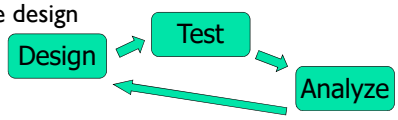
- Embedded computation
  - From desktop computers to everyday objects
  - How will human interfaces to embedded devices differ from those appropriate to workstations?
- Mixed media
  - Images, video, voice, sounds, text, formatted data… exchangeable over broadband
- Group interfaces
- User tailorability

Current topics in HCI

- Embedded computation
- Mixed media
- Group interfaces
- User tailorability
- Information utilities
  - Public information utilities and specialized industry services continue to proliferate (e.g., e-banking, e-government)
  - More and more digital information stored on networks, in remote servers
  - Computing appears to "dissolve" into the environment

Fundamental design principles

- Early focus on the users and the tasks
  - Users: specific and different
  - Tasks: what and how often
- Empirical measurement
  - Test, test, and test
  - Quantitative measurements
- Iterative design



Usability in design

- An approach to product development that incorporates direct user feedback throughout the development cycle
  - To reduce costs
  - To create products that meet user needs

Analyze usability through inspection methods and testing methods

- Inspection methods involve direct observation
  - of user by experimenter/designer
  - of designer by designer
- Testing methods requires user participation
  - Online, large scale tests allow for analytics
  - Small number of observed user tests provide qualitative and quantitative data
- What about "alpha testing", "beta testing"?
  - Focused on function not usability, but can give usability data

Inspection methods

- Card sort
  - contents written on cards and participant is asked to organize in the way that he/she sees fit
- Ethnography
  - field observation of user's environment and work/activity flow
- Heuristic evaluation
  - participants (users or designers) evaluate the user interface based on recognized design principles/heuristics, e.g., Nielsen's Heuristics
  - the most popular inspection method

Jakob Nielsen's 10 Usability Heuristics

- *Visibility of system status*
- *Match between system and the real world*
- *User control and freedom*
- *Consistency and standards*
- *Error prevention*
- *Recognition rather than recall*
- *Flexibility and efficiency of use*
- *Aesthetic and minimalist design*
- *Help users recognize, diagnose, and recover from errors*
- *Help and documentation*

Testing methods for usability

- Each test done by an individual, NOT focus group
- Remote usability testing
  - real-time or recorded
  - Great for recruiting participants in remote areas
- Live usability testing
  - Observe user at testing facility
  - Real-time and recorded--test conducted by a team of evaluators, one with the participant and others observe remotely

Web usability

- Purpose and strategy
  - What is the purpose of the site?
  - How is it made clear to the users
- Content, navigation, interaction
  - How should the content be organized so that users can navigate the site easily?
  - How will users search the content?
- Presentation and media design
  - How should individual pages be designed so people can make use of the information?
  - How should multimedia be used by people?

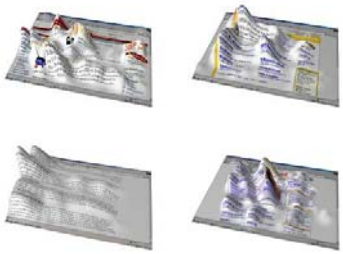
How do people use the web?

- What a developer wants to design for:
- A user who reads a page in an orderly way, sees and thinks about the options, and clicks on a carefully chosen link
- The reality:
- User looks for anything that vaguely resembles what he/she is looking for and is clickable!
- If it doesn't pan out, click the Back button and try again

How do people use the web?

- … as though they are in a great hurry
- They scan—they do not read everything
- They do not choose the *best option*—they choose the *first reasonable option*
  - No real penalty for guessing wrong
  - Weighing options may not greatly improve their chances
  - Guessing is less work
  - And they are in a great hurry

Eye-tracking experiment



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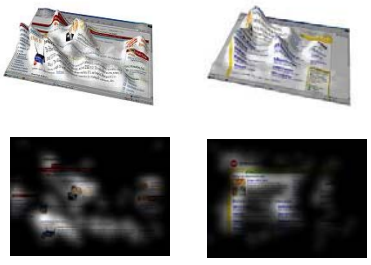

Usability testing

- Observe a user's actions and reactions when using a website
- Includes both general navigation through the site and attempts to accomplish specific tasks
  - Want both quantitative and qualitative data
- Done throughout the development process, not just at the end!

Usability test ≠ focus group

- In a usability test, one user at a time is shown something (on a website) and asked to work with it
- In a focus group, a small group of people react to ideas and designs that are shown to them—a group process

Role/duty of the test facilitator

- Try the test yourself first!
- Protect the participants
- Be empathetic
- Try to hear the participant's thought
- Don't give hints about what to do
- Keep instructions simple
- Take notes during or immediately after each session
- Need to have "thick skin"

What should observers look for?

- Do they get it?
- Can they find their way around?
- "Head slappers" and shocks
- Inspiration
- Passion

- Remember that we're seeing the user's best behavior
- Pay more attention to actions and explanations than opinions

After a usability test

- Complete notes/report
- Debrief as soon as possible
- Try to "fix" the problems
  - Tweaking vs. major overhaul
  - Resist adding instructions
- Test again!