SYLLABUS: INFO 4871/5871

EXPERIENCE DESIGN IN UBIQUITOUS COMPUTING

SPRING 2017, 3 CREDITS, 17 JANUARY–6 MAY

INSTRUCTOR INFORMATION

Name: Dr. Stephen Voida

Office Location: ENVD 201

My office hours are W 1:00pm–2:00pm, ENVD 201 and by appointment

You can reach me at svoida@colorado.edu

COURSE COORDINATES:

Lecture/Studio: TTh 2:00pm–3:15pm, ENVD 234A

COURSE INFORMATION

Course description and purpose: INFO 4871/5871 introduces the field of ubiquitous computing, including sensors, ambient displays, tangibles, mobility, and location- and context-awareness. These topics are explored from a user-centered design perspective, focusing on how a situated models of computing affect requirements gathering, interaction design, prototyping, and evaluation. Students gain mastery with contemporary "UbiComp" technologies and learn to incorporate them into a user-centered design process.

This course has no pre- or co-requisite registration requirements.

TEXTBOOKS AND MATERIALS

Title: *Ubiquitous Computing Fundamentals*
Author(s): Krumm, John (Ed.)
Publisher: Chapman and Hall/CRC Press
Book site: http://research.microsoft.com/en-us/um/people/jckrumm/UbiquitousComputingFundamentals/
ISBN: 978-1420093605
Amazon link: http://www.amazon.com/Ubiquitous-Computing-Fundamentals-John-Krumm/dp/1420093606/

Title: *Sketching User Experiences: The Workbook*
Author(s): Greenberg, Saul; Carpendale, Sheelagh; Marquardt, Nicolai; and Buxton, Bill
Publisher: Morgan Kaufmann
Book site: http://sketchbook.cpsc.ucalgary.ca/
ISBN: 978-0123819598
Amazon link: http://www.amazon.com/Sketching-User-Experiences-The-Workbook/dp/0123819598/

ASSIGNMENTS

READING SUMMARIES

In order to ensure that all students are adequately prepared for discussion and ready to join in the in-class activities, for each class period in which you are not presenting, you will write a 3-point summary of and thoughts about **each** of the required **UbiComp** readings (i.e., those assigned for *Tuesdays*).

- Briefly *summarize* the work in about a paragraph (i.e., describe what the authors did).
- Identify about some *limitations of the work* (e.g., technological shortcomings, ideological biases, cultural constraints, etc.) and what kinds of follow-on research questions might be explored in order to address those issues.
- List at least three *discussion points or issues* that you would like to raise/pursue as part of our in-class discussion.

These summaries are to be completed individually (e.g., not in consultation with one another) and are due at **6:00pm the night before discussion-oriented class meetings (Monday)**, to allow that week's presenters time to incorporate some of the more interesting points and questions into their in-class presentation. Please note that your grade for this component of the class will be determined based on whether you completed the assignment on time (e.g., submitted an online post including all four *clearly enumerated* required elements), not necessarily on whether you were able to fully grasp all of the nuances of these (admittedly sometimes complex/dense) articles. The goal of this assignment is to demonstrate your preparation for the in-class discussion; as a result, late submissions **will not be accepted/scored.**

Of the 11 weeks of class for which we have outside readings, you are required to submit **at least 9 weeks** of reading summaries. *You may elect to drop/skip up to two weeks of summaries without penalty (or explanation)*—please use these drops to account for illnesses, travel, overwhelmingly busy weeks, etc. Note also that for students in the graduate section (5871), for the week on which you lead the discussion, your presentation materials for that week will count in lieu of your reading summary.

CLASS PARTICIPATION

I expect students to be appropriately prepared for each class meeting, to attend all class meetings on time, and to conduct themselves in a professional manner. The central focus of this course is a seminar-style discussion of the issues, challenges, and trade-offs associated with Weiser's vision of ubiquitous

computing and the real-world instantiation of that vision. Every student in the classroom is expected to play an active role in shaping and contributing to that discussion.

