CS 5984: Introduction to Urban Computing

Instructor
Naren Ramakrishnan

Times
Wed 4-6:45pm (originating in Northern Virginia, video to Blacksburg)

Pre-requisites:
Graduate student standing. Prior background in some high-level programming language is assumed.

PhD students in CS, STAT, MATH, ECE, CEE, SOC, PHS, and UAP are especially encouraged to take this course.

Short description:
This course focuses on the study of major issues that cities face (public health, energy management, emergency preparedness, traffic modeling, and societal stability) through the methods of mathematical modeling, statistical analysis, data mining, and visualization. The course will serve as the gateway into the newly created UrbComp PhD program at Virginia Tech (supported by NSF NRT). Students will be exposed to a broad range of data science technologies and their applications to problems in urban computing. The course will be a sequence of short modules comprising a combination of lectures, exploration of public datasets, and case studies of successful urban computing systems and implementations.

Topis covered (not exhaustive):
1. Mathematical modeling for cities
2. Graph mining techniques
3. Basics of computational epidemiology
4. Computational sustainability
5. Social media analytics
6. Urban analytics case studies

Textbooks/Reference Material:
Since urban computing is an emerging area, the primary reading material for this course will be drawn from research papers in the literature. The reading list is expected to include surveys, popular science books, and research papers such as (not an exhaustive list):

1. Yu Zheng, Licia Capra, Ouri Wolfson, and Hai Yang, Urban Computing: Concepts, Methodologies, and Applications, ACM Transactions on Intelligent Systems and Technology, Oct 2014.
2. A.M. Townsend, Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia, Oct 6, 2014.

3. Eagle, N., Pentland, A., and Lazer, D.,Inferring Social Network Structure using Mobile Phone Data**,** *Proceedings of the National Academy of Sciences (PNAS), 2009.*

Assessment:
Assessment will be conducted as a combination of the following components:
Assignments (4 X 15): 60%
Oral + Written Communication: 20%
Final Project: 20%