Urban Data Analytics

URBG 71000-01

Spring 2021 – 3 units

Instructor: Professor Mehdi Heris

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Location: classes are online via Zoom: this link (Meeting ID: 862 9151 9373) Passcode: measured
Class time: Tuesdays 7:35 PM - 9:25 PM (Jan 29, 2021 - May 25, 2021)
Office hours: TBA

In this course, we will learn how to find data sources and datasets and learn from them. This course situates data analysis tasks and interpretations in the context of urban planning and research methods. This course uses advanced quantitative and statistical methods for analyzing urban issues. To start this course, students are expected to understand basic computer literacy including file management, software installation, and cloud-based data backups (e.g. Dropbox, Google Drive, MS OneDrive). Students are also expected to have a basic mathematical knowledge and data manipulation in MS Excel.

This course uses the Python programming language as the main platform for data manipulation and statistical analysis. Students will learn basic data manipulation using Python and measurement of relationships using statistical methods. We will start by downloading data from NYC's open data catalog and reading them in Jupyter Notebooks. After basic data visualizations, we will start exploring the data using descriptive statistics. Then, the fundamentals of inferential statistics will be taught. The course work will culminate with a final project that students will carry out by choosing among a pool of datasets to answer independent research questions.

Learning Objectives:

The learning objectives of this course include:

1. To learn about online datasets, open data catalogs, and other relevant resources;
2. To learn descriptive statistics;
3. To learn relationships between planning-related variables in urban areas and modeling them using linear regressions;
4. To learn basic programming skills in Python;
5. And to learn how to use data analysis for critically evaluating existing planning policies and building future alternatives.

Sessions:

Sessions	Topics	Assignment Introduction	Assignment Due	Reading
Week 1 Feb 2nd	**Welcome and course introduction:** We will review the course plan, tools, assignments, readings, file management, and research design	Assignment #1: download a table, run some pivot table, read the csv in Python, get columns and info.		a) Grix (2002): entire paper b) Andrews (2003): pages 23-44 and 51-62

	fundamentals, and data manipulation in MS Excel.			c) Field et al. (2012): pages xxv-xxxiv and 1-18
Week 2 Feb 9th	**Let's read a CSV file in a Jupyter notebook!** We will download a table of NYC COVID-19 to the local drive. Then we will read the table in a Jupyter Notebook and learn about Pandas Dataframes in Jupyter Notebooks. What is a variable? What are data types? We will continue the research design and quantitative method discussions.	Assignment #2: some Python programming, file management + final project phase 1: Choose your topic, your group, start your page and your bios.	Assignment #1	
Week 3 Feb 16th	**Let's learn about data types and why they matter!** We will identify and assign data types to variables; and learn about the basics of programming such as variable assignments, attributes, methods(), lists, dictionaries, and if/else statements. Basic descriptive stats in pandas. We will continue learning about research design, data units, and research questions.	Assignment #3: Working with a DF. Get all data types for a DF. Histograms. Final project phase 2: Project significance, RQs and RHs.	Assignment #2 Final project phase 1	
Week 4 Feb 23rd	**Let's learn about data distribution!** Mean, median, variance, and standard deviation. Let's learn about histograms and plot histograms of some variables. Fundamentals of research questions.	Assignment #4 (major assignment): descriptive stats for a DF. Subset the table, run the descriptive stats again. Is the distribution normal?	Assignment #3	
Week 5 March 2nd	**Let's calculate quantiles!** Research hypothesis and null hypothesis. What are quantiles? We will use Numpy and Pandas to calculate quantiles. Reading Assignment #1 due.	Final Project Phase 3: literature review, interview with an expert, video clip	Final project phase 2	
Week 6 March 9th	**Let's relearn and talk about your projects!**	Assignment #5	Assignment #4	

	We will review and synthesize the previous topics and start the final project frameworks and guidelines.			
Week 7 March 16th	**What is a sample, what is a population? The law of large numbers!** We will learn what sampling methods are and whether samples are representative of the population.	Assignment 6 (major) Final project phase 4 (Visuals and descriptive stats)	Final Project phase 3	
Week 8 March 23rd	**Let's unwrap the T statistic; confidence intervals; and hypothesis-testing!** We will start learning about inferential statistics	Assignment #7	Assignment #5	
Week 9 March 30th	**Spring recess. Enjoy the beginning of Spring!**			
Week 10 April 6th	**More on hypothesis testing: what is the scientific method in social science?** We will learn about asking right and wrong questions in measuring social science phenomena.	Final project phase 5 (Methods and tools for the inferential statistics)	Assignment #6 Final project phase 4	
Week 11 April 13th	**Are these two correlated?** We will learn about correlation and how to measure and visualize it!		Assignment #7 + Final project phase 5	
Week 12 April 20th	**Let's build a regression!** We will build and interpret a simple linear regression.			
Week 13 April 27th	**We will continue working on regressions!** How to make sure our regression is a good one!	Assignment # 8 (major)		
Week 14 May 4th	**Let's work on your individual final projects!**		Final Project due	
Week 15 May 11th				
Week 16 May 18th	**Let's present what we learned!** Final project presentations		Assignment #8	
Week 17	**Final Project Report Due**			

Evaluation:

Students will be evaluated based on eight assignments (65%), and a final project (35%).

