CSE 118
Applications in Ubiquitous Computing

Instructor: Prof. Nadir Weibel
Ass. Instructor: Dr. Ali Sarvghad

TAs: Yonatan Vaizman, Janet Johnson, Waqee Khalid
Who am I?

• Originally from Southern Switzerland (Ticino)
  • Languages: Italian (native), German, French, English and Spanish (basic)

• BSc. and MSc. in Computer Science and Engineering from ETH Zurich (Switzerland)

• PhD. in Computer Science (2009) from ETH Zurich

• Researcher and Lecturer at UCSD in Computer Science and Cognitive Science since 2009
UCSD

- Research Faculty in CSE
- Human-Centered and Ubiquitous Computing Lab (The Weibel Lab, HCC-Ubicomp)
- Affiliated Faculty with Calit2
  - The Design Lab (http://designlab.ucsd.edu)
  - Center for Wireless and Population Health Systems (http://cwpshs.ucsd.edu)
- Research Health Science Specialist at VA San Diego
Ubiquitous Computing
Ubiquitous Computing

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.

Mark Weiser
Ubicomp

Ubicomp is an **interdisciplinary** field that includes technologies that **bridge the digital and physical worlds**, **systems** and **applications** that incorporate such technologies, **infrastructures** that support them, **human activities and experiences** these technologies facilitate, and **conceptual overviews** that help us understand – or challenge our understanding of – the impact of these technologies.
Themes, Applications

• Sensing (temperature, location, emotion, energy)
• Activity recognition (e.g., walking/driving)
• Context-awareness (e.g., smart homes)
• Ambient displays
• Security, privacy
• **Social interaction, communication**
• **Health**
• Education
• ICT4D (developing regions)
• Environment
Research Question

How do we best enable access to information in the right way, at the right time and for the right user and situation?
Research Aims

To develop technology that supports knowledge workers’ and end-user’s fluid interaction with information in hybrid physical/digital information spaces
Chroma (2013)

Chroma: A Wearable Augmented-Reality Solution for Color-Blindness

Presented at Ubicomp 2014, Seattle WA. Best Paper Award Nominee
Cocoon Cam (2014)

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Computer Scientists Develop Technology To Help Locked In Syndrome Patients Communicate Using Eye Tracking

10 August 2015, 9:34 am EDT  By Nicole Arce Tech Times

Researchers at the University of California San Diego (UCSD) are developing various communication systems that use eye-tracking technologies that will help people with locked in syndrome communicate using the tiny movements they can make only with their eyes.

Locked in syndrome is a medical condition that can occur after a stroke that damages part of the brainstem, leading to the paralysis of the facial and body muscles but somehow leaving the eyes unaffected. Patients with locked in syndrome usually remain conscious of their surroundings but cannot move their bodies to or express themselves through facial expressions. Many of them can only communicate with the limited movements they can make with their eyes.

Researchers at the University of California San Diego receive $300,000 dollars from the Moxie Foundation to develop an eye tracking technology to help patients with locked in syndrome to communicate. (UCSD)
CSE 118 Class Logistics
The Course: Academic Preparation

- Directly engage the research literature
- A good look at the future
- Participatory, loosely structured
  - Mold this course to your interests
  - Get out of it what you put in
- A peek at what grad school could be like, and a preparation for it
  - Analytical thinking, communicating ideas, teamwork
  - Even if you’re not considering grad school…
The Course: Inquiry-based learning

- Lecture on Ubicomp Concepts (theme of the week) on Tuesdays
- We will have some visitors give talks, demo
- Mini-quiz to test understanding of lecture and readings (118)
- Seminar style, roundtable discussion on Thursdays (118+218)
- You must come prepared for class to discuss

- Research project
  - 16 teams (6 people per team) across CSE 118 and 218
  - Experimental hybrid class undergrad/grad
  - Graduate students will additionally lead project management
  - More on that on Thursday 11am-12.20pm in CSE 2154
The Course: Logistics

• Lecture (research topic)
  Tue 11:00am - 12:20pm, EBU3B (CSE) 2154

• Discussion (paper discussions in groups)
  Thu 2:00pm - 3:20pm, EBU3B 2154, 2109, 2217, 3109, 3217

• Tutorial (test discussion, tech intro)
  Thu 11am-12:20pm

  • Starting Week 3, No class on Thu 11am-12:20pm
    (TA office hours instead in CSE 2154)

• 16ish Hybrid Project Teams (CSE 118/218)

• Web page: http://ubicomp.ucsd.edu/cse118-218

• Piazza: http://piazza.com/ucsd/fall2017/cse118cse218
  > Register today! (group discussions, team formation)
CSE 118 - Tuesday’s Lecture

- 11:00am - 12.20pm in CSE 2154
- Lecture about the Ubicomp topic of the week
- Mini-Quiz on last week Tuesday’s lecture, assigned papers and Thursday’s discussion
- Google Form online at the beginning of the lecture. Bring your devices!
CSE 118 - Thursday’s Paper Discussion

