

Course Information

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| Instructor | Alex Mariakakis (email) and Edward Wang (email) |
| Teaching Assistant | Eric Whitmire (email) |
| Time | Thursdays, 6:00PM – 8:50PM (EEB 003) |
| Office Hours | Tuesdays, 9:00PM – 10:00PM (CSE 507) |

Course Description

The aim of this class will be to introduce you to ubiquitous computing (ubiquitous computing). We will focus on how traditional topics of computing have evolved to support the vision of a connected, portable, and a human-centric computing environment. The course will include discussion into contribution of various fields, including human-computer interaction, embedded computing, computer vision, distributed systems, machine learning, and electrical engineering. You will gain practical experience in developing sensing systems in different application domains, such as activity recognition, health sensing, gestural interaction, etc. The course will be a combination of lectures, tutorials, class discussions, and demonstrations. You will be evaluated on your class participation, reading summaries, and individual assignments/mini-projects (6 assignments in total). Lectures and discussion will occur during the first half of class-time and the second half will consist of tutorials on how to build and prototype various ubiquitous computing systems. The assignments will help you practice these concepts. You are allowed to work in groups to learn the material, but are required to complete and submit individual work. There are no pre-requisites for the course.

Schedule

| Date | Discussion Topic, Readings, and/or Videos | Lectures and Tutorials | Assignments |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------------------|
| Thu Mar 29, 2018 | Introduction to Ubiquitous Computing | What is UbiComp? Sensors | A0 assigned |
| Thu Apr 05, 2018 | History of UbiComp Required: The Computer for the 21st Century Mark Weiser, Scientific American, September 1991. | Android | A0 due A1 assigned |

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|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------|
| | Optional: Charting Past, Present, and Future Research in Ubiquitous Computing Gregory Abowd and Elizabeth Mynatt, ACM TOCHI 2000. What next, Ubicomp? Celebrating an intellectual disappearing act Gregory Abowd, UbiComp 2012. | | |
| Thu Apr 12, 2018 | Novel Interaction Required: Soli: Ubiquitous Gesture Sensing with Millimeter Wave Radar Jaime Lien et al, SIGGRAPH 2016. Optional: Tomo: Wearable, Low-cost, Electrical Impedance Tomography for Hand Gesture Recognition Yang Zhang and Chris Harrison, UIST 2015. | Signal Processing | |
| Thu Apr 19, 2018 | Activity Tracking Required: A Long-Term Evaluation of Sensing Modalities for Activity Recognition Beth Logan et al, UbiComp 2007. Optional: Inferring Activities from Interactions with Objects Matthai Philipose et al, PerCom 2004. | Machine Learning | A1 due A2 assigned |
| Thu Apr 26, 2018 | Smart Homes Required: ElectriSense: Single-Point Sensing Using EMI for Electrical Event Detection and Classification in the Home Sidhant Gupta et al, UbiComp 2010. Optional: Televisions, video privacy, and powerline electromagnetic interference Miro Enev et al, CCS 2011. | Neural Networks | |

| Date | Discussion Topic, Readings, and/or Videos | Lectures and Tutorials | Assignments |
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| Thu May 03, 2018 | <p>Low-Power Sensing</p> <p>Required: Energy-efficient computing for wildlife tracking: design tradeoffs and early experiences with ZebraNet Philo Juang et al, ASPLOS 2002.</p> <p>Optional: EM-Comm: Touch-based Communication via Modulated Electromagnetic Emissions Chouchang 'Jack' Yang and Alanson P. Sample, UbiComp 2017.</p> | <p>Arduino</p> | <p>A2 due A3 assigned</p> |
| Thu May 10, 2018 | <p>Health Sensing</p> <p>Required: BiliScreen: Using Mobile Phones to Monitor Newborn Jaundice Alex Mariakakis et al, UbiComp 2017. Video: Monitoring our health the way we monitor the weather Edward Wang, TEDxSanJuanIsland.</p> | | |
| Thu May 17, 2018 | <p>Fabrication</p> <p>Required: HapticPrint: Designing Feel Aesthetics for 3D Printing Cesar Torres et al, UIST 2015. BlowFab: Rapid Prototyping for Rigid and Reusable Objects using Inflation of Laser-cut Surfaces Junichi Yamaoka et al, UIST 2017. LaserOrigami: Laser-Cutting 3D Objects Stefanie Mueller et al, CHI 2013. faBrickation: Fast 3D printing of Functional Objects With Building Blocks Stefanie Mueller et al, CHI 2014. A Series of Tubes: Adding Interactivity to 3D Prints Using Internal Pipes Valkyrie Savage et al, UIST 2014. Acoustruments: Passive, Acoustically-Driven, Interactive Controls for Devices Gierad Laput et al, CHI 2015.</p> | <p>3D Printing</p> | <p>A3 due A4 assigned</p> |

| Date | Discussion Topic, Readings, and/or Videos | Lectures and Tutorials | Assignments |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------|
| Thu May 24, 2018 | Wearables Required: Glabella: Continuously Sensing Blood Pressure Behavior using an Unobtrusive Wearable Device Christian Holz and Edward Wang, UbiComp 2017. Optional: Chroma: A Wearable Augmented-Reality Solution for Color Blindness Enrico Tanuwidjaja et al, UbiComp 2014. | Arduino to Android | A4 due A5 assigned |
| Thu May 31, 2018 | Edge Computing Required: Edge Computing: Vision and Challenges Weisong Shi et al, IEEE Internet of Things Journal. Optional: MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications Andrew G. Howard et al, arXiv. | | |
| Thu Jun 07, 2018 | | | A5 due |

Reading Summaries

You are expected to read the papers or watch the videos before each lecture to prepare for an engaging and meaningful in-class discussion. You are also expected to submit summaries on Canvas ([link](#)) by midnight before the corresponding lecture (see class schedule).

The response should be at least 5 sentences long. The post can summarize the paper in your own words, propose future directions that the work can take, pose questions about the work, or follow-up on someone else's response.

Grading and Late Policy

If you anticipate being absent during a class when an in-class demo is supposed to be given, you may demo your assignment at a later time, but you must submit your code on time and email the instructor(s) beforehand to make arrangements. Late code submissions will not be able to earn points for the demo portion of the grade, but can still earn full points for the code portion. Exceptions will only be given in extreme or unforeseen circumstances.

Late reading summaries will not be accepted.

| Component | Percentage |
|------------------------------------|-------------------|
| Assignment 0 | 5% |
| Assignment 1 | 10% |
| Assignment 2 | 10% |
| Assignment 3 | 10% |
| Assignment 4 | 10% |
| Assignment 5 | 10% |
| Weekly reading summaries | 20% |
| Participation in class discussions | 25% |