



CUSP-GX-6006.001: Data Visualization

SPRING 2018

Lectures: Thursday, 5:30pm – 8:20pm

Location: 2 MTC, Room 820

Instructor:

Huy T. Vo, NYU-CUSP & CUNY-CCNY

huy.vo@nyu.edu

Office Hours: Monday, 3pm – 6pm @ 370 Jay St, 12th Floor, Room 1226

Course Assistant:

Kush Rajanbhai Shah

ks4437@nyu.edu

Office Hours: Wednesday, 10am-12pm @ 370 Jay St, 12th Floor, Room 1235 – Abu Dhabi Meeting Room

Course Description

Visualization and visual analytics systems help people explore and explain data by allowing the creation of both static and interactive visual representations. A basic premise of visualization is that visual information can be processed at a much higher rate than raw numbers and text. Well-designed visualizations substitute perception for cognition, freeing up limited cognitive/memory resources for higher-level problems. This course aims to provide a broad understanding of the principals and designs behind data visualization. General topics include state-of-the-art techniques in both information visualization and scientific visualization, and the design of interactive/web-based visualization systems. Hands on experience will be provided through popular frameworks such as matplotlib, VTK and D3.js.

Prerequisites

Basic knowledge of data analysis, computing algorithms, and programming

Course Objectives

- Understand the value of visualization
- Understand the capabilities of different techniques in InfoVis and SciVis
- Understand the principal of interactive visualization
- Gain knowledge in building interactive visualization systems

Required Text

Visualization Analysis and Design (AK Peters Visualization Series, CRC Press, Nov. 2014) by Tamara Munzner
Interactive Data Visualization for the Web, 2nd Edition (O'Reilly, Aug. 2012) by Scott Murray

Supplemental and copyrighted materials will be posted on NYU Classes and/or distributed in class.

Course Requirements



Each class session is divided into a 60-70-minute lecture and a hands-on lab for the rest of the time. Please bring your laptops to all class lectures. Class participation are recorded through lab submission. Programming assignments will be given bi-weekly to assess the ability in creating effective visualizations. This course uses Python as the main programming language for interacting with matplotlib and VTK. For web-based visualizations, we will be using JavaScript. There will be a session to introduce and/or refresh the knowledge of JavaScript. However, it is strongly suggested that the students to get familiar with JavaScript on their own, as early as possible in the class.

All assignments should be submitted via NYU Classes (unless otherwise noted). Please refrain from posting your work (assignments and projects) onto public spaces such as *github*. If you must do so, please only do it after the deadline or with access control.

There will be a mid-term exam but no finals, however, there will be a final project consisting of two parts: a project proposal, and a final presentation. Final projects need to use data visualization techniques learned in this class for addressing practical problems in urban science. Ideally, the outcome of your project should contain sufficient materials and contributions for a poster.

Grading

All requirements must be completed by the date specified and handed in at the beginning of class or they will not be counted toward the final grade. No late assignments will be accepted.

- Assignments – 40%
- Mid-term – 20%
- Final Project – 30%
- Class participation and attendance – 10%

NYU Classes

You must have access to the NYU Classes site (<http://newclasses.nyu.edu/>). All announcements and class-related documents (supplemental and suggested readings, discussion questions, etc.) will be posted there. Some class announcements will be distributed via NYU e-mail. Thus, it is important that you actively use your NYU email account, or have appropriate forwarding set up on NYU Home (<https://home.nyu.edu/>).

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.

Tentative Course Outline (subject to change)

| Week/Date | Topic | Assignment | |
|------------|--|------------|----------|
| | | Out | Due |
| W. 1 1/25 | Introduction and Class Overview | | |
| W. 2 2/01 | Data and Task Abstractions | | |
| W. 3 2/08 | Validation, JavaScript and D3.js | HW 1 | |
| W. 4 2/15 | Perception, Marks and Channel – <i>Lab : D3.js</i> | | |
| W. 5 2/22 | Tabular Data & Elementary Plotting Techniques | | HW 1 |
| W. 6 3/01 | Spatial Data | HW 2 | |
| W. 7 3/08 | Network/Graph Data | | |
| W. 8 3/15 | <i>NO CLASS: Spring Recess</i> | | |
| W. 9 3/22 | Mapping Color | HW 3 | HW 2 |
| W. 10 3/29 | Multiple Views, Facet, and Interaction | | |
| W. 11 4/05 | MIDTERM EXAM | | |
| W. 12 4/12 | Interactive Visualization Systems | HW 4 | HW 3 |
| W. 13 4/19 | PRESENTATION: Project Proposal | | Proposal |
| W. 14 4/26 | Intro to SciVis | | |
| W. 15 5/03 | Design Study Methodologies | | HW 4 |
| W. 16 5/10 | PRESENTATION: Final Project | | Report |