- Every week a new theme / topic
- Before class: read and annotate 2-3 papers for class
  - Dig into background reading if need/want
  - Bring questions to class (more important than answers)
- Take notes
- In class: jump into discussion!
  - Volunteer when you’re ready, be polite but assertive
  - Show respect, encourage balanced participation
  - If you’re late, you can’t participate
CSE 118 - Thursday’s Discussion Preparation

- Read and Annotate 2-3 papers (see “How to read an Engineering Paper”)
- Hand in one of the annotated paper (selected by the instructors)
- Answer the Reading Summary for a second paper
- Deadline: Thursday 2pm, online
How to Read an Engineering Research Paper

William G. Griswold
with additions by Nadir Weibal
(based on some ideas from Ali Khayam)
CSE, UC San Diego

Reading research papers effectively is challenging. These papers are written in a very condensed style because of page limitations and the intended audience, which is assumed to already know the area well. Moreover, the reasons for writing the paper may be different than the reasons the paper has been assigned, meaning you have to work harder to find the content that you are interested in. Finally, your time is very limited, so you may not have time to read every word of the paper or read it several times to extract all the nuances. For all these reasons, reading a research paper can require a special approach.
To develop an effective reading style for research papers, it can help to know two things: what you should get out of the paper, and where that information is located in the paper. First, I'll describe how a typical research paper is put together.

Despite a paper's condensed form, it is likely repetitive. The introduction will state not only the motivations behind the work, but also outline the solution. Often this may be all the expert requires from the paper. The body of the paper states the authors' solution to the problem in detail, and should also describe a detailed evaluation of the solution in terms of arguments or an experiment. Finally, the paper will conclude with a recap, including a discussion of the primary contributions. A paper will also discuss related work to some degree. Because of the repetition in these papers at different levels of detail and from different perspectives, it may be desirable, to read the paper "out of order" or to skip certain sections.
1. What is your take-away message from this paper?
2. What is the motivation for this work?
3. What is the proposed solution?
4. What is the author's evaluation of the solution?
5. What is your analysis of the identified problem, idea and evaluation?
6. What are the paper's contributions?
7. What are future directions for this research?
8. What questions are you left with?

Annotations

- Annotate every paper that is assigned
- Highlight important concepts
- Mark questions and contributions
- Add your own questions
- Identify take aways
- …

—> See “How to Read an Engineering Paper”

CSE 118/218 - Thursday’s Discussion

Logistics

- 5 groups, 5 classrooms, each one with a different instructor
- 18-20 students per room (CSE 118+218)
- Inner circle (9-10 students) discussion
- Outer circle observation

- More on this on Thursday, 11am-12.20pm in CSE 2154
CSE 118 Thursday’s Reading / Discussion Evaluation

• How will we grade discussion?
  • quality, not quantity
  • ideas and critique supported by evidence
  • helping group perform at high level (teamwork)

• How to Read and Engineering Paper
  • Use reading rubric to frame your note-taking
  • Structure discussion around participation rubric

• Hand-in your marked paper for evaluation
• Answer the summary questions
• Self-evaluate your progress
Research Projects
The Course: Research Projects

- ExtraSensory Dataset and Mobile App
  - http://extrasensory.ucsd.edu
- Black-box for automatic context recognition
- Array of 50+ recognizable behaviors with assigned confidence (%)
- Android Device
- Question: how many people do NOT have android?
- Your own innovative idea
ExtraSensory

Next Week, Tue 10/3 - Yonatan Vaizman
Research Projects
Teams and Project Proposal

• Week 1-2: Explore ExtraSensory, Install ExtraSensory App

• By Week 3: Form a team (3 undergrads + 3 grads) and decide on a project
  • What does your application do?
  • Who are its potential users?
  • When will it be used?
  • Why would anyone use it?
Research Projects
Teams and Ideas

• Define a team project (3 undergrads, 3 grads) to explore ubiquitous computing
  • Usefulness, scalability, cost, how, effects…
  • Not necessarily big, but insightful or useful
• Come up with own idea or build on existing work
• Goal: having a working prototype by the end of the quarter
  • something that you can demo!
• The best project will participate to the CHI or Ubicomp Conferences
The Course: Living it

• Live the UbiComp lifestyle
  • Go mobile: laptop, tablet, smart phone, smart watch…
  • Web 2.0: facebook, twitter, …
  • Put a small “public display” up at home
• Read about it
  • Subscribe to an RSS feed, mailing list, or magazine
  • ACM TechNews: http://www.acm.org/technews/
  • Wired: http://www.wired.com
• Observe it, talk about it, bring it into discussion
• It’s everywhere around you
CSE 118 Grading

• This course is graded on three elements:
  • Discussion preparation and participation (30%)
  • Lecture/paper technical knowledge (20%)
  • Project (50%)

• Details on the web page
BACKGROUND AND INTRODUCTION

The advent of affordable sensors and interaction devices (e.g., web cams, mobile phone based sensors, digital pens, Microsoft SenseCam, Microsoft Kinect, Google glasses, portable eye-tracking, HoloLens, Oculus Rift, etc.) and wireless mobile computing devices (e.g., mobile smart phones, Arduino boards with 802.11b wireless connectivity, etc.) has created boundless opportunities for in-the-world computing applications that can transform our lives.