INFO 5871 ONLY: The class participation grade will be derived both from the student's performance in preparing for and co-leading the seminar discussion of the readings and from their engaged, knowledgeable, and respectful participation in the in-class discussion. As a presenter/discussant, you will gain experience in reading, synthesizing, and presenting the assigned reading associated with a specific sub-area of ubiquitous computing. You will present once during the semester. Your presentation should last around 15–20 minutes, after which time you will transition to leading an open discussion. Your discussion should cover (at the least) the required readings as well as any optional readings listed for that topic. You should prepare in advance a short list of issues or questions that you would like to address over the discussion period. In addition to or instead of presenting the required/optional reading, you could, for example:

- demonstrate software from the reading;
- conduct a breakout session, where different parts of the class discuss a different key question from the readings;
- design a class exercise for the class based on the readings; or
- critique a particular design from the reading.

After class, you are responsible for submitting the lecture slides to the instructor for posting to D2L.

Class participation will be assessed each ***day*** on a 5-point scale using the following rubric:

- Serving as a discussion leader (5871 ONLY) **or** actively participating in the discussion; contributing multiple times to the discussion with thoughtful, relevant comments or questions: 5/5 (100%)
- Incidental participation in the class discussion; contributing minimally with relevant comments or questions: 4/5 (80%)
- Present and attending to the class discussion, with the contribution to the discussion including completing the reading summary and proposed in-class discussion questions for the class (co-)leaders submitted to D2L prior to class: 3/5 (60%)
- Not physically present in class: 0/5 (0%)

The lowest ***four*** in-class participation scores will be automatically dropped, allowing you some flexibility in the case that an out-of-class emergency comes up (e.g., illness, traffic accident, paper deadline, etc.) However, you will still be responsible for covering the assigned readings and submitting your summaries for every week (even if you can't physically be present), and you will be held to all technology tutorial and research project deadlines, since these projects involve the participation of multiple students working in teams.

Individual Assignments and Portfolio

Over the course of the term, students will be introduced to a wide variety of sketching and prototyping techniques. Each week, the Thursday class meeting will serve as a hands-on "studio" session focused on developing students' skills with a particular class of design techniques, as well as making them aware of how these techniques might be used to communicate particular aspects of a design.

Each week, students will be expected to complete an individual design exercise, which will give them an additional opportunity to practice applying a sketching or prototyping technique. (Some exercises may be completed in a small group of 2-4 students.) Each of these exercises will address a design challenge from a different sub-area within ubiquitous computing.

The deliverables from these exercises will be due at the beginning of the first studio (Thursday) class meeting after they are assigned. They will be evaluated primarily on the creativity of thinking represented and the communicative effectiveness of the deliverable; less focus will be placed on the artistic merit of the submissions. *Of the six exercises, only five will be counted towards students' individual assignments grade for the course; the lowest (or 1 missed) exercise score will be dropped. IA#2 (Slideware) is an optional assignment that can earn students up to ½ of a homework scores' worth of extra credit.*

Students will also complete one, in-depth design project on their own, where they will explore one of the design challenges from the weekly exercises more deeply and from different perspectives. The outcome from this project will be a more thoughtfully developed UbiComp product or system design, comprising at least 20 sketches or prototypes using **at least three** of the techniques introduced in the course (e.g., a suite of artifact design sketches, a Foamcore model of the artifact, and a video sketch of how the artifact might be used in a real-world scenario). Students will compile this final project in an individual portfolio, along with a short (2–3 page) design rationale document, and this submission will represent the "final examination" for the course.

TECHNOLOGY TUTORIALS (5871 ONLY)

One important skill for doing ubiquitous computing research is to be able to identify critical technologies and how to use them in developing system design briefs or prototype applications. This class will introduce a number of these critical technologies, and it is expected that students will have some additional ideas about technologies that would be considered important or interesting from a ubiquitous computing perspective. Each student will be responsible for developing a tutorial for a given technology. This tutorial is intended to give the reader an understanding of what the technology is, how to obtain it, and how to use it in practice to develop some application—that is, an example of how to "get started" using the technology. Tutorials should also include a list of references and/or URLs that a novice could use to become more expert or gather additional information about the technology.

