

EECS 250 - Advanced Topics in Computer Systems

Description

This course introduces advanced topics of computer systems, including operating systems, computer networking systems and mobile computing systems. The goal of the course is to cover a broad array of research topics in computer systems, and to engage you in top-flight research of systems. In this particular semester, Spring 2018, we will focus on mobile computing systems, edge computing systems, emerging networking systems and Internet of Things (IoT) systems.

Course outline

- Mobile computing
 - Deep Convolutional Neural Networks (CNNs) on smartphones and wearables
 - CNN-enabled mobile computing applications
 - Other mobile applications, such as Authentication and drone control
- Edge computing
 - Machine learning algorithms on Edges
 - Edge computing applications, such as virtual reality and video processing
- Wireless networking systems
 - Low power wide area networks
 - 60-GHz networks
 - Visible light communication and its applications
- Emerging IoT applications
 - Building occupancy estimations
 - Near-Field Communication
 - Localization
 - Privacy preserving

Grading.

- Paper summaries (30%): Each student will be required to read one paper per class. Some classes are scheduled with lectures or project discussion, but not paper reading. In this semester, we will read around 20 papers which are carefully selected from some top conferences by the instructor.
- Paper presentation (40%): In every class, one student or the instructor will present an assigned paper. The oral presentation should be within 40 min. The other students will ask questions after the presentation. *The student presenting the paper does not need to submit the paper summary.*
- Project (30%): Each student will, individually or in a group of at most two, execute a research project. The projects could be any topics related to computer systems, such as smartphone, wearable devices, drones, wireless systems, and data analytics systems on PCs. Each project will build a prototype of a computer system (e.g., an image processing system on smartphones, CNN implementation on smartphones or new interesting apps on smartphones), or reproduce some partial results obtained by the papers we read. By the end of the recess week, each student or group must finalize a project idea and submit a short project summary (1/2 page). In the first class after the recess week, we will discuss the ideas of everybody. *The midterm project description and discussion contribute 10% to the final score.* At the end of the term, each student or group must submit a *demo* abstract paper (2-3 pages, double columns, 10pt fonts) and present their paper in class. *The final project report and presentation contribute 20% to the final score.*

Prerequisites

No

Textbook

No

Program Learning Outcomes

At the end of this course, students will have hands-on experience with the development of computer systems; gain deep knowledge of the recent development of networking systems and mobile computing systems; identify the major research challenges in current research of systems; and be conversant with performance analysis and evaluation of computer systems. Through lectures, readings, homework assignments, and projects, students will demonstrate:

- Are able to identify novel and significant open research questions in computer systems, especially wireless networking systems and mobile computing systems.
- Are able to situate the above questions in the contexts of current research literatures.
- Are able to apply their knowledge of computing, mathematics, science, and engineering to the analysis of technological problems, as well as to the design and implementation of viable solutions to those problems.
- Possess the characteristics of lifelong learners; they are able to acquire and use new techniques, skills, and engineering and scientific tools for research and development in electrical engineering and computer science, as well as to develop new methods and make new discoveries.
- Practice a high standard of professional ethics, including integrity in the conducting and writing of research.
- Communicate effectively through oral, visual, and written means, effectively addressing a broad range of technical audiences.

Academic Integrity

Academic integrity policy. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work. Students are encouraged to study together and to discuss information and concepts covered in lectures. Students can provide/receive "consulting" to/from other students. However, the permissible cooperation should never involve one student having possession of a copy of all or part of the work done by someone else, in the form of an email, an email attachment file, a storage device, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will receive zero credit for the corresponding assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action. During examinations, each student has to do only their own work. Talking or discussing is not permitted, nor students comparing their papers, copying from others, or collaborating in any way. Any collaborative behavior during examinations will result in failure of the exam and may lead to failure of the course and University disciplinary action.

Disability service information

Accommodations for students with disabilities: The University of California, Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design diversity. I am available to discuss appropriate academic accommodations that may be required for students with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual

circumstances. Students are encouraged to register with the Disability Services Center to verify their eligibility for appropriate accommodations.

