CS 59000-MSC: Mobile Sensing, Computing, & Applications

Course Description:

This course will introduce cross-disciplinary ideas, techniques, and algorithms in mobile computing, with an emphasis on how they can be composed to build systems and applications for smartphones, wearables, quadcopters, and other mobile devices. Topics of interest include multimodal sensing (on smartphones, smartwatches, wearable glasses), energy efficiency, Internet of Things (IoT), indoor localization, augmented reality, activity and gesture recognition, CPU-offloading, and sensor data analytics. The course will end with a system/app that students develop and demonstrate using techniques learnt in class (or additional techniques in discussion with the instructor).

Lecture Time & Location: Tuesday & Thursday 1:30 pm - 2:45 pm in Felix Haas Hall G066

Instructor: He Wang (hw@purdue.edu)

Course Website: https://www.cs.purdue.edu/homes/hw/courses/cs590msc/

Topics:

- **GPS and indoor localization**: Why don’t we have indoor navigation today ... what are the challenges?
- **Activity and gesture recognition**: Can wearable devices like smartwatches track our movements and behavior?
- **Augmented reality**: What are far cooler applications, beyond Pokemon Go :-) ... What are the hard problems?
- **Drones, smart toys, and sports analytics**: How everything around is becoming alive, agile ...
- **Smart cars and connected cities**: Core questions in an autonomous car? Can we control city-scale traffic?
- **Privacy (via sensor side channels)**: Can one sensor behave like another? Can your accelerometer act as a microphone?
• **Sensing through wireless signals (WiFi, vibrations):** Can you detect human activity via WiFi signals?

• **Energy efficiency and cloud offloading:** How energy is critical; how cloud and local CPU needs to be traded?

**Some More Details:**

• Prerequisites: Probability, linear algebra, programming maturity on any one language needed.

• Experience on mobile platforms a plus but not mandatory: Android tutorials will be offered.

• No text book required – materials will be in the form of slides and handouts.

• Coarse load entails (1) mini programming assignments; (2) some homeworks, reading assignments, and writing reviews; (3) one major project.

• Mobile devices for projects (e.g., smartphones, wearables) can be provided.

**Grading:**

• Homework, reviews and presentation: 20%.

• Programming assignment: 20%

• One mid-term exam: 25%

• Final Project: 35%

• The mid-term will be a normal course period. No final exams.