Students may work individually or in groups of up to three on developing this "how-to" tutorial. The tutorials are to be placed on D2L and will be made available to students in this and subsequent semesters as "jumping-off" points for scoping their research projects and. Topics for your tutorial must be approved by the instructor in advance, and the instructor can help to identify potential technologies that would be suitable for developing a corresponding tutorial.

Technology tutorials consist of two deliverables. The first is a short (10–15-minute), in-class presentation of the content of the technology tutorial, with a short walkthrough or demonstration showing how the technology might be used. The second is the technology summary, "how-to" write up, and references, which should be posted to the wiki as a shared resource for students in this (and subsequent) semesters to use as a reference.

A few of things to bear in mind about the technology tutorials assignment:

- For most all of the students in the class, this assignment is about learning a new technology. *I don't expect students to become experts in using these technologies.* The goal is to provide the class with a mechanism to "divide and conquer" the process of learning about new technologies. If everyone takes the time to dig around on the web to understand one new technology and then teaches it to everyone else, we all collectively learn about 3–5 new technologies—a Good Thing!
- Given that all of the students in the course will be learning about new technologies, much of what I expect students to do is to spend time *researching what resources already exist* on the Internet to help newcomers get started with a technology. Often, the information that this assignment requires you to produce and present exists someplace online already—"getting started" tutorials or SDKs from a technology company's website, Q&A posts from coding community websites (e.g., StackExchange), blog posts from other enterprising developers, etc. Find and aggregate the "good parts" from these resources; this will help to save the rest of the class time that we might have spent doing the same thing later on.
- When you're working with a new technology, much of the initial cost is spent figuring out where to start. This is about as far as I expect students to go with these tutorials:
    - *Where do you get the [device/software toolkit/tool]?*
    - *What other equipment/software/supplies do you need to make it work?*
    - *How do you connect it to your [computer/prototype/design process]?*
    - *Can you provide one example of a step-by-step set of instructions to get the technology to do the most basic thing that it can do (i.e., a "Hello World" program or output)?*

  The idea is that students will show someone how to get through all of the typically-annoying startup stuff so that if they wanted to use the [device/software toolkit/tool], they'd at least be ready to go and know where to look for more details with a minimum of overhead.

GROUP PROJECT

The purpose of the project is to gain experience doing original design research in ubiquitous computing, synthesizing your results in written form, and presenting them in a public venue (this class). You are required to develop a project in an area *related to* ubiquitous computing. The project will be presented to the class in a workshop-like session at the end of the semester. For INFO 5871 students, the results of this project should also be reported in a 6–10-page long manuscript following the Ubicomp conference style guidelines (http://www.acm.org/publications/proceedings-template).

Although the kinds of projects that you propose/work on will vary in scope, the *design* focus of this course means that your project should include conducting formative user studies (interviews, surveys, and observations), creating mockups of user interfaces, evaluating the mockups with users, and iterating several times, resulting in a useful, usable, and desirable design of a ubiquitous computing application.

Talk to the instructor before settling on a project and submitting a project proposal. You may work in groups of 3 or more students; your proposal should include a justification for the number of group members and your group's composition, relative to the scope of and goals for the research project.

More details about each specific deliverable will be provided as the course progresses. Note that for each deliverable, each research team must **also submit a corresponding team assessment**. These team assessments must be signed by each team member and submitted in hardcopy. Your individual grade on the project will depend on both the overall group grade and your contributions to the group's work, as reported in peer evaluation forms that you will submit at each research project milestone.

High-quality submissions may be nominated by the instructor for revision and submission to a suitable, peer-reviewed publication venue (e.g., as a poster, demo, or video to the ACM International Joint Conference on Pervasive and Ubiquitous Computing or as a long or short paper to the ACM SIGCHI Conference on Human Factors in Computing Systems.)

