CSE 8803 IUC: Introduction to Urban Computing
Prakash, Spring '23, Georgia Institute of Technology

1. General Information
Instructor: Prof. B. Aditya Prakash, School of CSE, College of Computing
Contact: Please email badityap@cc.gatech.edu, with 'IUC 8803' in the subject
Course website: https://www.cc.gatech.edu/~badityap/classes/cse8803-iuc-Spring23/
Class Timings: Tuesdays and Thursdays, 2-3:15pm, Engineering Sci and Mechanics 201

2. Description
This course introduces various computational approaches for addressing the challenges that arise in urban environments such as energy management, emergency preparedness and traffic modeling. The course will discuss algorithms for storing, processing and mining data collected from urban settings. The course will consist of a mixture of computational methodologies and urban computing applications. There will be a special focus on topics such as epidemiology, sustainability, transportation, social science, and urban economics. The following topics (tentative) will be covered:

- Machine Learning Basics
- Network Science
- Spatial Modeling
- Trajectory Data Mining
- Time-Series Analysis
- Visual Analytics
- Public Health
- Urban Transportation
- Environment Monitoring
- Computational Sustainability
- Crowdfunding

From a methodology viewpoint the course will feature (i) Non-linear systems, (ii) Network algorithms, (iii) Stochastic Optimization, (iv) ML and neural models for spatio-temporal, graphs and social media data, (v) HPC simulations, and (vii) Visualization techniques. Students will be expected to participate in class discussion, submit assigned HWs and work on a project.

3. Background and Prerequisites
This is a graduate course and will be highly multi-disciplinary, and all the topics will span multiple areas. Students should have background in **at least one** of the following areas: data analytics, network science, algorithms, parallel computation, visualizations, urban analytics, mathematical modeling, statistics and optimization. Students will be encouraged to work in teams with complementary expertise, allowing them to explore new areas. Programming proficiency in at least one of Matlab, R, Python, C++, Java needed. 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.