New York University
Center for Urban Science + Progress

Rapid Prototyping of Urban Sensors:
Bottom-up techniques for building and deploying sensors
CUSP-GX-6004-002

Summer 2015
Thursdays, 17:30-20:30
Location: 2 MetroTech Center Rm 816

Instructor: Nicholas Johnson, Ph.D Candidate, nicholas.johnson@nyu.edu
Teaching Assistant: Mohit Sanjay Sharma, CUSP Assistant Research Scientist,
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Office Hours: TBD

Prerequisites
Graduate standing in CUSP. Non-CUSP students by permission from CUSP Program Director.
This course is discouraged for student who have taken the "*Quantified Self About Town*" course at
NYU ITP.

Course Description
Urban science revolves around using data to explore and answer questions about cities. Often this
data is available through a variety of sources and is easily obtainable. In some cases, however, the
necessary data may not exist and the need for building and deploying sensors becomes necessary.
Simultaneously, the recent onset of new low-cost technologies, the ubiquitous use of wifi and cellular
communication and a drive for smart and sustainable cities have opened the possibility for rapid
prototyping and deploying of sensors in urban spaces. Given this context, what can we learn about
cities from the deployment of sensors and how can we leverage these technologies to better
understand a city's infrastructure, environment and people?

This course will introduce the fundamentals of prototyping sensors and the techniques and
considerations for deployment in urban spaces. Through the course students will learn the basics of
electricity, programming micro-controllers, reading analog/digital inputs and wireless data
transmission. Students will be challenged to not only explore sensor integration and data collection
but to also think more broadly on how deploying sensors can help quantify and understand an urban
issues.

Course Objectives
- Understand how to convert digital/analog signals into data, understand what those signals actually represent and understand the considerations needed for deployment (data storage, transmission, power etc..)
- Understand the role and potential role for deploying sensors in urban areas
- Ability to quickly build and deploy a sensor to measure some phenomenon

Required Text
Will distribute prior to class.

Recommended/Suggested Readings
- *Physical Computing: Sensing and Controlling the Physical World with Computers*, Dan O'Sullivan and Tom Igoe ©2004, Thomson Course Technology PTR; ISBN: 159200346X
- *Make: Sensors*, Tero Karvinen, Kimmo Karvinen & Ville Valtokari ©2014, Maker Media Inc
- *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia,* Anthony Townsend, Norton and Company Inc New York, NY, 2014

Course Requirements
- Weekly assignments and reading
- Midterm/Final Term Projects
- Attendance and participation in discussions

Course Materials
Students are required to have their own Arduino. The *Budget Pack for Arduino* is recommended and available from adafruit.com though students may opt for other kits.

Grading

Weekly assignments and labs	25%
Participation and attendance	15%
Midterm project	20%
Final project	40%
	100%

NYU Classes
You must have access to the NYU Classes site (http://classes.nyu.edu/). All announcements and class-related documents (supplemental and suggested readings, discussion questions, etc.) will be posted there.

Some class announcements will be distributed via NYU e-mail. Thus, it is important that you actively use your NYU e-mail account, or have appropriate forwarding set up on NYU Home (https://home.nyu.edu/).

Statement of Academic Integrity

NYU CUSP values both open inquiry and academic integrity. Students graduate programs are expected to follow standards of excellence set forth by New York University. Such standards include respect, honesty, and responsibility. The program does not tolerate violations to academic integrity including:

- Plagiarism
- Cheating on an exam
- Submitting your own work toward requirements in more than one course without prior approval from the instructor
- Collaborating with other students for work expected to be completed individually
- Giving your work to another student to submit as his/her own
- Purchasing or using papers or work online or from a commercial firm and presenting it as your own work

Students are expected to familiarize themselves with the University's policy on academic integrity and CUSP's policies on plagiarism as they will be expected to adhere to such policies at all times – as a student and an alumni of New York University.

The University's policies concerning plagiarism, in particular, will be strictly followed. Please consult the *Chicago Manual of Style* for guidelines on citations. Do not hesitate to ask if you have any questions regarding writing style, citations, or any academic policies.

Course Outline

Week 1 - May 28th: Cities and Technology; Introduction to Electricity

Week 2 - June 04: Electrical components and programming micro-controllers

Week 3 - June 11: Sensors I: Overview of available sensors options, how sensors produce data

Week 4 - June 18: Sensor II: Small Data and Citizen Sensors

Week 5 - June 25: Data logging, location and ensuring data quality,

Week 6 - July 02: Wireless data transmission

Week 7 - July 09: Connecting to the web

Week 8 - July 16: Considerations for urban deployment

Week 9 - July 23: Final Presentations