Principles of Urban Informatics/ CUSP/ Fall 2019/ Syllabus

This course is the introduction to data and analytics strategies, tactics, tools that cities deploy in order to bring resolution to a wide variety of complex and important challenges and concerns. This will include detailed accounting of the use of data acquisition and management, integration, and analytics through the thorough investigation of case studies. In this course, the student will learn the major concepts, tools, and techniques for what informatics can do for cities. It includes background in how data management, visualization, and data science, have been successfully and unsuccessfully used in each case study. After this class you should be able to formulate a question relevant to Urban Science, find an appropriate data to answer the question, prepare and analyze the data, get an answer, to whichever confidence level, and communicate your answer, and your confidence level in the answer. *At times you will have a hard time figuring out the solutions to problems. Remember that we admitted you because we believed you would have a positive influence on the class, and that being at CUSP can fulfill your potential as an Urban Scientist. Don't worry about how much you already know, especially do not compare it to what other students know. You may have the wrong perception of your skills, and of the skills of your classmates, and your strengths and the strengths of your background may lie in another set of skills, just as important for an Urban Scientist. We are here to help you develop the skills you do not yet have and strengthen the skills you already have. You are here because we want you to be here and believe in your potential.*

This course should serve as the basis for all the following classes, and your future projects. The course will be organized in a modular fashion, with guest lectures.

The course will be structured following 3 modules:

Module 1: Introduction to Urban Informatics

During this module students will be introduced to the urban informatics construct and associated topics and will explore core concepts surrounding the Urban Informatics Ecosystem. They will get insight on sourcing data, analyzing data via statistical methods, and presenting data through written reports and visualizations. In Module 1 students will gain skills in working with Census and various other local open data , exploratory data analysis, and static data visualization.

Module 2: Urban Informatics Case Studies in Cities

In the course's second module, students will get introduced to a number of different case studies that utilize urban data and analysis to exhibit the value of the Urban Informatics Ecosystem. In this course we will dissect every portion of each case study in order to better understand problem scoping, data investigation and analysis, solution development, and ultimately how best to apply that solution for maximum impact. Students will also learn about the different types of informatics/analytics projects that can be deployed in an urban environment.

Module 3: Big Data and Smart Cities

In the course's final module, students will use knowledge acquired in earlier modules to explore urban data science in the context of smart cities. Classes will cover topics such as big data, open data, and smart cities, and civic hacking; and students will gain skills in real-time and crowd-sourced data collection and use, as well as in interactive data visualization. As the final project for the class, students will use novel sources of data to answer a research question of their choice.

Instructor: Dr. Amen Ra Mashariki, am8718@nyu.edu
office hours: TBD (or by appointment).

The Class assistants are:
Preksha Mutha: pjm526@nyu.edu
office hours: TBD
Anmol Kohli: anmol.kohli@nyu.edu
office hours: TBD

Books:
The primary textbooks are:

- Urban informatics: **Urban Analytics, Alex Singleton,SAGE 2018**

In addition, we will use the

- **Data Science from Scratch, Joel Grus , O'Reilly Media 2nd Edition**

Each week you will attend one lecture which will include time allotted as a "lab" session. **Attendance in lecture and lab is mandatory.**

Grades are based on

- **5% Pre-class assignments**
- **15% Class participation**
- **20% homeworks**
- **25% midterm**
- **35% final**

Weekly assignments will be handed out at the end of the class, and will be due strictly before the first class of the following week (meaning no submissions at all can be accepted after that as the homework may be reviewed in class, but refer to your session guidelines for the actual deadline!). Please come to class on time: at the beginning of each class you will be handed a "Pre-class assignment" to be answered **before each lecture**. You will have until 30 minutes into the class to answer them. The later you arrive at the class, the less time you will have to do the assignment. This will affect your grade. as described above. The assignments will cover the material in the previous classes, and the reading assignments.