Attendance is essential for this course. To learn the concepts, procedures, and tools, students need to be active learners in the class. In case students miss a class, they need to study the class documents (handouts, readings, exercises, etc.). They also need to seek guidance from the instructor on how to catch up with the class progress. Some sessions will have a group in-class assignment that students will work together to implement tasks. In each session, following a demonstration of general concepts by the instructor, there will be an in-class activity guided by a handout.

Eight Assignments (65%)	Assignment #1	6%
	Assignment #2	6%
	Assignment #3	6%
	Assignment #4 (major)	11%
	Assignment #5	6%
	Assignment #6 (major)	12%
	Assignment #7	6%
	Assignment #8 (major)	12%
Final Project (35%)	Phase 1	2%
	Phase 2	2%
	Phase 3	2%
	Phase 4	2%
	Phase 5	2%
	Final submission	25%

Students will need to work on eight assignments throughout the semester. Assignments will have general guidance and depending on their complexity they may have different wights. The guidance will not be step by step but will provide a general path to implement procedures. Each assignment comes with a rubric to provide a detailed evaluation guideline.

The final project will be an essential component of the course. Students will need to design a project (with a research question), using a datasets (from a pool), propose appropriate methods/tools for implementing data analysis, and finally visualize and present the results. The final project guideline will be detailed, including a rubric for evaluation. The instructor will have one-on-one check-in sessions with individual students during office hours to guide the projects. Students need to carry out final projects individually. However, in special cases, if the project scope is extensive-enough, students can work in pairs.

Required Readings

There are two required books for this course:

- Field, A., Miles, J., & Field, Z. (2012). Discovering statistics using R. Sage publications.
- Salkind, N. J., & Frey, B. B. (2019). Statistics for people who (think they) hate statistics. Sage Publications, Incorporated.

Optional:

- Andrews, R. (2003). Research questions. Bloomsbury Publishing.

Academic Integrity

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

ADA Policy

In compliance with the ADA and with Section 504 of the Rehabilitation Act, Hunter College is committed to ensuring educational access and accommodations for all its registered students. Hunter College's students with disabilities and medical conditions are encouraged to register with the Office of AccessABILITY for assistance and accommodation. For information and appointment contact the Office of AccessABILITY located in Room E1214 or call (212) 772-4857 /or VRS (646) 755-3129.

Hunter College Policy on Sexual Misconduct

In compliance with the CUNY Policy on Sexual Misconduct, Hunter College reaffirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationships. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

a. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444).
b. All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry

(colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link:"

Camera and audio policy:

Please be aware that the instructor in this course will require that the camera be on during class sessions.

Recoding Zoom Meetings:

I am not planning to record the meetings. In case we decide to do so, I will get your consent, and everyone will be informed. The following policy is the standard language provided by the school:

Students who participate in this class with their camera on or use a profile image are agreeing to have their video or image recorded solely for the purpose of creating a record for students enrolled in the class to refer to, including those enrolled students who are unable to attend live. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live.

CUNY Policies

Online courses are subject to the same CUNY policies as are in-person courses regarding academic integrity, the acceptable use of computer resources, equal opportunity and non-discrimination, sexual misconduct, workplace violence, domestic violence, and reasonable accommodations for persons with disabilities.

CUNY Academic Integrity Policy: https://www.cuny.edu/about/administration/offices/legal-affairs/policiesprocedures/academic-integrity-policy/

CUNY Policy on Acceptable Use of Computer Resources: https://www.cuny.edu/wpcontent/uploads/sites/4/page-assets/about/administration/offices/cis/itpolicies/ComputerUsePolicy1.pdf

CUNY Policy on Acceptable Use of University Data in the Cloud: https://www.cuny.edu/wp-content/uploads/sites/4/pageassets/about/administration/offices/cis/information-security/security-policiesprocedures/Acceptable-Use-of-University-Data-in-the-Cloud-2019-8-19a.pdf

and related Data Classification Standard:

https://www.cuny.edu/wpcontent/uploads/sites/4/page-assets/about/administration/offices/cis/information-security/security-policiesprocedures/Data-Classification-Standard-CUNY-2019-8-19a.pdf

CUNY Intellectual Property Policy:

https://www.cuny.edu/wpcontent/uploads/sites/4/page-assets/about/administration/offices/legalaffairs/policies-procedures/Intellectual-Property-Policy.pdf

CUNY information on copyright:

https://www.cuny.edu/about/administration/offices/legal-affairs/intellectualproperty/copyright-materials/

CUNY Equal Opportunity and Non-Discrimination Policy:

https://www.cuny.edu/about/administration/offices/legal-affairs/policiesprocedures/equal-opportunity-and-non-discrimination-policy/

CUNY Policy on Sexual Misconduct:

http://www.cuny.edu/wpcontent/uploads/sites/4/page-assets/about/administration/offices/legalaffairs/policies-procedures/Sexual-Misconduct.pdf

CUNY Campus and Workplace Violence Prevention Policy:

https://www.cuny.edu/wp-content/uploads/sites/4/pageassets/about/administration/offices/legal-affairs/CUNY-Campus-and-WorkplaceViolence-Prevention-Policy-2.28.11-and-amended-9.26.2011.pdf

CUNY Domestic Violence and the Workplace Policy:

http://policy.cuny.edu/generalpolicy/article-v/#policy_5.061

CUNY Procedures for Implementing Reasonable Accommodations and Academic Adjustments:

https://www.cuny.edu/about/administration/offices/legalaffairs/policies-procedures/reasonable-accommodations-and-academicadjustments/