(Working) Course Calendar

Week	Date	Daily Topic	Reading	Assignments (Due)
1	17 Jan	Course introduction	(syllabus)	—
	19 Jan	Sketching: Getting Into the Mood	*Sketching User Experiences* (*SUE*), Chapter 1	—
2	24 Jan	UbiComp: Introduction	*Ubiquitous Computing Fundamentals* (*UCF*), Chapter 1 Weiser *SciAm* article [D2L]	Reading summaries (2)
	26 Jan	Sketching: Sampling the Real World	*SUE* Chapter 2	**TECH TUTORIALS (TT): PROPOSALS (5871)**
3	31 Jan	UbiComp: Systems (part 1)	*UCF* Chapter 2 (§§2.1–2.3)	Reading summary (1)
	2 Feb	Sketching: Vanilla Sketches Evaluation: Sketch Boards and The Review	*SUE* Chapter 3 (§§3.1–3.5) *SUE* Chapter 6 (§§6.4–6.5)	—
4	7 Feb	UbiComp: Systems (part 2)	*UCF* Chapter 2 (§§2.4–2.7)	Reading summary (1)
	9 Feb	CLASS CANCELLED: INSTRUCTOR ILL		
5	14 Feb	UbiComp: From GUIs to "UUI"s	*UCF* Chapter 6	Reading summary (1)

Week	Date	Daily Topic	Reading	Assignments (Due)
	16 Feb	Crit #1: Vanilla Sketches Sketching: Slideware, Office Supplies, Templates, Photo Traces & Hybrid Sketches Evaluation: Uncovering the Initial Mental Model, Wizard of Oz, and Think Aloud	 *SUE* Chapter 3 (§§3.6–3.10) *SUE* Chapter 6 (§§6.1–6.3)	Individual Assignment (IA): Vanilla sketches
6	21 Feb	**TT: PRESENTATIONS (part 1)**	—	
	23 Feb	**TT: PRESENTATIONS (part 2)** **GROUP PROJECT (GP): SPEED DATING**	—	Optional/Extra Credit IA: Slideware sketches **TT: INSTRUCTABLE (5871)**
7	28 Feb	UbiComp: Location	*UCF* Chapter 7	Reading summary (1)
	2 Mar	Crit #3: Hybrid Sketches Sketching: Physical Sketching (Foamcore & Play-doh)	 *SUE* Chapter 3 (§3.9)	IA: Hybrid sketches
8	7 Mar	UbiComp: Context-Aware Computing	*UCF* Chapter 8	Reading summary (1) **GP: PROJECT PROPOSALS**
	9 Mar	Crit #4: Physical Sketches Sketching: Storyboards	 *SUE* Chapter 4	IA: Physical sketches
9	14 Mar	UbiComp: Field Studies	*UCF* Chapter 4	Reading summary (1)

Week	Date	Daily Topic	Reading	Assignments (Due)
	16 Mar	Crit #5: Storyboards Sketching: Animated Sequences	 *SUE* Chapter 5 (§§5.1–5.4)	IA: Storyboards **GP: LIT/TECH REVIEW**
10	21 Mar	UbiComp: Ethnography	*UCF* Chapter 5	Reading summary (1)
	23 Mar	Crit #6: Animated Sequence Sketching: Linear Video	 *SUE* Chapter 5 (§5.5)	IA: Animated sequences
11	28 Mar	**SPRING BREAK!**		
	30 Mar			
12	4 Apr	**Crit #7: Iteration on Previous Assignment** Sketching: Interactive Prototyping Workshop I	—	**IA: Iteration**
	6 Apr	**GP FIELDWORK MADNESS**	—	**GP: FIELDWORK SUMMARY**
13	11 Apr	UbiComp: Privacy (part 1)	*UCF* Chapter 3 (§§3.1–3.2)	Reading summary (1)
	13 Apr	Sketching: Interactive Prototyping Workshop II	—	—
14	18 Apr	**Crit #8: Linear Video** UbiComp: Privacy (part 2)	*UCF* Chapter 3 (§§3.3–3.4)	**IA: Video Sketch** Reading summary (1)
	20 Apr	**GP DESIGN MADNESS**	—	**GP: INITIAL DESIGN AND RATIONALE DOC**
15	25 Apr	Looking Ahead	Abowd article [D2L] Dourish & Mainwaring article [D2L]	—
	27 Apr	(flex day)	—	—

