URPL-GP-1620
Spatial Analysis and Visualization
Fall 2022

Last updated September 6 2022

Course dates: September 12 - December 14, 2022

Class hours
Lecture: Mondays, 6:45 - 8:25p (online)
Labs: 8:35-10:15p
- Mondays (Oksana Mironova, online)
- Tuesdays (Lucy Block, in person – Silver Center, Room 404)
- Wednesdays (Patrick Spauster, online)

Contact info
Oksana Mironova, Co-instructor: om794@nyu.edu
Lucy Block, Co-instuctor: lucy.block@nyu.edu
Patrick Spauster, Teaching Assistant: ps4375@nyu.edu

Office Hours
Instructors will be available on Slack and Zoom to answer questions at the following times each week:
Oksana Mironova — Tuesdays, 9-10am
Lucy Block — Fridays, 9-10am
Patrick Spauster — Thursdays, 5-6pm; Sundays 11:30am-12:30pm

Students can reach out to instructors if needed for check-ins outside of lab and office hours.

Course Description
This course will train students in the sound application of spatial and non-spatial tools to clean, manipulate, analyze, map, and visualize data to support their work throughout their urban planning careers. The course emphasizes the critical role of communication, design, and storytelling in effective data analysis and visualization. Students will engage with multiple tools and techniques including Sheets, R, and QGIS. The course will help students build a foundation in working with data that will allow them to learn and master additional programs, languages, and tools toward future goals.

Objectives
1. Learn how to find and access data relevant to the planning realm and understand sources, metadata, and limitations

2. Build a skillset of modern tools and techniques to obtain, process, clean, manipulate, and aggregate raw data
3. Learn to visualize and communicate spatial and non-spatial data with purpose, gain insights, and tell stories with data
4. Prepare a comprehensive, data-driven analysis of an urban planning Issue that uses the tools and techniques learned in class.

Notes

- The course requires a computer (Mac, Windows, or Linux) that can handle data processing and has permissions to install software. Students will not be dependent on a computer lab to do their work. Please contact the course instructors as early as possible if this requirement poses any issue to you.
- Instructors will notify the class indicating what software should be installed prior to each lecture when necessary. Instructors will be available to assist if students encounter issues.
- All tools taught and demonstrated in the course will be either Free and Open Source Software (FOSS) or free-tier cloud services. This provides maximum potential for application of these skills during the student's time at Wagner and beyond.
- Students should give clear attribution and sourcing for all code and data, in assignments and the final project.

Class Format

Lecture

Lectures will include presentations of concepts and live technical demonstrations and coding. Students are encouraged not to follow along line-by-line with live coding during the lecture, and to wait for the lab to try things out. Lectures will build on previous material and become more technical as the semester progresses. Lectures will be recorded via Zoom. If students cannot attend a lecture, they should contact their instructor to let them know as early as possible and watch the recording before the following class. The instructors will publish all code created during class, which students can use to review concepts, or modify for their own use. The lecture section of class is co-taught by your instructors Lucy Block and Oksana Mironova.

Lab

Labs provide time for students to try out the tools and skills covered in the lecture with help close-by from the instructors. Labs may also be used to review and discuss assignment expectations. Periodically, labs will be used for "peer review" for students to offer feedback on each other's work. Each lab will be run by one instructor, who will also grade your assignments.

Assignments

There will be three assignments graded on a 10-point scale and in total worth 30% of the final grade. The assignments will be based on the techniques and tools covered in class, but allow for flexibility depending on the student's interest and skill level. Rule of thumb: "Make it your own". Shared code and resources are abundant online. Re-using shared code is encouraged, but students should modify it to suit their needs and demonstrate proficiency and understanding of the concepts.

Class Notes
The instructors will use a google doc during each session to keep track of class Zoom recordings, as well as any other relevant notes, links, code snippets and other resources for students to reference. Students are encouraged to participate in the note-taking for the benefit of themselves and the entire class.

Slack
A Slack workspace will be the main mode of communication throughout the class. Students are expected to check Slack regularly for class announcements and important information. Instructors and students will use Slack to share code snippets, examples, links, and other resources. Students are encouraged to ask questions in the #general channel, share their work, and help each other if possible. Do not direct message the instructors with technical questions. Ask questions in the #general channel, so everyone can benefit from the exchange.

Brightspace
Brightspace will be used only for assignment submission and for grading.

Class Schedule

The class schedule is divided into three units, covering Intro to Data Analysis, R, and QGIS. Note that class topics and schedule are subject to change based on our progress and needs identified during the semester.

Unit 1: Intro to Data Analysis
Unit 1 will introduce students to the topics of data analysis, data visualization, and data storytelling. We will use Google Sheets in class, though everything we learn will be easily translatable to Excel.

