Mobile And Ubiquitous Computing (MUC)

Georgia Tech: CS4605 & CS7470

Syllabus

August 8, 2018

Thomas Ploetz

This document describes the general guidelines for and an overview of the MUC class at Georgia Tech. Use this as a reference throughout the semester. Mentors, TAs, and instructors will assist you in case there are any questions or concerns.

Content

General Course Information

Mobile and Ubiquitous Computing are often referred to as the third generation of computing where users continuously interact not with just one but many computing devices. The latter are thereby embedded into the everyday environment of their users in such a way that users—ultimately—will not even be aware of their interaction with computers. In this class students will explore the third generation of computing (and beyond) that enables such continuous and especially ubiquitous computing. Students will learn about the technical foundations of sensing, computing, and communication that are the pre-requisite for smooth and seamless interactions in a continuous manner. Based on these foundations students will work on practical projects that address cutting edge real world problems and will develop innovative solutions to it through means of mobile and ubiquitous computing. Beyond providing a solid technical foundation for mobile and ubiquitous computing the course will focus on aspects of how to actually make, that is build and deploy, mobile and ubiquitous computing systems.

Prerequisites

Formal Prerequisites

Undergraduate Semester level CS 2110 Minimum Grade of C or Undergraduate Semester level CS 2261 Minimum Grade of C.

Mandatory Requirement:
Before students start working on their projects they will need to provide documentation regarding successful completion of CITI IRB Training — specifically the following courses need to be completed (or refreshed):

Responsible Conduct of Research (1 — Basic Course)
Human Research (Group 2 Social / Behavioral Investigators and Key Personnel — 1 Basic Course)

Students will have three weeks (at the beginning of the semester) to complete the IRB training and submit their certificates (PDF) through Canvas (see below).

The CITI IRB online training can be accessed through: http://researchintegrity.gatech.edu/about-irb/irb-required-training and should not take longer than two hours to complete. Students who already have valid, that is not expired, certificates for the aforementioned courses can submit their certificates directly.

Important: Without valid CITI certification students cannot work on their projects and as such will not be able to fulfill the requirements of all project-related assignments!

Recommendations

Students shall have a general interest in the subject area of mobile, ubiquitous, pervasive, and wearable computing. Curiosity and eagerness to not only learn about (and understand) the field of mobile and ubiquitous computing, but also to *make* and experiment in practical, hands-on sessions are of benefit for enjoying the course.

Existing programming skills are of benefit (for mobile platforms, and/or for lower level device control; for web platforms). For some projects experience with data analysis frameworks such as Python, R, or Matlab is of benefit. Other projects will build on foundations of electrical engineering and manufacturing.

Time and Location

3:00pm — 4:15pm Tuesdays and Thursdays in “Scheller 200” (College of Business)

Queries Related to Course

Please send your queries related to course work here: send mail

Instructors

Professor

Dr Thomas Ploetz
Associate Professor
School of Interactive Computing
thomas.ploetz@gatech.edu

office:
Tech Square Research Building (TSRB), Second Floor, Room 234c (NW corner office facing interstate and parking garage)

office hours:
Wednesday, 3pm — 5pm

NO office hours during week commencing 10/08/18!

Occasional guest lectures will be given by Profs. Thad Starner and Gregory Abowd, as well as by other invited guests.

Teaching Assistants (TAs)

Anandghan Waghmare
anandghan@gatech.edu

Yuhui Zhao
yzhao343@gatech.edu

Nikhila Nyapathy
nikhila.nyapathy@gatech.edu

TA Office hours:
upon request

Tech Square Research Building (TSRB), Second Floor, between 235A and 236

Course Website

Course updates, discussions, readings assignments and any other information are distributed through the course CANVAS website.

Please visit this site frequently as all communication will go through it (if not via mailing list).

Course Communication

We are using CANVAS for all course related communication. Unless you are trying to schedule an appointment with either the TAs or the instructor (see office hours) please post all questions you may have to CANVAS as then fellow classmates will be able to benefit from it as well. CANVAS is our place for discussion, Q&A, and announcements.

Learning Management System (LMS) — Canvas

We will use Canvas as the learning management system (LMS) for the class. Canvas is the successor of T-Square. Assignments, material distribution, discussions etc. will all be handled through the LMS, which also links to discussions, the class calendar etc. Students who have not used Canvas before are asked to familiarize themselves with the system.

On Canvas the course can be found under:

Mobile&Ubiquitous Comp - A (CS-4605-A/7470-A)

Note that both sections of the course (4605 and 7470) are combined in one on Canvas. All students enrolled into the course are automatically enrolled to it in Canvas.

