**Invited Speaker:** Dan Work

**Date:** Monday, February 20, 2017

**Time:** 10:45 – noon

**Location:** Rice Hall, Room 242

**Host:** T Donna Chen

**Title:** From mobile sensing to mobile actuation: How smarter vehicles are shaping what we know about urban traffic

**Abstract**

Transportation systems are undergoing dramatic changes enabled by rapid advances in sensing and automation technologies increasingly integrated into the vehicle fleet. On the sensing side, GPS equipped taxis provide new opportunities to measure urban traffic at a scale and resolution that was not possible even a few years ago. We first present a method to estimate the traffic conditions from coarse GPS taxi data, and then provide a technique to detect outlier conditions observed during extreme events. The approach is implemented with data from nearly 700 million taxi trips collected over a four-year period in New York City, and allows new traffic dynamics in the aftermath of disasters to be discovered. On the actuation side, autonomous vehicles provide opportunities to serve as mobile actuators of the bulk traffic flow. We explore the problem of controlling predominantly human piloted traffic flows with only a small number of autonomous vehicles in the stream. To illustrate the concepts, we modify the experimental setting of Sugiyama et al. (2008) and measure the influence of a carefully controlled autonomous vehicle on human piloted vehicles. Even when the penetration rate of autonomous vehicles is as low as 5%, we show it is possible to eliminate the presence of stop-and-go waves that are observable in congested traffic today.

**About the speaker:**

Daniel Work is an assistant professor in the Department of Civil and Environmental Engineering, the Department of Electrical and Computer Engineering (courtesy), and the Coordinated Science Laboratory at the University of Illinois at Urbana-Champaign. Prof. Work earned his bachelor of science degree (2006) from the Ohio State University, and a master of science (2007) and Ph.D. (2010) from the University of California, Berkeley, each in civil engineering. Prior to joining the faculty at Illinois, Work was a research intern at Nokia Research Center, Palo Alto from 2008-2009, and a guest researcher at Microsoft Research Redmond in 2010. Prof. Work has research interests in transportation cyber physical systems, traffic modeling, and infrastructure data analytics. Prof. Work’s honors include participation in the National Academy of Engineering’s 2017 China US Frontiers of Engineering Symposium and the 2016 EU US Frontiers of Engineering Symposium, the UIUC CEE Excellence Faculty Fellow award (2016), the UIUC ASCE Outstanding Professor award (2015), and the NSF CAREER award (2014).