Late homeworks will not be accepted. A single 72-hour exception is allowed throughout the semester, explicitly declare that you are going to use it, and do use it wisely. The lowest grade in the first half of the course (before midterm), and the lowest grade in the second half will be disregarded in assigning you a final grade. If you fail to turn in an assignment that will be a 0, and (likely) the lowest grade. This means you will lose the chance to disregard your worst performance. Homework will be exclusively received through NYU Classes.

Homework projects – When stated I will encourage you to work in groups of up to 5 people, but as a collaborative project where different group members lead different aspects of the work. A statement to that extent **must be included in the completed assignment**. *Midterm* and *Final* will include aspects of the work developed in the homework sessions. Failing to actively participate in

the homework will result in not being able to get the Midterm and Final done.

For the *Midterm* and the *Final* you are responsible for the reading, and the homework. **In preparing for the exams, use the homeworks as a guide to which material I believe is essential. In the Midterm and Final YOU WILL BE EXPECTED TO WORK INDIVIDUALLY.**

There may be opportunity for an extra credit project to catch your grade after the first half of the semester (grade counting toward participation)

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.

Lecture and reading schedule (subjects to change as needed!):

1. Lecture 1 (9/4 & 9/5):
   Lecture: Introduction to Urban Informatics
   Lab: Psychology of Problem Solving

2. Lecture 2: (09/11 & 09/12)
   Lecture: Introduction to the Urban Informatics Ecosystem
   Through the lens of various shared case studies we will discuss the ecosystem that exists within a city that is used to develop and execute analytics initiatives

3. Lecture 3: (9/18 & 9/19)
   Lecture: Introduction to Open Data analysis, How to find and use open data
   Lab: Open Data Driven exploratory analysis

4. Lecture 4: (9/25 & 9/26)
   Lecture: Introduction to GIS analysis, Understanding GIS data
   Lab: TBD

5. Lecture 5: (10/-02 & 10/03)
   Lecture: Hands on GIS project
   Case Study # 1 walkthrough (TBD)
   Lab: Students will use Arc GIS Online to execute and Urban Informatics problem

6. *Guest Lecture: (10/09* ***& 10/10****)*
   Noel Hildago

7. Lecture 6: (10/16 & 10/17)
   Lecture: Introduction to Machine Learning
   Introduction to Data Science and machine learning. Understand the core capabilities and foundational concepts of machine learning
   Lab: Walk through a Machine Learning example, and execute small chunks of code

8. **Lecture 7: (10/23 & 10/24)**
   Midterm

9. Lecture 8: (10/30 & 10/31)
   Lecture: Case Study # 1 walkthrough - Predicting Blight in Urban Neighborhoods
   Lab: Execute an ArcGIS Online

10. Lecture 9: (11/06 & 11/07)
    Lecture: Guest Lecture: Esri/ ArcGIS Online experts
    Lab: Case Study research

11. Lecture 10: (11/13 & 11/14)
    Lecture: Case Study # 1 (part 2) data analysis
    Explicitly walk through coding examples and the process of execution of real work that has been done to predict blight.
    Lab: Execute sample code within ArcGIS Online

12. Lecture 11:(11/20 & 11/21)
    Lecture: Case Study # 2 walkthrough – Inspections
    The class will learn about how the City of Chicago and other cities thought about the inspections process, and how data and analytics was used to help.
    Lab: Read and summarize papers in urban inspections processes

13. Lecture 11: (11/22 & 11/23)
    Lecture: Case Study # 2 (part 2) data analysis
    Using code base from git hub and at least 4 examples, we will walk through the data and examples of urban inspections.
    Lab: The students will add to the code base.

    Thanksgiving Break 27-29

14. Lecture 12: (12/04 & 12/05)
    Lecture: Advanced Machine Learning in the Urban Context
    Lab: Students will learn about machine learning contexts as well as metrics used to validate, and test analysis used for solving problems

15. Lecture 13: (12/11 & 12/12)
    Lecture: Guest Lecture/ Final Projects review
    Lecture: TBD

Dec week 3 (12/15-16-17): Final

The Final exam will be an individual project assignment: you are responsible for ALL OF THE MATERIAL.