Course Objectives and Outcomes

This course aims to provide students with an overview and the foundations of the research field of the third generation of computing (and beyond). Through active, practical explorations the course aims to provide an appreciation of the practical potential the field offers for researchers and practitioners.

Course Outline

- Overview of the field and history of Ubiquitous Computing
- Sensors and sensor data analysis including applied machine learning
- Location technologies and how to use them
- Overview of wearable computing: Challenges and design processes
- Context aware computing
- Evaluation of mobile and ubiquitous computing systems
- Privacy in mobile and ubiquitous computing
- Real world applications: implications and challenges

Intended Outcomes

Knowledge

Upon successful completion of the course students will be able to:

- Build on the foundations of mobile and ubiquitous computing and their integration into practical applications;
- Discern the capabilities of different components of mobile and ubiquitous computing, which allows for informed decisions regarding suitability and technical challenges;
- Exploit the potential of mobile and ubiquitous computing techniques for real-world applications.

Skills

Through active course participation the students will gain:

- The ability to appreciate and analyze the foundations of the third generation of computing (Mobile and Ubiquitous Computing).
- The ability to use methods of mobile and ubiquitous computing in innovative, real-world practical applications.

Grading & Evaluation

Grading Scheme

Overall course grading is based on the Georgia Tech letter grading system (A through F, as defined here), where the various components of the course contribute to the overall grade as follows:

Contributions to Overall Grade

component	max. grade contribution
Attendance (activities)	100
Individual Assignment	100
Group Assignments (best 2 out of 3)	200
Project: proposal	100
Project: in-class presentation (talk and critique)	100
Project: final report	100
quiz 1	100
quiz 2	100
Project: final demo	100
total	**1000**

TAs will use detailed grading schemes for each component, which ensures fair and objective grading.

Calculating Final Grades

Each component (as described above) will be graded separately accumulating points towards the overall course grade. The final, overall course grade is then calculated as follows:

accumulated percentage	grade
90-100%	A
80-89%	B
70-79%	C
60-69%	D
<60%	Not passing

Attendance

Attendance will be recorded for all class activities and will contribute up to 10% to the overall grade (see below).

Assignments

Individual Assignment

One reading assignment will be given at the beginning of the class, which students have to work on individually and hand in for assessment. Students can earn up to 10% of the overall grade through this assignment. This assignment will cover an individually written essay about the state-of-the-art in ubiquitous computing. A separate discussion session on the topic will be held (September, 11). Attendance is mandatory and contributions to the discussion will be graded (individually).

Group Assignments

Three group assignments will be given out throughout the semester. These assignments are linked to in-class activities that students will work on in teams. These assignments will be graded and students can earn up to 10% of the overall course grade each through successful completion.

Important: See further explanation on grading of group assignments below.

The best two out of the three group assignments will be included into the overall grade. Note, however, that students must attempt all three group assignments. No submissions will not count towards the two assignments. For every not attempted group assignment the maximally achievable points will be cut by 33%. Example: One student does not submit or contribute sufficiently enough to one of the group assignments. For this student the number of points that can be achieved through group assignments will automatically be capped to 66% or 33% (instead of 100) — before grading.

Projects

Students will work in groups on one practical project (each) throughout the whole semester. Each project will be overseen by a mentor. Students will have to organize themselves into groups of four and define the specifics of their project. Project ideas will be provided by mentors but can also be defined by the students. A pool of mentors (more senior students, PhD students, staff and faculty members) and project ideas will be available. **Every project team needs to find a mentor and define their project in collaboration with this mentor.** Teaching assistants will support students during the project definition phase to make sure all students will be able to work on a project they want, find interesting, and leads to achievable results. All projects need to be discussed with and approved by TAs or the instructor. Part of these discussions is an adjustment of complexity (by the TAs in discussion with project teams) that will aim at class appropriate projects — that are neither trivial nor unachievable. Examples of successful projects from previous semesters will be shared with the students.

Process

Students will form project teams of four — as soon as the semester starts. Based on the initial readings, the example projects from previous years, and on research areas of and suggestions from mentors teams will start exploring the wider area of mobile and ubiquitous computing in order to get an understanding of what interests them and what direction their project could go. TAs will play an active role in this process and will help students finding their passion. TAs will also give feedback on the intended complexity of a project — ideally it should be challenging to push students to of their comfort zone and thus to enable learning, whilst at the same time not being unrealistically over-ambitious. This process will be iterative and requires substantial work, but —if done well— it will pay off with a project the team will be passionate about, which will lead to mastery of the field of mobile and ubiquitous computing.

A project fair will be held on August 28 (in class) where mentors present their project ideas / research fields. **Students should not wait until the project fair but start exploring potential project ideas and teams as the semester starts (August 21).**

Deadline for project sign-ups

8/31/2018

IRB

Students can only start working on their project when they have provided evidence for successful completion of relevant IRB (Institutional Review Board, which is concerned with ethical approvals for research conducted at Georgia Tech) training (CITI certificate(s) as outlined above).

All projects are—per definition—class-room (educational) projects and as such—if adhering to good academic practice as attested through a successful IRB training—are exempt from IRB approval. However, without proper IRB approval (if required by a project) the results of a project can NOT be published as such. Publication (for example, in form of a scientific article) typically requires IRB approval (depending on the project). Teams aiming for publication of their project results should discuss with their mentors / the professor to seek advice.

Deliverables

Each of the two projects has the following deliverables that will be graded:

1. Project proposal
2. Video presentation (after ~1/2 of project) — graded as P/F
3. Project presentation and critique (after ~1/3 of project)
4. Project demo (end of project)
5. Project report.

Guidelines for writing proposals, report, demo, slide and vide presentations are available on Canvas (Files section).

Grading

For group assignments and project deliverables every team will submit one copy of the assignment / deliverable to Canvas. Every group assignments must include a statement of the individual team members' contributions to the assignment. TAs and instructor will regularly discuss group participation with every team. All members of a project team will receive the same grade for the main portion of a deliverable. This is a general rule unless in extreme, well justified cases that will need to be discussed with TAs, mentor, and instructor. In case of unequal contributions to a group assignment the grading team will reduce grades on a case by case basis. TAs will grade the project components using a rubric that corresponds to the guidelines for students as mentioned above.

Extra Points for Project Complexity

Projects can and certainly will be of varying complexity. In order to encourage ambitious and thus more complex projects, teams can earn up to 20% extra points for more challenging projects. After the final project demonstration (in class), TAs and instructor will decide upon the overall complexity of the projects and distribute extra credit if appropriate. All project presentations will be in class with mandatory attendance and all students will vote on a ranking of the projects.

Best Project Award

A jury will assess all projects at the end of the semester. Outstanding projects will be awarded with honorable mention and best project awards.

Schedule

See calendar. Note that the schedule is subject to (minor) changes. So, please check the site frequently.

Midterm Evaluations (In-class quizzes)

Midterm evaluations (see below) provides feedback to students and instructor as basis for (self-)assessment of their course progress. Two in-class quizzes (30-40 minutes each) will be conducted, each of which will be graded contributing to the overall grade with 10% each (20% in total).

- Quiz 1: 09/27/2018
- Quiz 2: 11/20/2018

Exam

There will be NO final exam.

Final Demo

Project groups will give a final presentation, which significantly extends all previous project presentations (oral or written). In particular, this presentation shall comprise a fully functional prototype of what has been developed. Final project demos will be graded by the instructor and TAs.

The grade of the final demo contributes 10% to the overall grade. Please see above for further details on grading project components.

Course Policies

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Anti-Harassment Policy

We will implement a strict anti-harassment, zero tolerance policy in line with the institution's general anti harassment policy as it is defined here: http://titleix.gatech.edu/anti-harassment-policy.

Honor Code

Students are expected to follow the Georgia Tech Honor Code, available at http://osi.gatech.edu/content/honor-code, including but not limited to the section on plagiarism (see below).

Attendance & Class Participation

Students are encouraged to attend all sessions. Attendance is **mandatory** (and will be monitored) for all class activities (as specified in the calendar). These include:

- all practical, in-class exercises
- all in-class quizzes
- all in-class project presentation
- all project critique sessions
- all feedback sessions

See the course calendar for details of the schedule.

Active participation in class activities contribute to the final grade (total of max. 10% — see grading scheme). Actively attending one activity session — that is being in class on time, registering on attendance list, and actively contributing to the session through, for example, constructive discussions

and work on assignments / exercises — will earn students ten points. A total of 100 points will translate into full marks for attendance and class participation contributing 10% to the overall grade.

Students are expected to be in class on time — as a courtesy to fellow class mates as well as to the instructor. Instructors and TAs will do the same.

Group Work

Group work is explicitly encouraged for the project students will be working on throughout the course. Project reports will be written in groups (all members of a team submit the same report and receive the same grade). Group discussions in the classroom will be fostered — at appropriate times — throughout the course.

Academic Misconduct: Plagiarism & Cheating

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Instructor(s) and TAs will implement a zero-tolerance policy on plagiarism & cheating. This policy is based on the Code of Conduct as cited by the Georgia Tech Honor Code.

As per the Georgia Tech honor code, plagiarism is defined as

“Submission of material that is wholly or substantially identical to that created or published by another person or person, without adequate credit notations indicating authorship (plagiarism);“
[http://osi.gatech.edu/content/honor-code]

Plagiarism or any other kind of cheating as defined by the Georgia Tech Code of Conduct will result in failing the course.

As a reminder it is worth noting that attendance sheets will be treated the same way as any other material that shall be submitted by students. Signing up for anyone else other than oneself is considered forgery and counts as cheating for both parties involved.

Submission Policy

All work needs to be submitted through Canvas using the Assignments feature. For group assignments only one submission per team has to be made. We will use the group feature in Canvas as soon as project teams are finalized. TAs will assist students with submissions.

Acceptable format for written reports is PDF (only).

Acceptable format for slides *submission* (not presentation) is PDF (only). Use your favorite presentation software for the presentation in class but please export slides to PDF for submission to Canvas. Alternatively, students may submit links to online resources (such as Google Slides) that can be used for in-class presentations.

When submitting videos, please use standard codecs that can be played on either Mac or Windows machines (test before). However, it is strongly encouraged to rather provide links to online resources (such as youtube) were the videos have been uploaded.

Extensions, Late Assignments, & Re-Scheduled / Missed Exams

Late assignments will not be accepted without a suitable excuse (doctor's note, police report, etc.). Note that extenuating circumstances have to be brought to the instructor's attention before the fact — through the regular channels, that is *do not send doctor's notes to the instructor or TAs* but rather send them to student services who will get in touch with the instructor.

Late submission without evidence of extenuating circumstances will result in zero marks for the particular component.

Missing an in-class activity linked to a group assignment — This should be avoided at all cost as it will substantially complicate the group work. In case of a planned absence (e.g., for interviews) students are required to communicate this well in advance such that the team and instructor can discuss options. In case of unplanned yet excused absences (illness etc.) instructor and team will discuss options on how a student can make up what has been missed.

Missing an in-class quiz — without evidence of extenuating circumstances as defined before — will result in failing the quiz and thus zero marks for this component. However, in case of extenuating circumstances as defined before quizzes / exams may be rescheduled or other accommodations discussed— according to the official Gatech policy and procedure.

In any case it is strongly advised to consult with the instructor well in advance (at least one week notice) should extenuating circumstances result in extraordinary difficulties with the schedule. Within the constraints of fair treatment and within reason we will always aim for finding a satisfying solution.

Use of Mobile and other Electronic Devices in the Classroom

As a courtesy to fellow learners — and to the instructors — students are asked to switch off their phones during class. Instructors and TAs will do the same.

The general use of electronic devices, such as laptops, tablets etc. is encouraged during class *for note taking and activities related to the class (only).*

Learning Resources

Textbook

We will make use of the following textbook:

Krumm, J. (2009). Ubiquitous Computing Fundamentals (1st ed.). Chapman & Hall/CRC.
http://www.amazon.com/Ubiquitous-Computing-Fundamentals-John-Krumm/dp/1420093606

This semester we will put more focus on scientific articles rather than on a single textbook. The majority of the readings will be provided through the course website. For some assignments — and of course for the project work — students are expected to conduct their own, independent literature research (and reading).

Readings

Students are expected to read the required readings **prior to the session when they are due**. Class discussions and any examinations will assume familiarity with any reading material as distributed through the course website. All the readings and when they are due will be posted on the Canvas. Occasionally, a short written assignment (some of them graded) will accompany a reading to help prepare students for any in-class discussion.

Rapid Prototyping (Lab)

A selection of electronics and hardware rapid prototyping equipment and tools will be provided to teams on a first come first served basis. Students will have access to both the GVU Prototyping Lab as well as the GT Invention Studio where maker equipment such as laser cutter and 3D printer can be used.

Important: Prior to using the equipment, students must attend an orientation session within these labs. Without this orientation students will not be able to use the equipment. Please visit the websites and schedule orientation sessions independently.

Course Calendar

Weekly lecture topics, readings and other assignments and project due dates will all be posted on Canvas. Please visit this page often as it will be updated regularly.