Week	Date	Daily Topic	Reading	Assignments (Due)
16	2 May	GP FINAL PRESENTATIONS (part 1)	—	—
	4 May	GP FINAL PRESENTATIONS (part 2)	—	GP: FINAL PORTFOLIO
FINALS	TBA	NO IN-PERSON MEETING *(CHI 2017 IN DENVER!!)*	—	IA: INDIVIDUAL PORTFOLIO

GRADING

There are two separate grading scales for this course, depending on which section in which you are registered (undergraduate or graduate):

INFO 4871

10%—Reading quizzes/summaries
10%—Class participation, including participation in weekly sketch/prototype crits
30%—Weekly sketching/prototyping exercises
50%—Group project

INFO 5871

10%—Reading quizzes/summaries
20%—Class participation, including leadership of a UbiComp topic discussion (10%) and participation in weekly sketch/prototype crits (10%)
20%—Weekly sketching/prototyping exercises
10%—Technology tutorial
40%—Group project

This course will use a standard 100-point grading scale:

93.0% and above:	A	73.0%–76.9%:	C
90.0%–92.9%:	A-	70.0%–72.9%:	C-
87.0%–89.9%:	B+	67.0%–69.9%:	D+
83.0%–86.9%:	B	63.0%–66.9%:	D
80.0%–82.9%:	B-	60.0%–62.9%:	D-
77.0%–79.9%:	C+	Below 60.0%:	F

Assignments are expected to be submitted on time. In fairness to the instructor and students who completed their work on time, a grade on an individual assignment deliverable (e.g., a sketching assignment) shall be reduced 10% if it is submitted late and a further 10% for each 24-hour period it is submitted after the deadline; submissions received more than 48 hours late will not be graded. Reading

summaries and deliverables completed as part of a group (e.g., a technology tutorial or research project milestone) **will not** be accepted after the specified deadline; a late submission on these assignments will result in a zero grade.

Using Desire to Learn and Other Technologies

This course will use Desire to Learn (D2L; http://learn.colorado.edu) as the primary instructor–student communication hub. Submissions will be collected via D2L Discussion and Dropbox modules, and any changes in this syllabus will be communicated via D2L News postings. The instructor will also monitor online forums hosted as part of the D2L course site to address questions or needed clarifications about course content, assignments, etc. I strongly recommend that you check in on the D2L course site at least once during each class meeting day to stay apprised of any course- or assignment-related updates.

Communication

All questions about this course should include a subject heading that begins with "INFO 4871/5871" so that I am sure not to miss your email in a what is, at times, a VERY crowded inbox. If you have a question, it is very likely that another student has that same question, so please ask! You will be doing your classmates a favor.

Timing and Availability

Your instructor responds to course-related emails during the professional workday (between 9am and 5pm on weekdays). You should expect to receive a response to your email within 24 hours (exclusive of weekends; we go skiing, too!). Please plan ahead and understand that course deadlines drive most of the emails I need to respond to; if you email right before a deadline, your email might be at the end of a very long queue that I will do my best to get through prior to the deadline, but cannot guarantee.

Accommodation Statement

I am committed to providing everyone the support and services needed to participate in this course. If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Injuries guidelines under the Quick Links at the Disability Services website and discuss your needs with me.

Religious Observances

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled

presentations, assignments or required assignments/attendance. If this applies to you, please speak with me directly as soon as possible at the beginning of the term.

Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, ability, and nationality. Class rosters are provided to the instructor with each student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that we may make appropriate changes to our records. For more information, see the policies on class behavior and the student code.

Discrimination and Harassment

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at honorcode.colorado.edu.