New York University Tandon School of Engineering
Computer Science and Engineering
Course Outline CS-GY 6323 Visual Analytics
SPRING 2020
Professor Enrico Bertini
Thu 3:20-5:50pm
Room JAB775

Contacts:
enrico.bertini@nyu.edu
370 Jay, Rm 1154
Phone: 646 997 3731
Office hours: Thu 6:00 pm, or by appointment on Fri

TABLE OF CONTENTS

Course Prerequisites

Students taking this course have to have basic programming skills. Having taken other data analysis or statistics courses is a plus but not requested. It is suggested to take this course in combination with the Information Visualization course.

Course Description

Being able to extract insights from large quantities of heterogeneous data has become one of the biggest opportunities and challenges of our time. Which so much information collected and stored in digital form the biggest bottleneck has become how to help people reason with data effectively. Visual Analytics is the science that studies how to enable effective analytical reasoning based on data and interactive visual interfaces.

The course is an introduction to the problems addressed by Visual Analytics and the solutions it provides. We will cover the following broad areas of investigation.

- **Analytical reasoning:** how people reason with data.
- **Data processing and model building:** how data can be transformed to extract the information needed to solve a problem.
- **Visual representation and interaction:** how to build effective interactive visual interfaces to help people solve problems with data.
- **Presentation and dissemination:** how to communicate the results of the analysis effectively.

The course includes several data analysis and visualization design exercises, readings of several research papers and the development of a major project to develop in a team of 2-3 students.

Course Objectives

- Identify the kind of problems visual analytics can solve
- Develop analytical questions for a data analysis problem and develop appropriate data manipulations and graphs to answer them
- Describe how the exploratory data analysis process works and its cognitive underpinnings
- Perform exploratory data analysis and avoid major fallacies of analysis and interpretation
- Design develop and evaluate effective visual interfaces to analyze tabular, textual, temporal, and spatial data
- Use appropriate data transformation methods to enable data analysis of complex, large and heterogeneous data sets
- Identify appropriate ways to couple automated data transformation and modeling methods with interactive user interfaces and visualizations
- Evaluate visual analytics systems in terms of their efficacy in supporting identified goals and needs

Course Structure

The course includes lectures, practical work in class, readings, exercises, and visual analytics design and development projects.

Textbooks

There is no required texts. However the following books are those that contain most of the information taught in the course:

- J. J. Thomas and K. A. Cook. Illuminating the Path: The Research and Development Agenda for Visual Analytics. IEEE Computer Society, 2005. (freely available here: http://vis.pnnl.gov/pdf/RD_Agenda_VisualAnalytics.pdf)

Other recommended texts are:

- Readings in Information Visualization, Stuart K. Card, Jock Mackinlay, Ben Shneiderman, Morgan Kaufmann, 1999.
- Tamara Munzner, Visualization Analysis and Design, CRC Press, 2014.
- (http://www.cs.ubc.ca/~tmm/vadbook/)
- Daniel Keim, Jörn Kohlhammer, Geoffrey Ellis and Florian Mansmann, Mastering the Information Age: Solving Problems with Visual Analytics, Eurographics Press, 2010. (freely available here: http://www.vismaster.eu/wp-content/uploads/2010/11/VisMaster-book-lowres.pdf)

You can find the books on Amazon, at the NYU bookstore, and at the Dibner Library.

Course requirements

The course requires:

- Participation: full attendance of weekly classes;
- Homework: submission of all homework (see details below);
- Final Project

Grading breakdown:

- Participation: 10%
- Homework: 30%
- Projects: 60%

Attendance

The course requires full attendance of classes for the face to face section of the course and virtual meetings for the online section. Attendance counts as 10% of the final grade (10 points out of 100). Missed meetings result in reduction of attendance points as follows:

Missed Classes	Pt. reduction
1, 2	0
3, 4, 5	3, 4, 5
6 or more	10

For special situations such as sickness, religious festivities, problems with transport, no attendance points will be removed as long as you send your instructor a note via email **before** the class starts. Attendance will be recorded at the beginning or end of each meeting every week.

Homework

The course includes three different types of homework:

- **Readings.** To solidify, expand, and deepen the knowledge acquired in class.
- **Data analysis assignments.** To train your data analysis skills on relevant visual analytics problems.

Grading policy

Late and no submission policy:

Late	Pt. deducted
1 day	0.5
2-7 days	1
Above 7 days	2
No submission	10

Important note on “due dates”: it is your responsibility to check that you understand when a given assignment is due. It is never a good justification to say: “*I made a mistake and thought the submission was due ...*”. Keep in mind that 12pm is actually noon in the afternoon, not midnight!

Projects

There are two types of projects: analysis-oriented and application oriented.

- **Analysis-oriented:** focus on analyzing data for a non-trivial problem and reporting the results effectively through a dashboard.
- **Application-oriented:** focus on developing an application to analyze a specific type of data for a specific problem.

Midterm Tests

There is no midterm exam for this course.

Schedule

This is the tentative schedule for the course. Note that the schedule may change to adapt to specific needs of the class.

1/30/2020	Introduction to Visual Analytics
2/6/2020	Exploratory Data Analysis
2/13/2020	Cognitive Models
2/20/2020	Visual Representations
2/27/2020	Data Representation and Transformation
3/5/2020	Interaction
3/12/2020	High Dimensional
3/19/2020	Spring Break
3/26/2020	Text and Language
4/2/2020	Temporal
4/9/2020	Spatial (and Spatio-Temporal)
4/16/2020	Networks
4/23/2020	Multimedia
4/30/2020	Dissemination and Presentation
5/7/2020	Evaluation

Quoting Policy and Collaboration

The work students submit for individual assignments and class projects must be their own original work. When ideas are borrowed from existing work it is necessary to provide citations and a clear statement that describes which part has been adopted and which is original. For homework students are NOT allowed to collaborate with their peers. The submitted homework must be produced and submitted individually.

Academic Dishonesty

It's always annoying having to explain that copying work or cheating is not allowed. I like to totally trust each and everyone of you. But bad things happen and I have to warn you that academic dishonesty is a very serious thing and you might get in very serious trouble if caught cheating. Students caught in dishonest behavior get an F score for the course and are reported to the school.

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.