This course explores these opportunities in the form of both a project-based class and a preparatory course for graduate school. On the one hand we will focus on the development of specific applications and interaction techniques based on these devices. On the other hand, we will learn how to read, present, and discuss research papers from the literature of ubiquitous computing, pervasive computing, and human-computer interaction.

OVERALL PLAN

Every week a new ubiquitous computing concept will be introduced as the topic of the week. We will discuss the technology behind it, and how it has been used in research (i.e. reading and discussing technical and research papers). In addition we will form teams to undertake small research projects.

The projects will involve the design and implementation of a ubiquitous computing application. This year (Fall 2017) the class projects will use the ExtraSensory App, a mobile phone application for behavioral context recognition. This app was previously used to collect the ExtraSensory Data set (http://extrasensory.ucsd.edu), and class projects will use it as a black-box tool for automatic context recognition of activities (e.g., walking, eating, shower), environments (e.g., at home, at work, in a meeting), and more. Projects will have to exploit these predicted behaviors and work on a novel application.

Teams will span CSE 218 graduate students and CSE 118 undergraduates. While both graduate and undergraduate students will work on the development of the applications, graduate students will take an additional leadership and management role in the project.

http://ubicomp.ucsd.edu/cse118-218/
CSE 118/218: Ubiquitous Computing - Fall 2017

CSE 118 - Course Details

TUESDAY'S LECTURE
Every Tuesday, we will introduce a new ubiquitous computing concept (with the exception of Week 1, when we will introduce Ubicomp). The format will be a standard lecture setting, but we will encourage active participation. We will also demo any specific technology if we presented that week. The content of the lecture will be tested through a mini quiz at the beginning of the following week Tuesday's class.

TUESDAY'S QUIZZES
At the beginning of Tuesday's lecture, each student will participate in a required online mini-quiz that will test understanding of the technology presented the week before, the content of the assigned papers, and any relevant discussion that emerged from Thursday's group discussion. Quizzes will be delivered online, so every student needs internet access through their own device (laptop, tablet, smart phone, etc.).

THURSDAY'S DISCUSSION
Thursday will be the most interactive part of the class. Students will be assigned 2-3 papers to read and annotate, and the instruction team will pick one that students need to hand in, annotated, at the beginning of the lecture.

Students will be divided into topic groups and assigned to different rooms. Every group will be further split into an inner circle and an outer circle. The inner circle will be discussing the assigned papers, while the outer circle will be observing the discussion and taking notes on the dynamics of the group discussion. Roles will be inverted in the second part of the discussion. Assigned discussion groups are available here.

Prior to the discussion, students will be required to complete a reading-summary form and submit the annotated paper. Please annotate all papers (this is the point of the class), and submit the reading summary and the annotations for the selected paper by Thursday at 2 pm here:

- Reading summaries: [Submit Reading Summary](http://ubicomp.ucsd.edu/cse118/submit/reading-summary)
- Annotations: [Submit Annotations](http://ubicomp.ucsd.edu/cse118/submit/annotations)
  (Annotations can also be submitted on hard copy by the end of class on Thursday to your instructors)

http://ubicomp.ucsd.edu/cse118-218/course-details-118
Ubicomp
Ubicomp at Xerox PARC

Xerox Parc, 1991

https://www.youtube.com/watch?v=b1w9_cob_zw
Experiment at PARC – TAB
Experiment at PARC - PAD
Experiment at PARC – BOARD
Next

- Papers to read
  - V. Bush, "As We May Think", Atlantic Monthly, July 1945
- Thursday 11am-12.20pm CSE 2154: Logistics on Discussions, Projects, and Team Formation
- No class on Thursdays 2-3.20pm (only this week)
Group Formation

• Start NOW to talk with your peers about common interests and cool ideas

• Groups can be heterogeneous, not everybody needs to do hardcore programming, but groups need also designers, managers, etc. Some of you are from outside CSE

• Use Piazza, remember that groups will have to be across CSE 118 and CSE 218

• If you have a good idea, send me a short description and perhaps a sketch I will present it next week during class

• Look on the web for what other people already did (as inspiration only: you should do something new)
For Thursday

• Register on Piazza and start discussion on groups and projects

• Read course website, especially:
  • How to read an engineering paper
  • Structured form for reading a paper
  • Note taking rubric
  • Participation rubric
Thank you!