Instructor

- Instructor: Wan Du
- Office Hours: Tue 10:00 m to 11:15pm at SE2 208.
- Webpage: <http://faculty.ucmerced.edu/wdu/>
- Email: wdu3@ucm.edu

Class schedule

We will read and discuss papers published in top conferences, including ACM ASPLOS, ACM SIGCOMM, ACM MobiSys, ACM MobiCom, ACM SenSys, ACM/IEEE IPSN, and ACM/IEEE SEC. The papers listed in the below table are some papers suggested by the instructor. These papers can be replaced by some papers which the students are more interested in. To provide the other students sufficient time to read the paper, the request of changing a paper must be submitted to the instructor two weeks before the class and approved by the instructor.

Date	Presenter	Papers
01/16	Wan	Lecture: Introduction of computer systems and the course plan
01/18	Wan	Lecture: The Internet of things and networked embedded systems
01/23	Wan	<i>Empowering Low-Power Wide Area Networks in Urban Settings</i> , SIGCOMM' 17
01/25	Wan	Lecture: Mobile computing systems
01/30	Wan	<i>Indoor Follow Me Drone</i> , MobiSys' 17
02/01	Wan	Lecture: Convolutional Neural Networks
02/06	Wan	<i>Neurosurgeon: Collaborative Intelligence Between the Cloud and Mobile Edge</i> , ASPLOS' 17
02/08		<i>CAT: High-Precision Acoustic Motion Tracking</i> , MobiCom' 16
02/13		<i>LEO: Scheduling Sensor Inference Algorithms across Heterogeneous Mobile Processors and Network Resources</i> , MobiCom' 16
02/15		<i>Accelerating Mobile Audio Sensing Algorithms through On-Chip GPU Offloading</i> , MobiSys' 17
02/20		<i>DeepMon: Mobile GPU-based deep learning framework for continuous vision applications</i> , MobiSys' 17
02/22		<i>MobileDeepPill: A Small-Footprint Mobile Deep Learning System for Recognizing Unconstrained Pill Images</i> , MobiSys' 17
02/27		<i>DeepEye: Resource Efficient Local Execution of Multiple Deep Vision Models using Wearable Commodity Hardware</i> , MobiSys' 17
03/01		<i>DeepIoT: Compressing Deep Neural Network Structures for Sensing Systems with a Compressor-Critic Framework</i> , SenSys' 17
03/06		<i>DeepASL: Enabling Ubiquitous and Non-Intrusive Word and Sentence-Level Sign Language Translation</i> , SenSys' 17
03/08		<i>Furion: Engineering High-Quality Immersive Virtual Reality on Today's Mobile Devices</i> , MobiCom' 17
03/13		<i>Towards Efficient Edge Cloud Augmentation for Virtual Reality MMOGs</i> , SEC' 17
03/15		<i>Where's The Bear?- Automating Wildlife Image Processing Using IoT and Edge Cloud Systems</i> , IoTDI' 17
03/20		<i>ParkMaster: An in-vehicle, edge-based video analytics service for detecting open parking spaces in urban environments</i> , SEC' 17
03/22		<i>iBlink: Smart Glasses for Facial Paralysis Patients</i> , MobiSys' 17
03/27		No class - Recess week. The project description (1/2 page) is due by the end of this week.
04/03	All	Discussion on the project ideas.
04/05		<i>Pulsar: Towards Ubiquitous Visible Light Localization</i> , MobiCom' 17

04/10		<i>PassiveVLC: Enabling Practical Visible Light Backscatter Communication for Battery-free IoT Applications</i> , MobiCom' 17
04/12		<i>Automating Visual Privacy Protection Using a Smart LED</i> , MobiCom' 17
04/17		<i>Glimpse: A Programmable Early-Discard Camera Architecture for Continuous Mobile Vision</i> , MobiSys' 17
04/19		<i>MagneComm: Magnetometer-based Near-Field Communication</i> , MobiCom' 17
04/24		<i>Non-Intrusive Multi-Modal Estimation of Building Occupancy</i> , SenSys' 17
04/26	All	Final project presentation
05/01	All	Final project presentation
05/03	All	Final project presentation