ESE537: Mobile Sensing Systems and Applications (Fall 2023)

Syllabus

1. Course Staff and Office Hours

Name	Email	Office Hours	Office	Phone
Fan Ye Instructor	fan.ye@ stonybrook.edu	TuTh 2-4pm by appt	Light Engr 217	631-632-8393

2. Course Description

This is a graduate course focusing on recent advances and developments in mobile sensing systems and their applications, especially those leveraging mobile, embedded devices and AI/ML algorithms for various applications. Topics include: conventional mote-class sensor networks, participatory sensing leveraging mobile devices, intelligent hardware and Internet-of-Things, location sensing, edge/cloud learning systems and AI/ML algorithms for applications in smart health care, smart homes, buildings, transportation and environment. Students need to read the latest literature and write reviews, work on research projects and develop solutions, present their work and write formal reports. The practice of the basic research skills are major components. The course intends to be self-sufficient and prior experiences in programming, mobile devices and embedded systems, especially backgrounds in basic AI/ML algorithms and software, are highly recommended.

3. Objectives

The course intends to give students a broad understanding of the evolution and latest development in mobile sensing systems and applications, from conventional mote-class sensors, to mobile/customized device based sensing, and most recent sensing applications leveraging AI/ML algorithms and infrastructure. Students will also be trained for essential research skills, including literature study and critique, oral presentation, problem formulation, solution development, and formal writing. Through hand-on and cutting edge research problems, students can practice their skills by developing and evaluating designs through prototypes and/or simulations.

4. Readings

Readings will be mostly research papers, plus online materials which will be distributed in advance.

5. Content

1. Mote-class sensing systems: different sensor node platforms and MAC technologies, data dissemination, applications in structure, environment and data center monitoring
2. Mobile device based sensing systems: characteristics of modern mobile devices (e.g., smartphones, tablets) and their embedded sensors
3. Participatory sensing: the paradigm, common mathematical and algorithmic techniques, applications in transportation (e.g., fuel efficiency, road monitoring), activity recognition, fitness/health monitoring (e.g., sleep quality, exercise), environment monitoring (e.g.,

noise, pollution)
4. Customized sensing systems, especially those leveraging AI/ML techniques for health data (e.g., customized radios for sensing of human activities, body postures, vital signs and locations) and emerging applications (e.g., aging population, screening and surveillance of diseases, vehicles and drones).
5. Edge and cloud learning systems/infrastructure and related AI/machine learning algorithms for applications (e.g., streaming data, time series data).

6. Grading

The grade will be based on attendance, presentation, assignments, and one hand-on project where high quality reports are expected.

Attendance and discussion	20%
Oral presentation	20%
Assignments (Paper/material reviews)	20%
Project (execution, report, presentation)	40%

7. Disability

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, 128 ECC Building (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation are confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information, go to the following web site: http://www.ehs.sunysb.edu and search Fire Safety and Evacuation and Disabilities.

8. Academic Honesty

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

9. Conduct

The University at Stony Brook expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to observe national, state, and local laws and University regulations; and to respect the rights, privileges, and property of other people. Faculty are required to report disruptive behavior that interrupts faculty's ability to teach, the safety of the learning environment, and/or students ability to learn to Judicial Affairs.