Syllabus:
CS 5390/4390 Fall 2014: Data Visualization

Instructor:
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Teaching assistant:
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Class time and location:
MW 12:00-1:20pm, CCSB 1.0510

Course website: http://svmoore.pbworks.com/

Course description: The goal of this course is to develop a broad understanding of the principles, methods, and techniques for designing effective visualizations of data. The course will encompass foundations for both spatial data (e.g., gridded data from simulations and measurement devices) and nonspatial data (e.g. graphs, text, high-dimensional tabular data), as well as theories of visualization design. You will gain experience in using cutting-edge data analysis systems, as well as in developing your own interactive visualization tools.

Prerequisites: The prerequisites for this class are matrix algebra and calculus, as well as some programming experience. If you are unsure please see me. Graduate students from other departments with the appropriate background are welcome.

Textbooks:
Visualization Design and Analysis: Abstractions, Principles, and Methods, by Tamara Munzner, AK Peters (to appear 2014). Pre-publication draft available at http://www.cs.ubc.ca/~tmm/courses/533/book/vispmp-draft.pdf .

Visual Thinking for Design, by Colin Ware, Morgan Kaufman, 2008.

Visualizing Data: Exploring and Explaining Data with the Processing Environment, by Ben Fry, O'Reilly, 2007.

Data Visualization: Principles and Practice, Second Edition, by Alexandru C. Telea, CRC Press, 2015.

The ParaView Tutorial, Version 4.1, by Kenneth Moreland, Sandia National Lab, 2013.
http://www.paraview.org/Wiki/The_ParaView_Tutorial

Learning outcomes:
After successfully completing this course, students should be able to

- Select an appropriate technique to visualize a given data set
- Follow sound design principles in implementing a visualization
- Critique and evaluate a data visualization
- Apply computer graphics principles to data visualization
- Use state-of-the art data visualization software packages effectively
- Develop interactive visualizations

Course topics:
The following is a list of topics to be discussed. The exact schedule may vary depending on previous background of class participants. Although the instructor will do some lecturing, we will try to use a "flipped classroom" format to some extent that will require reading and preparation by class participants prior to class and involve group work during class.

- Visual design principles
- Data abstractions
- Filtering and aggregation
- Visual encoding
- Visual perception
- Use of color
- Graphics principles (3D graphics, isosurfaces, etc.)
- Animation
- Interaction
- Visualization software
- Applications
    - Scientific simulations
    - Flow visualization
    - Tabular data visualization
    - Graph visualization
    - Text and document visualization

Assignment, exams, and grading:
There will be approximately six homework and lab assignments, some of which will involve programming. There will be one exam, to be given approximately 2/3 of the way through the course, and a term project. There will be an extra problem on the midterm exam for graduate students that will be optional/extra credit for undergraduates. Some homework assignments will also have an extra problem for graduate students. Graduate students will also be expected to do a more challenging project. Your lowest homework grade will be dropped. The grading breakdown will be approximately as follows:

Homework and labs	35%
Class preparation and participation	15%
Course exam	25%
Course project	25%

Course project:
The course project will consist of:
1. an implementation of a visualization for a significant data set
2. a report describing the background for the visualization and design decisions for the implementation
3. a presentation during the final exam period describing and demonstrating your visualization

The specific dataset can be of your choosing but you must have your topic pre-approved by the instructor. Suggested datasets will also be provided by the instructor. You may work individually on the project or in teams of up to three people. In the case of group work, you must clearly document the contributions of each team member and carry out the amount and difficulty of work proportional to the size of your team.

Make-up assignments and exam:
If you are unable to attend the exam or to turn in a homework assignment on time due to a legitimate reason, such as a health problem or accident or pressing family matter, you will be allowed to make up the relevant exam or assignment.

Accommodations for Students with Disabilities:
If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

Academic Honesty Policy:
Make sure you understand the UTEP academic honesty policy. Students are encouraged to share ideas, but you must do your own homework and you must write your own code for the labs and projects (you may copy code that is on the course website). If homework or program code is suspected of being duplicated or copied, you will receive an incomplete for the assignment, and your case will be referred to the Dean of Students for adjudication. If the instructor has reason to believe that you have cheated on a quiz or exam, your case will be referred to the Dean of Students for adjudication.