201703_Visualization of Complex Data_DATS_6401_11

Fall Semester, 2017

Course Time: 6.10 PM – 8.40 PM

Course Place: Duques Hall and Funger Hall 2201 G Street NW Room 359

Course Web Site: http://blackboard.gwu.edu

Instructor: Chris Mathew

Office: Duques Hall and Funger Hall 2201 G Street NW Room 359

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Office hours: 5.30 to 6 PM

Synopsis

This course is a practical approach to data visualization using both popular visualization programming languages as well as using visualization tools used by the industry. Students will learn about the exploratory data analysis, information design, interactive data visualization, communicate information clearly and efficiently via statistical graphics, plots and information graphics.
This course will cover how to use the programming language **D3.js, SVG** to make complex visualizations. We will also learn about required web technologies like **JavaScript, Html5, Css, Angularjs, Nodejs** to make the visualization more interactive and interact with databases.
This course will cover how to use visualization tools like **Tableau, HighCharts** to make visualizations and charts.

Program Prerequisites

- STAT 1051 _or_ STAT 1053 or equivalent -- Introduction to Statistics
- Knowledge of web programming languages like html5, JavaScript, Css.
- Knowledge of database technologies like MySQL.

Visualization of Complex Data

Schedule of Classes

A preliminary schedule of topics for this course is shown in the table below.

Week	Dates	Topics
1	08/30/2017	Overview of visualization, overview of all the courses, go over the tableau interface.
2	09/06/2017	Visualization design, data types, chart types, make 10 different charts, filters with tableau, map, calculations, dashboard.
3	09/13/2017	Tableau with different datasets, Introduction to Html5, CSS, JavaScript and JS Frameworks.
4	09/20/2017	Introduction to SVG, Canvas, Introduction to D3.js, D3.js APIs
5	09/27/2017	D3.js Scales, Line Charts, Multiple Line Chart, Bar Charts, Column Charts
6	10/04/2017	D3.js Stacked chart, Grouped chart, Pie chart, Donut chart
7	10/11/2017	D3.js Layouts, Transitions, Events, Scatter plot charts, Bubble charts
8	10/18/2017	D3.js Maps with GeoJSON, TopoJSON
9	10/25/2017	Introduction to HighCharts, Make charts with HighCharts
10	11/01/2017	Introduction to NodeJs, AngularJs, MySQL
11	11/08/2017	Using Node.js and AngularJs, with D3.js for visualization
12	11/15/2017	Using Node.js and AngularJs, with D3.js and connecting to MySQL for visualization
13	11/29/2017	Other emerging visualization frameworks

14	**12/06/2017**	**Online application with HighCharts, D3.js with transition, events**

Course Overview

Course Description

Students in Visualization of Complex Data will develop skills and knowledge in the latest techniques in data visualization and its role in the field of data science.

This course focuses on fundamentals of data visualization, including practical aspects such as data modeling, graphics, representation methods, and implementations using tools such D3.js, tableau, and high charts.

Learning Objectives

1) To be able to explain and discuss the field of data visualization and its role in data science
2) To acquire meaningful knowledge and skills relevant to current and anticipated career paths in data science
3) To be able to analyze and interpret research and technology articles in data visualization.
4) To be able to apply basic methods and techniques to practical problems in data visualization.
5) To choose an area of personal and career interest for doing a substantial data visualization project.

Required textbooks, materials, and recommended readings:

Tableau

- Visualizing Data by Ben Fry (oreilly)
- Creating data stories with tableau public by Ashley Ohmann

D3.js

- D3.js in Action - Elijah Meeks
- D3 Tips and Tricks - Malcolm Maclean
- Learning D3.js data Visualization - Andrew Rininsland
- https://d3js.org/

HighCharts

- http://www.highcharts.com/

JavaScript/Html/CSS/SVG

- http://www.w3schools.com/

Nodejs

- https://nodejs.org/en/
- Node Cookbook - David Mark Clements

AngularJS

- http://www.w3schools.com/angular/default.asp
- https://angularjs.org/

SQL

- http://www.w3schools.com/sql/default.asp

Course Format

This course will be taught in a highly collaborative mode, where students work together in groups on a variety of classroom activities. The nature of the collaborative class is such that it is critically important

that you come to class prepared to work on the material each day. It is expected that you will have read the recommended resources before each class, and we will spend our class time supplementing the ideas in the assignments and applying them to questions and problems that you will work on in class.

Course Structure

Class time: We will *not* be spending time repeating what is presented in the recommended readings. That would not be a good use of your time since the material can (and will be expected to) be covered by you before class. It is essential that you have read the material ahead of time in order to get the most out of our in-class activities. Class time will generally be spent discussing and working on things related to the material, which should in turn help you to obtain a better and deeper understanding of the underlying ideas and issues. The class time is when we have the best opportunity for extensive interaction. You are strongly encouraged to ask questions and initiate discussions in class at all times. You will be working in your groups during class, as well as outside of class, so it is important that your group functions smoothly.

Class assignments (20%): There will be assignments throughout the semester. The nature of these assignments will vary depending upon what we are doing in class at the time.
Quizzes and Exams (30%): There will be lot of quizzes to assess learning and make sure students are keeping up with the progress of the class.
Individual Project (50%): There will be a **midterm** and **final projects** to access learning.

In order to foster cooperation and collaboration among as many of you as possible, *the course will be graded on an absolute scale*. This means that helping your fellow student does not in any way jeopardize your own grade, and in fact, is likely to help you, since explaining things to others will help you understand things better. The grading scale is as follows:

100.0 - 93.00	A
90.0 – 92.00	A-
87.0 - 89.00	B+
83.0 - 86.00	B
80.0 - 82.00	B-

Learning outcomes:

As a result of completing this course, students will be able to

- Able to analyze data and tell stories using visualization techniques.
- Become expert in using visualization tools like Tableau
- Become proficient in hybrid visualization tools like HighCharts.
- Become proficient in visualization programming languages like D3.js.
- Become skilled in web technologies like html5, css, JavaScript, nodejs.

University policies:

Average minimum amount of out-of-class or independent learning expected per week: 5 hours of independent learning per week

University policy on observance of religious holidays

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: students.gwu.edu/accommodations-religious-holidays.

Academic integrity code

Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For details and complete code, see: studentconduct.gwu.edu/code-academic-integrity

Safety and security

In the case of an emergency, if possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

Support for students outside the classroom

Disability Support Services (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: disabilitysupport.gwu.edu/

Mental Health Services 202-994-5300

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information see: counselingcenter.gwu.edu/