>*September 5 - Labor Day,* **no lecture, no labs**
>**September 12 - Class 1** - Data uses and sources, data types & formats, research with purpose, data storytelling
>**September 19 - Class 2** - Data cleaning, manipulation, aggregation, and pivot tables
>**September 26 - Class 3** - Documenting your work, intro to visualization

Unit 2: R
Students will be introduced to the R language using RStudio and will explore tidyverse and other packages available to help clean data, create visualizations, and share their work online.

>**October 3 - Class 4** - R, RStudio, tidyverse, basic manipulation
>**October 11 (Tuesday) - Class 5** - Data manipulation and aggregation in R
>- Assignment 1 due
>- October 10 is Indigenous Peoples Day, so Monday's lecture and lab (Section 1) meets on Tuesday instead. Students in the Tuesday lab (Section 2) can *optionally* attend an online lab on Tuesday or Wednesday that week.
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>**October 17 - Class 6** - Joins, pivots, and ggplot2
>**October 24 - Class 7** - ggplot2 continued, APIs, and Census data
>**October 31 - Class 8** - Data visualization continued, Datawrapper, and custom styling

Unit 3: QGIS
The QGIS unit will focus on spatial data, and creating useful and compelling static maps. Students will learn GIS basics, and will be able to create maps from spatial data, build their own spatial datasets, conduct light spatial analysis, and learn the fundamentals of map design.

>**November 7 - Class 9** - Intro to spatial analysis in QGIS
>- Assignment 2 due
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>**November 14 - Class 10** - Census data, joins, spatial analysis
>**November 21 - Class 11** - Geocoding and more advanced spatial analysis
>- Assignment 3 due
>- Wednesday November 23 is Fall break. Students in the Wednesday lab (Section 3) can *optionally* attend a Monday or Tuesday lab that week if they wish.
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>**November 28 - Class 12 -** QGIS, flex
>**December 5 - Class 13 -** QGIS, flex
>
>**December 12 - Class 14 -** Lecture: closing, flex
>   **Final Presentations:**
>- Students will give their final presentations in their assigned **lab section** the week of December 12 (on December 12, 13, or 14).
>- The final project is due by the start of your lab section.

Evaluation

Participation
The participation grade will be based on the student's engagement on the course Slack workspace and active engagement during lectures, lab and peer review sessions with fellow students. There are many opportunities to ask for help, to help others, or to share tips, tricks, and best practices. Students are encouraged to share articles, visualizations, maps, tools, and anything else relevant to the course material to facilitate discourse.

Assignments
The three assignments are spread across the three main blocks of instruction. Assignments 1 and 2 will require demonstration of data analysis, visualization, and communication concepts covered in class, and students are encouraged to choose subjects and data sources that interest them. Assignment 3 will focus on preparing for the final project. Assignments will be graded on a 10 point scale and account for 30% of the student's final grade.

Final Project
The final project will consist of a blog and presentation that tells a data story about an urban planning-related topic of your choosing, making use of the tools and techniques learned in class. The final project will require both technical analysis and effective communication techniques. The analysis will contextualize and pose a clear research question, demonstrate analysis methods, visualize and communicate findings, and provide interpretation of the results. Projects must also include thorough documentation that allows others to follow and replicate the analysis. Students may work alone or in teams of two or three. Each team must give a presentation of their project in their final lab session.

Grading Breakdown
Students will be graded by their assigned lab instructor. If students choose to do their final project in a group with students from another section, their final project may be graded by that instructor instead.
- Participation: 20%
- Assignments: 30% (3 assignments, 10% each)
- Final Project: 50%
    - 10% - In-class presentation
    - 40% - Blog post and supporting documents

Attendance
If you know you need to miss a lecture or lab, communicate with your instructor in advance so you can stay on track with course work. If you miss lectures or labs without communicating in advance with your instructor, it may impact your participation grade.

Late Assignments
Communicate with your instructor if you anticipate needing more time to complete an assignment. If in doubt, get in touch. If we hear from you, we can accommodate your needs and figure out a plan with you. Late submission without advance communication will result in a 10% reduction in your grade for that assignment if submitted before the following assignment is due and 25% reduction if submitted after the following assignment is due.

Extra Credit
Some lab sessions may involve a small assignment or activity that builds on the skills covered in lecture. While students are not required to complete these activities, students will have the opportunity to submit their completed work for 0.5 points of extra credit per assignment.

Additional Notes

Academic Integrity

Academic integrity is a vital component of Wagner and NYU. Each student is required to sign and abide by Wagner's Academic Code. Plagiarism of any form will not be tolerated since you have all signed an Academic Oath and are bound by the academic code of the school. Every student is expected to maintain academic integrity. If you are unsure about what is expected of you should **ask**.

Accommodations for Students with Disabilities
Academic accommodations are available for students with disabilities. Please visit the Moses Center for Students with Disabilities (CSD) website at www.nyu.edu/csd and click on the Reasonable Accommodations and How to Register tab or call or email CSD at (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodations are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

Religious Holidays
NYU's Calendar Policy on Religious Holidays states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations.