

# EEL 6788 - Advanced topics in wireless networks

Focus on urban sensing

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# Welcome to EEL 6788 - Advanced topics in wireless networks

- This class is a vehicle for students to immerse themselves into current research topics in wireless networks.
- To clarify a misunderstanding caused by the EEL prefix: this is not an electrical engineering class. Our perspective is computer science computer engineering: software, networking protocols, some hardware. We are not interested in antennas, signal processing etc.
  - ▶ EE majors are, of course welcome to the class.
- Every year, we choose a different topic. Previously we had:
  - ▶ Ad hoc networks
  - ▶ Sensor networks
  - ▶ Sensor networks from an agent perspective

# This year's topic: urban sensing

- How to use the ubiquitous personal devices
  - ▶ best example being smartphones
  - ▶ ... but also cameras, watches, personal health monitors etc.
- to **sense** our environment
- **collect, validate, integrate** and **secure**

the data

- and **deliver** it to interested customers, either centralized or distributed.
  
- Also known as **participatory sensing, urban computing** etc.

# Example 1: real time distributed environment monitoring

- monitor the level of allergens in areas around the city
- use the cell phone's sensor to sense the data
- distribute the information
  - ▶ to centralized locations where a map is created
  - ▶ peer to peer to people who are interested

## Challenges

- How do we know that people are interested?
- What is the motivation in sending?
  - ▶ Free-rider problem

## Example 2: citizen science

- setting up a study which monitors some environmental value important to the community
  - ▶ e.g. noise, pollution, vibration caused by trucks, water quality
- real world studies are **very** expensive
- use cellphones to record data, send it to a central location

### Challenges

- Do we trust the data?
  - ▶ Can we prevent malicious users to distort the values?
  - ▶ What about recording errors?
  - ▶ The issue of motivation

## Example 3: price arbitrage

- prices of products show a variation across stores
- stores rely on the fact that comparison shopping is expensive
  - ▶ time
  - ▶ fuel cost
  - ▶ attention span
- use peer-to-peer networks to record / take a picture of prices
- distribute it to interested parties.

### Challenges

- Motivation, free-riders, trust
- Conflict of interest: do I want to share the deal I found?
  - ▶ **Idea:** prospect of mutual benefit

# Who is interested in urban sensing?

- Industry
  - ▶ Microsoft
  - ▶ Nokia
- Academia
  - ▶ UCLA
  - ▶ Dartmouth
  - ▶ MIT
- Startup companies

# About the instructor

- Damla Turgut
- <http://www.eecs.ucf.edu/~turgut>
- HEC-317, [turgut@eecs.ucf.edu](mailto:turgut@eecs.ucf.edu) (**preferred**), phone: (407) 823-6171
- Class time: MW 9am-10:15am
- Office hours: MW 3pm-6pm
- Research interests:
  - ▶ wireless networks (sensor, ad hoc, etc.)
  - ▶ mobile computing
  - ▶ embodied agents

# Class organization

- It is a **research class**. Goal is to collectively explore an interesting new domain.
- Strong emphasis on student participation.
- The culminating experience (and determining factor of the grade) is the **project**
  - ▶ real world smart-phone application (Android, iPhone, WebOS etc)
  - ▶ real world PC-simulated smart-phone application (eg. Android emulator)
  - ▶ netbook apps
  - ▶ simulation of urban sensing scenarios (YAES etc.)
  - ▶ surveys
- Projects with programming components can be 1-2 persons, survey projects are 1 person only.
- Objective: projects as scientific papers.

# Class deliverables and grading

- Presentation (20%)
- Project (60%)
- Homeworks (20%)
  
- Standard 90/80/70/60 scale will be used for final grades.
- However, the instructor may use +/- grading for the final grades.

# Presentation

- Research a topic in urban sensing and present it in class in a 20 min presentation.
  - ▶ The goal is to be able to cover more material than if I would have to lecture.
  - ▶ The goal of the presentation is to **teach us**.
- It is usually centered around a single application. I would expect it to be a bit more than summarizing a paper: you need to read the background of the persons, the circumstances etc.
- Example: **CenceMe** from Dartmouth. Yes there is a paper which describes the Nokia N900 version. But there is also a later iPod application, it might be that there is a small company as well etc.
- I will put up a series of suggested topics, you can come with your own.
- Send me the presentation in Powerpoint, OpenOffice or PDF ahead of time such that I can put it on the webpage.

# Project

- Real world application using a smartphone platform (Android, iPhone etc.)
  - –//– with smartphone emulated on a PC (eg. Android emulator)
  - –//– simulated on a PC (eg. YAES ...)
  - Netbook apps (preferable using peer-to-peer wireless)
  - Surveys
- 
- Programming projects 1-2 person, surveys 1 person **only**.
  - You can get away without programming, but you then you need to **read** a lot.

# Project as paper

- Check the website for the exact deliverables of a project.
- They are structured such that you can send the project to a conference / journal.
- ... and I think you should
- ... consider it as an exercise in a research project

# Homeworks: reading assignment

- Two or three reading assignments on papers relevant to the topic.
- Deliverable: 500 word summaries on the papers.

# Timeline (tentative)

- **January 31:** Decide on the project, assemble the teams.
  - ▶ Make sure you have a half page description about the specification of the project: what tools are you going to use, what functionality do you expect to work at the end of the project.
- **February 28 - March 2:** Half time report of the projects (no class presentations)
  - ▶ Some code should be working... Ideal report: we have done most of the functionality, but we need some debugging.
  - ▶ The final report is already started, with the already accomplished
  - ▶ Show me your progress: come to the office hours and demo it, show it over skype, send me a video, etc.
- March 2: Homework 1 due (presentations 1/26 - 2/28)
- April 11: Homework 2 due (presentations 3/2 - 4/6)
- **April 13-25:** in-class presentations of the projects
  - ▶ Focus on **demo**
- **April 27:** final reports due
- April 30: Homework 3 due (all the project presentation writeups due)

# Tegrity issues

- The first preference would be to actually come to the class for your presentation and present your project.
- But you can record your presentation and we will play them in class:
  - ▶ Using the Powerpoint record presentation mode.
  - ▶ Video tape it.
  - ▶ Use the Tegrity recording feature.
  - ▶ ... I am open to other technological approaches, e.g. video conferencing.
    - ★ A challenge is that it needs to retain an accessible Tegrity record.