Course Prerequisites

Course Outline CS-GY 6323 Visual Analytics
SPRING 2020
Professor Enrico Bertini
Thu 3:20-5:50pm
Room JAB775

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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. With 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:


Other recommended texts are:

- (http://www.cs.ubc.ca/~tmm/vadbook/)

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:

<table>
<thead>
<tr>
<th>Missed Classes</th>
<th>Pt. reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>0</td>
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<tr>
<td>3, 4, 5</td>
<td>3, 4, 5</td>
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<tr>
<td>6 or more</td>
<td>10</td>
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</tbody>
</table>

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:**

<table>
<thead>
<tr>
<th>Late</th>
<th>Pt. deducted</th>
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</thead>
<tbody>
<tr>
<td>1 day</td>
<td>0.5</td>
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<tr>
<td>2-7 days</td>
<td>1</td>
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<tr>
<td>Above 7 days</td>
<td>2</td>
</tr>
<tr>
<td>No submission</td>
<td>10</td>
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</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1/30/2020</td>
<td>Introduction to Visual Analytics</td>
</tr>
<tr>
<td>2/6/2020</td>
<td>Exploratory Data Analysis</td>
</tr>
<tr>
<td>2/13/2020</td>
<td>Cognitive Models</td>
</tr>
<tr>
<td>2/20/2020</td>
<td>Visual Representations</td>
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<td>2/27/2020</td>
<td>Data Representation and Transformation</td>
</tr>
<tr>
<td>3/5/2020</td>
<td>Interaction</td>
</tr>
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<td>3/12/2020</td>
<td>High Dimensional</td>
</tr>
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<td>3/19/2020</td>
<td>Spring Break</td>
</tr>
<tr>
<td>3/26/2020</td>
<td>Text and Language</td>
</tr>
<tr>
<td>4/2/2020</td>
<td>Temporal</td>
</tr>
<tr>
<td>4/9/2020</td>
<td>Spatial (and Spatio-Temporal)</td>
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<tr>
<td>4/16/2020</td>
<td>Networks</td>
</tr>
<tr>
<td>4/23/2020</td>
<td>Multimedia</td>
</tr>
<tr>
<td>4/30/2020</td>
<td>Dissemination and Presentation</td>
</tr>
<tr>
<td>5/7/2020</td>
<td>Evaluation</td>
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</tbody>
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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 mosecsd@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.