

CSCE 590 – Data Visualization (Spring 2016)

Instructor: Dr. Gabriel Terejanu (Dr. T)

Time: TBA

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Location: TBA

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Office Hours: TBA

Course Objective

The course introduces key design principles and techniques for data visualization. The major goal of this course is to introduce a unified framework to data visualization and a set of specific guidelines based on mechanisms of perception to facilitate the design of effective visualizations. This framework allows one to reason about similarities and differences between two visualization tasks. After successful completion of this course, students will be able to create effective visualizations using a structured approach, evaluate and improve visualizations, create interactive web-based visualizations, and use storytelling principles for effective communications.

Prerequisite

Students should have basic knowledge in linear algebra and probability theory, and be able to program using a high-level language such as Python, R and Matlab to complete homework assignments.

Primary Textbook

Tamara Munzner. *Visualization Analysis and Design*. CRC Press, 2014

Additional Recommended Books

1. Colin Ware. *Information Visualization: Perception for Design*. Morgan Kaufmann, 2013
2. Matthew O. Ward, Georges Grinstein, Daniel Keim. *Interactive Data Visualization: Foundations, Techniques, and Applications*. CRC Press, 2015, 2nd edition

Lecture Notes/Assignments/Readings

Lecture notes, homework assignments and additional material will be available at blackboard.sc.edu. You will be responsible for downloading them to prepare for class and complete assignments.

Student Work and Grading

1. (30%) Homework assignments
2. (20%) Midterm project presentation – peer evaluation
3. (20%) Final project presentation – peer evaluation
4. (20%) Final project report
5. (10%) Attendance and participation

Difference between Undergraduate, Honors, and Graduate Work

Graduate and honors students are assigned additional problems in homework assignments and additional requirements for their class project.

Grades

A (90-100%), B+ (85-90%), B (80-85%), C+ (75-80%), C (70-75%), D+ (65-70%), D (60-65%), F (0-60%)

Tentative Schedule

- Week 1 Foundations of Data Visualization (human visual perception). Visualization Aspects (exploration, interactivity, effectiveness). Analysis Framework (what data, why use visualization, how to construct visual encodings and interactions). Hands on: introduction to Tableau.
- Week 2 Data Abstraction. Data types (items, attributes, links, position, grids). Dataset types (tables, network, grids, geometry). Hands on: introduction to IPython and plotly.
- Week 3 Task Abstraction. Why use visualization in terms of actions (analyze, search, query) and targets (trends, outliers, features). Comparing two idioms. Hands on: simple statistics.
- Week 4 Validation. How to create effective visualizations. Validations approaches and examples.
- Week 5 Marks and Channels. Building blocks for analyzing visual encodings. Expressiveness and effectiveness principle. Relative versus absolute judgments.
- Week 6 Rules of Thumb. Advice and guidelines for effective data visualization.
- Week 7 Tables. How to arrange tabular data spatially (scatterplots, bar charts, stream graphs, heat maps, parallel layouts, radial layouts).
- Week 8 Midterm Proposal Presentations**
- Week 9 Spatial Data (scalar fields, vector fields, tensor fields) and Networks (connection versus matrix view, hierarchy marks).
- Week 10 Color (effective color maps) and Multiple Views (linked views, superimpose layers).
- Week 11 Interaction and Data Quality. *Research Directions in Data Wrangling* by Kandel et al.
- Week 12-13 Visualizing High Dimensional Data. Dimensionality Reduction and Clustering.
- Week 14 *Storytelling: The Next Step for Visualization* by Kosara and Mackinlay.
- Week 15 Final Presentations and Reports**

Academic Integrity

Homework assignments are expected to be the sole effort of the student submitting the work. Students are expected to follow the Code of Student Academic Responsibility. Every instance of a suspected violation will be reported. Students found guilty of violations of the Code will receive the grade of F for the course in addition to whatever disciplinary sanctions are applied.